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The Impact of Household Food Gardens on Food Security in South Africa, Lesotho and Zimbabwe

Michelle Shannon Fouché

Dissertation submitted in fulfilment of the requirements for the degree

Magister Scientiae:

Dietetics

Department of Nutrition and Dietetics

University of the Free State

Supervisor: Prof CM Walsh

Bloemfontein

January 2018

DECLARATION WITH REGARD TO INDEPENDENT WORK

I, Michelle Shannon Fouché, identity number 8907101472189 and student number 2007028752, do hereby declare that this research project submitted to the University of the Free State for the degree MAGISTER SCIENTIAE: Impact of food gardens on Food Security in South Africa, Lesotho and Zimbabwe, is my own work, and has not been submitted before to any institution by myself or any other person in fulfilment of the requirements for the attainment of any qualification. I further cede copyright of this research in favour of the University of the Free State.

M. S. Fouché

SIGNATURE OF STUDENT

31 January 2018

DATE

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LIST OF ABBREVIATIONS

BBC	British Broadcasting Corporation
HIV	Human Immunodeficiency Virus
AIDS	Acquired Immune Deficiency Syndrome
FAO	Food and Agriculture Organisation
WHO	World Health Organisation
UNICEF	United Nations Children's Fund
SANHANES	South African National Health and Nutrition Examination Survey
WFP	World Food Program
SADC	Southern African Development Community
BHASO	Batani HIV/AIDS Service Organisation
SWAALES	Society of Women against AIDS in Africa
HDD	Household Dietary Diversity
DD	Dietary Diversity
LPI	Living Poverty Index
MAHFP	Months of Adequate Household Food Provisioning
AFSUN	African Food Security Urban Network
UNMP	United Nations Millennium Project
FCS	Food Consumption Scale
HFIAS	Household Food Insecurity Access Scale
CCHIP	Community Childhood Hunger Identification Project
NFCS	National Food Consumption Survey
SSA	Statistics South Africa
FNCO	Food and Nutrition Coordinating Office
DoA	Department of Agriculture

LDHS	Lesotho Demographic and Health Survey

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A. SADC Household Food Garden Census Form

B. Consent form

C. Information Document

D. SADC Questionnaire

E. Approval – Health Sciences Research Ethics Committee

F. Household Food Gardening programme (Lima)

SUMMARY

Food insecurity is a challenge faced by many in the developing world, where more and more individuals are finding healthy food inaccessible due to poverty. The triple burden of malnutrition includes undernutrition (underweight, stunting and wasting); overnutrition (overweight and obesity); and micronutrient deficiencies. These may coexist in the same household. Although it is well accepted that household food gardens have the potential to address the various forms of malnutrition, studies to confirm their impact are lacking.

In the present study, a pre- and post- test study design was applied to determine the impact of household vegetable gardening interventions in South Africa, Lesotho and Zimbabwe. In each country the household food gardening intervention was implemented by a different organisation, including The Department of Agriculture in South Africa, the Society of Women against AIDS in Africa (SWAALES) in Lesotho and Batani HIV/AIDS Service organisation (BHASO) in Zimbabwe). Programme beneficiaries of these intervention partners were eligible to be included in the study. These intervention partners worked in the study population that included households from Rampepe Village in Lesotho, Kayelisha Informal Settlement in Bloemfontein and Mashvingu in Zimbabwe. In each of these areas, 50 households were purposively selected for the study in each country (for logistic reasons). From each list of 50 households, 25 households were randomly included in an intervention group and 25 were included in a control group.

A standardised questionnaire was completed by fieldworkers in a structured interview with a member of the household (preferably the household head). This was done before and after the household food garden interventions. The questionnaire was used to determine socio-demographic conditions as well as indirect measures of food security in each household, using the Living Poverty Index (LPI); Months of Adequate household Food Provisioning (MAHFP); Household Dietary Diversity (HDD) and frequency of vegetables eaten.

The LPI assesses the frequency that households go without basic necessities of life (namely food, water, medicine, electricity, and fuel and cash income). Responses to questions are combined to calculate a LPI score for the household, with 0 indicating no poverty to 4

(complete poverty). The MAHFP determines the total number of months out of the previous 12 months that the household was unable to meet their food needs, ranging from 0 to 12. A score of 12 indicates that the household had year-round adequate food provisioning, while 8-11 indicates moderate food security, 4-7 low food security and zero to 3 severe food insecurity. HDD is determined using the previous 24-hour period as a reference. The number of different food groups consumed during this period from a possible 12 food groups is noted. The HDD scores are interpreted in the following way: 0- 3 = low dietary diversity; 4-5 = medium dietary diversity and 6-12 = high dietary diversity. Frequency of vegetables eaten by adults and children in the households is measured using a set of 6 responses to the question 'How frequently do ADULTS/CHILDREN in the household eat vegetables? The responses include several times a day, once a day, a times per week, once a week, rarely and Never.

The sample included in the study in South Africa consisted of more female than male participants. Most participants were unmarried and more than 40% had completed high school or had a tertiary qualification. As evidenced by the LPI of 2.8, the sample was characterised by high levels of poverty. Measures of food security showed that about a third of participants had a low level of food security. At baseline, the median HDDS was 7 in the control group and 6 in the intervention group, indicating high dietary diversity. As far as frequency of vegetables consumed was concerned, less than half of participants reported that both adults and children ate vegetables relatively frequently.

In terms of the impact of the intervention, the MAHFP increased to a score of 11 in the control group at follow-up and improved by 2 points in the intervention group that was exposed to the household food garden intervention. Median HDDS did not change in the control group but showed a 2 point improvement in the intervention group at follow-up. The main outcome of the intervention was obviously related to vegetable consumption, but households showed little improvement. More adults consumed vegetables a few times a day, but children's' vegetable consumption remained the same. Overall, the household food garden intervention had a moderately positive effect on the indicators of food security in the intervention group. An improvement in the median MAHFP from 8 to 10 occurred (95% CI for the change [-2; 0]).

The sample included in the current study in Lesotho consisted of more male than female participants. About half were married and less than 20% had completed high school or had a tertiary qualification. As evidenced by the LPI of 2.5, the sample was characterised by high levels of poverty. Despite this, some measures of food security showed that participants were not as badly off as one would have expected. Even before intervention, the median MAHFP was 11 in the control group and 10 in the intervention group, indicating relatively good levels of food provisioning. At baseline, the median HDDS was 5 in the control group and 6 in the intervention group, indicating medium to high dietary diversity. As far as frequency of vegetables consumed was concerned, a relatively high percentage of participants reported that both adults and children ate vegetables relatively frequently. The habit of sharing that has been described in the Lesotho population, probably contributed to these findings. No improvements were noted in the frequency of vegetables consumed in the intervention group or in the control group.

In terms of the impact of the intervention, the MAHFP remained at 11 in the control group at follow-up and improved by one point in the intervention group that was exposed to the household food garden intervention. Median HDDS did not change in either group at follow-up. The main outcome of the success of the intervention was obviously related to vegetable consumption. Significant improvements were noted in the frequency of vegetables consumed in the intervention group that were not noted in the control group. These can thus most probably be attributed to the intervention.

The sample included in the current study in Zimbabwe consisted of more female than male participants. Most of the population was married and had a fairly high level of education with more than 50% of individuals having completed high school and in possession of a tertiary qualification. As evidenced by the LPI of 2.3, the sample was characterised by high levels of poverty. Despite this, some measures of food security showed that participants were not as badly off as one would have expected. Even before intervention, the median MAHFP was 11 at baseline in the control group and 10 in the intervention group, indicating relatively good levels of food provisioning. At baseline, the median HDDS was 6 in the control group and 7 in the intervention group, indicating medium to high dietary diversity. As far as frequency of vegetables consumed was concerned, a relatively high percentage of

participants reported that adults ate vegetables frequently, though less frequent than in adults children still had a relatively high level of vegetable consumption.

In terms of the impact of the intervention, the MAHFP improved by one point in in the control group at follow-up and remained at 11 the intervention group that was exposed to the household food garden intervention. Median HDDS did not change in either group at follow-up. The main outcome of the intervention was obviously related to vegetable consumption, but due to an already high level of consumption at baseline no significant improvement could be seen.

In conclusion, the impact of the household food garden intervention varied in each of the countries. This could be attributable to different levels of education, cultures and environmental factors. The improvements that were noted do however show that food gardens have the potential to improve availability of food, level of diversity in the diet and frequency of vegetables eaten.

OPSOMMING

Voedselonsekerheid is ‘n uitdaging wat menigte mense affekteer in ontwikkelende lande, meer en meer individue bevind gesonde voedsel ontoegnklik a.g.v. armoede. Die tripel las van wanvoeding behels wanvoeding (ondermass, groei-inkorting en uittering); oormassa en vetsug; en mikrovoedingstof-tekorte en kan dikwels in die selfde huishouding gesien word.

In die huidige studie, was ‘n voor- en na- toets studie ontwerp toegepas om die impak van ‘n huishoudelike groentetuin intervensie in Suid-Afrika, Lesotho and Zimbabwe te bepaal. In elke land was die huishoudelike groentetuin intervensie deur verskillende organisasies ge-implementeer, die Departement van Landbou in Suid-Afrika, ‘the Society of Women against AIDS in Africa (SWAALES) in Lesotho en ‘Batani HIV/AIDS Service Organisation (BHASO)’ in Zimbabwe. Die intervensie Vennote se begunstigdes het in aanmerking gekom vir die studie. Die intervensie Vennote het in die studie bevolking gewerk en dit het Kayelisha informele nedersetting in Bleomfontein, Rampepe dorpie in Lesotho en Mashvingu in Zimbabwe ingesluit. 50 huishoudings in elk van die gebiede was uitgesonder vir die studie in elke land (vir logistieke redes). Van elke lys van 50 huishoudings is daar 25 huishoudings lukraak gekies vir ‘n intervensie groep en 25 was dan in n kontrole groep.

‘n Gestandardiseerde vraelys was deur veldwerkers voltooi tydens ‘n gestruktureerde onderhoud met ‘n lid van die huishouding (verkieslik die hoof). Hierdie is voor en na die huishoudelike groentetuin intervensie gedoen. The vraelys was gebruik om sosiodemografiese toestande, asook indirekte maatreëls van voedselsekerheid in elke huishouding te bepaal. Dit is gedoen d.m.v. die ‘Living Poverty Index (LPI); Months of Adequate household Food Provisioning (MAHFP); Household Dietary Diversity (HDD); en frekwensie van groenteinname.

Die LPI assesseer hoe gereeld huishoudings sonder basiese noodsaaklikhede vir oorlewing gaan (naamlik kos, water, medisyne, elektrisiteit, brandstof en kontank). Reaksies op die vra is gkombineer om ‘n LPI-telling uit te werk, 0 dui geen aarmoede aan waar 4 volledige aarmoede aandui. Die MAHFP bepaal die totale aantal maande in die vorige jaar wat die huishouding nie in staat was om hulle voedsel-behoeftes te bereik nie, met ‘n omvang van 0 tot 12. A telling van 12 dui daarop aan dat die huishouding vir die hele jaar voldoende

voedsel voorsiening gehad het, terwyl ‘n telling tussen 8 en 11 matige voedselsekerheid aangedui het, 4 tot 7 ‘n lae vlak van voedselsekerheid en 0 tot 3 voedselonsekerheid aangedui het. HDD word bepaal deur deurom die vorige 24 uur as ‘n verwysing te gebruik. Die aantal verskillende voedselgroepe wat tydens hierdie tydperk verorber was (uit ‘n moontlike 12 groepe) word aangeteken. Die HDD tellings word as volg interpreter: 0-3 ‘low dietary diversity’; 4-5’ medium dietary diversity’; 6-12 ‘high dietary diversity’. Frekwensie van groenteinname in volwassenes en kinders was bepaal deur 6 moontlik antwoorde of die volgende vraag ‘Hoe gereeld eet Volwassenes/Kinders indie huishouding groente? Die moontlike antwoorde sluit verskeie keer per dag, een maal per dag, ‘n paar keer ‘n week, enn maal per week, skaars en nooit in.

Die monster wat tydens die studie ingesluit is vir Suid-Afrika het meer vrouens as mans bevat. Die mederheid van die deelnemers was ongetroud en meer as 40% het hoerskool voltooi of ‘n tersiere kwalifikasie besit. Die LPI in die groep (2.8) het aangedui dat die huishoudings hoe vlakke van armoede beleef. Maatreels van voedselsekerheid het gewys dat omtrent ‘n derde van die deelnemers ‘n lae vlak van voedselsekerheid handaf het. Voor die intervensie (basislyn) was die HDD median telling van die kontrole groep 7 en die intervensie groep 6, dus het die huidhoudings ‘n hoe vlak van diversiteit in hulle dieet. I.v.m. frekwensie van groenteinname, het minder as helfde van die deelnemers rapporteur dat volwasssenes en kinders op ‘n relatiewe gereelde basis groente eet.

t.o.v. die impak wat die intervensie gemaak het, die MAHFP telling het verhoog na 11 in die kontrole groep met die opvolg besoek en het met 1 punte verbeter in die intervensie groep. Median HDD telling het geen veranderingin die kontrole groep getoon nie, maar het wel met 2 punte in die intervensie groep verbeter. Die hoof uitkomste van hierdie studie was duidelik om die verwantskap tussen groente tuine en groenteinname te bepaal, maar huishoudings het min verbetering gewys. Meer volwassenes het groente 1 maal per day geeet, waar kinders dieselfde hoeveelheid groente geeet het voor en na die intervensie.

Oor die algemeen, het huishoudelike groentetuin intervensie n matige positiewe effek of maatreel van voedselsekerheid gehad in die intervensie groep. A verbetering van 8 tot 10 in die MAHFP median het plaasgevind (95%CI vir verandering [-2;0]).

Die monster van ingesluit is in die huidige studie vir Lesotho, was hoofsaaklik van mans opgemaak. Omtrent helfde was getroud en minder as 20% het hoerskool voltooi of 'n tersiere kwalifikasie. Hoe vlakke van armoede was opvallend met 'n LPI van 2.5. tespyte van dit, was huishoudings verbasend nie so sleg af soos oorspronklik verwag nie. Selfs voor die intervensie, was die median MAHFP 11 in die kontrole groep en 10 in die intervensie groep, wat daarop aangedui het day huishoudings relatief goed doen met vlakke van voedsel-voorsiening. Die median HDD telling voor die intervensie was 5 in die kontrole groep en 6 in die intervensie groep, dus het die huishoudings n matig tot hoog verskeidenheid in die dieet handhaaf. T.o.v. frekwensie van groenteinname, het n relatiewe hoe persentasie deelnemers rapporteer dat beide volwassenes en kinders gereeld groente geeet het. Die mededeelsaamheid wat beskryf word in Lesotho kon moontlik hiernatoe bygedra het.

T.o.v. die impak wat die intervensie gemaak het, die MAHFP het dieselfde gebly (11) in die kontrole groep met die opvolg besoek en het met 1 punt verbeter in die intervensie groep. Median HDD telling het geen verandering in die kontrole of intervensie groep getoon nie. Die hoof uitkomste van hierdie studie was duidelik om die verwantskap tussen groente tuine en groenteinname te bepaal, maar huishoudings het geen verbetering gewys nie na die intervensie nie.

Die monster van ingesluit is in die huidige studie vir Zimbabwe, was hoofsaaklik van vrouens opgemaak. Die mederheid was getroud en meer as 50% het hoerskool voltooi of 'n tersiere kwalifikasie. Hoe vlakke van armoede was opvallend met 'n LPI van 2.3. Tenspyte van dit, was huishoudings verbasend nie so sleg af soos oorspronklik verwag nie. Selfs voor die intervensie, was die median MAHFP 11 in die kontrole groep en 10 in die intervensie groep, wat daarop aangedui het day huishoudings relatief goed doen met vlakke van voedsel-voorsiening. Die median HDD telling voor die intervensie was 6 in die kontrole groep en 7 in die intervensie groep, dus het die huishoudings n matig tot hoog verskeidenheid in die dieet handhaaf. T.o.v. frekwensie van groenteinname, het n hoe persentasie deelnemers rapporteer dat volwassenes gereeld groente geet het, al was dit minder as die volwassenes, het kinders ook gereeld groente geeet.

T.o.v. die impak wat die intervensie gemaak het, die MAHFP het met 1 punt verbeter in die kontrole groep met die opvolg besoek dieselfde gebly in die intervensie groep. Median HDD

telling het geen verandering in die kontrole of intervensie groep getoon nie. Die hoof uitkomste van hierdie studie was duidelik om die verwantskap tussen groente tuine en groenteinname te bepaal, maar omdat groenteinname reeds hoog was voor die intervensie – was daar geen betekenisvolle verbetering nie.

Om af te sluit, het die impak van die huishoudelike greontetuin intervensie in elke land verskil. Hierdie kon aan verskillende vlakke in opvoeding, kultuur en omgewings faktore togeken word. Die verbetering wat wel opgemerk is, dui aan dat huishoudelike groentetuine die potensiaal het om beskikbaarheid van voedsel, vlak van verskeidenheid in die dieet en frekwensie van groenteinname te verbeter.

Chapter 1

Introduction and problem statement

1.1. Introduction

According to the Food and Agriculture Organization (FAO) "Food security (is) a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2006).

Despite the benefits of food gardens suggested in scientific literature, few studies have been published that provide evidence to support the important role that household food gardens can play in preventing or addressing food insecurity.

1.1.1 Malnutrition

According to the World Health Organisation (WHO), one in four people in Sub-Saharan Africa are malnourished in some or other form (WHO, 2015). This can include childhood malnutrition (wasting or stunting), adult malnutrition (underweight or overweight and obesity) as well as micronutrient deficiency (also called hidden hunger). Malnutrition and micronutrient deficiencies are thus a major challenge in developing countries. The "triple-burden of malnutrition" describes a situation where overweight and underweight coexists in the same population and even in the same household, with micronutrient deficiencies also occurring (Corsi *et al.,* 2011; Muller and Krawinkel 2005). This triple burden is evident in developing countries where under nutrition (especially stunting) occurs in children; overweight and/or obesity in adults (especially women) and micronutrient deficiencies in both children and adults.

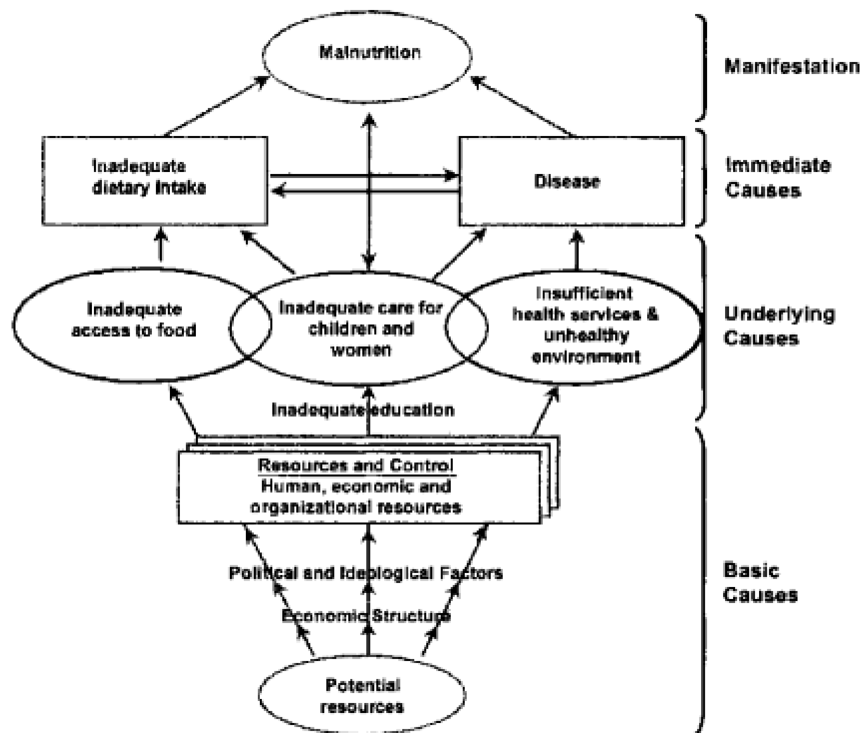

Figure 1.1: Causes of malnutrition (UNICEF, 1991)

The UNICEF conceptual framework categorises the causes of malnutrition into three levels (UNICEF, 1991). Basic causes involve the structure and processes of a society and a lack of capital (financial, human, physical, social and natural). This then contributes to income poverty (employment, self-employment, dwelling, assets, remittances, pensions, transfers, etc.) This poverty may stem from inadequate education, war, natural disasters and civil disorder. Household food insecurity; inadequate care of mothers and children; and an unhealthy household environment and lack of health services form part of the underlying category, while the immediate causes include inadequate dietary intake (protein, energy and micronutrients) and disease (severe/frequent infections), ultimately manifesting in malnutrition (Figure 1.1).

According to Abrahams *et al.* (2011), the nutrition transition has resulted from changes in dietary patterns and physical activity over time. Five stages have been identified, including the Hunter-gatherer (Stage one), Famine (Stage two), Receding-famine (Stage three), Nutrition-related non-communicable disease (Stage four) and Behaviour change (Stage five) stages. Stage one (the Hunter-gatherer stage), is characterised by a high carbohydrate and fibre diet that is low in fat – combined with a high level of activity, and resulting in low levels

of obesity. Stage two (Famine) is characterised by food scarcity and low dietary diversity. Although levels of physical activity may not be different to stage one, the adoption of a lifestyle of settling and cultivation is common during this stage. Stage three (receding Famine) is characterised by a low carbohydrate diet and higher consumption of fruit, vegetables and protein. In this stage, however, physical activity starts to decrease as a more technically advanced agricultural system is adopted. Stage 4 (nutrition related non-communicable disease) is characterised by a high refined carbohydrate, fat, sugar and cholesterol intake, with a decreased consumption of fibre and low levels of physical activity. As a result, the prevalence of obesity increases during this stage. Lastly, Stage 5 (Behavioural change) is characterised by a greater awareness and desire to be healthier and prevent disease. This then involves the consumption of more unrefined carbohydrates, fruit and vegetables with lower consumption of fat, salt, sugar, processed foods and red meat, together with increased levels of physical activity (Abrahams *et al.,* 2011).

Many developing countries are experiencing stage 4 of the nutrition transition. This transition from traditional food to more processed, energy dense food has resulted in a greater intake of saturated fats, sugar and salt as refined cereals and cheap energy-dense foods are more accessible than the more nutrient-dense options (e.g. fish, lean meat, vegetables and fruit) (Popkin, 2001). This lifestyle contributes to a higher incidence of overweight and obesity and the resultant chronic, nutrition-related diseases (Faber *et al*., 2011). Furthermore, these chronic diseases of lifestyle are believed to be more common in adults that were exposed to an unfavourable environment during pregnancy and early childhood (during the first 1000 days), especially if they experienced rapid weight gain after infancy (Victora *et al.,* 2008).

Not all African countries are at the same stage of the nutrition transition and the pattern of malnutrition varies accordingly. In terms of the three countries included in the present study, the percentage of obese women in South Africa is higher than the percentage of stunted children. In Lesotho, the percentage of obesity in women and stunting in children is very similar, while in Zimbabwe the percentage of stunted children is still higher than the percentage of women who are obese (Abrahams *et al.,* 2011).

1.1.2 Food security in South Africa, Lesotho and Zimbabwe

According to Smith *et al.* (2000), food insecurity can be determined on two levels, including the national as well as the household or individual level. National food security does not guarantee household food security. As previously mentioned, the definition of food security that has been developed by the FAO confirms that food security does not only encompass the absence of food, but also focuses on the physical, social and economic factors that are involved in providing sufficient quantities of good quality food to promote health and well-being (FAO 2006). More detailed definitions of food security, factors that influence food security and tools used to assess food security will be discussed in chapter 2.

In many developing countries, food security is inadequate for millions of individuals. Chronic food shortages as well as food crises result in compromised well-being, hunger and malnutrition (Misselhorn, 2005).

South Africa is an upper-middle income country marked by inequality (World Bank (WB), 2018; Woolard, 2002). Statistics South Africa (SSA) report that 55.5% of South Africans live in poverty (SSA, 2017). According to Du Toit *et al*. (2011) South Africa does not lack food, but certain individuals and households in the population have inadequate access to it. This threat affects more than a third of the population. The recent South African National Health and Nutrition Examination Survey (SANHANES), reported that less than half of the South African population (45.6%) are food secure, with 28.3% being at risk of hunger and 26% experiencing hunger (Shisana, 2013). South African households are vulnerable to food insecurity due to factors that include poverty and lack of purchasing power, inadequate safety nets, weak disaster management systems, weak support networks as well as inadequate and unstable household food production (Shisanya and Hendriks, 2011).

According to the Mattes *et al.* (2016), Lesotho has a high-moderate level of poverty. Lesotho's food production has decreased over a period of years due to erratic weather, soil erosion (Makhotla and Hendriks, 2004; Silici *et al.,* 2011) and inappropriate cultivation methods (Makhotla and Hendriks, 2004). As a result, the country now imports 70% of their food from neighbouring South Africa.

Zimbabwe is a low-income country with a major food deficit. Almost three quarters (72%) of the population live below the national poverty line and 30% of the rural poor are classified as extremely poor (WFP, 2017). In Zimbabwe, an estimated six million people have limited or no access to safe water and sanitation. About 4.1 million people (42%) in Zimbabwe are food insecure (WFP, 2017). Political instability, breakdowns in service delivery systems and constraints on food imports as a result of soaring prices, along with the severe impact of climate change on agriculture, has had a significant impact on national food security in Zimbabwe (FAO, 2013). In addition, natural disasters and instability in the economy have impacted negatively on national food production. Due to the high prices of most commodities in Zimbabwe, households tend to use grain to barter for other commodities, further exhausting their household food stock (WFP, 2017). Because of the deficit in national food security, households are forced to produce their own food. By the year 2002, about 28 500 hectares were being cultivated, with vegetable gardens being grown on more than 10 000 hectares. As the benefits of vegetable gardening became more evident, more and more interest in household vegetable gardens occurred and the number of gardens increased even further (FAO, 2005). More recently, Zimbabwe has again been experiencing a drought resulting in large-scale crop failure and worsening the state of food insecurity (USAID, 2018).

1.1.3 Household food gardens as a means of addressing malnutrition and improving food security

Very few households in most developing countries have home gardens that produce enough to meet their requirements (Makhotla and Hendriks, 2004). Despite the major potential of food gardens to alleviate malnutrition and food insecurity suggested in scientific literature, few studies have been published that provide evidence that food gardens can impact on food security. The benefits and challenges related to household food gardens will be explored in Chapter 2.

1.2 Aims and objectives

This study formed part of a larger overarching study undertaken by the Centre for Development Support at The University of The Free State, titled "Household food gardens:

effective and sustainable impact mitigation response to the HIV and AIDS epidemic in urban settlements in Lesotho, South Africa and Zimbabwe". The overarching study aimed to investigate the potential benefits of sustainable, eco-friendly household food gardens in South Africa, Lesotho and Zimbabwe, that spanned over a period of two and a half years (July 2013 to 2015). The project was funded by the Southern African Development Community (SADC). Although the main objective of the study was the research component, the Centre for Development Support partnered with the Department of Agriculture in South Africa, the Society of Women against AIDS in Africa (SWAALES) in Lesotho and Batani HIV/AIDS Service organisation (BHASO) in Zimbabwe to implement the household food garden interventions.

The eight objectives of the overarching study were to:

- Develop and implement a proof-of-concept for urban household food gardens
- Assess the impact of urban household food gardens on nutrition and food security
- Assess the impact of urban household food gardens on HIV/AIDS impact mitigation
- Assess the impact of urban household food gardens on gender empowerment
- Assess the income generation and economic impacts of urban household food gardens
- Assess cost benefit and cost-effectiveness of urban household food gardens
- Document the implementation of urban household food gardens
- Propose recommendations for appropriate and scalable intervention in SADC.

This sub-study focused on the impact of household food gardens on different measures of food security.

1.2.1. Aim and objectives of the present study

1.2.1.1. Main aim

The main aim of this study was thus to determine the impact of household food garden interventions in South Africa, Lesotho and Zimbabwe on food security in both intervention and control areas.

1.2.1.2. Objectives

In order to achieve the main aim, the following objectives were identified:

- To obtain information on the socio-demographic situation of participating households
- To determine food security using different measures of food security, including Living Poverty Index (LPI); Months of Adequate Household Food Provisioning (MAHFP); Household Dietary Diversity (HDD); and the Frequency of Vegetables Eaten
- To assess the impact of household food gardens on the different measures of food security

1.3. Outline of the dissertation

This dissertation has been structured to include an introduction and problem statement (Chapter 1); a literature review on household food gardens as an intervention to address food security (Chapter 2); methodology (Chapter 3), followed by results and discussion pertaining to the three countries in article format (Chapter 4 – Chapter 6) and conclusions and recommendations (Chapter 7).

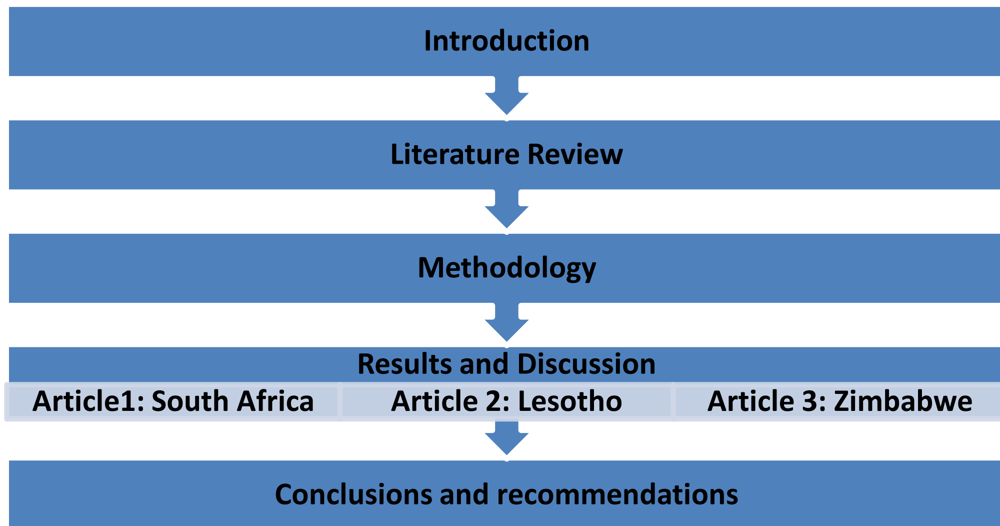

Figure 1.2: Progression of the study

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Chapter 2

Household food gardens to address food insecurity

2.1. Introduction

Household food gardens are one of the oldest food production systems. Because of their potential to provide food, they have been recognised as an effective intervention to alleviate hunger and malnutrition (Galhena *et al.,* 2013). A small, well managed plot has the potential to meet a household's annual vegetable requirements, positively influencing nutrient intake and food security (Bellows *et al.*, 2010; Marsh, 1998).

Descriptions of home gardens date back to the 1930's, and food gardens, also known as 'victory gardens' were described during World War 2 (Milburn and Vail, 2010; Ohmer *et al.,* 2009). These gardens provided relief from pressure on the public food supply. A programme that initiated 20 million gardens across the United States produced approximately 40% of the fresh vegetables in the country at that time (Ohmer *et al.,* 2009).

As far as the definitions of household food gardens are concerned, a number of authors have described what they consider a garden to be. Some have focused on the provision of food for the household, while others have emphasised its role in income generation. Galhena *et al.* (2013) describe the household food garden as "a well-defined area near the family dwelling that serves as a small-scale supplementary food production system maintained by the household members, and one that encompasses a diverse array of plant species that mimics the natural eco-system". Ideally, a food garden should require minimal land and labour and make use of simple technology (Galhena *et al.*, 2013). According to Faber & Laurie (2011), household food gardens should furthermore be cost-effective, sustainable and culturally acceptable.

Household food gardens are a natural asset that can contribute to the food supply at household level while also providing produce that can be sold at local markets, making a positive contribution to the financial status of the family (Maroyi 2009; Nell *et al.,* 2000). Food gardens can thus contribute to food security on more than one level.

Increased consumption of plant products such as fruits and vegetables has the potential to improve nutritional status, health and food security. In addition to the benefits already mentioned, household food gardens can further contribute to the quality and type of foods that are available to the household, while also creating shifts in resource control within households and communities (Arimond, 2011).

From the above it is clear that household gardens should ideally be small, close to the home, diverse, and provide produce for both consumption and income.

2.2. Food Security

In many developing countries, food security is inadequate for millions of individuals. Chronic food shortages and food crises result in compromised well-being, hunger and malnutrition. Governmental and non-governmental institutions, as well as formal and informal policy and decision makers, are therefore presented with a serious challenge (Misselhorn, 2005).

Food security, as defined by the 1996 World Food Summit, is achieved when "all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 2006; Jones, *et al.,* 2013: 482).

Anderson (1990) elaborates on this by stating that "food security includes at a minimum: (1) the ready availability of nutritionally adequate and safe foods, and (2) an assured ability to acquire acceptable foods in socially acceptable ways (e.g., without resorting to emergency food supplies, scavenging, stealing, or other coping strategies)".

According to Bremner (2012), food security is achieved through:

- Consistently having enough, appropriate food;
- An ability to purchase or barter for food;
- The correct processing and storage of food;
- Access to adequate health and sanitation services; and
- A sound knowledge of nutrition and child care.

According to the World Food Programme (WFP), food availability is defined as "the amount of food that is present in a country or area through all forms of domestic production, imports, food stocks and food aid" (WFP, 2009). Availability relates to physical availability of food quantities by means of own production, business/commercial imports or donors available for human consumption (Battersby, 2011). Access includes adequate resources or other means to acquire the necessary quantities of appropriate foods (Battersby, 2011; Schmidhuber and Tubiello, 2007), while utilisation addresses all food safety and quality aspects of nutrition (Schmidhuber and Tubiello, 2007). Utilisation involves the proper use, processing and storage as well as adequate knowledge on food and nutrition practices for better nutrient absorption and metabolic utilization (Battersby, 2011). Lastly, stability involves being able to cope with natural and man-made disasters, the accumulation of stocks and diversification. Seasonal or permanent employment, livelihood and coping strategies and safety nets form part of the stability in food access. Food utilisation requires stability through constant access to health care, clean drinking water and sanitation (Burchi *et al.*, 2011). The different dimensions of food security are thus dependent on one another and form part of a hierarchy (Taruvinga *et al.,* 2013). Food availability is partly necessary to ensure food access (though it does not guarantee it), which in turn is partly necessary to ensure effective utilisation (Barret, 2010).

According to Smith *et al.,* (2000), food insecurity can be determined on two levels, including the national as well as the household or individual level. National food security does not guarantee household food security, and the opposite is also true.

Food insecurity can further be categorised into chronic and short-term lack of food security. Chronic food insecurity is often the result of poverty or lack of income that leads to a person being unable to consume the minimum amount of food needed for a healthy life for an extended period of time. On the other hand, short-term lack of food security is either temporary (due to shocks, only occurs for a limited time) or seasonal (forms trend, e.g. every winter) (Galhena *et al.,* 2013).

2.2.1. Factors that influence food security

As indicated in Figure 2.1, Smith *et al*. (2000) list political instability, war and civil strife; macroeconomic imbalances and trade dislocations to environmental degradation; poverty; population growth; gender inequality; inadequate education; and poor health as factors that influence food security. Food security is therefore influenced by a number of factors on global, regional, national, household and individual levels. On a global level, these include population growth and climate change. On a regional and national level, markets, distribution systems, basic services and health factors have a role to play. On a household and individual level, household size, age, gender, employment status, level of income and area of residence are important considerations (Barrett, 2010; Smith et al., 2000).

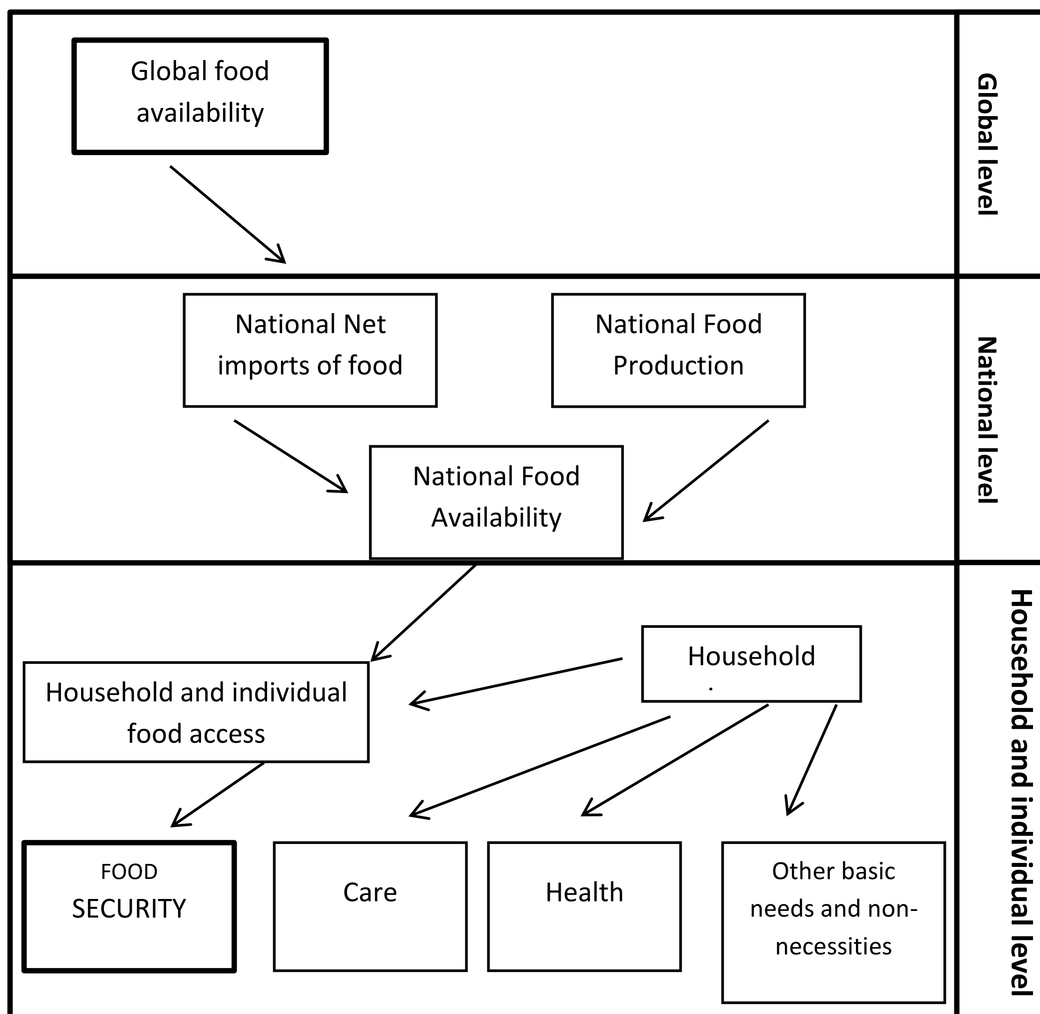

Figure 2.1: Conceptual framework of factors that influence food security (adapted from Smith *et al*., 2000)

2.2.1.1. Global level

Global food security depends on the total food production in the world (Smith *et al*., 2000). Increases in population growth are increasing the amount of food needed to adequately feed the world and particularly the sub-Saharan African population (Bremner, 2012). At present, the greatest challenge involves meeting the higher demand for food (in affluent and poor communities), in a socially and environmentally sound way (Godfray *et al.*, 2010). With increases in the global rate of urbanisation, food access is most affected (Drimie *et al.,* 2013).

Climate change also plays a part in global food security (Lloyd *et al.,* 2011; Wheeler and von Braun 2013), as weather and climate play an important part in agricultural production (Parry, 1999) and thus impact food availability (Schmidhuber and Tubiello, 2007). The implications of climate change on food security will have to be considered carefully, as not all areas will be affected negatively by this phenomenon. On the positive side, it is predicted that a gain of 9% in cropland may be evident by 2080 in the northern hemisphere. On the negative side, most of Africa is likely to experience losses in arable land, increases in water stress and lower cereal yields. This is likely to further increase the pressure on domestic production to meet requirements (Devereux and Edwards, 2005). Utilisation of food is also impacted by climate change as the ability of individuals to use food effectively is influenced by altered food safety conditions (Schmidhuber and Tubiello, 2007).

Food production, the ability to purchase food and being able to receive food aid, is directly influenced by political stability (Deaton and Lipka, 2015). Food production often requires large investments before harvests provide any benefits at a later stage – political instability weakens the possible returns of these transactions. The exchange of food is negatively impacted by political instability as access to food is significantly compromised. The potential for trading possibilities with other countries is undermined, affecting the individual's ability to buy food. Investments in countries that are affected by political instability are also high risk and therefore more effort and resources are required to maintain higher expected return rates. Food transfers are often cancelled by political instability as the safety of aid workers becomes a concern. The issue of theft is also present in cases of civil conflict (Deaton and Lipka, 2015).

2.2.1.2. National level

On a national level, food availability depends on a country's food production, food stocks, net imports and food aid (Smith *et al.,* 2000). Food availability requires that essential inputs (e.g. arable land and permanent cropland); positive results from these inputs (e.g. food production); and structures for supply (e.g. food supply and food aid) are present (Napoli, 2011). To a large degree, food access depends on the functioning of food markets and distribution systems (Altman *et al.,* 2009). Food access is comprised of a physical, economic and social component. On a national level, the physical component can be negatively impacted by an inadequate transport infrastructure, as food cannot be delivered to the parts of the country that lack it (Napoli, 2011). Restrictions in electricity supply, changes in oil prices and rising food prices all have long-term implications that reach far enough to impact even remote rural households (Altman *et al*., 2009).

Market systems play an important role in the provision of access to food (Napoli, 2011). Market access is directly limited by poor infrastructure as transportation costs are increased – this limits profits that could be made from selling produce. Market standards, limited information and the requirement of large capital investments also act as barriers (Mwaniki, 2006).

2.2.1.3. Household and individual level

On a household and individual level, a number of factors need to be considered**.** Among these household size, age, gender, level of education, income and employment as well as the area of residence can impact on food security.

Household size is determined by the number of adults in a household (Babatunde *et al.,* 2007). According to Thiele and Weiss (2003), small children, below the age of six years, do not influence household dietary diversity (HDD), while older children, from the age of 7 to 17, increase the level of dietary diversity (DD) in the home (Thiele and Weiss, 2003). The increase in DD for this age group could be due to the higher nutrient requirements of adolescents and from them obtaining their food from various external sources as they become more exposed to school and the community. The diversity may not necessarily be a

result of healthy dietary habits, as the intake of energy-dense snack foods and convenience meals increases in this age group (Feeley *et al.,* 2012).

Food security can be influenced by the age of the household head, as age influences the ability to access employment and earn an income. In terms of food production, younger individuals are expected to be able to produce more because they are physically stronger (Babatunde *et al.,* 2007).

Different roles are played by men and women in guaranteeing food security (FAO, 2016). Women add value as they are able to produce food, manage natural resources and earn an income, all while taking care of the household's food security (Mwaniki, 2006:5). A survey undertaken by Taruvinga *et al.,* (2013) in the Eastern Cape, South Africa, indicated that female-headed households were more likely to achieve a higher DD than male-headed households. This could be attributed to the fact that chores like growing and processing of food are often the responsibility of women in the household (FAO, 2006). Smith *et al.* (2003) confirm that women with a higher social status tend to have better nutritional status and often take better care of their children. Bias in food allocation also affects this as some regions favour older boys, men and elders (Girard, 2012).

Formal education is positively associated with better DD (Taruvinga *et al*., 2013), mainly because it has the ability to influence production and nutritional decisions positively (Babatunde *et al.,* 2007). Production is positively influenced as farmers may be exposed to new techniques and technologies during education opportunities (World Bank, 1990). In a postal survey undertaken in England by Wardle *et al.* (2000), a positive correlation between vegetable and fruit intake and nutrition knowledge was made. Participants with better nutrition knowledge were 25 times more likely to consume adequate amounts of vegetables and fruits.

Employment status and socio-economic status have an influence on the food security status and DD of a household (Babatunde *et al.,* 2007). Poor households spend a large portion of their income on food, and labour is often considered to be their primary asset (Jones *et al.,* 2013). The level of income in the household can therefore be connected to food security, as higher levels of income are associated with higher diversity in the diet (Thiele and Weiss,

2003). On the one hand, employment increases income and the chances of purchasing a variety of foods, but on the other hand, persons who have full-time jobs have less time for preparation and may include less variety in meals (Thiele and Weiss, 2003).

Thiele and Weiss (2003) report that urban households tend to purchase a wider variety of food than those living in a less urbanised environment. On the other hand, rural households tend to spend more money on food because of higher transport costs, lower discounts in rural shops, and products exceeding their expiration dates due to a smaller number of shoppers (Ramabulana, 2011). Rural areas often have a sparse population that is spread out over larger distances; these populations are mostly made up of poor individuals with a low level of education. The purchasing power of these individuals is low, thus influencing the types of food stocked in rural shops (Liese *et al*., 2007).

Disease and infection reduce the potential to obtain food and increase the burden on the household as these individuals have increased nutritional requirements (Mwaniki, 2006). Food insecurity can also be aggravated by illness or death of the breadwinner (UNMP, 2005).HIV and AIDS often force women to take on the role of caretaker, resulting in less time to grow or prepare food (FAO, 2016).

2.2.2. Tools used to measure food security

Various tools can be used to measure food security with different tools having different focal points which help measure different outcomes and components on different scales. When selecting a tool, it best to choose one that is relevant to the specific study population and the outcomes that will be measured.

Table 2.1: Tools used to measure food security (compiled from Jones *et al*., 2013; Gericke *et al*., 2000)

Tool	**What it measures**	**Scale**	**Food Security Component**	**Purpose**
Food consumption score (FCS)	A questionnaire developed in South Africa and used in developing countries to determine the level of food consumption of households.	National, regional and household level	Food Accessibility	Establish the level of food security and monitor any change It can also be used to calculate food rations after determining the need
Household Dietary Diversity Score (HDDS)	A questionnaire developed in the United States and used to determine the number of food groups consumed by households over a specific period of time.	National, regional and household level	Food Access	To determine food security, assess household dietary diversity and change over time
Household food insecurity access scale (HFIAS)	A survey developed in the United States undertaken with low income households to determine the level of access households have to food.	Regional and household level	Food Access	To assist in developing context specific interventions and to monitor the impact of such interventions
Community childhood hunger identification project (CCHIP)	A questionnaire developed in the Unites States,	Household Individual	Food Access	To develop a definition of hunger and a model of

	validated for South African use and used to assess the level of food insufficiency in households, and experienced by adults, and children under 12 years old.	Children		domestic hunger To use in the identification of poor households at risk or experiencing food insecurity To assist in planning programs and policies
Living Poverty Index (LPI)	A cross-national survey of public attitudes in Sub-Saharan Africa.	National level	Poverty	To track national and sub-national trends of lived poverty
Months of Adequate Household Food Provisioning (MAHFP)	A questionnaire developed in the United States and used to determine the months of adequate or inadequate food supply.	National, regional and household level	Food Access	To determine food security, months of food provisioning and change over time

2.2.2.1. Living Poverty Index

Poverty can result from a number of factors including lack of income; limited or lack of access to education and other basic services; increased morbidity and mortality from illness; homelessness and inadequate housing; unsafe environments; and social discrimination and exclusion. The presence of poverty has a significant effect on participation in decision-making (Mattes, 2008). Households with a low level of income are more vulnerable to the impacts of inflation and high food prices (Jacobs, 2009).

Standard of living can be assessed by determining the frequency that households go without basic necessities of life (namely food, water, medicine, electricity, and fuel and cash income) (Mattes, 2008). Absolute poverty is defined as 'a condition characterised by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information'. Poverty is therefore closely linked with food security, as it forms part of the root cause of food insecurity due to poor individuals being unable to access food (Smith *et al*., 2000).

The LPI is a tool that has been developed to assess levels of poverty (and thus indirectly levels of food security) in households. It allows for information to be gathered from the respondent rather than from a schedule of household activities, as with other measures. A set of questions that focuses on the rate at which individuals actually go without basic necessities forms the core of this tool (over the past twelve months, how often, if ever have you or your family gone without enough food to eat, clean water, medicine or treatment, fuel and a cash income?). The tool is based on the assumption that individuals are the best judges of their quality of life.

2.2.2.2. Months of Adequate Household Food Provisioning

Household resources constantly need to be managed, as various circumstances result in different food needs throughout a year. Ideally, this management should be reflected in year-round availability of food, which should ideally be above the minimum requirement (Bilinsky and Swindale, 2010).

A standardised MAHFP questionnaire is another tool that can also be used to measure food security (Billinsky and Swindale, 2010). As previously mentioned, the FAO defines food access as 'the adequate income or other means to acquire food quantities needed' (FAO, 2006:4). MAHFP helps determine the level of access households or individuals have to food year-round (Billinsky and Swindale, 2010).

The MAHFP tool investigates a household's food supply by asking participants to state whether or not there were months in the past year, in which they did not have enough food to eat – a simple yes or no is required. Should a participant report that there were shortages, further investigation is done as to which particular months these shortages were experienced (Bilinsky and Swindale, 2010).

MAHFP for each household is calculated by subtracting the total number of months out of the previous 12 months that the household was unable to meet their food needs from 12 (e.g. 12 – sum(A+B+C+D+E+F+G+H+I+J+K+L). Values for A through L were '0' or '1' (Bilinsky and Swindale, 2010). The scoring is then used to categorise households into three groups. A score of twelve indicates that the household had year-round adequate food provisioning. Households that score between 11 and 8 are categorised as being food secure; households

that score between 4 and 7 are considered to have a low level of food security and households that score between zero and 3 are considered to be food insecure.

2.2.2.3. Household Dietary Diversity

Poor food security is often linked to monotonous, starch-based diets that lack a variety of micronutrients. DD is universally recognized as a key component of healthy diets and therefore a useful outcome when assessing food security. DD assesses the number of different foods or food groups consumed over a given period (Earl, 2011). According to Gopi *et al.* (2016), HDD is affected by the same factors that affect food security.

Associations between a higher Dietary Diversity Score (DDS) and a higher intake of calcium, fibre and vitamin C have been reported (Azadbakht *et al.,* 2005). According to Fulton *et al*. (2016), an increase in fruit and vegetable intake is very likely to improve the overall profile of the diet and has a positive effect on DD. This happens because micronutrient intake increases, fat intake decreases and carbohydrate and fibre intake increases (Labadarios *et al.,* 2011; Lock *et al.,* 2005). Furthermore, increased fruit and vegetable consumption protects against chronic diseases and promotes general health and well-being (Azadbakht *et al.,* 2005).

In young children, whose vulnerability to micronutrient deficiencies is high due to increased nutrient requirements, DD has been positively associated with improved micronutrient intake (Steyn *et al.,* 2006). Better DD is closely linked to better nutritional status of children, especially in developing countries and it is widely accepted that a lack of diversity in the diet can be linked to stunting in children under the age of five years (Rah *et al.,* 2006).

HDD refers to the number of different food groups consumed in the past twenty-four hours from a possible 12 food groups (Swindale and Billinsky, 2006)**.** The DD tool measures the quality of the diet through measuring the number of different food groups consumed, instead of the number of different foods. The 12 groups used in the measurement of HDD include cereals; roots and tubers; vegetables; fruit; meat, poultry and offal; eggs; fish and seafood; pulses, legumes and nuts; milk and milk products; oils and fats; sugar and honey; and miscellaneous. This tool usually uses the previous 24-hour period as a reference period (Swindale and Billinsky, 2006).

2.2.2.4. Frequency of fruit and vegetable consumption

Since hungry individuals are unable to function at their full potential, encouraging the intake of nutritious food, including vegetables, should form an integral part of sustainable development programmes (Nell, 2000). In a study undertaken by Kendall *et al.* (1996), to measure the relationship between hunger and food security, food availability and food consumption, it was found that fruit and vegetable consumption decreased with an increase in food insecurity. Food insecure households consumed fewer servings of fruit and vegetables than food secure households (Alaimo, *et al.* 2008).

Assessing the frequency of fruit and vegetable consumption is thus able to provide information that is an indicator of food security.

2.3. Food gardening systems

Although traditional food gardens are most often grown at the household level, other food gardens may include community gardens, container gardens, keyhole gardens, door and trench gardens and hydroponics.

2.3.1. Community Gardens

According to Shisanya and Hendriks (2011), community gardens are “run by individuals who pledge support to a farm operation so that the farmland becomes, either legally or through customary right of use, the community’s farm, with growers and consumers providing mutual support and sharing the risks and benefits of food production”.

Community gardens are ideal in cases where there is limited access to land (usually in urban areas) and are managed by different families, benefiting not only the community but individuals too (Okvat and Zautra, 2011). Various types of community gardens have been identified. These may include child and school gardens; leisure gardens (for relaxation); entrepreneurial gardens (for poverty alleviation); crime diversion gardens (to prevent loitering, vandalism and drug dealing); healing and therapy gardens (for patients in institutions); quiet gardens; and neighbourhood pocket parks (Guitart *et al.,* 2015). By turning abandoned lots into green areas filled with plant-life, flowers, seating areas and play areas, urban decay and littering can be addressed (Ohmer *et al.,* 2009).

According to Milburn & Vail (2010), characteristics of successful community gardens include the following:

- Interactions take place in a safe environment between individuals of different races, age and socio-economic backgrounds;
- Sustainability depends on the continuous involvement of community members rather than outside agencies;
- Various skills are required for their maintenance;
- Garden space is managed by residents;
- They are able to produce striking, short-term aesthetic effects;
- A sense of pride is cultivated among the involved community; and
- Self-worth is facilitated as individuals recognize their positive contribution.

2.3.2. Container gardening

Growing vegetables in containers is another way in which household food production can be promoted. Most vegetables can be grown in containers (e.g. broccoli, cucumber, spinach, tomato, squash, peppers, green onions, peppers, beans, lettuce, radishes, parsley, etc.) (Masabni and Cotner, 2009). This method of gardening requires limited space that can be used in a productive way. Various containers such as ceramic pots, old crates, dustbins, drums, tubs, wooden boxes, old tyres and recycled bottles can be used. For potatoes, a potato bag can be used and cages are useful when growing beans, tomatoes or cucumbers. When planting in containers, proper drainage and size needs to be considered (Pennisi, 2009).

Figure 2.2: Container gardens

Seeds can be germinated in baking pans, pots, cardboard milk boxes or plastic trays. By covering the seed tray with a plastic bag, germination can take place faster (Masabni and Cotner, 2009).

2.3.3. Keyhole Gardens

Figure 2.3: Keyhole gardens

Keyhole gardens are a bio-intensive gardening method where key-hole shaped raised mounds of earth are used for gardening. Keyhole gardens are approximately 2 meters in diameter and 1 meter in height. A basket is placed in the centre of this structure and filled with organic kitchen waste to provide the soil with nutrients. Layers are used to provide nutrition to the soil. The materials used to construct this garden are local, recycled, re-useable and low in cost. Fruit and vegetables can be grown around the centre and medicinal or companion plants are used to surround these (Arias *et al.,* 2013:7). These gardens require less land and labour than other gardening methods which is especially helpful in instances where the elderly or sick wish to garden. Other benefits include its ability to produce a large amount and wide variety of vegetables. It is designed to retain water, ensures soil fertility, and it is relatively easily maintained. This type of garden is more resistant to pests due to the companion planting system, where plants that repel pests are planted with the vegetables, it's technology is simple and therefore easily implemented, and it has been used with success in challenging agronomic conditions, such as in Lesotho (Arias *et al.,* 2013; Aphane *et al.,* 2011).

2.3.4. Door and Trench Gardens

Trench gardens are a gardening method where shallow channels are dug into the ground, while a door garden is made in an area that is dug out in the size of a door. For trench gardens, the channels are about 50 centimetres long and 15 to 20 centimetres deep. They can be filled with straw, corn stalks, leaves, manure, bones and metal cans; this then forms the first of three layers. Soil covers these materials and forms the second layer and is covered by a mixture of soil and manure forming the third and top layer. Seeds are then planted in the top layer and covered with mulch (Romero-Daza *et al.,* 2009).

This form of gardening has the potential to deliver a larger variety of produce as a result of its size (Romero-Daza *et al.*, 2009).

The door garden, also known as a peace garden, is a 1m by 2m garden that is 50cm deep. The trench is filled with rubbish (e.g. tins, eggshells, bones, wood and paper) that allows for better drainage. Alternating layers of soil and organic matter (e.g. grass, weeds, twigs and leaves) are packed in the door garden. Seeds are planted in this layer as it retains moisture well (Department of Agriculture, 2002).

Both door and trench gardens are initially a very labour-intensive gardening method as they require a lot of kneeling and bending (Romero-Daza *et al.*, 2009). Once they have been established, labour inputs decrease (Daidone *et al.,* 2016).These gardening systems retain water well (Daidone *et al.,* 2016).

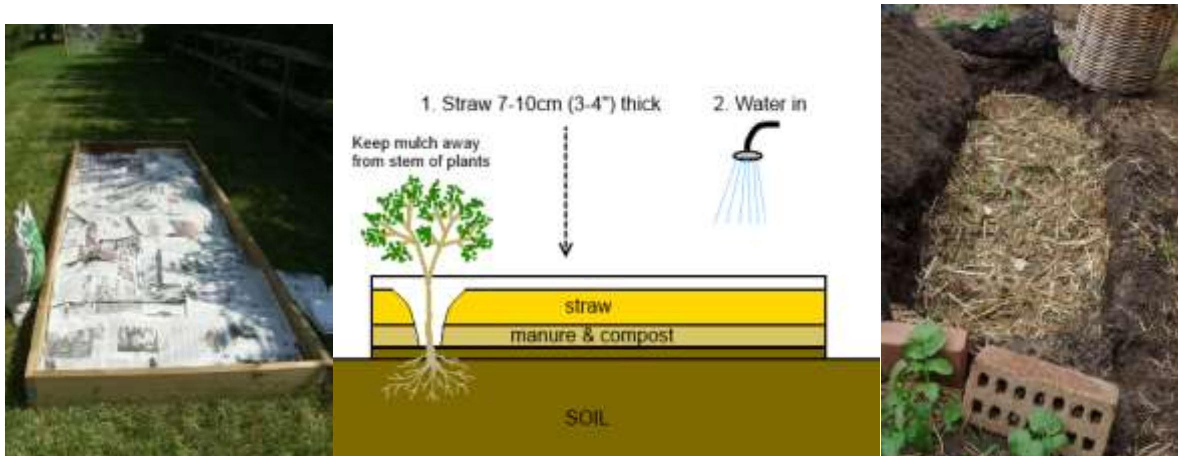

Figure 2.4: Trench/ Door gardening

2.3.5. Hydroponics

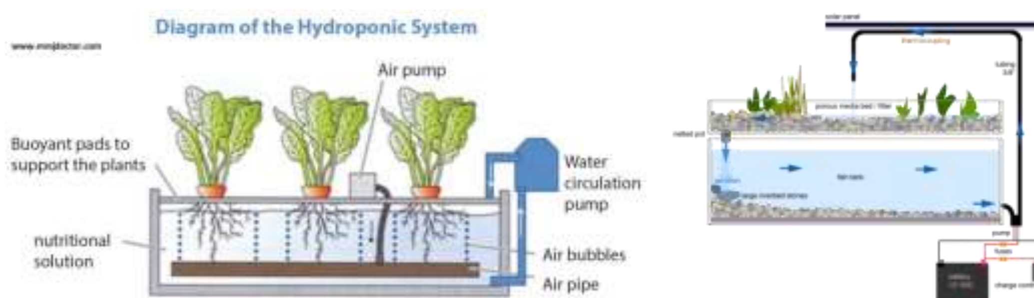

Figure 2.5: Hydroponic System

According to Diver (2006:1), hydroponics can be defined as "the production of plants in a soilless medium whereby all nutrients supplied to the crop are dissolved in water" (Diver, 2006).

This form of food production has proven to be very useful in countries that struggle with shrinking land and water resources and large populations. Adaptations can be made to the basic system in order for it to be used in developing countries for intensive food production in a limited area (Sheikh, 2006).

2.4. Benefits of household food gardens

Households in developing countries generally do not have sustainable household food gardens that produce enough food to meet the requirements of the family (Makhotla and Hendriks, 2004). Despite this, household food gardens offer many diverse benefits.

According to Nell *et al.* (2000), the three cornerstones of community development include education and training; economic development and job creation; and health. Because of the vast array of benefits involved with household food gardening, the following section will focus on how most of the benefits relate to these cornerstones.

2.4.1. Education and personal development/training

Household food gardens can be used as an educational platform, e.g. demonstration gardens. By being exposed to training, individuals are empowered to increase the quantity and quality of produce from their household food gardens. Knowledge related to the management of the food garden, soil and compost making, irrigation, planting seeds, seedlings and caring for vegetables, pest control and harvesting, processing, preservation and marketing is valuable (Nell *et al.,* 2000).

Through communal gardening, knowledge on indigenous practices (selection of plant species and farming practices) is also exchanged between individuals, as advice and support is provided by community members. Thus, skills are developed and knowledge is preserved from one generation to the next. Through this development of skills, a sense of belonging can also be facilitated (Weinberger, 2013). Individuals are able to develop leadership skills and take responsibility for further training within the community (Okvat and Zautra, 2011; Brennan, 2007).

Individual empowerment, especially among women involved with gardening, has been noted in education programmes aimed at improving gardening skills (Weinberger, 2013:850). Women in developing countries are often dependent on their male partners or husband on an economic, social and emotional level. In general, their lower social status results in limited access to nutrient-rich food. Through acquiring additional skills and being able to contribute to food production and household income, women are empowered (Galhena *et al.,* 2013; Du Plessis and Lekganyane, 2010).

2.4.2. *Economic development and job creation*

As mentioned in chapter 1, poverty and periods of food price increases are often characterised by the consumption of cheaper sources of energy, thus compromising micronutrient intake (Shisanya and Hendriks, 2011; Zezza and Tasciotti, 2010).

Household food gardens can play an important role in improving income generation and food garden interventions have the potential to create employment opportunities (Galhena *et al.,* 2013; Weinberger 2013).

Household food gardens have the potential to provide individuals with disposable income through the sale of garden produce at local markets (Okvat and Zautra, 2011). Household food gardens also contribute to household stability against temporary shortages and seasonality (Zezza and Tasciotti, 2010). In some instances, produce is sold directly from household gardens. Households who are not able to harvest yet or do not possess a garden, often purchase vegetables from their neighbours (Maroyi, 2009).

Savings can also be generated from the consumption of home-grown products instead of purchased food. These savings can then be directed towards buying additional nutrient rich food items, paying for household expenses like healthcare and education, as well as building up savings (Weinberger, 2013). By doing this, household food gardens facilitate entrepreneurship and self-reliance (Galhena *et al.,* 2013; Nell *et al*.,2000).

2.4.3. Health

Though habit is considered an influencing factor for vegetable and fruit intake, it has been noted that availability plays an important role with fruit and especially vegetable intake (Morgan *et al.,* 2010). Household food gardens can provide a supplemental food source, thus improving food security and DD. Having a household food garden provides an affordable source of nutritious food, addressing both access and availability (Galhena *et al*., 2013). Dietary intake is improved as a result of greater diversification of the diet as fruit and vegetables are excellent sources of phytonutrients, micronutrients and fibre (Weinberger, 2013). As mentioned in chapter 1, diversification has the potential to prevent or reduce chronic micronutrient deficiencies (Wijesinha-Bettoni *et al.,* 2013; Burchi *et al*., 2011).

Household food gardens can also contribute to the individual's health through providing home remedies that can be used for specific illnesses (Galhena *et al.,* 2013). An estimated 80 per cent of the world's population is said to depend on traditional medicine for primary health care (Galhena *et al.,* 2013). Some spices and aromatic herbs can also be obtained from plants in the garden which may help in the management of chronic diseases of lifestyle when used to flavour food in the place of salt (Geldenhuys, 2007; Schipmann *et al.,* 2002).

Fruit and vegetable consumption has been linked to a reduced risk for various chronic diseases. Concerning obesity, fruit and vegetable consumption is considered an effective measure (along with energy reduction in the diet) for initial weight-loss, but more importantly for weight management. Yokoyama *et al.* (2014), furthermore found a positive association between fruit and vegetable consumption and a reduction in blood pressure. Fruit and vegetable consumption has been shown to improve the regulation of blood vessel enlargement, prevent platelet aggregation and decrease inflammatory markers, while also reducing stroke risk (Yokoyama *et al*., 2014). Increased fruit and vegetable consumption is also beneficial in protecting against rheumatoid arthritis, osteoporosis and Chronic Obstructive Pulmonary Disease (Boeing *et al.,* 2012).

2.4.3.1. In Pregnancy

According to Girard *et al*. (2012), under nutrition is a burden that falls heavily on children and women. This is especially true in the case of pregnant and lactating women in low and middle-income countries, since nutrient requirements are elevated during pregnancy and lactation (Talukder *et al.,* 2010). Access to nutrient dense foods, risk of infectious diseases and access to adequate health care are all affected by the lower social status of women in many developing countries. An infection and malnutrition cycle further increases the already high nutrient requirements of pregnant women (Girard *et al.,* 2012).

Malnutrition during pregnancy increases the risk for intrauterine growth retardation, resulting from *in utero* nutrient and micronutrient deprivation (Girard *et al.,* 2012; Victora *et al.*, 2008). Pregnant women of short stature have an increased risk for pre-term delivery, caesarean delivery, and maternal morbidity (Black *et al.,* 2008). Intrauterine growth retardation furthermore affects the growth and development of a number of organs,

including the brain, heart, liver and kidneys (Sedaghat, 2015; Latini *et al.,* 2004). The extent of the damage depends on the timing and severity of the insult (Sedaghat, 2015).

As mentioned in chapter 1, obesity is also a form of malnutrition. This form of malnutrition often occurs in adults that were undernourished as children and thus did not reach their full height potential. If this is followed by fast weight gain as a result of the nutrition transition, obesity is very likely to occur. It is not uncommon for overweight adults to suffer from micro-nutrient deficiencies. Growth restriction *in utero* has been associated with an increased risk for developing metabolic syndrome as an adult (also known as the Barker Theory). Metabolic syndrome is linked to obesity, arterial hypertension, hyperlipidaemia, cardiovascular disease, impaired glucose tolerance, insulin resistance and diabetes. It may also result in the increased risk of osteoporosis, schizophrenia, and depression (Sedaghat, 2015; Latini *et al.,* 2004).

Good nutrition during pregnancy can be promoted through the intake of foods from household food gardens that provide essential nutrients. Adequate nutrient intake increases the likelihood of a healthy pregnancy and lowers the risk of intra-uterine growth retardation. Healthy pregnancies in turn, decrease the likelihood of morbidity, stunted growth and delayed development in infants and children. In this way, the intergenerational cycle of malnutrition, infection and underdevelopment can be addressed (Korkmaz, 2016; Girard, 2012).

2.4.3.2. In Children

Cognitive development can be negatively affected by poor nutrition during pregnancy and early childhood, with major implications for the individual on the one hand, and for whole countries on the other (Shisanya and Hendriks, 2011; Nell *et al.,* 2000).

Due to the consumption of starchy-staple diets in developing countries, micronutrient deficiencies in children are common. Breast milk composition is also determined by maternal nutritional status and intake of micronutrients (Black *et al.,* 2008).

One of the most prominent deficiencies is Vitamin A deficiency, which directly impacts growth, development and health in children (Faber *et al.,* 2002). Vitamin A plays an essential

part in vision and eye health and is also seen as a very important factor in survival (Faber *et al.,* 2002; Ruel and Levin, 2000). Children are also often affected by iron deficiency (well-recognized as the most common micronutrient deficiency in the world). Physical growth, cognitive development and immunity are all impaired during iron deficiency. Iron deficiency affects school performance, and results in fatigue and reduced work capacity (Ruel and Levin, 2000).

Malnutrition is associated with poorer cognitive performance and/or lower school grades in middle childhood. Stunting at the age of two years has been associated with delayed school entry, increased grade repetition and dropout, and poorer school performance (Weinberger, 2013; Victora, *et al.*, 2008). In the longer term, malnourished children are more likely to develop chronic disease later in life.

Household food gardens allow for an increased intake of yellow/orange and dark green leafy vegetables, which are rich in micronutrients (Faber *et al*., 2002). Better access, availability and utilisation of vegetables also contribute to healthier dietary habits being established in children. Through this, health, growth and cognitive development of children and adolescents are improved (Weinberger, 2013). Interestingly, involving children in the growing of fruit and vegetables promotes their consumption over the course of their lives (Chaufan *et al.,* 2015).

2.4.3.3. In the elderly

Wang and Glickman (2013), state that gardening is able to improve the quality of life of the elderly. Gardening is positively associated with improved cognitive functioning in elderly individuals and is thought to contribute to healthy aging (Wang and Glickman, 2013).

Various other benefits - including increased creativity, increased access to healthy food, social interaction, sensory stimulation and practicing of fine and gross motor skills and improved hand-eye coordination - have been linked to gardening (Wang and Glickman, 2013:89). These benefits help elderly individuals to cope better with social issues such as poverty and violence (Okvat and Zautra, 2011).

Along with the mentioned benefits, gardening creates a sense of accomplishment and contributes to stress relief and relaxation (Puett *et al*.,2014; Wang and Glickman, 2013; Okvat and Zautra, 2011; Milburn and Vail*,* 2010). Elderly individuals can also benefit from the moderate to rigorous exercise that they are exposed to while participating in this activity, with the benefit of improving strength and flexibility (Wang and Glickman, 2013:100).

2.4.3.4. Health of the environment

Gardening practices can be both beneficial and detrimental to the environment. This all depends on whether positive (e.g. composting, using local plants and materials) or negative (e.g. limiting plant diversity, use of chemical synthetic pesticides) practices are implemented (Guitart *et al.,* 2015).

Home gardens can provide erosion control measures; feed (fodder for livestock); act as windbreakers; and provide fuel in the form of wood. Soil fertility is also maintained by the use of waste obtained from plants and animals (Essein *et al.,* 2013). Home gardens can furthermore help to reduce food supply chain length, resulting in fewer greenhouse gas emissions. Resource and energy use is more efficient, the carbon footprint is improved, food waste is reduced and better interactions between humans and nature are facilitated by home food production (Ghosh, 2014).

Home gardening allows for vegetables to be grown as an environmentally friendly hobby for all household members (Qaiser *et al.,* 2013:63). Gardens benefit the eco-system by creating habitats for beneficial organisms and animals, and increasing pollination. By planting a variety of crops, soil fertility and protection against pests and diseases is also improved (Galhena *et al.,*2013; Faber *et al.,* 2011).

The use of good gardening techniques (biomass mulching, no-till, ridge-till, terracing, grass strips, crop rotations or combinations of all of these methods) is beneficial in soil conservation, as land is protected by plant cover. This is important, as globally soil erosion is taking place at a faster rate than topsoil renewal, resulting in decreased crop productivity as the soil is unable to hold sufficient amounts of water, nutrients and organic matter (Pimentel, 2011).

Household food gardens are effective nutrient cycling systems as they recycle organic soil matter on a regular basis (Galhena *et al.,* 2013. Gardens may also help influence climate change through carbon sequestration. Carbon dioxide is absorbed by plants which then separate the oxygen and carbon – releasing the oxygen into the environment while the carbon is kept in the soil making it more fertile. This process helps reduce the amount of carbon in the atmosphere (Okvat and Zautra*,* 2011).

Other ways in which gardens help reduce greenhouse gases are also recognised. Locally grown food requires no transport from afar – thus a smaller energy demand and fewer carbon emissions. Energy requirements for packaging, storage, heating and lighting are also reduced (Okvat and Zautra, 2011). Composting with kitchen scraps and yard waste in organic gardens further reduce greenhouse gas emissions as they no longer need to be transported to landfills (Okvat *and Zautra, ,* 2011).

Rainfall is also intercepted by vegetation, helping increase its absorption and contributing positively to groundwater levels. This also reduces run-off which in turn helps minimise flooding and pollution of open bodies of water (Okvat and Zautra*,* 2011).

By growing gardens, biodiversity is enhanced, as a habitat for birds, insects and other animals is created (Okvat and Zautra, 2011). Home gardens can represent agro-biodiversity on many levels. They have the ability to house a variety of species with different life-cycles and various purposes such as the provision of fuel, fibre, medicine and food, among others (Galuzzi *et al.,* 2010).

Finally, garden soil and grass surfaces absorb less heat than concrete, tar or brick surfaces – helping moderate local climate. The presence of trees amplifies this effect through the provision of shade and moisture which helps precipitation and cloud formation (Okvat and Zautra, 2011). Air pollution is also addressed as carbon monoxide, nitrogen oxide and sulfur dioxide is removed from the air by trees (Okvat and Zautra, 2011).

2.5. Challenges related to household food gardens

As with most community development interventions, some obstacles may be present when establishing household food gardens. The main challenges include lack of resources; lack of knowledge; poor participation; and lack of sustainability.

2.5.1. Lack of resources

Access to land on which to grow a household food garden is a common challenge. Many individuals do not own land and have limited rights concerning land use. The lack of ownership of land is not ideal for establishing long-term food gardens. Without the security of land, efforts and time invested in gardens may not be worthwhile (Galhena *et al.,* 2013; Milburn and Vail, 2010).

A second limitation is the lack of access to sufficient credit. Garden inputs such as water, fertile soil, seeds and planting materials are needed but may need to be purchased. Seeds of good quality and improved variety and compost are often not available to gardeners (Yusuf *et al.,* 2008). According to Yiridoe and Anchirinah (2005), the choice of garden crops is dependent on the intended use of its produce (for income generation or household use).

Shortage of family or hired labour also influences the initiation and management of household food gardens (Galhena *et al.,* 2016; Du Plessis and Lekganyane, 2010). In rural areas, crop damage by animals tends to be common due to a lack of adequate fencing and the tendency for animals to move around freely (Yiridoe and Anchirina, 2008).

Women in particular, struggle with these constraints, as they have limited land rights, limited access to common property resources; lack equipment and appropriate technology; lack access to financial services, markets and information; and generally have lower levels of education (Arimond, 2011).

2.5.2. Lack of Knowledge

According to Yusuf *et al.* (2008), lack of knowledge about gardening is one of the major challenges when attempting to grow a sustainable vegetable garden. In order to succeed in

starting a vegetable garden that produces proper yields of good quality, the necessary knowledge and skills required to grow a garden need to be learned (Nell *et al.,* 2000).

Milburn and Vail (2010) mention that vegetable gardening interventions often require a period of continued training and supervision to improve knowledge and skills, increase interest and encourage ownership (Milburn and Vail*,* 2010). See later section on nutrition education and training.

2.5.3. Participation

A factor that plays a major role in the successful implementation of community food garden interventions is the willingness of community members to participate. Ideally, members of the community need to be willing to learn new skills, accept responsibility and take on leadership roles (Okvat and Zautra, 2011; Milburn and Vail, 2010). Leadership roles play an important part in successful interventions, since local community members need to be involved in deciding what their gaols are, increasing the chances of commitment and success (Milburn and Vail, 2010).

Due to cultural differences, the roles taken on by men and women in agricultural activities may vary (Yiridoe and Anchirina, 2005). Women often have to many responsibilities, including child care and many household roles (Ramachandran, 2006). The FAO (2011) has noted that women are more likely to be actively involved in weeding and crop harvesting, though they may not be strong enough to work the farm land (e.g. tilling and ploughing). Traditionally, men are more likely to be involved in large scale food production, because they are preferred for land ownership. In some cases, women are allowed to continue using the land owned by their husbands (e.g. if the husband has moved away in search of work to earn a better living) (FAO, 2011).

2.5.4. Sustainability

According to Maroyi (2009), a sustainable livelihood is one that “can cope with, or recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base”.

Women, children and the elderly are most commonly responsible for management of household food gardens. This provides a challenge, as the size of the plot and the intensity of the gardening activities directly influences the level of production. Therefore, measures need to be taken in order to ensure that the household food garden is a manageable size (Milburn and Vail, 2010).

Sustainability of vegetable gardening programmes are improved if they are supported by governments. Individuals and even communities are also often faced with the challenge of governments who do not invest in and support food garden programmes that address food insecurity (Burchi, 2011). On the other hand, when gardens are built by an external group and handed over to individuals/communities to manage, they are often abandoned as no one person feels responsible for the garden (Milburn and Vail, 2010).

Marsh (1998) notes that sustainability depends on the recognition of previous experience in gardening within the community and the encouragement of traditional methods to grow gardens. She has suggested the following to encourage sustainability:

- Village or community leaders should be involved in technical training; a group approach is best;
- Education and nutrition awareness should form part of garden planning;
- Whole families should be included in garden planning and management, with women as the main distributors of produce and income generated;
- Use of locally adapted varieties and diversity should be encouraged;
- Giveaways (e.g. wheelbarrows, garden tools, etc.) need to be minimised as local materials for soil, water and pest management should be relied on;
- Household or community seed production should be encouraged; and
- Regular feedback should be used as a monitoring tool, to identify and make relevant changes regarding training material or other needs.

Sustainable development is based on economy, environment and health. Economic systems that take natural environments into consideration while being socially just, should be encouraged. These three pillars reinforce one another and all form part of sustainable development (Weinberger, 2013).

2.6. Food gardens, nutrition education and training programmes

In general, nutrition education can be defined as ”a set of learning experiences designed to facilitate the voluntary adoption of eating and other nutrition-related behaviours conducive to health and well-being.” Nutrition education can be a useful tool in changing perceptions about healthy behaviours and how to adopt them. In addition to focusing on individuals, nutrition education interventions should also consider social, political and physical environments (Contento *et al.,* 1995).

Contento (2008) states that nutrition education is comprised of three major phases. The first motivational phase is aimed at increasing awareness and facilitating motivation, while the second phase involves action and how to make change happen and the third phase encourages environmental support through the involvement of policy makers.

Sayhoun *et al.* (2004) recognise that individuals are an important part of their social and physical environments and that behaviour change, particularly lifestyle choices, stem from addressing the environment in which decisions are made. Process measures such as adherence, attrition and outreach will help determine if an intervention is implemented and received as intended (Sayhoun *et al.,* 2004).

According to Perez-Rodrigo and Aranceta (2003), strategies for nutrition education implemented in settings like cities, workplaces, hospitals and schools allow for a large population to be efficiently reached, e.g. children/students, school staff, families and community members. Mushapi *et al.,* (2015) state that nutrition education could help improve the nutritional status of children when the knowledge of caregivers is improved, resulting in improvements in the way that they feed their children.

In the case of school children, school-based interventions facilitate an ideal environment to address dietary behaviour change. This is possible because children consume at least one meal or snack per day during a school day. School-based nutrition education programmes that may include exposure to vegetables, education on vegetables and their benefits and food preparation, have been linked to a moderate increase in vegetable and fruit consumption (Morgan *et al.,* 2010).

According to Faber *et al.* (2002), educational interventions increase the effectiveness of home garden interventions. Girard *et al.* (2012), note that agricultural interventions that included nutrition education and counselling were more effective in achieving nutrition-related outcomes than those that did not include an education component.

Teaching children to garden at school or at home is able to increase children's exposure to vegetable gardening and may have a positive effect on their preferences of and attitudes toward vegetables. When this is combined with culturally relevant and easily understood nutrition education, the impact is even greater. Through garden-based education, children, school staff and families are able to gain basic knowledge of food gardening. In addition to gardening, these programmes also provide a platform for teaching basic life skills such as cooking, social and cultural aspects of food and eating, food preparation and food preservation and storage (Morgan *et al.,* 2010; Perez-Rodrigo and Aranceto, 2003).

In areas where seasonality influences food production, processing and preservation of foods are important considerations. Preservation of food during times of plenty can make provision for lean seasons when vegetables are scarce, thus improving food security (Kiremire *et al.,*2010).

Food preservation can include a number of techniques. Traditional food drying is the oldest known method and is still commonly used today (Axtell, 2002; Sharif *et al.,* 2017). Meat, fish, vegetables, spices, nuts and milk are included in the wide range of foods that can be dried (Axtell, 2002). Sun drying involves laying foods out in yards, on rocks and roofs or hanging it under the eaves of houses. Sun drying requires minimal financial input, other than labour (Axtell, 2002).Foods dried by this method are however, at risk of contamination by dust and dirt. Birds, animals and insects can also be a challenge. Obviously dry and sunny conditions are optimal, with wet conditions increasing the likelihood of mould growth and spoilage. Some discoloration and nutrient loss (of especially vitamins) may also occur during drying (Axtell, 2002).

Continuous, practical and supported household food garden education has been shown to be more effective than a one-off theoretical training experience. Experienced gardeners within the community are able to successfully provide this support (Masabni and Cotner,

2009). Demonstration gardens can be very useful and serve as a sustainable source of training (Faber *et al.,* 2002).

In Africa, various organisations facilitate interventions to train individuals to maximise output from their food gardens, as well as adopt new gardening methods.

Food and Trees for Africa run a programme where support is provided through the provision of resources (educational posters, seeds, fruit trees, compost, seedling, tools and The Growing Green Book) and training (Food and Trees for Africa, year). Lima is another organisation that aims to address food insecurity through supporting and increasing food production. This is done through the provision of nutrition education, basic agricultural training and infrastructural grants. They have also developed instructional videos and training materials on household-level composting, traditional food production and garden pest and disease control (Lima).

Increasing the availability of micronutrient rich foods through establishing demonstration gardens and training owners of the demonstration gardens, can improve the sustainability of household food gardens. If programme beneficiaries are provided with relevant agricultural training and supplied with basic inputs (e.g. seeds, seedlings, tools, etc.), chances of success are increased. Increasing income through sale of vegetables focuses on equipping individuals with marketing skills. Finally, educating community health volunteers about health and nutrition related aspects (including micronutrient-rich food consumption) has the potential to bring about behaviour change (Olney *et al.,* 2013).

2.7. Conclusion

As individuals and communities continue to be greatly affected by the global food crisis, a need for sustainable, community-specific interventions is evident. Household food garden interventions address all four pillars of community development proving to be a diverse and effective method in dealing with long-term challenges. Though faced with many constraints, it is a form of intervention that can be adapted according to the target population.

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Chapter 3

Methodology

3.1. Introduction

The main aim of this study was to determine the impact of a household food garden intervention on food security of households in South Africa, Lesotho and Zimbabwe.

3.2. Study Design

This study comprised a quantitative pre-test, post-test design.

3.3. Population and sampling

The study population included households from each of three main sites that were included in the study - namely Rampepe Village (Leribe, Lesotho), Kayelisha Informal Settlement Phase 4; Phase 6; Freedom Square; Bergman; Joe Slovo and Caleb Motshabi (Bloemfontein, South Africa), and Mashvingu (Zimbabwe).

The three areas that were included were chosen due to their inclusion in three different household food garden interventions that were implemented by the Department of Agriculture in South Africa, the Society of Women against AIDS in Africa (SWAALES) in Lesotho and Batani HIV/AIDS Service organisation(BHASO) in Zimbabwe (referred to as the intervention partners).

3.3.1. Rapid Appraisal

In each study area, a rapid appraisal census (Appendix A) was undertaken prior to the intervention. All households that were included in the lists of beneficiaries of the intervention partners were included in the census. In South Africa, all Re Kgaba Diratswana beneficiary households, in Lesotho all SWAALES beneficiary households and in Zimbabwe all BHASO beneficiary households were included.

During the census, information about the presence of a vegetable garden at each household was collected.

3.3.2. Sample

Based on the results of the rapid appraisal, households that met the inclusion criteria for the main study were identified. From these households, 50 households were purposively selected for the study in each country (for logistic reasons, e.g. budget and a limited number of fieldworkers). From each list of 50 households, 25 households were randomly included in the intervention group and 25 were included in the control group.

3.3.2.1. Inclusion criteria

- Households providing informed consent after being informed (Appendices B and C).
- Area of residence: households that were situated in the beneficiary communities in South Africa, Lesotho and Zimbabwe.
- Households with no garden, more specifically no physical evidence of a garden.
- Households with a non-functioning garden – there may have been a garden, but the garden was not being maintained and had not produced any crops during the past season.
- Households with a functional garden, but a garden of a different type from the gardens to be provided to the intervention group as part of the particular intervention.

3.3.2.2. Exclusion Criteria

- Households with a garden type similar to the gardens to be provided to the intervention group as part of the study.

3.4. Measurements

The main study questionnaire included information about the following sections: household composition, household data, food insecurity, food gardens, food remittances received from household food gardens, food from household food gardens, gardening, health, HIV and AIDS and urban food aid.

For the purpose of this sub-study, only the baseline survey and data from the second follow-up survey (winter follow-up) was included (pre-test, post-test) and only the sections of the

questionnaire that are relevant to the aim and objectives of the sub-study (socio-demography, Living Poverty Index (LPI); Months of Adequate Household Food Provisioning (MAHFP); Household Dietary Diversity (HDD), and frequency of vegetables eaten) were considered.

3.4.1. Operational definitions and techniques

The following information was gathered from the study sample :

- Socio-demography and household composition (Appendix D)
- Living Poverty Index (Appendix D)
- Months of Adequate Household Food Provisioning (Appendix D)
- Household Dietary Diversity (Appendix D)
- Frequency of vegetables eaten (Appendix D)

3.4.1.1. Socio-demography and household composition

For the purpose of this study, socio-demography included basic demographics of household members, household structure, household income, household amenities, and access to water, sanitation and electricity.

3.4.1.2. Food Security

3.4.1.2.1. Living Poverty Index

For the purpose of this study, the LPI questionnaire was included as a section in the sub-study questionnaire and used to assess the presence of poverty and standard of living (Mattes, 2008), both of which are indirect indicators of food security. The standard of living was determined by assessing the frequency that households go without basic necessities of life (namely food, water, medicine, electricity, and fuel and cash income). It was calculated for a period of 12 months prior to the interview by using a set of six questions, each with six possible responses (the sixth response being ‘I don’t know’). The range of responses each received a score on a five point scale. The responses were then combined to calculate the average LPI score for the household, 0 (no poverty) to 4 (complete poverty). The index was

then used to track changes in the households' experience of poverty before and after the household food garden intervention (Mattes, 2008).

3.4.1.2.2. Months of Adequate Household Food Provisioning

The standardised MAFHP questionnaire developed by Billinsky and Swindale (2010) was applied as a part of the sub-study questionnaire as a measure of food security of households. MAHFP for each household was calculated by subtracting the total number of months out of the previous 12 months that the household was unable to meet their food needs from 12 (e.g. 12 – sum(A+B+C+D+E+F+G+H+I+J+K+L). Values for A through L were '0' or '1' (Bilinsky and Swindale, 2010).

In order to indicate levels of food security, the scores were categorised into three groups. A score of twelve indicated that the household had year-round adequate food provisioning. Households that scored between eleven and eight were deemed to have moderate food security; households that scored between four and seven were considered to have a low level of food security and households that scored between zero and three were considered to be food insecure.

3.4.1.2.3. Household Dietary Diversity

For the purpose of this study, the level of diversity in the household diet was determined using a standardised questionnaire on HDD (FAO, 2011) as part of the sub-study questionnaire. This tool used the previous 24-hour period as a reference and was used to calculate a HDD score. In this way, the number of different food groups consumed during the previous 24-hours was determined from a possible 16 food groups. To determine the HDD score a set of 12 food groups was used, namely: cereals; root and tubers; vegetables; fruits; meat, poultry, offal; eggs; fish and seafood; pulses/legumes/nuts; milk and milk products; oil/fats; sugar/honey; and miscellaneous. Once the data had been obtained a HDDS was calculated by tallying the total number of food groups from 12 consumed by the members of the household. This value ranged from 0 to 12. For the purpose of this study, an expanded set of food groups was used in order to determine the consumption of vitamin-A rich fruit and vegetables (instead of just the total of vegetables and fruit), when generating

the HDDS the expanded set was combined back into the original 12 food groups (Swindale and Bilinsky,).

The HDD scores were interpreted in the following way: 0- 3 = low dietary diversity; 4-5 = medium dietary diversity and 6-12 = high dietary diversity (FAO, 2011).

3.4.1.2.4. Frequency of vegetables eaten

The frequency of vegetables eaten by adults and children in the households was measured using a set of 6 responses to the question 'How frequently do ADULTS/CHILDREN in the household eat vegetables? The responses included: Several times a day, once a day, a times per week, once a week, rarely and Never. The responses were coded and used to draw a comparison between vegetable consumption before and after the intervention.

3.5. Study Procedures

After approval to conduct the study had been obtained from the Health Sciences Research Ethics Committee of the University of The Free State in South Africa (Appendix E), the Ministry of Health in Lesotho and the Medical Research Council in Zimbabwe, the census was undertaken and households that were eligible to be included in the main study were identified. From this list, 50 households (including 25 randomly selected intervention and 25 control households) from each country were purposively selected, based on practical considerations of the intervention partners.

Fieldworkers from the Centre for Development Support at the University of the Free State in South Africa, the University of Lesotho and the Great University of Zimbabwe received training on the data collection process using the questionnaires. This training took place during August 2014 and was done by individuals from the main study's steering committee

3.5.1. Baseline Survey

Once the control and intervention households had been identified, the first set of baseline interviews (pre-intervention) were undertaken between August and September 2014. A two-person team of fieldworkers conducted structured interviews with individuals in participating households using the questionnaire which was compiled for the main study.

The interviews were done at the households. The questionnaires were completed by the fieldworkers, who noted the response given by the participant (usually the household head).

3.5.2. Implementation of the intervention

The 25 intervention households in each country received training and assistance in establishing their gardens from July to September 2014 from the 3 intervention partners. In South Africa, vegetables that were planted for the summer harvest included pumpkin, carrots, spinach, green beans, tomatoes, onion, beetroot and potatoes. In Lesotho, vegetables planted for the summer harvest included spinach, rape, beetroot, carrots, mustard, butternut and cabbage. In Zimbabwe, vegetables planted for the summer harvest included rape, beans, carrots, spinach and tomatoes. Planting for the winter harvest took place between January and June 2015. In collaboration with each of the three intervention partners, the gardeners received basic training from Lima Rural Development Foundation (Appendix F) on garden layout and bed design; natural soil fertility, pest and disease control; nutrition training; food preservation, processing and storing; seed harvesting and saving; and preparation for winter crops, frost and cold damage.

Maintenance and monitoring continued throughout the remaining months of the project (July 2015 to September 2015) and was done by coordinators and extension officers of the Re Kgaba Diratswana programme of the Department of Agriculture in South Africa (continuous support), an extension officer and program assistant in Lesotho (monthly training) and a field officer in Zimbabwe (bi-monthly visits). Training material(s) were made available in both English as well as the relevant local language(s)

3.5.3. Follow-up Survey

Following the implementation of the household food garden intervention by the intervention partners, a follow-up survey, called the summer follow-up, took place between January and June of 2015. A second follow-up, called the winter follow-up, took place between July and September of 2015, in both cases the same team conducted interviews with control and intervention households using the same questionnaire.

Control households were informed of the incentive they would receive at the completion of the study (the same household food garden intervention as the intervention group).

3.6. Pilot Study

The questionnaire was piloted prior to the commencement of the data collection phase of the study, in Bloemfontein and Mashvingu, and relevant and appropriate amendments were effected.

In Bloemfontein, the pilot study was undertaken before the main survey in eight randomly selected households by the South African and Lesotho fieldworkers that met the inclusion criteria. These households were selected at the fieldworkers' discretion in a different area than households for the main study. In Mashvingu, Zimbabwe four households were selected by the Zimbabwean fieldworkers. The amount of time needed to complete the questionnaires was determined as well as the clarity of the questions asked. Participants each received a small incentive from the interviewer upon completion of the questionnaire (a shopping voucher at a local grocery store to the value of R100 in South Africa and 10 dollars in Lesotho and a 5 dollar note in Zimbabwe). After the pilot study, necessary changes and corrections were made.

Changes made include the following:

- Underlining of key words in order to assist the interviewer;
- Instructions for the interviewer at certain questions were inserted to ensure uniformity;
- Wording/phrasing of questions and answer options were changed in the questionnaire to make them more applicable to the target population;
- Parts of the questionnaire were omitted as their presence was determined unnecessary in reaching the objectives; and
- The layout of columns in the questionnaire was edited to allow for a more efficient interview.

The data from the pilot study was not included in the results of the main study.

3.7. Validity and Reliability

3.7.1.1. Validity

Validity is the ability of a tool or instrument to measure that which it is supposed to measure. The measurement is not considered valid if the instrument repeatedly measures a characteristic in the same person or group higher or lower than it actually is (Monsen *et al.,* 2003).

Validity was guaranteed by researching evidence-based literature concerning indirect measures of household food security and including these in the questionnaire. The sub-sections included in the overall questionnaire (Living Poverty Index (LPI), Months of Adequate Household Food Provisioning (MAHFP) and Household Dietary Diversity (HDD) are all standardised questionnaires and therefore no adjustment was necessary.

3.7.1.2. Reliability

Reliability is the degree of correlation between sets of data when the measurement is done more than once on the same study participant or group, by the same or a different observer (Monsen *et al.,* 2003). To ensure reliability in this study, the researchers used the same, standardised questionnaires to obtain information from participants. Structured interviews were conducted by local fieldworkers who received training on research ethics, survey methodology and fieldwork, as well as proper execution of the relevant food security measurements (LPI, MAHFP, HDD and frequency of vegetables eaten). The use of structured interviews contributed to reliability as they helped eliminate the possibility of research bias and subjectivity, since questions were asked exactly as worded in the questionnaire.

The questionnaires were designed in such a way that fieldworkers did not ask leading questions. Fieldworkers were assisted by foot-note instructions in the questionnaire guiding them throughout the interview. The order in which the questions were asked was also carefully considered to avoid previous questions influencing the participant's answers. The questionnaires were also translated into the local languages. The questionnaires were translated into the relevant languages, with the original translations being back-translated by another person to improve the reliability of the translations.

Quantitative data gathered during the study by means of the procedures mentioned in the data collection process were captured using a double entry process in CSPro. An exact replica of the questionnaire was programmed into the CSpro programme and was programmed to disallow any irrelevant data entry (e.g. words instead of numbers, incorrect values) enabling the data capturers to maintain the integrity of the data.

3.8. Statistical Analysis

Quantitative data gathered by means of the above mentioned procedures was captured using a double entry process by a full-time doctoral student from the department of Economics and a part-time Masters student (the researcher of this sub-study) from the department of Nutrition and Dietetics at The University of the Free Sate. As mentioned, the data was captured twice by each capturer using CSpro from which data could then be exported to Excel.

Descriptive statistics, namely frequencies and percentages for categorical data, means and standard deviations or percentiles, were calculated for before (pre-intervention baseline survey) and after (post-intervention survey) the intervention per group. The changes from before the intervention were calculated and described by means of 95% confidence intervals.

For the purpose of this sub-study, data was analysed by the Department of Biostatistics, UFS.

3.9. Methodology Errors

Language barriers were overcome by making use of local fieldworkers as these fieldworkers were able to explain/conduct interviews in the native tongue, using questionnaires translated into all relevant languages (Sesotho in RSA and Lesotho, Shona in Zimbabwe). The questionnaire was kept as short as possible to avoid fatigue of the participant and a series of yes or no responses were used wherever possible.

The reliability of the study could also have been influenced by the countries differing in terms of landscape, gardens or the type of vegetables grown locally. This meant that different countries required different types of instructions regarding the implementation of

their household food gardens. This issue was addressed by making use of the different local intervention partners. Training was done by the same organisation, Lima, in order to help create congruence between the countries. The intervention was then adapted in the intervention phase according to country requirements (e.g. choosing plants that grow well in the area). Each country's intervention was therefore implemented in a way that catered for their, culture, demographics and climate. For this reason, the results of each country are reported separately.

Withdrawal/ fall-out would have influenced results and therefore the purpose of the project was explained to participants in detail before obtaining informed consent. During this explanation, participants were also informed that if they were selected for the control group, they would still be receiving training and a household food garden intervention after the completion of the study.

An additional number of households were also randomly sampled as a reserve group in each case before baseline. These reserve households could then be approached if the team had exhausted the households in the original sample, mainly where the relevant households moved, could not be located or refused participation. This reserve included an additional four to five households in both the randomly selected experimental and control samples.

3.10. References

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Chapter 4

Impact of a Household Food Garden Intervention on measures of Food Security in an informal settlement in South Africa

4.1. Introduction

South Africa is deemed a food secure nation as it is able to produce enough staple food and has the capacity to import food if necessary. Sadly, the same cannot be said at household level (Du Toit, 2011). Poor household food security is one of the reasons that malnutrition remains a major challenge (Altman *et al.,* 2009). Malnutrition can take a number of forms, including wasting and stunting; micronutrient deficiencies (also referred to as hidden hunger); and overweight and obesity (IFPRI, 2014; Khor and Sharif, 2003). It is not uncommon for stunted and wasted children to live in a household where adults are overweight and/or obese and to become overweight themselves as they become older (Doak *et al.,* 2005).

In terms of micronutrient deficiency, the 2005 National Food Consumption Survey Fortification Baseline (NFCS), revealed that 64% of South African children aged 1-9 years were vitamin A deficient, 28% were anaemic, 13% had a poor iron status and 45% had a low zinc status (Labadarios, 2005). More recently, the South African National Health and Nutrition Examination Survey (SANHANES) undertaken in 2012, provided information on the nutritional status of children aged birth to 5 years, indicating a national prevalence of 43.6% for vitamin A deficiency and 10.7% for anaemia (Shisana *et al.,* 2013). They also reported on nutritional status of adults, stating that Vitamin A deficiency was prevalent in 13.3%, and anaemia in 23.1% of women of child-bearing age. Furthermore, anaemia was identified in 17.5% of all participants older than fifteen years.

In terms of food security, the National Food Consumption Survey of 2005, applied the Community Child Hunger Identification Project (CCHIP) index and found that 52% of South African children experienced hunger, while 55.4% of individuals regularly cutting or skipped meals (Labadarios *et al.,* 2011). Using the Months of Adequate Household Food Provisioning (MAHFP) questionnaires as measure of food security, the 2009 General Household Survey

found that 20% of households in South Africa had inadequate or severely inadequate access to food (Du Toit, 2011). The most recent SANHANES also used the CCHIP index, and reported that 45.6% of the population was food secure, with 28.3% at risk for hunger and 26% experiencing hunger (Shisana *et al.,* 2013). A study undertaken amongst urban and rural households in the Free State (also using the CCHIP index), reported that 73.2% of households had a high risk of food insecurity, with 72% of households cutting the size of meals or skipping meals and 18% of children experiencing hunger (Walsh and Van Rooyen, 2015).

Being food secure, involves the ability of individuals to obtain sufficient quantities and quality of food on a daily basis (Du Toit, 2011). Based on this basic definition, food security has four core concepts, namely: availability, access, utilisation and stability. Availability relates to the physical availability of enough food obtained through own production, purchases, imports or donations. Access includes adequate income or other means to acquire necessary quantities of food. Utilisation involves the proper use, processing and storage of food, as well as adequate knowledge on healthy food and nutrition practices (Battersby, 2011). Lastly, stability involves being able to cope with natural and man-made disasters, the accumulation of stocks and diversification. Food utilisation requires stability through constant access to health care, clean drinking water and sanitation (Burchi *et al.*, 2011).

The South African Integrated Food Security Strategy states that inadequate safety nets, weak disaster management systems, weak support networks and inadequate and unstable household food production and lack of purchasing power are some of the most significant causes of food insecurity (Shisanya and Hendriks, 2011). All of these factors are strongly linked with poverty. Although a general decline in poverty was noted in South Africa between 2006 and 2011, this period was followed by an increase in poverty. In 2015, 30.4 million South Africans were living in poverty (this amounts to 55.5% of the population) (SSA, 2017). Individuals living in informal urban settlements are the most vulnerable to price increases and tend to pay more for their basic food needs than those living in cities. Their continued and increasing reliance on food purchases leaves them vulnerable to economic shocks. With fewer people growing their own food, and a reliance on social grants, food purchasing has become the most common means of obtaining food (Perreira, 2014).

According to Altman *et al*. (2009), the steady increase in maize and wheat prices directly impacts the ability of the urban and rural poor to obtain these staple foods. Due the continued increase in prices, poor households are forced to spend a larger part of their money on food.

The nutritional adequacy of the diet is influenced by the number of food items and food groups that are consumed, thus contributing to a more diverse diet (Rah *et al.,* 2010). According to Faber *et al.* (2011), the South African population's diet is generally low in variety from fruits, vegetables and animal foods, thus influencing their micronutrient intake. The nutrition transition describes changes in diet and levels of physical activity. The shift from a more traditional diet to a more Western diet is characterised by a diet that is high in saturated fat, cholesterol, sugar and refined carbohydrates that are low in fibre (Abrahams *et al.,* 2011). Unhealthy foods that are high in cheap animal proteins, fats and refined cereals and sugar are generally more energy-dense and affordable than healthier foods (Faber *et al.,* 2011; Lock *et al.,* 2005). Rapid urbanisation, along with the nutrition transition, has contributed to an increased prevalence of overweight and obesity (Perreira, 2014) and diet-related chronic diseases such as diabetes, heart disease and some cancers (Perreira, 2014; Abrahams *et al*., 2011).

To simply improve food security through food hand-outs does not provide a sustainable solution. Interventions should target the basic and underlying causes of poor food security, such as poor socioeconomic circumstances and unfavourable agro-ecological situations (Hart, 2011). Interventions aimed at improving food security need to focus on reaching the largest number of people at the fastest pace (Bonti-Ankoma, 2001; Smith *et al.,* 2000).

Home food production has been shown to have the potential to address food insecurity and decrease hunger by increasing availability, accessibility and utilisation (Galhena *et al.,* 2013). For this to happen, however, access to markets and high quality natural resources is required(Faber *et al*., 2011).

The quantity and quality of nutrients available to families with gardens is improved and typically, these households can obtain more than 50% of their supply of vegetables and fruit from their own gardens (Galhena *et al.,* 2013). Home gardens can further influence well-

being by being an important source of supplementary income for poor rural and urban households. Through this, the women of the household are able to contribute financially and have more influence in decision-making. Home gardens may also provide relief in times of stress by becoming a long-term source of food and income. After the withdrawal of programme support to establish home gardens, continued improved levels of income have been observed, suggesting good sustainability of food garden interventions (Puett *et al.,* 2014).

In view of the high levels of poverty, malnutrition and food insecurity in South Africa, relevant interventions that can address these challenges are urgently required. With this in mind, the aim of this study was to determine the impact of a household food garden intervention on measures of food security in South Africa.

This study formed part of a larger study undertaken by the Centre for Development Support at The University of The Free State titled “Household food gardens: effective and sustainable impact mitigation response to the HIV and AIDS epidemic in urban settlements in Lesotho, South Africa and Zimbabwe”. The overarching study aimed to investigate the potential benefits of sustainable, eco-friendly household food gardens on household food security in South Africa, Lesotho and Zimbabwe. It spanned over a period of two and half years (July 2013 to 2015). The project was funded by the Southern African Development Community (SADC). The Centre for Development Support at the University of the Free State partnered with the Department of Agriculture in South Africa, the Society of Women against AIDS in Africa (SWAALES) in Lesotho and Batani HIV/AIDS Service organisation (BHASO) in Zimbabwe in order to implement the household food garden interventions in each country.

For the purpose of this publication, the impact of a household food gardens intervention on measures of food security in South Africa will be discussed.

4.2. Study Design

This study comprised a quantitative pre-test, post-test design.

4.3. Study Population

The study population included households from Kayelisha Informal Settlement; All households in these areas that were eligible to participate in the Re Kgaba Diratswana programme that was implemented by the Department of Agriculture in South Africa comprised the population (referred to as the intervention partner). This programme was initiated in 2013 to empower communities to secure a sustainable food source, while creating an uplifting environment (Media Update, 2014).

4.3.1. Rapid Appraisal

In the study area, a rapid appraisal census (Appendix A) was undertaken prior to the intervention. All households that were included in the list of beneficiaries of the intervention partner were included in the census.

During the census, information about the presence of a vegetable garden at each household was collected and based on this; households that met the inclusion criteria for the main study were identified.

4.3.2. Sample

From these households, 50 households that met the inclusion criteria were purposively selected as the sample for the study by the intervention partner, the Re Kgaba Diratswana Programme in South Africa (for logistic reasons). From the list of 50 households, 25 households were randomly included in the intervention group and 25 were included in the control group.

4.3.2.1. Inclusion criteria

- Households providing informed consent after being informed of the procedures (Appendix B and C).
- Area of residence: households that were situated in the beneficiary communities in South Africa.
- Households with no garden, more specifically no physical evidence of a garden.

- Households with a non-functioning garden – there may have been a garden, but the garden was not being maintained and had not produced any crops during the past season.
- Households with a functional garden, but a garden of a different type from the gardens to be provided to the intervention group as part of the particular intervention.

4.3.2.2. Exclusion Criteria

- Households with a garden type similar to the gardens to be provided to the intervention group as part of the study.

4.4. Methodology

4.4.1. Operational Definitions and Techniques

The questionnaire (Appendix D) developed for the main study included the following sections: household composition; household data (information on the structure of the household and ways in which the household implemented strategies to survive); food insecurity measures that included the Living Poverty Index (LPI), MAHFP; Household Dietary Diversity (HDD), and Frequency of vegetables eaten. Information about food gardens (whether or not the household had a food garden, what constraints they experienced, how important the household perceived having a garden, food remittances received from household food gardens, and food obtained from household food gardens); health and HIV and AIDS; and finally information about urban food aid (whether they were receiving any form of food aid from a faith-based organisation, a Non-Governmental Organisation, or a community based organisation).

For the purpose of this sub-study, results pertaining to socio-demographic information and measures of food security, including the LPI, MAHFP, HDD and frequency of vegetables eaten, are reported.

Questionnaires were completed by fieldworkers in a structured interview with a member of the household (preferably the household head) at the household.

4.4.1.1. Household demographics, responsibilities and structure

For the purpose of this study information related to socio-demography, included gender, marital status and level of education of the respondent; household structure; and household responsibilities.

4.4.1.2. Living Poverty Index

The LPI questionnaire developed by Mattes (2008) was applied to assess the standard of living or level of poverty through determining the frequency that households went without basic necessities of life (namely food, water, medicine, electricity, fuel and a cash income) for a period of 12 months prior to the interview. Six questions, each with six possible responses (the sixth response being 'I don't know') were asked. The range of responses each received a score on a five-point scale. The responses were then combined to calculate the average LPI score for the household, with 0 indicating no poverty and 4 indicating complete poverty (Mattes, 2008).

4.4.1.3. Months of Adequate Household Provisioning

The MAFHP questionnaire developed by Billinsky and Swindale (2010) was applied as a measure of household food security. MAHFP for each household was calculated by subtracting the total number of months out of the previous 12 months that the household was unable to meet their food needs from 12 (e.g. 12 – sum (A+B+C+D+E+F+G+H+I+J+K+L). Values for A through L were '0' or '1' (Bilinsky and Swindale, 2010).

The scores were then categorised into three groups. A score of 12 indicated that the household had year-round adequate food provisioning. Households that scored between 11 and 8 were categorised as being food security; households that scored between 4 and 7 were considered to have a low level of food security and households that scored between zero and 3 were considered to be food insecure.

4.4.1.4. Household Dietary Diversity

The Household Dietary Diversity Score (HDDS) is defined as the number of food groups consumed over a period of 24hours (Swindale and Bilinsky, 2006). The level of diversity in

the household diet was determined using the HDD tool developed by the Food and Drug Organisation (FAO, 2011). Using this tool, the number of different food groups consumed during the previous 24-hours was determined from a possible 12 food groups, that included: cereals; roots and tubers; vegetables; fruits; meat, poultry, offal; eggs; fish and seafood; pulses/legumes/nuts; milk and milk products; oil/fats; sugar/honey; and miscellaneous.

Once the data had been obtained, a HDDS was calculated by tallying the total number of food groups from 12 consumed by the members of the household. This value ranged from 0 to 12(Swindale and Bilinsky, 2006).

The HDD scores were interpreted in the following way: 0- 3 = low dietary diversity; 4-5 = medium dietary diversity and 6-12 = high dietary diversity (FAO, 2011).

4.4.1.5. Frequency of vegetables eaten

The frequency of vegetables eaten by adults and children in the households was measured using a set of 6 responses to the question 'How frequently do ADULTS/CHILDREN in the household eat vegetables? The responses included: Several times a day, once a day, a few times per week, once a week, rarely and never.

4.4.2. Study Procedures

Following approval of the protocol by the Health Sciences Research Ethics Committee (Appendix E) of the University of The Free State, the census was undertaken and households that were eligible to be included in the study were identified.

Prior to the census and baseline household interviews, fieldworkers from the Centre for Development Support at the University of the Free State received training on the data collection process. This training took place during August 2014.

4.4.2.1. Baseline Survey

Once the control and intervention households had been identified, the first set of baseline interviews were undertaken between August and September of 2014. A two-person team of fieldworkers, from the Centre for Development Support at the University of the Free State, conducted structured interviews with individuals in participating households (preferably the

household head) using the questionnaire which was compiled for the main study. The questionnaires were completed by the fieldworkers in a structured interview, indicating the response given by the participant on the questionnaire.

4.4.2.2. Implementation of the intervention

In South Africa, the households that were included in the household food garden intervention were beneficiaries of the Department of Agriculture's Kgaba Diratswana Programme. This programme was initiated in 2013 to empower communities to secure a sustainable food source, while creating an uplifting environment (Media Update, 2014).

The twenty-five intervention households were trained on and assisted with the implementation of their household food gardens from August to September 2014. Vegetables that were planted for the summer harvest included pumpkin, carrots, spinach, green beans, tomatoes, onion, beetroot and potatoes. Planting for the winter harvest took place between January and June 2015.

The gardeners within those households received basic training on garden layout and bed design; natural soil fertility, pest and disease control; nutrition training; food preservation, processing and storing; seed harvesting and saving; and preparation for winter crops, frost and cold damage. Training of beneficiary households of the Re Kgaba Diratswana programme was done by Lima Rural Development Foundation (Appendix F) representatives at Lebone Village in Bloemfontein (where a demonstration garden was established). Maintenance and monitoring of gardens continued throughout the duration of the project (July 2014 to September 2015). Training material(s) were made available in both English as well as Sesotho.

Control households were informed of the incentive they would receive at the completion of the study (the same household food garden intervention as the intervention group).

4.4.2.3. Follow-up Survey

Following the implementation of the household food garden intervention, the follow-up survey took place between July and September of 2015. The same team that had conducted

the baseline survey conducted the interviews with control and intervention households at follow-up, using the same questionnaire.

4.5. Pilot Study

A pilot study was undertaken prior to the commencement of the data collection phase of the study, during August 2014 in Bloemfontein.

Eight randomly selected households within a South African community in Bloemfontein were identified by the South African fieldworkers. These households (that met the inclusion criteria) were selected at the fieldworkers' discretion in a different area than the areas that would be included in the main study. The amount of time needed to complete the questionnaires as well as the clarity of the questions was determined. The participants of the pilot study each received an incentive (a Shoprite voucher valued at R100) from the interviewer upon completion of the questionnaire. After the pilot study was completed, a few changes and corrections were made to the questionnaire. These included the following: Underlining of key words in order to assist the interviewer; Instructions for the interviewer at certain questions were inserted to ensure uniformity; Wording/phrasing of questions and answer options were changed in the questionnaire to make them more applicable to the target population; Parts of the questionnaire were omitted as their presence was determined unnecessary in reaching the objectives; and the layout of columns in the questionnaires were edited to allow for a more efficient interview. The data from the pilot study was not included in the results of the main study.

4.6. Validity and Reliability

4.6.1. Validity

Validity is the ability of a tool or instrument to measure that which it is supposed to measure. The measurement is not considered valid if the instrument repeatedly measures a characteristic in the same person or group higher or lower than it actually is (Monsen *et al*, 2003).

Validity was guaranteed by researching literature concerning household food security and dietary diversity. The questionnaires took the relevant literature into consideration and

questions were motivated by scientific evidence. The questionnaires were translated into the relevant language (Sotho), with the original translations being back-translated by another person to improve their validity

4.6.2. Reliability

Reliability is the degree of correlation between sets of data when the measurement is done more than once on the same study participant or group, by the same or a different observer (Monsen *et al.,* 2003). To ensure reliability in this study, the researchers used the same, standardised questionnaires to obtain information from participants. Structured interviews were conducted by local fieldworkers who received training on research ethics, survey methodology and fieldwork, as well as proper execution of the relevant nutritional measurements (LPI, MAHFP, HDD, and frequency of vegetables eaten). The use of structured interviews contributed to reliability as they helped eliminate the possibility of research bias and subjectivity, since questions were asked exactly as worded in the questionnaire.

The questionnaires were designed in such a way that fieldworkers did not ask leading questions. Fieldworkers were assisted by foot-note instructions in the questionnaire guiding them throughout the interview. The order in which the questions were asked was also carefully considered to avoid previous questions influencing the participant's answers. The questionnaires were also translated into the local language (SeSotho).

4.7. Statistical Analysis

Descriptive statistics, namely frequencies and percentages for categorical data, means and standard deviations or percentiles, were calculated for before (pre-intervention baseline survey) and after (post-intervention survey) the intervention per group. The changes from before the intervention were calculated and described by means of 95% confidence intervals. The sub-study data was analysed by the Department of Biostatistics, UFS.

4.8. Results

4.8.1. Household demographics, responsibilities and structure

Table 4.1 includes the results pertaining to household demographics, structure and responsibilities.

The control and intervention groups were similar at baseline, with no significant differences occurring in any of the household particulars. At baseline the percentage of male and female participants (as reported by the household heads) was more or less equal in the control group (Male 52%; Female 48%), while there were slightly more male participants in the intervention group (Male 60%; Female 40%). In both groups, about a third of participants were living with a partner, followed by individuals who were widowed (Control 28%; Intervention 12%) and then those who categorised themselves as unmarried (Control 2%; Intervention 16%). Only about a quarter to a third of participants had completed high school (Control 25%; Intervention 31,8%).In terms of household structure, more than half of households consisted of males, females and children (had a nuclear structure) (Control 56%; Intervention 64%), while about a third were female centred (Control 32%; Intervention 28%). At baseline, the main meal of the day was eaten at home by about 90% of all participants (Control 88%; Intervention 92%). Household responsibilities, like buying and preparing food, were mainly the responsibility of the head of the household.

Table 4.1: South Africa: Household demographics, responsibilities and structure at baseline

Baseline					
	Control		Intervention		95%Ci for difference at Baseline
	N=25	%	N=25	%	
Gender					
Male	13	52	15	60	
Female	12	48	10	40	[-18.3%; 32.9%]
Marital Status					
Unmarried	5	2	4	16	[-17.7; 25.4%]
Married	4	16	7	28	
Living together/cohabiting	8	32	9	36	
Divorced	0	0	1	4	
Separated	1	4	1	4	
Widowed	7	28	3	12	

Table 4.1: South Africa: Household demographics, responsibilities and structure at baseline (cont.)

household structure					
Female centred	8	32	7	28	[-20.5%; 27.9%]
Male centred	3	12	2	8	
Nuclear	14	56	16	64	
Extended	0	0.0	0	0.0	
Live alone	0	0.0	0	0.0	
Highest level of education					
No formal schooling	1	4.2	1	4.6	
Some primary	6	25	10	45.5	
Primary completed	3	12.5	1	4.5	
Some high school	8	33.3	3	16.6	
High school completed	6	25	7	31.8	[-31.4;18.4]
Diploma/degree from tech/college	0	0	0	0	
Where was the main meal eaten yesterday?					
Home (this household)	22	88	23	92	[-22.9; 14.7%]
Shared meal with other households/neighbours	3	12	0	0	
Workplace	0	0	1	4	
Did not eat a meal	0	0	1	4	
Who in the household does the following?					
buys food					
Household head	21	84	18	72	[-11.2%; 33.8%]
Other	4	16	7	28	
prepares food					
Household head	13	52	12	48	[-22.2%; 29.4%]
Other	12	48	13	52	
decides who gets food and when					
Household head	12	48	10	40	[-18.3%; 32.9%]
Other	13	52	15	60	

4.8.2. Living Poverty Index

Table 4.2 indicates the results pertaining to the LPI of the control and intervention groups at baseline and at follow-up.

Table 4.2: South Africa: Living Poverty Index at Baseline and at Follow-up

	Baseline					Follow-up				
	Control		Intervention			Control		Intervention		
	N=25	%	N=25	%	95%CI for difference between groups at baseline	N=24	%	N=25	%	95%CI for difference between groups at follow-up
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough food to eat?										
Never	5	20.0	5	20.0	[-12.2% ; 34.5%]	5	20.8	5	20.0	[-35.2% ; 16.2%]
Just once or twice	3	12.0	0	0		4	16.7	7	28.0	
Several times	6	24.0	7	28.0	[-34.5% ; 12.2%]	7	29.2	4	16.0	[-16.2% ; 35.2%]
Many times	7	28.0	9	36.0		5	20.8	0	0	
Always	4	16.0	4	16.0		3	12.5	9	36.0	
Don't know	0	0	0	0		0	0	0	0	
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough clean water for the home?										
Never	5	20.0	8	32.0	[-41.1% ; 3.3%]	4	16.7	2	8.0	[9.3% ; 51.6%]*
Just once or twice	12	48.0	14	56.0		19	79.2	14	56.0	
Several times	4	16.0	2	8.0	[-3.3% ; 41.1%]	1	4.2	5	20.0	[-51.6% ; -9.3%]*
Many times	2	8.0	1	4.0		0	0	4	16.0	
Always	2	8.0	0	0		0	0	0	0	
Don’t know	0	0	0	0		0	0	0	0	
Over the past 12 months, how often, if ever, have you or your family (household) gone without medicine or medicinal treatment?										
Never	1	4.0	5	20.0	[-12.6% ; 21.3%]	8	33.3	5	20.0	[-20.1% ; 25.8%]
Just once or twice	23	92.0	18	72.0		11	45.8	14	56.0	
Several times	1	4.0	1	4.0	[-21.3% ; 12.6%]	4	16.7	2	8.0	[-25.8% ; 20.1%]
Many times	0	0	1	4.0		1	4.2	2	8.0	
Always	0	0	0	0		0	0	2	8.0	
Don’t know	0	0	0	0		0	0	0	0	

*statistically significant

Table 4.2: South Africa: Living Poverty Index at Baseline and at Follow-up (cont.)

Over the past 12 months, how often, if ever, have you or your family (household) gone without electricity in your home?										
Never	0	0	6	24.0	[-47.6% ; -8.9%]*	6	25.0	5	20.0	[-19.3% ; 31.3%]
Just once or twice	0	0	1	4.0		10	41.7	10	40.0	
Several times	0	0	7	28.0		5	20.8	1	4.0	
Sany times	0	0	5	20.0	[8.9% ; 47.6%]*	1	4.2	3	12.0	[-34.8% ; 15.2%]
Always	25	100.0	6	24.0		1	4.2	6	24.0	
Don't know	0	0	0	0		1	4.2			
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough fuel to cook your food?										
Never	2	8.0	11	44.0	[-75.8% ; -33.1%]*	7	29.2	3	12.0	[-35.1% ; 16.7%]
Just once or twice	4	16.0	10	40.0		4	16.7	11	44.0	
Several times	11	44.0	3	12.0		9	37.5	2	8.0	[-16.7% ; 35.1%]
Many times	7	28.0	1	4.0	[33.1% ; 75.8%]*	3	12.5	3	12.0	
Always	1	4.0	0	0		1	4.2	6	24.0	
Don't know	0	0	0	0		0	0	0	0	
Over the past 12 months, how often, if ever, have you or your family (household) gone without a cash income?										
Never	0	0	2	8.0	[-26.3% ; 9.4%]	4	16.7	1	4.0	[-27.8% ; 24.2%]
Just once or twice	1	4.0	1	4.0		8	33.3	12	48.0	
Several times	8	32.0	11	44.0	[-9.4% ; 26.3%]	5	20.8	1	4.0	[-20.5% ; 31.4%]
Many times	9	36.0	9	36.0		3	12.5	0	0	
Always	7	28.0	2	8.0		4	16.7	10	40.0	
Don't know	0	0	0	0		0	0	1	4.0	

*statistically significant

In terms of the LPI, households were asked to report how often they went without enough food to eat, clean water, medicine or medical treatment, electricity in the home, fuel to cook and a cash income in the previous year. In order to calculate the 95% CIs, the six possible answers were grouped into two sub-sets as follows: Never and once or twice formed sub-set one, while several times, many times and always formed the sub-set two.

At baseline, a large percentage of participants reported going without enough food to eat several times, many times, or always (Control: 68%; Intervention: 80%). A small percentage of households reported going without enough clean water several times, many times or always (Control: 32%; Intervention: 12%). Very few households reported going without medicine or medical treatment several times, many times or always (Control: 4%; Intervention: 8%). A larger percentage of households in the control group reported going without enough fuel to cook food several times, many times or always than in the intervention group (Control: 76%; Intervention: 16%). Almost all households reported going without a cash income several times, many times or always (Control: 96%; Intervention: 88%).

Although the control and intervention groups were very similar in terms of most variables at baseline, they differed in terms of the availability of electricity. At baseline none of the participants in the control group reported that they had never or just once or twice gone without electricity over the past twelve months, compared to 28% in the intervention group, a difference that was statistically significantly different (95% CI for the percentage difference [-47.1%; -8.9%]*). Similarly a significantly higher percentage of participants in the control group (100%) reported that they had gone without electricity several times, many times and always, compared to 72% in the intervention group (95%CI for percentage difference [8.9%; 47.6%]*). Availability of electricity influenced fuel availability for cooking food, as can be seen by the higher percentage of participants in the control group (76%) that reported that they had gone without enough fuel for cooking food several times, many times and always.

At follow-up, the percentage of participants in the intervention group that reported that they had gone without enough clean water for several times, many times and always, was significantly higher (36%) than the control group (4.2%) (95% CI for the percentage difference [-51.6%; -9.3%]*).

Table 4.3 indicates the change for better in answers to questions related to LPI, while Table 4.4 refers to the median change in LPI.

When asked how often, the respondents or their family had gone without enough food to eat, 12 respondents in the control group unexpectedly reported a change for the better (response changed to a better category, e.g. from several times, many times and always to never or just once or twice), while 4 reported a change for the worse. Thus significantly more reported a change for the better at follow-up (95%CI for the change [-57.6%;-1.8%]*). After the vegetable gardening intervention, significantly more participants in the intervention group, also experienced a change for the better in terms of enough food to eat at follow-up (95%CI for the change [-55.7%; -1.7%]).

Table 4.3: South Africa: Change for better in answers to questions related to Living Poverty Index

Questions	Change in control group (n=24)			Change in intervention group (n=25)			
	N	%	95%CI for change within group (paired)	n	%	95%CI for change within group (paired)	95%CI for change between groups (unpaired)
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough food to eat?							
Change for better	12	50%	[-57.6%; -1.8%]	12	48%	[-55.7% ; -1.7%]	[-20.5% ; 22.1%]
Change for worse	4	16.6%		4	16%		
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough clean water for the home?							
Change for better	9	37.5%	[-43.3% ; 13.5%]	3	12%	[-2.9% ; 46.6%]	[-37.8% ; 10.0%]
Change for worse	5	20.8%		9	36%		
Over the past 12 months, how often, if ever, have you or your family (household) gone without medicine or medicinal treatment?							
Change for better	9	37.5%	[-43.3% ; 13.5%]	6	24%	[-20.6% ; 35.0%]	[-33.9% ; 13.4%]
Change for worse	5	20.8%		8	32%		
Over the past 12 months, how often, if ever, have you or your family (household) gone without electricity in your home?							
Change for better	0	0%	[-14.7% ; 14.7%]	10	40%	[-45.4% ; 9.5%]	[-39.1% ; -2.3%]*
Change for worse	0	0%		5	20%		
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough fuel to cook your food?							
Change for better	13	54%	[-57.1% ; 5.9%]	2	8%	[-0.1% ; 45.1%]	[-30.5% ; 17.8%]
Change for worse	6	25%		8	32%		
Over the past 12 months, how often, if ever, have you or your family (household) gone without a cash income?							
Change for better	15	62.5%	[-77.3% ; -36.3%]	16	64%	[-76.9% ; -32.0%]	[-19.5% ; 10.2%]
Change for worse	0	0%		1	4%		

*statistically significant

In terms of enough clean water, medicine or medical treatment, fuel to cook food and a cash income, the percentage of participants that experienced a change for the better or a change for the worse, was not significantly different within the control and intervention groups at baseline or follow-up, nor between the control and intervention groups at follow-up.

In terms of electricity, the percentage of participants that showed a change for the worse in the intervention group, was significantly higher than in the control group (95%CI for change between groups [-39.1%; -2.3%]), where provision of electricity was poor to begin with.

Table 4.4: South Africa: Median change in Living Poverty Index

Baseline			
Control		Intervention	
Median	Range	Median	Range
2.8	1.7 - 4.5	1.8	0.5 - 3.0
Follow-up			
Median	Range	Median	Range
1.8	0 - 3.6	1.5	0.5 - 5.0

The median LPI score in the control group changed from 2.8 to 1.8 at follow-up (the lower the better), an improvement of 1 point compared to an improvement of 0.3 in the intervention group, a difference in the change that was significant (95% CI interval for the change between groups [-2.2;-0.5]).

4.8.3. Months of Adequate Household Food Provisioning

Table 4.5 shows the percentage of households that experienced adequate and inadequate food provisioning during the different months of the year.

Table 4.5: South Africa: Months of Adequate Household Food Provisioning at baseline and at follow-up

	Baseline				**Follow-up**			
	Control		Intervention		Control		Intervention	
	n=24	%	n=25	%	n=24	%	n= 25	%
In the past 12 months, were there months in which you did not have enough food to meet your family's needs?								
Yes	21	84.0	24	96.0	19	79.2	17	68.0
No	4	16.0	1	4.0	5	20.8	8	32.0
If Yes, Which were the months (in the past 12 months) in which you did not have enough food to meet your family's needs?								
January								
No	14	56.0	13	52.0	15	62.5	17	68.0
Yes	11	44.0	12	48.0	9	37.5	8	8.0
February								
No	18	72.0	15	60.0	18	75.0	16	64.0
Yes	7	28.0	10	40.0	6	25.0	9	36.0
March								
No	18	72.0	16	64.0	18	75	19	76.0
Yes	7	28.0	9	36.0	6	25	6	24.0
April								
No	16	64.0	17	68.0	18	75.0	20	80.0
Yes	9	36.0	8	32.0	6	25.0	5	20.0
May								
No	14	56.0	12	48.0	20	83.3	20	80.0
Yes	11	44.0	13	52.0	4	16.7	5	20.0
June								
No	11	44.0	7	28.0	20	83.3	18	72.0
Yes	14	56.0	18	72.0	4	16.7	7	28.0
July								
No	11	56.0	9	36.0	20	83.3	18	72.0
Yes	14	44.0	16	64.0	4	16.7	7	28.0
August								
No	14	56.0	12	48.0	19	79.2	18	72.0
Yes	11	44.0	13	52.0	5	20.8	7	28.0
September								
No	19	76.0	16	64.0	18	75.0	20	80.0
Yes	6	24.0	9	36.0	6	25.0	5	20.0
October								
No	21	84.0	18	72.0	19	79.2	18	72.0
Yes	4	16.0	7	28.0	5	20.8	7	28.0
November								
No	19	76.0	16	64.0	15	62.5	16	64.0
Yes	6	24.0	9	36.0	9	37.5	9	36.0
December								
No	18	72.0	13	52.0	18	75.0	17	68.0
Yes	7	28.0	12	48.0	6	25.0	8	32.0

The descriptive data related to MAHFP were used to determine the median MAHFP (table 4.6) as well as the categories of MAHFP (table 4.7).

Table 4.6: South Africa: MAHFP Medians

Baseline			
Control		Intervention	
Median	Range	Median	Range
8	0;12	8	0;12
Follow-up			
Median	Range	Median	Range
11	0;12	10	0;12

Table 4.6 shows that at baseline, most households had a low to moderate level of food security, as both the control and intervention group scored a median of 8 for MAHFP. This meant that most households experienced inadequate provisioning of food for four months of the year.

The follow-up scores were not significantly different, with a median score of 11 for the control group and 10 for the intervention groups, who both thus had moderate to high levels of food security. Unexpectedly, the median score of the control group also improved from baseline (8) to follow-up (11).

Table: 4.7: South Africa: MAHFP Score categories

Category	**Baseline**				**95%CI for % difference**	**Follow up**				**95%CI for % difference**
	Control (n=25)		**Intervention (n=25)**			**Control (n=24)**		**Intervention (n=25)**		
	N	%	n	%		n	%	n	%	
Very low (0)	2	8.0	4	16.0	[-27.5%; 11.5%]	3	12.5	3	12.0	[-19.2%;20.6%]
Low (1-4)	4	16.0	3	12.0	[-16.4%;24.2%]	0	0	1	4.0	[-19.5%;10.2%]
Moderate (5-8)	7	28.0	7	28.0	[-23.9%;23.9%]	3	12.5	4	16.0	[-23.9%;17.3%]
High (9-11)	8	32.0	11	44.0	[-36.0%;14.2%]	13	54.2	9	36.0	[-9.1%;42.0%]
Food Secure (12)	4	16.0	1	8.0	[-6.3%; 30.9%]	5	20.8	8	32.0	[-33.9%;13.4%]

The intervention households were grouped into categories according to their MAHFP Score. The scores were then categorised as follows 9-12 (Food secure); 5-8 (moderately food secure) and 1-4 (food insecure); and 0 (completely food insecure). Thus, the higher the score, the better (table 4.7).

4.8.4. Household Dietary Diversity

Table 4.8, indicates the percentage of respondents that ate and did not eat the different food groups on a daily basis.

Table 4.8: South Africa: Household Dietary Diversity

	Baseline				Follow-up			
	Control		Intervention		Control		Intervention	
	N = 24	%	N=25	%	N=24	%	N=25	%
Type of food								
Cereals								
No	0	4	0	0	2	8.3	0	0
Yes	24	96	25	100	22	91.7	25	100
Vitamin A rich vegetables								
Yes	1	4	0	0	8	33.3	14	56
No	23	96	25	100	16	66.7	11	44
White vegetables and roots								
No	17	68	21	84	13	54.2	11	44
Yes	7	32	4	16	11	45.8	14	56
Dark green leafy vegetables								
No	22	92	22	88	18	75	12	48
Yes	2	8	3	12	6	25	13	52
Other vegetables								
Yes	6	24	10	40	11	47.8	13	52
No	17	76	15	60	12	52.2	12	48
Vitamin A rich fruit								
No	24	100	25	100	22	91.7	23	92
Yes	0	0	0	0	2	8.3	2	8
Other fruit								
Yes	3	12	6	24	9	37.5	8	32
No	21	22	19	76	15	62.5	17	68
Organ meat								
No	24	100	23	92	21	87.5	21	84
Yes	0	0	2	8	3	12.5	4	16
Flesh meats								
No	15	64	17	68	14	58.3	17	68
Yes	9	36	8	32	10	14.7	8	32
Eggs								
No	23	96	23	92	17	70.8	16	64
Yes	1	4	2	8	7	29.2	9	36
Fish								
No	20	80	22	88	23	95.7	22	88
Yes	4	20	3	12	1	4.3	3	12
Legumes, nuts and seeds								
No	23	96	25	100	19	79.2	21	84
Yes	1	4	0	0	5	20.8	4	16
Milk and milk products								
No	18	76	19	76	12	50	12	48
Yes	6	24	6	24	12	50	13	52

Table 4.8: South Africa: Household Dietary Diversity (cont.)

Oils and fats								
No	12	52	12	48	6	25	5	20
Yes	12	48	13	52	18	75	20	80
Sweets								
No	9	36	9	36	2	8.3	3	12
Yes	15	64	16	64	22	91.7	22	88
Spices, condiments and beverages								
No	2	8	3	12	1	4.2	0	0
Yes	22	92	22	88	23	85.8	25	100

Table 4.9: South Africa: Median Household Dietary Diversity Score

Baseline			
Control		Intervention	
Median	Range	Median	Range
7	4 - 8	6	3 - 10
Follow-up			
Median	Range	Median	Range
7.5	2 - 12	8	5 - 11

At baseline, the median DDS of the control group was 7 (range 4-8), while in the intervention group it was slightly lower at 6 (range 3-10). At follow-up, the median score remained more or less the same in the control group (7.5, range 2-12), while it changed from 6 to 8 (range 5-11) in the intervention group, an improvement that was close to significant (95% CI for the median change of [-2; 0]).

Table 4.10: South Africa: Household Dietary Diversity Scores

Category	**Baseline**				**95%CI for % difference**	**Follow-up**				**95%CI for % difference**
	Control n=25		**Intervention n=25**			**Control n=24**		**Intervention n=25**		
	n	%	n	%		n	%	n	%	
Low HDDS (0-3)	0	0	2	8.0	[-25.0%; 6.5%]	2	8.3	0	0	[-6.3%;25.8%]
Medium HDDS (4-5)	6	24.0	7	28.0	[-27.2%;19.8%]	1	4.2	1	4.0	[-15.8%;16.6%]
High HDDS (6-12)	19	76.0	16	64.0	[-13.0%;35.1%]	21	87.5	24	96.0	[-27.3%;9.1%]

Households were categorised into low, medium and high dietary diversity categories according to their scores (table 4.10). At baseline, there were no significant differences in the percentage of participants that fell into the different categories. Only 0-8% of

participants had a HDD in the low category, while 24-28% fell within the medium HDD category and 76-64% into the high HDD category.

At follow-up, a small change was seen in the households in the low HDD category, with an 8.3% increase in the control group and a 8% decrease in the intervention group. A notable decrease in both groups of households in the medium HDD category was seen, but the difference was not statistically significant (95%CI for the % difference [-15.8%;16.6%]). An increase of 11.2% in the control group and 32% in the intervention group was seen in the percentage of households in the high HDD category, though it was not statistically significant (95%CI for % difference, [-27.3%; 9.1%]).

4.8.5. Frequency of vegetables eaten in the household

Table 4.11 indicates the frequency of vegetables eaten by adult and children in South Africa, while table 4.12 indicates the change in frequency of vegetables eaten within and between groups.

Table 4.11: South Africa: Frequency of vegetables eaten

	Control				**Intervention**			
	Baseline		**Follow-up**		**Baseline**		**Follow-up**	
	N=25	%	N=24	%	N=25	%	N=25	%
Adults								
Several times a day	10	40	4	16.7	5	20	1	4
once a day	7	28	8	33.3	6	24	5	20
Few times per week	6	24	6	25	11	44	11	44
Once a week	1	4	3	12.5	2	8	2	8
Rarely	1	4	3	12.5	1	4	6	24
Never	0	0	0	0	0	0	0	0
Children								
Several times a day	7	28	6	25	6	24	5	20
Once a day	7	28	2	8.3	2	8	0	0
Few times per week	5	20	6	25	7	28	3	12
Once a week	4	16	5	20.8	7	28	10	40
Rarely	0	0	3	12.5	2	8	3	12
Never	2	8	2	8.3	1	4,0	4	16
No Children in household	0	0.0	0	0.0	0	0.0	0	0.0

At baseline, 40% of adults in the control group and 16.7% in the intervention group reported eating vegetables several times a day, followed by adults that ate vegetables once a day

(Control: 28%; Intervention: 33.3%). About a third (28%) of the children in the control group reported eating vegetables several times a day, with 25% eating vegetables several times a day in the intervention group.

At follow-up, fewer adults in both the control and intervention group ate vegetables several times a day (Control 20%; Intervention 4%). An increase in the percentage of adults that ate vegetables a few times a week was noted (Control 44%; Intervention 44%). The percentage of children that ate vegetables several times a day remained similar in both the control (24%) and intervention (20%) groups.

Table 4.12: South Africa: Change in frequency of vegetables eaten within and between groups

	Change in control group (n=24)		95% CI for change within group	Change in intervention group (n=25)		95% CI for change within group	95% CI for change between groups
	n	%		N	%		
Adults							
Change for better	6	25%	[-57.1%; 5.9%]	4	16%	[-63.3%; -8.0%]*	[-13.7%; 31.1%]
Change for worse	13	54.2%		21	84%		
Children							
Change for better	7	28%	[-46.3%; 17.0%]	3	12%	[-57.8; -7.2]*	[-5.8%; 38.6%]
Change for worse	17	70.8%		22	88%		

*statistically significant

Although a change for the better was seen in a relatively large percentage of households in the control group in terms of frequency of vegetables consumed by both adults and children, these changes were not statistically significant (95% CI for the change [-57.1%; 5.9%] for adults and 95% CI for the change[-46.3%; 17.0%] for children).

In contrast, the change for the better seen in both adults and children in the intervention group, was statistically significant (95% CI [-63.3%; -8.0%]*for adults and 95% CI [-57.8%; -7.2%]* for children).

Though statistically significant changes were noted for consumption of vegetables by adults and children in the intervention group, the changes calculated between groups was not statistically significant at follow-up (95% CI [-13.7%; 31.1%] for adults; 95% CI [-5.8%; 38.6%] for children).

4.9. Discussion

In South Africa, the study population (as reported by the household head) was comprised of slightly more males than females, with a quarter to a third having completed high school. These results are similar to the SANHANES (2017) findings that reported that only a third (32.8%) of the South African population had completed high school.

Poverty can be linked with food security, as it forms part of the basic causes of malnutrition in developing countries, since poor individuals are unable to access food (Smith, *et al*., 2000: 200). Households included in the study ranged from experiencing no poverty to complete poverty, but median scores revealed that the control group had a lower standard of living (2.8) than the intervention group (1.8) at baseline, a difference that was statistically significant. This difference can be attributed to the fact that the control group was located in a less developed area than the intervention group, where access to electricity was limited. In terms of other indicators of poverty, however, the control and intervention areas were very similar.

According to Statistics South Africa (2017) electricity is used by 57.7% of households for heating, 80.2% for cooking and 87% for lighting in the Mangaung municipality in the Free State. Almost all households (99.1%) have access to piped water (inside the dwelling, inside the yard or access point outside the yard). In our study population, a large percentage of households went without enough fuel to cook food on several occasions. At the time that the study was undertaken, access to water was, however, not reported to be a major challenge, as households reported that they had only gone without enough clean water on very few occasions (only once or twice).

After the intervention, the median LPI of the intervention group improved slightly from 1.8 at baseline to 1.5 at follow-up, but the improvement was not statistically significant. Although improvements in food security were hoped for as a result of the household food

garden intervention, major improvements in standard of living were not expected. It is, however possible for food gardens to generate savings from the consumption of home-grown products instead of purchased food. These savings can then be directed towards buying additional nutrient rich food items, paying for household expenses like healthcare and education, as well as building up savings (Weinberger, 2013). Although no statistically significant change was noted for cash income, access to supplementary vegetables that no longer needed to be purchased could have allowed for minor savings on food expenditure within the intervention households.

At follow-up the median standard of living score of the control area improved significantly from baseline (2.8) to follow-up (1.8). Households in the control group reported a change for the better in availability of food to eat, access to water, medicinal treatment, fuel for cooking and cash income. Since the food garden intervention was not implemented in control areas, it could not be credited for the improvements that were noted. It is possible that other factors that were not assessed, such as levels of employment and number of dependents in the household, may have changed in the control group at follow-up and may have been responsible for the improvement in standard of living.

As previously mentioned, MAHFP is an indication of the number of months that households have gone without enough food to meet their family's needs. Using MAHFP as a measure of food security (access), the General Household Survey of 2009 estimated that 20% of South Africans are subject to inadequate or severely inadequate food access (SSA, 2009). Similarly, 24% of the control group and 28% of the intervention group in the current study had very low and low scores for MAHFP at baseline.

In terms of median scores, the results showed that the control and intervention households had a moderate level of MAHFP (food security) (both had a median score of 8 for MAHFP at baseline). After the intervention, an unexpected improvement in the median scores of both the control and intervention groups was noted, with an increase of 3 and 2 points respectively – placing them in the food secure category (9-12 MAHFP). No statistically significant difference was noted between these two groups CI [-3; 2].

According to Thorne-Lyman *et al.,* (2010), DD can be linked with improved nutrient intake in both developed and developing countries and thus this tool has been suggested as an indicator of food security.

HDD can be impacted by household food gardens as they have the ability to contribute to a more diversified diet and a higher consumption of nutritious food (Weinberger, 2013). At baseline households presented with a relatively high median level of DD even before the intervention. Although DD is used as an indicator for dietary quality, care needs to be taken when interpreting this information. A high DDS is not a guarantee of a nutrient-dense, quality diet – results from other South African studies have shown that a high DDS may be related to an increased intake of unhealthy foods, such as fast foods (Steyn *et al.,* 2006). Drimie *et al.* (2013) state that urbanisation may lead to an increased consumption of unhealthy fats, sugars, salt and processed foods. This finding was evident in the baseline results of this study that showed that cereals, oils and fats, sweets, spices, condiments and beverages were food groups that the majority of the households had access to.

Vegetable production and sale may supplement the household's income and thus the other foods that they are able to purchase (Galhena *et al.,* 2013). The intake of other foods may also be influenced by having a vegetable garden.

The fact that an improvement in DD occurred in both the intervention and control groups, indicates that the intervention may not have been the reason for the improvement. The improvement in DD seen in control areas may possibly be ascribed to the improved awareness related to vegetable consumption that may have been sparked by participation in the baseline survey itself.

Fruit and vegetables are an important source of micronutrients, phytonutrients and fibre and form an integral part of a balanced diet (Wijesinha-Bettoni *et al.,* 2013). According to Lock *et al.,* (2005), a study related to the global burden of disease attributable to low vegetable and fruit consumption showed that the mean consumption of fruit and vegetables by South Africans placed them in the lowest consumption category globally (along with other African countries).

At baseline, no difference was noted between the control and intervention group for consumption of vegetables by adults or children, making them comparable. At follow-up, a significant change for the better was however noted with participants in the intervention group reporting a change for the better in the frequency of vegetables consumed by adults and children.

Dietary habits can be positively influenced when people are involved with their own food production (growing, harvesting, cooking or preserving) (Bellows *et al.,* 2003). In a study undertaken by Alaimo *et al.* (2008) to assess fruit and vegetable consumption of community gardeners, households with members that participated in community gardening had a higher percentage of individuals who consumed 5 portions of fruit and vegetables per day in comparison with households who did not have someone participating in community gardening activities (32.4% vs 17.8%).

The 'Hawthorne Effect' is defined as "the alteration of behaviour by the subjects of a study due to their awareness of being observed." The Hawthorne Effect occurs when people change their behaviour for the better because they know they are being studied or observed (Chiesa and Hobbs, 2008). According to the systematic review on the Hawthorne effect that was undertaken by McCambridge *et al.* (2014), there is evidence to show that research participants (particularly in health science research) do sometimes change their behaviour because of their inclusion in a study (such as in completing an interview related to a certain topic), even though they may not be directly exposed to an intervention.

As part of the baseline survey, both intervention and control households were interviewed. The baseline survey included a number of sections related to fruit and vegetable gardening and consumption. As part of the main study, information related to food insecurity, food gardens, food remittances received from household food gardens, food from household food gardens, gardening, health and HIV and AIDS and urban food aid was collected. We propose that the Hawthorne effect may have played a role in some of the unlikely improvements seen in the control group included in this study.

The fact that the sample size was small and the households in the control and intervention areas differed significantly in terms of access to electricity, may be considered a limitation of

the study. The sample sDespite this, the other indicators of poverty were very similar in the two groups, indicating that they were comparable in terms of socio-demographic status.

The DDS does not take into consideration the nutrient quality of food consumed (within and between food groups). Although this may not be an important consideration in areas where a nutrition transition is not present, it does pose a problem in areas where the majority of different foods eaten may not comprise healthy food choices.

4.10. Conclusion and Recommendations

The sample included in the current study in South Africa consisted of more male than female participants. Most participants were unmarried and more than 40% had completed high school or had a tertiary qualification. As evidenced by the LPI of 2.8, the sample was characterised by high levels of poverty. Measures of food security showed that about a third of participants had a low level of food security. At baseline, the median HDDS was 7 in the control group and 6 in the intervention group, indicating relatively high dietary diversity. As far as frequency of vegetables consumed was concerned, less than half of participants reported that both adults and children ate vegetables relatively frequently.

In terms of the impact of the intervention, the MAHFP increased to a score of 11 in the control group at follow-up and improved by 2 points in the intervention group that was exposed to the household food garden intervention. In the intervention group, an improvement in the median MAHFP from 8 to 10 occurred (95% CI for the change [-2; 0]). Median HDDS did not change in the control group but showed a 2 point improvement in the intervention group at follow-up. The main outcome of the intervention was obviously related to vegetable consumption, but households showed little improvement. More adults consumed vegetables a few times a day, but children's vegetable consumption remained the same. Overall, the household food garden intervention had a moderately positive effect on some indicators of food security in the intervention group, but the improvement was not as big as anticipated and unexpected improvements were also seen in the control group.

In terms of recommendations to improve the impact of household food garden interventions, it might add value to continue to support gardeners more intensively during the initial phases of growing a garden. This could improve sustainability of gardening

interventions and prevent gardeners from defaulting. Once the benefits of producing vegetables become evident, they will be more likely to continue making a garden without external support.

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Chapter 5

The Impact of a Household Food Garden Intervention on measures of Food Security in Lesotho

5.1. Introduction

The small mountainous country of Lesotho is populated by about 2.2 million people, with two-thirds living in rural areas. Mainly the villages in the lowlands of the country are populated (AFSUN, 2015; LDHS, 2014; Ziervogel and Calder, 2013). About 60-70% of the Lesotho population is severely food insecure (AFSUN, 2015). In rural areas, the majority of individuals are dependent on agriculture for survival, which proves challenging as less than 10% of the country's total area is suitable for growing crops. Land availability is further influenced by urbanisation and environmental factors, such as soil erosion and climate change (Olowu, 2013). The number of landless households is steadily increasing and is currently well above 40% (Thebe and Rakotje, 2013).

Lesotho is considered to be one of the least developed and poorest countries in the world. This can be attributed to high unemployment rates, a decrease in production from agricultural activities, lower life expectancy and increased child mortality rates. Half of Lesotho's population lives below the poverty line and depend on remittances to survive (Crush *et al.,* 2010). In Lesotho, household location has a major impact on food security. Rural and urban households are generally not self-sufficient, depending on food purchases to meet the food needs of the household. Households in the mountainous areas find it very difficult to produce crops and have limited access to markets, making them even more vulnerable to food shortages (AFSUN, 2015). Other shocks and stressors that rural households face include lack of resources, land degradation and an erratic climate (Ziervogel and Calder, 2003). Despite these challenges, household agricultural activities form the basis of livelihoods in the majority of households (Silici *et al*., 2011).

The main staple of Lesotho is white maize that is imported from South Africa (Rothman *et al*., 2018; Makhotla and Hendriks, 2004; Makenete *et al.,* 1998). The staple diet of the Basotho people consists mainly of maize and vegetables (FNCO, 2001). Although the country

is largely dependent on imports, maize, sorghum and wheat are grown by smallholders. Beans, peas and potatoes are also grown (AFSUN 2015: 8). Rothman *et al*. (2018) report that women from rural households in Lesotho are prone to consuming sour porridge and stiff home-made porridge as staples. Protein is mainly obtained from dried beans, while vegetables like onions, cabbage, tomatoes, turnips and potatoes are consumed almost daily, but are often prepared with fat or oil and eaten in small quantities (Rothman *et al.,* 2018). Obesity is more prevalent in urban areas where households are more likely to consume processed meats, pasta, sweetened beverages and condiments like mayonnaise. The Lesotho Demographic and Health Survey (LDHS) showed that 49% of children between 6 and 23 months did not consume Vitamin-A rich foods and 59% did not consume iron-rich foods during the day or evening before the interview (LDHS, 2014).

As a result of the nutrition transition in Lesotho the prevalence of overweight and obesity saw an increase from 2009 to 2014. This increase was positively associated with an increase in wealth, with 42% of rural women and 50% of urban women being overweight or obese (LDHS, 2014: 173). Being underweight was associated with a low level of education and a low level of income. In 2013, 27% of women and 14% of men in Lesotho were anaemic (LDHS, 2014: 174).

The LHDS (2014) also reported that 33% of children under the age of 5 years were stunted (experienced chronic food shortage), while 3% were wasted and 10% were underweight. Over nutrition was also present, with 7% of children under the age of 5 years being overweight. Stunting, wasting and underweight tended to be more prevalent in the poorer areas.

Agricultural wage-workers in Lesotho are predominantly female. In rural areas most households own land and engage in agricultural activities. Women that own land, work alongside wage-workers and may also assist other women that own land (Olowu, 2013). This system could have developed as a result of the past absence of men in the country when they travelled to surrounding countries in search of work (Safilios-Rothschild, 1985; Crush *et al.,* 2010). More recently, the LDHS (2014) revealed that Lesotho's population is 53% female and 47% male, with women heading 36% of all households. The trend of living separated from families for extended periods of time due to work and education opportunities is still

evident, with 33% of Basotho males being absent from the households in 2009 (LDHS, 2014).

In addition to farming, sharing makes a significant contribution to the livelihoods of people in Lesotho (Turner, 2005). Lesotho has adopted various forms of sharing. These include the Chief receiving tribute from community members, and then required to support community members in times of hardship. Members of the community may furthermore informally share resources with each other during times of hardship or help each other farm. More recently, a more formal system of paying labourers in cash has developed. Finally, sharecropping has also been adopted. In this system land owners and providers of inputs, equipment or services each have designated roles for a farming season – crops are then shared at the end of the season (Turner, 2005).

Although a number of vegetable garden interventions have been implemented by the Lesotho government and various non-governmental organisations, nothing has recently been published about their impact. In 1991 a publication by Kumar (1991) noted that the positive effects of vegetable garden interventions in Lesotho were often lost once donor support ceased. If correctly implemented, household food gardens can provide a supplemental food source, thus improving food security and DD. Having a household food garden provides an affordable source of nutritious food, addressing both access and availability (Galhena, *et al*., 2013). Food gardens can also contribute to income generation (Galhena et al., 2013; Weinberger 2013).

With this in mind, a study was undertaken as part of a larger overarching study undertaken by the Centre for Development Support at The University of The Free State titled "Household food gardens: effective and sustainable impact mitigation response to the HIV and AIDS epidemic in urban settlements in Lesotho, South Africa and Zimbabwe". The overarching study aimed to investigate the potential benefits of sustainable, eco-friendly household food gardens and the resultant household food security and nutritional effects in South Africa, Lesotho and Zimbabwe. It spanned over a period of two and half years (July 2013 to 2015). The project was funded by the Southern African Development Community (SADC). The Centre for Development Support partnered with the Department of Agriculture in South Africa, the Society of Women against AIDS in Africa (SWAALES) in Lesotho and

Batani HIV/AIDS Service organisation(BHASO) in Zimbabwe in order to implement the household food garden interventions.

For the purpose of this publication, the impact of a household food garden intervention on measures of food security in Lesotho will be discussed.

5.2. Study Design

This study comprised a quantitative pre-test, post-test design.

5.3. Study Population

The study population included Rampepe Village in the Leribe settlement in Lesotho. All households in this area were eligible to participate in the SWAALES vegetable gardening programme and thus comprised the population. .

5.3.1. Rapid Appraisal

The area included in the population was chosen due to its inclusion in the household food garden interventions that was implemented by SWAALES in Lesotho (referred to as the intervention partner). A rapid appraisal census (Appendix A) was undertaken prior to the intervention In all households that were included in the list of beneficiaries of the intervention partner.

During the census, information about the presence of a vegetable garden at each household was collected and based on this; households that met the inclusion criteria for the main study were identified.

5.3.2. Sample

From the households included in the census, 50 households that met the inclusion criteria were purposively selected for the study (for logistic reasons). From each list of 50 households, 25 households were randomly included in the intervention group and 25 were included in the control group.

5.3.2.1. Inclusion criteria

- Households providing informed consent after being adequately informed (Appendices B and C).
- Area of residence: households that were situated in the beneficiary community in Lesotho
- Households with no garden, more specifically no physical evidence of a garden.
- Households with a non-functioning garden – there may have been a garden, but the garden was not being maintained and had not produced any crops during the past season.
- Households with a functional garden, but a garden of a different type from the gardens to be provided to the intervention group as part of the intervention.

5.3.2.2. Exclusion Criteria

- Households with a garden type similar to the gardens to be provided to the intervention group as part of the study.

5.4. Methodology

Prior to the baseline household interviews, fieldworkers from the National University of Lesotho received training on the data collection process. This training took on 5 and 6 August 2014.

5.4.1. Operational Definitions and techniques

The questionnaire developed for the main study included the following sections: household composition, household data, food insecurity, food gardens, food remittances received from household food gardens, food from household food gardens, gardening, health, HIV and AIDS, urban food aid, and clarification.

For the purpose of this sub-study, measures of food security included the Living Poverty Index (LPI), Months of Adequate Household Food Provisioning (MAHFP), Household Dietary diversity (HDD) and Frequency of vegetables eaten.

The questionnaire was completed by the trained fieldworkers in a structured interview with a member of each household (preferably the head of the household) at the household.

5.4.1.1. Household demographics, responsibilities and structure

For the purpose of this study questions related to socio-demography, including basic demographics of household members, household responsibilities and household structure were asked.

5.4.1.2. Living Poverty Index

The LPI questionnaire was used (Mattes, 2008) to assess the standard of living (an indirect indicator of both poverty and food insecurity) by determining the frequency that households went without basic necessities of life (namely food, water, medicine, electricity and fuel and cash income). It was assessed for a period of 12 months prior to the interview by using a set of 6 questions, each with 6 possible responses (the sixth response being 'I don't know'). The range of responses each received a score on a five point scale. The responses were then combined to calculate the average LPI score for the household, 0 (no poverty) to 4 (complete poverty) (Mattes, 2008). The index was then used to determine changes in the households' experience of poverty before and after the household food garden intervention.

5.4.1.3. Months of Adequate Household Provisioning

The standardised MAFHP questionnaire, another indirect measure of food security, developed by Billinsky and Swindale (2010) was applied to determine MAHFP during the previous year. MAHFP for each household was then calculated by subtracting the total number of months out of the previous 12 months that the household was unable to meet their food needs from 12 (e.g. 12 – sum(A+B+C+D+E+F+G+H+I+J+K+L). Values for A through L were '0' or '1' (Bilinsky and Swindale, 2010:3-5).

The scores were categorised into three groups - according to level of food security. A score of 12 meant that the household had year-round adequate food provisioning. Households that scored between 11 and 8 were deemed to have moderate food security; households that scored between 4 and 7 were deemed to have a low level of food security and households that scored between zero and 3 were considered to be food insecure.

5.4.1.4. Household Dietary Diversity

HDD Score is defined as the number of food groups consumed over a period of 24hours (Steyn *et al*., 2006). The level of diversity in the household diet was determined using the standardised questionnaire on HDD (FAO, 2011). This questionnaire was used to calculate the HDD Score of a household (HDDS). In this questionnaire the number of different food groups consumed during the previous 24-hours was determined from a possible 12 food groups, that included cereals; roots and tubers; vegetables; fruits; meat, poultry, offal; eggs; fish and seafood; pulses/legumes/nuts; milk and milk products; oil/fats; sugar/honey; and miscellaneous.

Once the data had been obtained, a HDD Score was calculated by tallying the total number of food groups from 12 consumed by the members of the household. This value ranged from 0 to 12 (Swindale and Bilinsky, 2006).

The HDD scores were categorised and interpreted in the following way: 0- 3 = low dietary diversity; 4-5 = medium dietary diversity and 6-12 = high dietary diversity (FAO, 2011).

5.4.1.5. Frequency of vegetables eaten

The frequency of vegetables eaten by adults and children in the households was measured using a set of 6 responses to the question 'How frequently do ADULTS/CHILDREN in the household eat vegetables? The responses included: Several times a day, once a day, a few times per week, once a week, rarely, and never. The responses were coded and used to draw a comparison between vegetable consumption before and after the intervention.

5.4.2. Study procedures

Following approval of the protocol by the Health Sciences Research Ethics Committee of the University of the Free State (Appendix E) and the Ministry of Health in Lesotho, the census was undertaken and households that would be included in the study were identified.

5.4.2.1. Baseline Survey

Prior to the baseline household interviews, fieldworkers from the National University of Lesotho received training on the data collection process. This training took on 5 and 6 August 2014.

Once the control and intervention households had been identified, the first set of baseline interviews were undertaken. A two-person team of fieldworkers, from the National University of Lesotho, conducted structured interviews with individuals in participating households using the questionnaire which was compiled for the main study. Interviews were conducted with the household head at the household. The questionnaires were completed by the fieldworkers, who indicated the response given by the participant on the questionnaire.

5.4.2.2. Implementation of the intervention

In Lesotho, the households that were included in the household food garden intervention were beneficiaries of the SWAALES. SWAALES is a Non-Profit, Non-Governmental Organization that aims to achieve a HIV/AIDS free world and to empower African Women and Children to claim equal rights, access to health care, education, and economic and socio-cultural opportunities (Derrick, 2014).

The 25 intervention households were trained on and assisted with the implementation of their household food gardens from July to September 2014. Vegetables that were planted for the summer harvest included pumpkin, carrots, spinach, green beans, tomatoes, onion, beetroot and potatoes. Planting for the winter harvest took place between January and June 2015. The gardeners within those households received basic training on garden layout and bed design; natural soil fertility, pest and disease control; nutrition training; food preservation, processing and storing; seed harvesting and saving; and preparation for winter crops, frost and cold damage. Training of beneficiary households of the SWAALES program was done by Lima Rural Development Foundation representatives. Maintenance and monitoring continued throughout the remainder of the project (July 2014 to September 2015). Training material(s) were made available in Sesotho. Control households were

informed of the incentive they would receive at the completion of the study (the same household food garden intervention as the intervention group).

5.4.2.3. Follow-up Survey

Following the implementation of the household food garden intervention, the follow-up survey took place between July and September of 2015. The same team that had conducted the baseline survey conducted the interviews with control and intervention households at follow-up, using the same questionnaire.

4.5. Pilot Study

A pilot study was undertaken prior to the commencement of the data collection phase of the study. This took place in August 2014 in Bloemfontein and relevant and appropriate amendments were affected. Changes that were made to questionnaires following the pilot study included the following: Underlining of key words in order to assist the interviewer; Instructions for the interviewer at certain questions were inserted to ensure uniformity; Wording/phrasing of questions and answer options were changed in the questionnaire to make them more applicable to the target population; Parts of the questionnaire were omitted as their presence was determined unnecessary in reaching the objectives; and the layout of columns in the questionnaires were edited to allow for a more efficient interview.

Households within the Rampepe Village in Lesotho, (that met the inclusion criteria) were selected at the fieldworkers' discretion in a different area than households for the main study. The amount of time needed to complete the questionnaires was determined as well as the clarity of the questions. The pilot study participants each received an incentive (R100 shopping voucher) from the interviewer upon completion of the questionnaire.

The data from the pilot study was not included in the results of the main study.

5.6. Validity and Reliability

5.6.1. Validity

Validity is the ability of a tool or instrument to measure that which it is supposed to measure. The measurement is not considered valid if the instrument repeatedly measures a characteristic in the same person or group higher or lower than it actually is (Monsen *et al.,* 2003).

Validity was guaranteed by researching evidence-based literature concerning indirect measures of household food security and including these in the questionnaire.

5.6.2. Reliability

Reliability is the degree of correlation between sets of data when the measurement is done more than once on the same study participant or group, by the same or a different observer (Monsen *et al.,* 2003). To ensure reliability in this study, the researchers used the same, standardised questionnaires to obtain information from participants. Structured interviews were conducted by local fieldworkers who received training on research ethics, survey methodology and fieldwork, as well as proper execution of the relevant food security measurements (LPI, MAHFP, HDD and frequency of vegetables eaten). The use of structured interviews contributed to reliability as they helped eliminate the possibility of research bias and subjectivity, since questions were asked exactly as worded in the questionnaire.

The questionnaires were designed in such a way that fieldworkers did not ask leading questions. Fieldworkers were assisted by foot-note instructions in the questionnaire guiding them throughout the interview. The order in which the questions were asked was also carefully considered to avoid previous questions influencing the participant's answers. The questionnaires were also translated into the local languages. The questionnaires were translated into the relevant languages, with the original translations being back-translated by another person to improve the reliability of the translations.

Quantitative data gathered during the study by means of the procedures mentioned in the data collection process were captured using a double entry process in CSPro. An exact replica of the questionnaire was programmed into the CSpro programme and was

programmed to disallow any irrelevant data entry (e.g. words instead of numbers, incorrect values) enabling the data capturers to maintain the integrity of the data.

5.7. Statistical Analysis

Quantitative data gathered was captured using a double entry process by a full-time doctoral student from the Department of Economics and a part-time Masters student from the department of Nutrition and Dietetics (the researcher) at The University of the Free Sate. As previously mentioned, the data was captured twice by each capturer using CSpro from which data could then be exported to Excel. Descriptive statistics, namely frequencies and percentages for categorical data, means and standard deviations or percentiles, were calculated for before (pre-intervention baseline survey) and after (post-intervention survey) the intervention per group. The changes from before the intervention were calculated and described by means of 95% confidence intervals.

The sub-study data was analysed by the Department of Biostatistics, UFS.

5.8. Results

5.8.1. Household demographics, responsibilities and structure

Table 5.1 includes the results pertaining to household demographics, structure and responsibilities.

In table 5.1, the confidence intervals show that there were no significant differences between the control and intervention groups at baseline in terms of household demographics. When looking at the gender distribution of participants, the control group was 72% male and 28% female and the intervention group was 64% male and 36% female.

In both groups, about a half of participants were married (Control: 48%; Intervention: 56%), followed by individuals who were separated (Control 32%; Intervention 44%) and slightly more individuals who were unmarried and widowed in the control group (Control 12%; Intervention 0%). In terms of education, about 40% of participants had completed primary school (Control 44%; Intervention 41.7%), while a higher percentage of participants in the intervention group had completed some high school (Control: 20.0%; Intervention: 41.7%).

Table 5.1: Lesotho: Household demographics, responsibilities and structure

Baseline					
	Control		Intervention		95%Ci for difference at Baseline
	N=25	%	N=25	%	
Gender					
Male	18	72.0	16	64.0	
Female	7	28.0	9	36.0	[-31.8% ; 17.1%]
Marital Status					
Unmarried	3	12.0	0	0	[-3.5% ; 30.0%]
Married	12	48.0	14	56.0	
Living together/cohabiting	1	4.0	0	0	
Divorced	1	4.0	0	0	
Separated	8	32.0	11	44.0	
Widowed	3	12.0	0	0	
Highest level of education					
No formal schooling	0	0	0	0	
Some primary	4	16.0	0	0	
Primary completed	11	44.0	10	41.7	
Some high school	5	20.0	10	41.7	
High school completed	5	20.0	3	12.5	[-20.2% ; 9.6%]
Diploma/degree from tech/college	0	0	1	4.2	

Where was the main meal eaten yesterday?					
Home (this household)	22	88.0	25	100.0	[-30.0% ; 3.5%]
Shared meal with other households/neighbours	1	4.0	0	0	
Workplace	1	4.0	0	0	
Did not eat a meal	1	4.0	0	0	
household structure					
Female centred	6	24.0	6	24.0	[-23.1% ; 23.1%]
Male centred	6	24.0	4	16.0	
Nuclear	5	20.0	4	16.0	
Extended	3	12.0	10	40.0	
Live alone	5	20.0	1	4.0	
Who in the household does the following?					
buys food					
Household head	17	68.0	16	64.0	[-21.1% ; 28.5%]
Other	8	32.0	9	36.0	
prepares food					
Household head	14	56.0	10	40.0	[-11.0% ; 40.0%]
Other	11	44.0	15	60.0	
decides who gets food and when					
Household head	15	60.0	13	52.0	[-18.3% ; 32.9%]
Other	10	40.0	12	48.0	

Households in both groups (about 1 in 4), acknowledged a female as the head of the household (Control 24%; Intervention 24%), while a similar percentage came from a male headed household (Control 24%; Intervention 16%).

At baseline, the main meal of the day was eaten at home by about 90% of all participants (Control 88%; Intervention 100%). In both groups, household responsibilities such as buying food were mainly the responsibility of the head of the household (Control 68%; Intervention 64%), who was also the most likely to decide who receives food and when (Control 60%; Intervention 52%).

5.8.2. Living Poverty Index

Table 5.2 indicates the results pertaining to the LPI of the control and intervention groups at baseline and at follow-up. Table 5.3 indicates the change for better in answers to questions related to LPI, while Table 5.4 refers to the median change in LPI.

Table 5.2: Lesotho: Living Poverty Index at Baseline and at Follow-up

	Baseline					Follow-up				
	Control		Intervention			Control		Intervention		
	N=25	%	N=25	%	95%CI for difference between groups at baseline	N=20	%	N=25	%	95%CI for difference between groups at follow-up
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough food to eat?										
never	5	20.0	5	20.0	[-5.2%; 45.4%]	9	45.0	11	44.0	[-35.1%; 18.3%]
just once or twice	8	32.0	3	12.0		2	10.0	5	20.0	
several times	6	24.0	9	36.0	[-43.3%; 6.9%]	6	30.0	3	12.0	[-14.4%; 38.5%]
many times	5	20.0	7	28.0		3	15.0	5	20.0	
always	1	4.0	1	4.0		0	0	0	0	
don't know	0	0	0	0.0		0	0	1	4.0	
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough clean water for the home?										
never	18	72.0	13	52.0	[1.5%; 44.4%]*	13	65.0	10	40.0	[-5.3%; 46.1%]
just once or twice	5	20.0	4	4.0		2	10.0	3	12.0	
several times	0	0	2	8.0	[-44.4%; -1.5%]*	2	10.0	4	16.0	[-42.4%; 8.9%]
many times	2	8.0	6	24.0		3	15.0	7	28.0	
always	0	0	0	0		0	0	0	0	
don't know	0	0	0	0		0	0	1	4.0	
Over the past 12 months, how often, if ever, have you or your family (household) gone without medicine or medicinal treatment?										
	N=24		N=25			N=19		N=25		
never	14	58.3	9	36.0	[-22.8%; 27.5%]	12	63.1	13	52.0	[-14.2%; 25.2%]
just once or twice	2	8.3	7	28.0		6	31.6	9	36.0	
several times	4	16.7	4	16.0	[27.5%; 22.8%]	1	5.3	2	8.0	[-25.2%; 14.2%]
many times	4	16.7	5	20.0		0	0	0	0	
always	0	0	0	0		0	0	1	4.0	
don't know	0	0	0	0		0	0	0	0	
Over the past 12 months, how often, if ever, have you or your family (household) gone without electricity in your home?										
never	0	0	0	0	[-13.3%; 13.3%]	1	5.0	0	0	[-8.9%; 23.6%]
just once or twice	0	0	0	0		0	0	0	0	
several times	0	0	1	4.0	[-13.3%; 13.3%]	1	5.0	0	0	[-23.6%; 8.9%]
many times	25	100.0	24	96.0		18	90.0	24	96.0	
always	0	0	0	0		0	0	1	4.0	
don't know	0	0	0	0		0	0	0	0	

Table 5.2: Lesotho: Living Poverty Index at Baseline and at Follow-up (cont.)

Over the past 12 months, how often, if ever, have you or your family (household) gone without enough fuel to cook your food?										
never	13	52.0	15	60.0	[-31.2%; 16.4%]	9	45.0	12	48.0	[-31.6%; 22.2%]
just once or twice	4	16.0	4	16.0		2	10.0	3	12.0	
several times	4	16.0	3	12.0	[-16.4%; 31.2%]	3	15.0	4	16.0	[-14.4%; 38.5%]
many times	2	8.0	2	8.0		4	20.0	3	12.0	
always	2	8.0	1	4.0		2	10.0	1	1.0	
don't know	0	0	0	0		0	0	2	8.0	
Over the past 12 months, how often, if ever, have you or your family (household) gone without a cash income?										
never	1	4.0	1	4.0	[15.5%; 30.5%]	4	20.0	3	12.0	[26.8%; 25.8%]
just once or twice	6	24.0	4	16.0		3	15.0	6	24.0	
several times	11	44.0	6	24.0	[-30.5%; 15.5%]	9	45.0	10	40.0	[-22.3%; 30.6%]
many times	4	16.0	9	36.0		4	20.0	4	16.0	
always	3	12.0	5	20.0		0	0	1	4.0	
don't know	0	0	0	0		0	0	1	4.0	

In terms of LPI, the control and intervention groups were not different (at baseline and at follow-up), except for the variable ‘enough clean water for the house’. The options ‘never’ and ‘just once or twice’ were grouped together.

At baseline 92% of the participants in the control group reported that they had never or just once or twice gone without water over the past 12 months, compared to 56% in the intervention group, a difference that was statistically significantly different (95% CI for the percentage difference [1.5%; 44.4%]*. Similarly a significantly lower percentage of participants in the control group (8%) reported that they had gone without water several times, many times and always, compared to 32% in the intervention group (95%CI for percentage difference [-44.4%; -1.5%]*). At follow-up, the percentage of participants in the control area that went without enough clean water was still higher than in the intervention group, but the difference was not significant anymore.

At baseline, households that reported not having enough food to eat ‘several and many times’ were slightly more in the intervention group (Control 44%; Intervention 64%); households that did not receive medicine or medical care ‘several or many times’ were also slightly higher in the intervention group (Control: 23.4%; Intervention 36%),with households that reported going without electricity ‘many times’ being more in the control group (Control: 100%; Intervention: 96%). Households that reported the absence of enough fuel to cook their food ‘several or many times’ were similar in the control (24%) and intervention

(20%) group, as were the percentage of households that went without a cash income ‘several or many times’ (60% in both the Control and Intervention groups).

At follow-up, none of the differences between the two groups were statistically significant. A small improvement in the frequency that households had gone without enough food to eat was however seen in the intervention group (95%CI [-14.4%; 38.5%]). No change was observed in the control group.

Table 5.3: Lesotho: Change for better in answers to questions related to Living Poverty Index

Questions	Change in control group (n=20)			Change in intervention group (n=25)			
	N	%	95%CI for change within group (paired)	N	%	95%CI for change within group (paired)	95%CI for change between groups (unpaired)
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough food to eat?							
Change for better	9	45.0	[-53.0% ; 9.4%]	12	48.0	[-51.1% ; 8.5%]	[-26.8% ; 21.0%]
Change for worse	4	20.0		6	24.0		
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough clean water for the home?							
Change for better	4	20.0	[-43.4% ; 16.9%]	9	36.0	[-7.3% ; 43.6%]	[-26.8% ; 25.8%]
Change for worse	7	35.0		4	16.0		
Over the past 12 months, how often, if ever, have you or your family (household) gone without medicine or medicinal treatment?							
Change for better	8	40.0	[-42.4% ; 25.1%]	13	52.0	[-59.9% ; -4.3%]*	[-10.2% ; 37.9%]
Change for worse	6	30.0		4	16.0		
Over the past 12 months, how often, if ever, have you or your family (household) gone without electricity in your home?							
Change for better	0	0	[-30.1% ; 7.7%]	0	0	[-10.8% ; 20.2%]	[-19.5% ; 12.4%]
Change for worse	2	10.0		1	4.0		
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough fuel to cook your food?							
Change for better	6	30.0	[-21.5% ; 47.3%]	4	16.0	[-13.6% ; 35.7%]	[-10.4% ; 41.9%]
Change for worse	9	45.0		7	28.0		
Over the past 12 months, how often, if ever, have you or your family (household) gone without a cash income?							
Change for better	9	45.0	[-50.2% ; 15.6%]	13	52.0	[-59.5% ; -4.8%]*	[-14.2% ; 32.9%]
Change for worse	5	25.0		4	16.0		

In terms of change in LPI (table 5.3), 9 respondents in the control group reported a change for the better (response changed to a better category, e.g. from several times, many times and always to never or just once or twice), while 4 reported a change for the worse at follow-up when asked how often they had gone without enough food to eat. Although a higher percentage reported a change for the better at follow-up, the change was not statistically significant (95%CI for the change [-53.0%; 9.4%]).

At follow-up, a higher percentage of participants in the intervention group, experienced a change for the better in terms of enough food to eat, but the change was not statistically significant (95%CI for the change [-26.8%; 25.8%]). In terms of access to medicine or medical treatment, no significant change was observed in the control group (95% CI for the change [-42.4%; 25.1%], while a statistically significant change was reported by households in the intervention group, with 13 households reporting a change for the better at follow-up (95% CI [-59.9%; -4.3%]*).

A change for the better in the availability of cash income was reported in both the control (9 households) and intervention groups (13 households), but the change was only significant in the intervention group (95% CI for the change [-59.5%; -4.8%]*).

In terms of enough clean water, electricity, and fuel to cook food, the percentage of participants that experienced a change for the better or a change for the worse, was not significantly different within the two groups or between the two groups (table 5.3).

Table 5.4: Lesotho: Median change in Living Poverty Index

Baseline			
Control		Intervention	
Median	Range	Median	Range
2.5	1.7;4.5	2.83	1.7;4.3
Follow-up			
Median	Range	Median	Range
2.58	1.3;3.5	2.5	1.7;6.0

[-0.3; 0.5]

The median LPI score in the control group changed from 2.5 to 2.58 at follow-up (the lower the better), a decrease of 0.08 compared to a slight, but not significant improvement of 0.33 in the intervention group (95% CI interval for the change [-0.3; 0.5]) (table 5.4).

5.8.3 Months of Adequate Household Food Provisioning

In table 5.5, the percentage of participants that experienced adequate household food provisioning during the different months is noted.

Table 5.5: Lesotho: Months of Adequate Household Food Provisioning

	Baseline				**Follow-up**			
	Control		Intervention		Control		Intervention	
	n=25	%	n=25	%	n=20	%	n= 25	%
In the past 12 months, were there months in which you did not have enough food to meet your family's needs?								
Yes	17	68	20	80	11	55	14	56
No	8	32	5	20	9	45	11	44
If Yes, Which were the months (in the past 12 months) in which you did not have enough food to meet your family's needs?								
January								
No	19	76	19	76	16	80	20	80
Yes	6	24	6	24	4	20	5	20
February								
No	21	84	20	80	16	80	20	80
Yes	4	16	5	20	4	20	5	20
March								
No	21	84	17	68	17	85	24	96
Yes	4	16	8	32	3	15	1	4
April								
No	21	84	18	72	20	100	24	96
Yes	4	16	7	28	0	0	1	4

Table 5.5: Lesotho: Months of Adequate Household Food Provisioning

May								
No	18	72	16	64	19	95	23	92
Yes	7	28	9	36	1	5	2	8
June								
No	23	92	18	72	19	95	21	84
Yes	2	8	7	28	1	5	4	16
July								
No	23	92	16	64	20	100	23	92
Yes	2	8	9	36	0	0	2	8
August								
No	24	96	19	76	18	90	23	92
Yes	1	4	6	24	2	10	2	8
September								
No	19	76	20	80	18	90	24	96
Yes	6	24	5	20	2	10	1	4
October								
No	24	96	20	80	18	90	24	96
Yes	1	4	5	20	2	10	1	4
November								
No	24	96	24	96	19	95	23	92
Yes	1	4	1	4	1	5	2	8
December								
No	22	88	24	96	18	90	21	84
Yes	3	12	1	4	2	10	4	16

The descriptive data in table 5.5 was used to determine the median scores (table 5.6) and categories of scores for MAHFP (table 5.7).

Table 5.6: Lesotho: MAHFP medians

Baseline			
Control		Intervention	
Median	Range	Median	Range
11	7;12	10	2;12
Follow-up			
Median	Range	Median	Range
11	8;12	11	6;12

The median score in the control group for MAHFP remained the same (11) (the higher the better). The median score in the intervention group did however show some, but not a statistically significant improvement of 1 (95% CI for the difference [-2; 0]) (table 6).

Table 5.7: Lesotho: MAHFP Score categories

Category	Baseline				95%CI for % difference	Follow up				95%CI for % difference
	Control (n=25)		Intervention (n=25)			Control (n=20)		Intervention (n=25)		
	N	%	n	%		n	%	n	%	
Very low (0)	0	0	0	0	[-13.3%; 13.3%]	0	0	0	0	[-13.3%; 16.1%]
Low (1-4)	0	0	2	8.0	[-25.0%; 6.5%]	0	0	0	0	[-13.3%; 16.1%]
Moderate (5-8)	3	12.0	4	16.0	[-24.2%; 16.4%]	1	5.0	1	4.0	[-15.1%; 19.9%]
High level of Food Security (9-11)	14	56.0	14	56.0	[-25.7%; 25.7%]	10	50.0	13	52.0	[-28.9%; 25.3%]
Food Secure (12)	8	32.0	5	20.0	[-12.2%; 34.5%]	9	45.0	11	44.0	[-26.0%; 28.1%]

In terms of score categories for MAHFP, there were no significant differences in the percentage of respondents with scores in the different categories in the two groups at baseline and at follow-up.

The households were grouped into food secure categories according to their MAHFP score. Table 5.7 shows that at baseline, the control group did not have any households that scored in the very low and low category (0%), with the intervention group having only 8% of households in the low food security category.

At follow-up, though not significant, a small improvement was noted in the intervention group where there were no longer any households in the low food security category.

5.8.4. Household Dietary Diversity

Table 5.8, indicates the percentage of respondents that ate and did not eat the different food groups on a daily basis.

The data in table 5.8 was used to calculate the median HDD score (table 5.9) and the categories of HDD (table 5.10).

Table 5.8: Lesotho: Household Dietary Diversity

	Baseline				Follow-up			
	Control		Intervention		Control		Intervention	
	N = 25	%	N=25	%	N=20	%	N=25	%
Type of food								
Cereals								
No	24	96	25	100	20	100	25	100
Yes	1	4	0	0	0	0	0	0
Vitamin A rich vegetables								
Yes	0	0	0	0	0	0	5	20
No	25	100	25	100	20	100	20	80
White vegetables and roots								
No	4	16	1	4	0	0	2	8
Yes	21	84	24	96	20	100	23	92
Dark green leafy vegetables								
NO	17	68	18	72	15	75	18	72
Yes	8	32	7	28	5	25	7	28
Other vegetables								
Yes	2	8	4	16	1	5	5	20
No	23	92	21	84	19	95	20	80
Vitamin A rich fruit								
NO	0	0	0	0	0	0	1	4
Yes	25	100	25	100	20	100	24	96
Other fruit								
Yes	1	4	2	8	1	5	0	0
No	24	96	23	92	19	95	25	100
Organ meat								
NO	1	4	1	4	0	0	1	4
Yes	24	96	24	96	20	100	24	96
Flesh meats								
NO	2	8	3	12	3	15	2	8
Yes	23	92	22	88	17	85	23	92
Eggs								
NO	4	16	7	28	1	5	5	20
Yes	21	84	18	72	19	95	20	80
Fish								
NO	0	0	0	0	0	0	3	12
Yes	25	100	25	100	20	100	22	88
Legumes, nuts and seeds								
NO	2	8	5	20	4	20	4	16
Yes	23	92	20	80	16	80	21	84
Milk and milk products								
NO	4	16	2	8	1	5	3	12
Yes	21	84	23	92	19	95	22	88
Oils and fats								
NO	16	64	13	64	10	50	21	84
Yes	9	36	12	54	10	50	4	16
Sweets								
NO	12	48	15	60	6	30	8	32
Yes	13	52	10	40	14	70	17	68
Spices, condiments and beverages								
NO	16	64	18	72	11	55	21	84
Yes	9	36	7	28	9	45	4	16

Table 5.9: Lesotho: Median Household Dietary Diversity Score

Baseline			
Control		Intervention	
Median	Range	Median	Range
5	3;9	6	3;8
Follow-up			
Median	Range	Median	Range
5	3;7	6	4;7

[-2; 0]

At baseline, the median HDD score of the control group was 5 (range 3-9); while in the intervention group it was slightly higher at 6 (range 3-8). At follow-up, the median score remained the same in the control group (5, range 3-7) and intervention group (6, range 4-7) with no statistically significant change, (95% CI for the median change of [-2; 0]).

Table 5.10: Lesotho: Household Dietary Diversity Scores

Category	**Baseline**				**95%CI for % difference**	**Follow up**				**95%CI for % difference**
	Control n=25		**Intervention n=25**			**Control n=20**		**Intervention n=25**		
	n	%	N	%		n	%	n	%	
Low HDD (0-3)	9	36.0	7	28.0	[-17.1%; 31.8%]	8	40.0	3	12.0	[2.5%; 50.7%]
Medium HDD (4-5)	12	48.0	12	48.0	[-25.8%; 25.8%]	11	55.0	17	68.0	[-38.5%; 14.4%]
High HDD (6-12)	4	16.0	6	24.0	[-29.7%; 14.5%]	1	5.0	5	2.0	[-34.5%;6.7%]

Households were categorised into low, medium or high dietary diversity categories according to their scores. At baseline, about a third of the control and intervention households had a low level of dietary diversity (Control 36%; Intervention 28%). Half of the households in both the control and intervention group had a medium level of dietary diversity (48%).

At follow-up, 40% of the control group had a low level of dietary diversity. The intervention group showed a slight improvement (16%) with 12% of households in the low dietary diversity category. The more than half of households in the control and intervention had a medium level of dietary diversity (Control 55%; Intervention 68%).

5.8.5. Frequency of vegetables eaten in the household

Table 5.11 indicates the frequency of vegetables eaten by adults and children in Lesotho, while table 5.12 indicates the change in frequency of vegetables eaten within and between groups.

Table 5.11: Lesotho: Frequency of vegetables eaten

	Control				**Intervention**			
	Baseline		Follow-up		Baseline		Follow-up	
Adults	N=25	%	N=25	%	N=20	%	N=25	%
Several times a day	18	72	20	80	9	45	13	52
once a day	3	12	3	12	7	35	5	20
few times per week	3	12	2	8	4	20	7	28
once a week	1	4	0	0	0	0	0	0
rarely	0	0.0	0	0.0	0	0.0	0	0.0
never	3	12.5	0	0	7	35	7	28
Children								
Several times a day	16	66.7	16	66.7	7	35	8	32
once a day	2	8.3	6	25	1	5	8	32
few times per week	0	0	2	8.3	0	0	0	0
once a week	1	4.2	0	0	0	0	0	0
rarely	2	8.3	0	0	0	0	0	0
never	0	0	0	0	5	25	2	8
No Children in household								

At baseline, 72% of adults in the control group and 45% in the intervention group reported eating vegetables several times a day. Adults in the control and intervention group that never ate vegetables were 0% and 35% respectively. Two thirds (66.7%) of the children in the control group reported eating vegetables several times a day, with 35% eating vegetables several times a day in the intervention group. No children in the control group never ate vegetables, whereas 25% of children in the intervention group were reported never eating vegetables.

At follow-up, more adults in both the control and intervention group ate vegetables several times a day (Control 80%; Intervention 52%). A lower percentage of adults in these households also reported never eating vegetables (Control 0%; Intervention 28%). The percentage of children that ate vegetables several times a day remained similar in both the

control (66.7%) and intervention (32%) groups. With regards to never eating vegetables, the intervention group showed a slight improvement (8%).

Table 5.12: Lesotho: Change in frequency of vegetables eaten within and between groups

	Change in control group (n=20)		95% CI for change within group	Change in intervention group (n=25)		95% CI for change within group	95% CI for change between groups
	n	%		N	%		
Adults							
Change for better	3	15.0	(-51.0%; 6.6%)	5	20.0	(-58.5; -6.4%)*	(-17.4%; 25.5%)
Change for worse	8	40.0		12	48.0		
	N=17	%		N=24	%		
Children							
Change for better	2	11.8	(-56.1%; 4.7%)	4	16.7	(-65.7%; -7.8%)*	(-25.9%; 19.8%)
Change for worse	7	41.2		14	58.3		

In the intervention group, a 20% improvement in the frequency of vegetables eaten was noted after the intervention, a change that was statistically significant (95% CI for the change from baseline to follow-up of [-58.5; 6.4%]*. A statistically significant improvement of 16% was also noted in children in the intervention group ((95% CI [-65.7%; -7.8%]*).

In the control group, the improvement in consumption of vegetables by adults and children was not statistically significant (95% CI for the change [-51.0%; 6.6%] for adults and [-56.1%; 4.7%] for children.

Though statistically significant changes were noted for consumption of vegetables by adults and children in the intervention group, there was no difference between the groups at follow-up(95% CI [-17.4%; 25.5%] for adults and [-25.9%; 19.8%] for children.

5.9. Discussion

Despite the fact that the literature has previously reported that in the past males were often absent in Lesotho due to migration to work elsewhere (LDHS, 2014), there were more male than female participants in the current study. Most participants were either married or separated. These findings are similar to those of the 2009 Lesotho Demographic and Health Survey (2009) that reported that half of the population was married (LDHS, 2009). In terms of education, the majority of participants were educated beyond primary school level, but few had completed high school.

Basic causes of food insecurity include inadequate access to food as a result of poverty (Smith *et al*. 2000). According to the United Nations (UN), poverty is defined as 'a human condition characterised by the sustained or chronic deprivation of the resources, capabilities, choices, security and power necessary for the enjoyment of an adequate standard of living and other civil, cultural, economic, political and social rights' (UN, 2001). Poverty can therefore be closely linked to food insecurity. In the current study, participants had relatively high median LPI scores at baseline, indicating a high level of poverty. After the intervention, an improvement in the median LPI of the intervention group was noted, that was not evident in the control group. This improvement could thus be associated with the intervention, since a smaller percentage of participants in the intervention group reported going without food for regular intervals. They also reported better access to medical treatment or medicine and an improvement in availability of cash in the household. As previously mentioned, household food gardens can contribute to the food supply at household level, while also providing produce that can be sold at local markets (Maroyi, 2009), making money available to spend on other commodities such as medical treatment.

Being food secure, involves the ability of individuals to obtain sufficient food on a daily basis (Du Toit, 2011). Food gardens have the potential to improve food security by increasing the quantity of food that is eaten, while also contributing to nutrient intake and quality of the diet (Galhena *et al.* 2013; Marsh, 1998). At baseline, households in both the control and intervention groups already had a high level of MAHFP, with adequate food provisioning for a majority of the year, making an improvement in this measure unlikely. The relatively good MAHFP score could be attributed to the culture of sharing among Basotho people (Turner,

2005). After the food garden intervention, a small (one point) improvement was noted in the median score of the intervention group.

DD is universally recognised as a key component of healthy diets and therefore a useful outcome when assessing food security (Earl, 2011; Thorne-Lyman *et al.,* 2009). According to Ruel *et al.,* (2000), the diets of people living in developing countries often lack diversity, since they often survive on staple plant-based diets. Household food gardens have the potential to influence DD through increasing the availability of vegetables, contributing to a more diversified diet and a higher consumption of nutritious food (Weinberger, 2013).

At baseline, the median DD of participants in control households was categorised as medium, while those in intervention households had a higher level DD. After the intervention the median scores for both the control and intervention households remained the same.

Although DD is often used as an indicator of dietary quality, care needs to be taken when interpreting this information. A higher DDS does not guarantee the consumption of a nutrient-dense, quality diet. Results from South African studies have shown that a high DDS may be related to an increased intake of unhealthy foods, such as fast foods (Steyn et al., 2011). The study of Rothman *et al*. (2018) confirmed that women from both rural and urban households in Lesotho consumed unhealthy foods such as refined starches, fatty and sugary foods. Results from the DD data of the current study showed that after the intervention, the intake of cereal (the dietary staple) and dark green leafy vegetable intake did not change, while households ate slightly more fruit, flesh meat, eggs, legumes, nuts, seeds and sweets. When looking at frequency of vegetables eaten however, significant improvements were noted in the intervention group that were not noted in the control group. These can thus most probably be attributed to the intervention.

The fact that the measures that were applied to measure food security focused more on the experiences of participants and on the types of foods that were eaten is a limitation of the study. No information on quantities of foods (especially quantities of vegetables) that were eaten was collected, making it difficult to accurately determine the adequacy of the diet.

The inclusion of more than one measure of food security in the current study provided a holistic view of the situation in Lesotho. Applying a variety of tools made it possible to evaluate the contribution of a number of variables to food security, since they focus on different components, all of which impact on food security.

5.10. Conclusion and Recommendations

The Lesotho sample included in the current study consisted of more male than female participants. About half were married and less than 20% had completed high school or had a tertiary qualification. As evidenced by the LPI of 2.5, the sample was characterised by high levels of poverty. Despite this, some measures of food security showed that participants were not as badly off as one would have expected. Even before intervention, the median MAHFP was 11 at in the control group and 10 in the intervention group, indicating relatively good levels of food provisioning. At baseline, the median HDDS was 5 in the control group and 6 in the intervention group, indicating medium to high dietary diversity. As far as frequency of vegetables consumed was concerned, a relatively high percentage of participants reported that both adults and children ate vegetables relatively frequently. The habit of sharing that has been described in the Lesotho population, probably contributed to these findings.

In terms of the impact of the intervention, the MAHFP remained at 11 in the control group at follow-up and improved by one point in the intervention group that was exposed to the household food garden intervention. Median HDDS did not change in either group at follow-up. The main outcome of the success of the intervention was obviously related to vegetable consumption. Significant improvements were noted in the frequency of vegetables consumed in the intervention group that were not noted in the control group. These can thus most probably be attributed to the intervention.

in terms of recommendations to improve the impact of household food garden interventions, value may be gained from equipping individuals with knowledge on gardening practices that cater for environmental challenges (e.g. drought, frost, etc,). Sharing and communal gardens may also benefit this type of community as individuals pool resources and combine knowledge.

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Chapter 6

The Impact of a Household Food Garden Intervention on measures of Food Security in Zimbabwe

6.1. Introduction

Zimbabwe, a landlocked country, is populated by about 16 million people (WHO, 2015; FAO, 2005). In the past, Zimbabwe was self-sufficient and even exported its surplus produce to fellow SADC countries, often referred to as the bread basket in its region (BBC, 2017; Forum for Food Security in Southern Africa, 2003).Unfortunately, natural disasters, economic decline and political factors resulted in a reduced capacity to produce food crops and exportable commodities for foreign income. The country's strategic grain reserve was therefore exhausted and world food aid became the primary source of relief (Forum for Food Security in Southern Africa, 2003). Currently, Zimbabwe is impoverished and faces a variety of economic challenges. High unemployment rates (78%), political strife and repression are very evident (BBC, 2017). Political instability directly influences food security as effective food production, the ability to purchase food and the reception of food aid is dependent on governments that are able to coordinate future expectations (Deaton and Lipka, 2015).

Even though evidence about the situation in Zimbabwe is lacking, it is expected that Zimbabwe is vulnerable to food insecurity (Gadaga *et al*., 2009). In addition to the factors mentioned above, food insecurity can be ascribed to poor macroeconomic performance, unfair land distribution, and misapplied social policy. Households are further impacted by external shocks like recurrent drought (Gadaga *et al.,* 2009; Bohle *et al.,* 1994).

Due to the failure of many farms in Zimbabwe, smallholder farmers are most affected by food insecurity (WFP, 2012). However, smallholder farmers are often unable to meet their food requirements through production due to a lack of resources and environmental challenges . They also face an inability to obtain food from markets, as household income is insufficient and markets are unreliable. For this reason smallholder farmers tend to focus on subsistence (ZDHS, 2015).

Most families cannot afford to purchase foods which now have to be imported, and thus depend on household food production to meet their basic food needs. In 2004 it was reported that food security in rural Zimbabwe is largely dependent on household food production from household gardens (Mango *et al.*, 2004). As the socio-economic environment in Zimbabwe changed, household food gardens became an important source of food and income (FAO, 2005). By the year 2002, about 28 500 hectares were being cultivated, with vegetable gardens being grown on more than 10 000 hectares. As the benefits of vegetable gardening became more evident, more and more interest in household vegetable gardens occurred and the number of gardens increased even further (FAO, 2005).

According to Steyn and Mchiza (2015) in a review on whether Sub-Saharan Africa has seen changes in diet and obesity over the past 33 years , an increase in the prevalence of overweight and obesity was noted from 2002 to 2005 in Zimbabwe. As is commonly observed in many developing countries, Zimbabwe also presents with the double-burden of malnutrition (maternal overweight/obesity and stunting in children), with 25% of women being overweight and 30% of children under the age of 5, being stunted. Similar figures have been reported in the 2015 Zimbabwe Demographic and Health Survey (ZDHS) undertaken in the ten Zimbabwean provinces that reported that 27% of children under the age of 5 were stunted. In addition to stunting, 3% of children were wasted; 8% were underweight and 6% were overweight. When looking at anaemia, 37% of children (aged 6 to 59 months), 27% of women and 6% of men in Zimbabwe experienced some degree of anaemia.

In a study undertaken by Maroyi (2009) in the Nhema region, it was found that land was often allocated to male household heads. Reasons for the allocation generally involved the building of houses, main or crop fields for staple and cash crops to be grown and garden plots. Communities were actively involved in the decision-making process of where main fields, homesteads and garden plots were placed, but once the decision had been made, the individual households determined the activities on the land. Different roles are played by men and women in guaranteeing food security (FAO, 2016). Women add value as they are able to produce food, manage natural resources and earn an income, all while taking care of the household’s food security needs (Mwaniki, 2006).

Women-headed households are assumed to be affected more in terms of poverty, as they often have fewer income earners in the household and are less productive agriculturally (due to a lack of resources) compared to their male counterparts (Horrell and Krishnan, 2006). However, a survey undertaken by Taruvinga*et al.,* (2013) in the Eastern Cape, South Africa, indicated that female-headed households were more likely to achieve a higher dietary diversity (DD) than male-headed households. This could be attributed to the fact that chores like growing and processing of food are often the responsibility of women in the household (FAO, 2016) and they are more likely to spend money on food than on other commodities. Smith *et al.* (2003) confirm that women with a higher social status tend to have better nutritional status and often take better care of their children. Individual empowerment, especially among women involved with gardening, has been noted in education programmes aimed at improving gardening skills (Weinberger, 2013).

This study formed part of a larger overarching study undertaken by the Centre for Development Support at The University of The Free State titled "Household food gardens: effective and sustainable impact mitigation response to the HIV and AIDS epidemic in urban settlements in Lesotho, South Africa and Zimbabwe". The overarching study aimed to investigate the potential benefits of sustainable, eco-friendly household food gardens and the resultant household food security and nutritional effects in South Africa, Lesotho and Zimbabwe. It spanned over a period of two and half years (July 2013 to 2015). The project was funded by the Southern African Development Community (SADC). The Centre for Development and Support partnered with the Department of Agriculture in South Africa, the Society of Women against AIDS in Africa (SWAALES) in Lesotho and Batani HIV/AIDS Service organisation(BHASO) in Zimbabwe in order to implement the household food garden interventions.

For the purpose of this publication, the impact of a household food garden intervention on measures of food security in Zimbabwe will be discussed.

6.2. Study Design

This study comprised a quantitative pre-test, post-test design.

6.3. Study Population

The study population included Mashvingo settlement in Zimbabwe, a beneficiary area of the intervention partner, BHASO. All households in this area that were eligible to participate in the BHASO programme comprised the population.

6.3.1. Rapid Appraisal

A rapid appraisal census (Appendix A) was undertaken in all households included in the population prior to the intervention. During the rapid appraisal, a short survey was completed in all households where someone was home during the day in order to differentiate between households that:

- had no garden (there was no physical evidence of a garden);
- had a non-functional garden (the garden that was present was not being maintained and had not produced crops in the past season);
- had a functional garden that differed from the type of gardens that was provided to the intervention groups; and
- had a functional garden that was similar to the type of garden that was to be provided to the intervention group.

6.3.2. Sample

The sample for the present study included fifty households selected from the population. Households that were identified during the census as having no garden or a garden that was different to the one that was to be provided, were included in a two-stage sampling procedure where twenty five households were randomly selected for the control group and twenty five households were purposively included in the intervention group.

6.3.2.1.Inclusion criteria

- Households that provided informed consent after being informed (Appendices B and C)
- Area of residence: households that were situated in the beneficiary communities of BHASO in Mashvingo.
- Households with no garden, more specifically no physical evidence of a garden.
- Households with a non-functioning garden – there may have been a garden, but the garden was not being maintained and had not produced any crops during the past season.
- Households with a functional garden, but a garden of a different type from the gardens to be provided to the intervention group as part of the particular intervention.

6.3.2.2. Exclusion Criteria

- Households with a garden type similar to the gardens to be provided to the intervention group as part of the study.

6.4. Methodology

6.4.1. Operational Definitions and techniques

The questionnaire developed for the main study included the following sections: household composition, household data, food insecurity, food gardens, food remittances received from household food gardens, food from household food gardens, gardening, health, HIV and AIDS, urban food aid, and clarification.

For the purpose of this sub-study, measures of food security included the Living Poverty Index (LPI) (Appendix D), Months of Adequate Household Food Provisioning (MAHFP)(Appendix D), Household Dietary diversity (HDD) (Appendix D) and Frequency of vegetables eaten (Appendix D).

These questionnaires were completed in a structured interview with a household member (preferably the head of the household).

6.4.1.1. Household demographics, responsibilities and structure

For the purpose of this study, questions related to socio-demography, including basic demographics of household members, household responsibilities and household structure were asked.

6.4.1.2. Living Poverty Index

The LPI questionnaire developed by Mattes (2008) was applied to assess the standard of living (an indicator of both poverty and food security). The frequency that households went without basic necessities of life (namely food, water, medicine, electricity and fuel and cash income) was determined. It was calculated for a period of 12 months prior to the interview by using a set of six questions, each with six possible responses (the sixth response being 'I don't know'). The range of responses each received a score on a five point scale. The responses were then combined to calculate the average living poverty index score for the household, 0 (no poverty) to 4 (complete poverty) (Mattes, 2008).

6.4.1.3. Months of Adequate Household Provisioning

The standardised MAFHP questionnaire (Billinsky and Swindale, 2010) was used to determine the level of food security of households. MAHFP for each household was then calculated by subtracting the total number of months out of the previous 12 months that the household was unable to meet their food needs from 12 (e.g. 12 – sum(A+B+C+D+E+F+G+H+I+J+K+L). Values for A through L were '0' or '1' (Bilinsky and Swindale, 2010).

The scores were categorised into three groups - according to level of food security. A score of 12 meant that the household had year-round adequate food provisioning. Households that scored between 11 and 8 were deemed to have moderate food security; households that scored between 4 and 7 were deemed to have a low level of food security and households that scored between zero and 3 were considered to be food insecure.

6.4.1.4. Household Dietary Diversity

HDD Score is defined as the number of food groups consumed over a period of 24hours (Steyn, *et al.*, 2006). The level of diversity in the household diet was determined using the standardised HDD questionnaire, developed by the FAO (2011). This questionnaire was used to calculate the HDD Score. In this questionnaire the number of different food groups consumed during the previous 24-hours was determined from a possible 12 food groups. The 12 food groups included: A. cereals; B. root and tubers; C. vegetables; D. fruits; E. meat, poultry, offal; F. eggs; G. fish and seafood; H. pulses/legumes/nuts; I. milk and milk products; J. oil/fats; K. sugar/honey; and L. miscellaneous.

Once the data had been obtained, a HDD Score was calculated by tallying the total number of food groups from 12 consumed by the members of the household. This value ranged from 0 to 12 (FAO, 2011; Swindale and Bilinsky, 2006).

The HDD scores were categorised and interpreted in the following way: 0- 3 = low dietary diversity; 4-5 = medium dietary diversity and 6-12 = high dietary diversity (FAO, 2011).

6.4.1.5. Frequency of vegetables eaten

The frequency of vegetables eaten by adults and children in the households was measured using a set of 6 responses to the question ‘How frequently do ADULTS/CHILDREN in the household eat vegetables? The responses included: Several times a day, once a day, a times per week, once a week, rarely and Never. The responses were coded and used to draw a comparison between vegetable consumption before and after the intervention.

6.4.2. Study Procedures

Following approval of the protocol by the Medical Research Council of Zimbabwe, the census was undertaken and households that would be included in the study were identified. The procedures that were applied during the baseline survey, the vegetable gardening intervention and the follow-up survey are discussed in the following section.

6.4.2.1. Baseline Survey

Prior to the baseline household interviews, fieldworkers (staff members from The Great University of Zimbabwe) received training on the data collection process. This training took place between 11 and 14 August 2014. Once the control and intervention households had been identified, the first set of baseline interviews were undertaken. A two-person team of fieldworkers, from The Great University of Zimbabwe, conducted structured interviews with individuals in participating households using the questionnaire which was compiled for the main study. Interviews were conducted with the household head at the household. The questionnaires were completed by the fieldworkers, who indicated the response given by the participant on the questionnaire.

6.4.2.2. Implementation of the intervention

In Zimbabwe, the households that were included in the household food garden intervention were beneficiaries of the BHASO Programme. BHASO is a Non-Governmental Organisation based in Mashvingo Zimbabwe that place people living with HIV and AIDS at the centre of its programming. Programme components include: Food security and livelihood; Health and Nutrition; New life post-test support; Support to support groups; Orphans and other vulnerable children; Youth empowerment for behaviour change; Children's ART Literacy and Gender and advocacy. The Food Security and Livelihood component was predominantly involved the study (BHASO, 2018).

The twenty-five intervention households received training and were assisted with the implementation of their household food gardens from July to September 2014. Vegetables that were planted for the summer harvest included pumpkin, carrots, spinach, green beans, tomatoes, onion, beetroot and potatoes. Planting for the winter harvest took place between January and June 2015. The gardeners within those households received basic training on garden layout and bed design; natural soil fertility, pest and disease control; nutrition training; food preservation, processing and storing; seed harvesting and saving; and preparation for winter crops, frost and cold damage. Training of beneficiary households of the BHASO programme was done by Lima Rural Development Foundation. Maintenance and monitoring continued throughout the remainder of the project (July 2014 to September

2015). Training material(s) were made available in both English as well as Shona. Control households were informed of the incentive they would receive at the completion of the study (the same household food garden intervention as the intervention group).

6.4.2.3. Follow-up Survey

Following the implementation of the household food garden intervention, the follow-up survey took place between July and September of 2015. The same team that had conducted the baseline survey, conducted the interviews with control and intervention households at follow-up, using the same questionnaire.

6.5. Pilot Study

A pilot study was undertaken prior to the commencement of the data collection phase of the study. This took place in August 2014 in Masvingo, in an area that was not included in the intervention area.

These households (that met the inclusion criteria) were selected at the fieldworkers' discretion in a different area than households for the main study. Four households were included. The amount of time needed to complete the questionnaires was determined as well as the clarity of the questions asked. The pilot study participants each received an incentive (5 Dollars) from the interviewer upon completion of the questionnaire.

Changes that were made to questionnaires following the pilot study included the following: Underlining of key words in order to assist the interviewer; Instructions for the interviewer at certain questions were inserted to ensure uniformity; Wording/phrasing of questions and answer options were changed in the questionnaire to make them more applicable to the target population; Parts of the questionnaire were omitted as their presence was determined unnecessary in reaching the objectives; and the layout of columns in the questionnaires were edited to allow for a more efficient interview.

The data from the pilot study was not included in the results of the main study.

4.6. Validity and Reliability

4.6.1. Validity

Validity is the ability of a tool or instrument to measure that which it is supposed to measure. The measurement is not considered valid if the instrument repeatedly measures a characteristic in the same person or group higher or lower than it actually is (Monsen, et al, 2003:11).

Validity was guaranteed by researching literature concerning household food security and dietary diversity. The questionnaires took the relevant literature into consideration and questions were motivated by scientific evidence. The questionnaires were translated into the relevant language (Shona), with the original translations being back-translated by another person to improve their validity.

4.6.2. Reliability

Reliability is the degree of correlation between sets of data when the measurement is done more than once on the same study participant or group, by the same or a different observer (Monsen, et al., 2003:11). To ensure reliability in this study, the researchers used the same, standardised questionnaires to obtain information from participants. Structured interviews were conducted by local fieldworkers who received training on research ethics, survey methodology and fieldwork, as well as proper execution of the relevant nutritional measurements (LPI, MAHFP, HDD, and frequency of vegetables eaten). The use of structured interviews contributed to reliability as they helped eliminate the possibility of research bias and subjectivity, since questions were asked exactly as worded in the questionnaire.

The questionnaires were designed in such a way that fieldworkers did not ask leading questions. Fieldworkers were assisted by foot-note instructions in the questionnaire guiding them throughout the interview. The order in which the questions were asked was also carefully considered to avoid previous questions influencing the participant’s answers. The questionnaires were also translated into the local language (Shona).

6.7. Statistical Analysis

Quantitative data gathered was captured using a double entry process by a full-time doctoral student from the Department of Economics and a part-time Masters student from the department of Nutrition and Dietetics (the researcher) at The University of the Free Satein CSPro. An exact replica of the questionnaire was programmed into the CSpro programme and was programmed to disallow any irrelevant data entry (e.g. words instead of numbers, incorrect values) enabling the data capturers to maintain the integrity of the data. The data was captured twice by each capturer from which data could then be exported to Excel. Descriptive statistics, namely frequencies and percentages for categorical data, means and standard deviations or percentiles, were calculated for before (pre-intervention baseline survey) and after (post-intervention survey) the intervention per group. The changes from before the intervention were calculated and described by means of 95% confidence intervals.

Quantitative data gathered during the study by means of the procedures mentioned in the data collection process were captured using a double entry process.

The sub-study data was analysed by the Department of Biostatistics, UFS.

6.8. Results

6.8.1 Household demographics, responsibilities and structure

Table 6.1 includes the results pertaining to household demographics, structure and responsibilities.

Table 6.1: Zimbabwe: Household demographics, responsibilities and structure at baseline

Baseline					
	Control		Intervention		95%Ci for difference at Baseline
	N=25	%	N=25	%	
Gender					
Male	3	12	6	24	
Female	22	88	19	76	[-9.9% ; 32.9%]
Marital Status					
Unmarried	21	84	14	68	[-19.6% ; 19.6%]
Married	3	12	4	16	
Divorced	1	4	1	4	
Separated	0	0	2	8	
Widowed	0	0	1	4	
Highest level of education					
No formal schooling	0	0	1	4	
Some primary	0	0	1	4	
Primary completed	8	32	5	20	
Some high school	3	12	4	16	
High school completed	12	48	7	28	[-25.8%; 25.8%]
Diploma/degree from tech/college	1	4	6	24	
Where was the main meal eaten yesterday?					
Home (this household)	21	84	24	96	[-30.9% ; 6.3%]
Shared meal with other households/neighbours	2	8	1	4	
Workplace	2	8	0	0	
Did not eat a meal					
Household Structure					
Female Centred	21	84	17	68	[-7.8% ; 37.8%]
Male centred	3	12	4	16	
Nuclear	1	4	1	4	
Extended	0	0	2	8	
Live alone	0	0	1	4	
Who in the household does the following?					
buys food					
Household head	9	36	8	32	[-28.5% ; 21.1%]
Other	16	64	17	68	
prepares food					
Household head	11	44	14	56	[-14.8% ; 36.5%]
Other	14	56	11	44	

decides who gets food and when					
Household head	6	24	8	32	[-16.4% ; 31.2%]
Other	19	76	17	68	

As can be seen in Table 6.1, the control and intervention groups were similar at baseline (none of the 95% CI for the difference between the indicated categories were significant).

At baseline, the study population was predominantly female in both groups (control: 88%; Intervention: 76%) and unmarried (Control 84%; Intervention 68%). In terms of education, a large percentage (more than half) of participants had completed high school and/or had a tertiary qualification (Control: 52% ; Intervention: 52%). In the majority of households, a female was recognised as the head of the household (Control 84%; Intervention 68%).

The main meal of the day was eaten at home by almost all participants (Control 84%; Intervention 96%). The responsibility of buying food was mainly the responsibility of someone other than the household head (only 36% in the control group and 32% in the intervention group of household heads bought food). Preparation of food was evenly shared between the household head and other members of the household and the decisions on who would receive food and when was performed by someone other than the household head (only 24% in the control group and 32% in the intervention group of household heads decided on food distribution).

6.8.2 Living Poverty Index

Table 6.2 indicates the results pertaining to the LPI of the control and intervention groups at baseline and at follow-up. Table 6.3 indicates the change for better in answers to questions related to LPI, while Table 6.4 refers to the median change in LPI.

Table 6.2: Zimbabwe: Living Poverty Index at Baseline and at Follow-up

	Baseline					**Follow-up**				
	Control		Intervention			Control		Intervention		
	N=24	%	N=25	%	95%CI for difference between groups at baseline	N=25	%	N=24	%	95%CI for difference between groups at follow-up
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough food to eat?										
Never	9	36	12	48	[-25.1%; 25.1%]	0	0	0	0	[-30.7%; 20.3%]
Just once or twice	7	28	4	16		9	36	10	41.7	
Several times	8	32	6	24	[-23.9%; 26.8%]	3	12	5	20.8	[-20.3%;30.9%]
Many times	1	4	3	12		8	32	7	29.2	
Always	0	0	0	0		5	20	2	8.3	
Don't know										
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough clean water for the home?										
Never	14	56	10	40	[-12.3%; 33.3%]	0	0	0	0	[-52.7%; -3.5]*
Just once or twice	6	24	8	32		11	44	18	75	
Several times	3	12	7	28	[-29.9%; 16.8%]	8	32	2	8.3	[3.5%; 52.7%]*
Many times	1	4	0	0		4	16	2	8.3	
Always	1	4	0	0		2	8	2	8.3	
Don't know										
Over the past 12 months, how often, if ever, have you or your family (household) gone without medicine or medicinal treatment?										
Never	4	16	7	28	[-6.5%; 41.6%]	1	4	0	0	[-30.2%; 20.0%]
Just once or twice	15	60	8	32		7	28	9	37.5	
Several times	2	8	6	24	[-38.2%; 10.9%]	10	40	9	16.7	[-20.0%; 30.2%]
Many times	4	16	3	12		6	24	4	16.7	
Always	0	0	1	4		1	4	2	8.3	
Don't know										
Over the past 12 months, how often, if ever, have you or your family (household) gone without electricity in your home?										
Never	10	40	13	52	[-40.2%; 7.7%]	3	12	1	4.2	[-30.2%; 20.0%]
Just once or twice	5	20	7	28		5	20	8	33.3	
Several times	5	20	4	16	[-4.1%; 44.1%]	7	28	9	37.5	[-20.0; 30.2%]
Many times	1	4	1	4		8	32	6	25	
Always	4	16	0	0		2	8	0	0	
Don't know										
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough fuel to cook your food?										
Never	2	8	3	12	[-20.0%; 30.2%]	0	0	0	0	[-22.8%; 27.5%]
Just once or twice	7	28	5	20		9	36	8	33.4	
Several times	6	24	2	8		7	28	6	25	[-27.5%; 22.8%]
Many times	8	32	10	40		4	16	5	20.8	
Always	2	8	5	20		5	20	5	20.8	
Don't know										

Table 6.2: Zimbabwe: Living Poverty Index at Baseline and at Follow-up (cont.)

Over the past 12 months, how often, if ever, have you or your family (household) gone without a cash income?										
Never	4	16	3	12	[-16.0%; 33.6%]	0	0	0	0	{-17.3%; 23.9%]
Just once or twice	5	20	4	16		4	16	3	12.5	
Several times	6	24	6	24	[-29.6%; 19.6%]	2	8	7	29.2	[-23.9%; 17.3%]
Many times	10	40	7	28		10	40	10	41.7	
Always	0	0	5	20		9	36	4	16.7	
Don't know	0	0	0	0		0	0	0	0	

As part of the LPI, households were asked to report how often they went without enough food to eat, clean water, medicine or medical treatment, electricity in the home, fuel to cook and a cash income in the previous year. The six possible answers were grouped into two sub-sets as follows: Never and once or twice formed sub-set one, several times, many times and always formed the sub-set two. In terms of the LPI, the control and intervention groups were not different (at baseline and at follow-up), except for the variable 'enough clean water for the home'.

At baseline, a large percentage of participants reported going without enough food to eat several times, many times, or always (Control: 36%; Intervention:36%). About a third of households reported having gone without enough clean water several times, many times or always (Control: 30%; Intervention: 28%). A quarter (24%) of control households and 40% of intervention households reported having gone without medicine or medical treatment several times, many times or always. Fewer households in the intervention group went without electricity several times, many times or always (Control: 40%; Intervention: 20%). A large percentage of households reported going without enough fuel to cook food several times, many times or always (Control: 64%; Intervention: 68%). The majority of households reported going without a cash income several times, many times or always (Control: 64%; Intervention: 72%).

At follow-up, significantly more households in the intervention group had (never or just once or twice gone without clean water for the home, than households in the control group (Intervention: 75%; Control: 44%) 95%CI [-52.7%; -3.5%]*.

Table 6.3: Zimbabwe: Change for better in answers to questions related to Living Poverty Index

Questions	Change in control group (n=24)			Change in intervention group (n=20)			
	n	%	95%CI for change within group (paired)	n	%	95%CI for change within group (paired)	95%CI for change between groups (unpaired)
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough food to eat?							
Change for better	6	25.0	[-12.0%; 48.8%]	7	35.0	[-39.7%; 22.1%]	[-7.5%; 44.4%]
Change for worse	11	44.0		5	25.0		
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough clean water for the home?							
Change for better	5	20.8	[-16.5%; 39%]	10	50.0	[-58%; 6.1%]	[-13.2%; 36.6%]
Change for worse	8	33.3		4	20.0		
Over the past 12 months, how often, if ever, have you or your family (household) gone without medicine or medicinal treatment?							
Change for better	7	29.2	[-36.7%; 13.9%]	6	30.0	[-37.8%; 20.0%]	[-27.1%; 19.3%]
Change for worse	4	16.7		4	20.0		
Over the past 12 months, how often, if ever, have you or your family (household) gone without electricity in your home?							
Change for better	7	29.2	[-19.9%; 42%]	4	20.0	[-23.3%; 32.3%]	[-11.2%; 40.6%]
Change for worse	10	41.7		5	25.0		
Over the past 12 months, how often, if ever, have you or your family (household) gone without enough fuel to cook your food?							
Change for better	15	62.5	[-67.1%; -5.9%]*	11	55.0	[-62.5%; 2.1%]	[-23.7%; 23.8%]
Change for worse	5	20.0		4	20.0		
Over the past 12 months, how often, if ever, have you or your family (household) gone without a cash income?							
Change for better	8	33.3	[-30.4%; 30.4%]	10	50.0	[-60.1%; -1.1%]*	[-23.7%; 23.8%]
Change for worse	8	33.3		3	15.0		

In terms of change in LPI, the control and intervention groups were not different at follow-up (none of the 95% CI for change between groups were significant). When asked how often the respondents or their family had gone without enough food to eat, seven participants in the intervention group, experienced a change for the better (response changed to a better category, e.g. from several times, many times and always to never or just once or twice), (95%CI for the change [-39.7% ;22.1%]). Six respondents in the control group reported a change for the better while 11 reported a change for the worse at follow-up.

In terms of enough clean water, medicine or medical treatment and electricity, the percentage of participants that experienced a change for the better or a change for the worse, was not significantly different within the control and intervention groups at baseline or follow-up, nor between the control and intervention groups at follow-up.

Concerning a cash income, ten households in the intervention group reported a statistically significant change for the better from baseline to follow-up (95% CI [-60.1%; -1.1%]). In the control group, fifteen households reported a change for the better concerning enough fuel to cook food, a change that was statistically significant (95%CI [-67.1%; -5.9%]*).

Table 6.4: Zimbabwe: Median change in Living Poverty Index

Baseline			
Control		Intervention	
Median	Range	Median	Range
2.3	1.2;3.5	2.3	1.3;3.7
Follow-up			
Median	Range	Median	Range
2.3	1.3;3.7	2.2	1.0;3.2

[-0.17; 0.67]

As previously mentioned the LPI refers to the standard of living of each group and is determined by the frequency that households go without basic necessities of life. It is scored on a 0 to 4 scale, with 0 indicating no poverty and 4 indicating total poverty (the lower it is the better) (Mattes, 2008).

In the control group, the median LPI score remained the same (2.3 at baseline and at follow-up), but a small, non-significant improvement of 0.1 was noted in the intervention group (95% CI interval for the change from baseline between groups [-0.17; 0.67]). Thus both groups had a LPI that indicated a relatively high level of poverty.

6.8.3 Months of Adequate Household Food Provisioning

In table 6.5, the percentage of participants that experienced adequate household food provisioning during the different months is noted. This information was then used to determine the median scores (table 6.6) and categories of scores for MAHFP (table 6.7).

Table 6.5: Zimbabwe: Months of Adequate Household Food Provisioning

	Baseline				**Follow-up**			
	Control		Intervention		Control		Intervention	
	n=25	%	n=25	%	n=25	%	n= 24	%
In the past 12 months, were there months in which you did not have enough food to meet your family's needs?								
Yes	20	80.0	16	64.0	16	64.0	15	62.5
No	5	20.0	9	36.0	9	36.0	9	37.5
If Yes, Which were the months (in the past 12 months) in which you did not have enough food to meet your family's needs?								
January								
No	17	68.0	23	92.0	18	72.0	17	70.8
Yes	8	32.0	2	8.0	7	28.0	7	29.2
February								
No	21	84.0	21	84.0	20	80.0	20	83.3
Yes	4	16.0	4	16.0	5	20.0	4	16.7
March								
No	22	88.0	21	84.0	22	88.0	23	95.8
Yes	3	12.0	4	16.0	3	12.0	1	4.2
April								
No	23	92.0	23	92.0	22	88.0	19	79.2
Yes	2	8.0	2	8.0	3	12.0	5	20.8
May								
No	22	88.0	24	96.0	17	68.0	21	87.5
Yes	3	12.0	1	4.0	8	32.0	3	12.5
June								
No	20	80.0	24	96.0	22	88.0	20	83.3
Yes	5	20.0	1	4.0	3	12.0	4	16.7
July								
No	19	76.0	22	88.0	23	92.0	23	95.8
Yes	6	24.0	3	12.0	2	8.0	1	4.2
August								
No	20	80.0	19	76.0	23	92.0	22	91.7
Yes	5	20.0	6	24.0	2	8.0	2	8.3
September								
No	19	76.0	19	76.0	20	80.0	24	100
Yes	6	24.0	6	24.0	5	20.0	0	0
October								
No	21	84.0	21	84.0	21	84.0	24	100
Yes	4	16.0	4	16.0	4	16.0	0	0
November								
No	19	76.0	21	84.0	23	92.0	22	91.7
Yes	6	24.0	4	16.0	2	8.0	2	8.3
December								
No	17	68.0	22	88.0	21	84.0	22	91.7
Yes	8	32.0	3	12.0	4	16.0	2	8.3

In table 6.5, the percentage of participants that experienced adequate household food provisioning during the different months is noted.

Table 6.6: Zimbabwe: MAHFP medians

Baseline			
Control		Intervention	
Median	Range	Median	Range
10	0;12	11	4;12
Follow-up			
Median	Range	Median	Range
11	1;12	11	8;12

[-1; 1]

Table 6.6 shows that at baseline, all households had a high level of food security as the control and intervention group scored a median of 10 and 11 respectively for MAHFP. This meant that most households experienced adequate provisioning for most months of the year.

The median MAHFP score in the control group changed from 10 to 11 (the higher the better), an improvement of 1 point compared to no change in the intervention group (11) (95% CI for the change [-1; 1]).

Table 6.7: Zimbabwe: MAHFP Score categories

Category	**Baseline**				**95%CI for % difference**	**Follow up**				**95%CI for % difference**
	Control (n=25)		**Intervention (n=25)**			**Control (n=25)**		**Intervention (n=24)**		
	N	%	n	%		n	%	n	%	
Very low (0)	1	4.0	0	0	[-9.7%; 19.5%]	0	0	0	0	[-13.8%; 13.3%]
Low (1-4)	0	0	1	4.0	[19.5%; 9.7%]	1	4.0	0	0	[-10.2%; 19.5%]
Moderate (5-8)	4	16.0	2	8.0	[-11.5%; 27.5%]	3	12.0	1	4.2	[-10.0%; 26.1%]
High food security (9-11)	15	60.0	13	52.0	[-18.3%; 32.9%]	12	48.0	14	58.3	[-35.2%; 16.5%]
Food Secure (12)	5	20.0	9	36.0	[-38.4%; 8.8%]	9	36.0	9	37.5	[-26.8%; 23.9%]

The households were grouped into food secure categories according to their MAHFP score. The scores were then categorised as follows 9-12 (High -food secure); 5-8 (moderate -food secure) and 1-4 (low-food insecure); 0 (completely food insecure) – thus the higher the score the better. Table 6.7 shows that at baseline, the control group and intervention group each had only 1 household in the very low and low food security category.

At baseline, in both groups the majority of households were classified into the moderate/ high food security category (Control: 76%; Intervention 60%). With 20% of the control group and 36% of the intervention group being food secure (score of 12). At follow-up, small improvements were seen, though no statistically significant differences were noted.

6.8.4 Household Dietary Diversity

Table 6.8, indicates the percentage of respondents that ate and did not eat the different food groups on a daily basis. These were used to calculate the median HDD score (table 6.9) and the categories of HDD (table 6.10).

Table 6.8: Zimbabwe: Household Dietary Diversity

	Baseline				**Follow-up**			
	Control		Intervention		Control		Intervention	
	N = 25	%	N=25	%	N=24	%	N=25	%
Cereals								
No	0	0	1	4.0	2	8.3	0	0
Yes	25	100	24	96.0	22	91.7	25	100
Vitamin A rich vegetables								
Yes	22	88	23	92	21	84	20	83.3
No	3	12	2	8	4	16	4	16.7
White vegetables and roots								
No	20	80	23	92	19	76	13	54.2
Yes	5	20	2	8	6	24	11	45.8
Dark green leafy vegetables								
NO	11	44	12	48	16	64	19	79.2
Yes	14	56	13	52	9	36	5	20.8
Other vegetables								
Yes	2	8	4	16	0	0	50	20.8
No	23	82	21	84	25	100	19	79.2
Vitamin A rich fruit								
NO	22	88	22	88	21	84	23	95.8
Yes	3	12	3	12	4	16	1	4.2
Other fruit								
Yes	20	80	22	88	13	52	15	62.5
No	5	20	3	12	12	48	9	37.5
Organ meat								
NO	21	84	24	96	24	96	21	87.5
Yes	4	16	1	4	1	4	3	12.5

Table 6.8: Zimbabwe: Household Dietary Diversity (cont.)

Flesh meats								
NO	17	68	20	80	19	76	14	58.3
Yes	8	32	5	20	6	24	10	41.7
Eggs								
NO	21	84	22	88	23	92	21	87.5
Yes	4	16	3	12	2	8	3	12.5
Fish								
NO	22	88	21	84	24	96	21	87.5
Yes	3	12	4	16	1	4	3	12.5
Legumes, nuts and seeds								
NO	17	68	18	72	17	68	15	62.5
Yes	8	32	7	18	8	32	9	37.5

Milk and milk products								
NO	16	64	18	72	12	48	13	54.2
Yes	9	36	7	28	13	52	11	45.3
Oils and fats								
NO	7	28	10	40	7	28	5	20.8
Yes	18	72	15	60	18	72	19	79.2
Sweets								
NO	12	48	11	44	3	12	2	8.3
Yes	13	52	14	56	22	88	22	91.7
Spices, condiments and beverages								
No	6	24	2	8	5	20	9	37.5
Yes	19	75	23	92	20	80	15	62.5

Table 6.9: Zimbabwe: Median Household Dietary Diversity Score

Baseline			
Control		Intervention	
Median	Range	Median	Range
6	4;10	6	3;12
Follow-up			
Median	Range	Median	Range
7	5;10	7	4;10

[-2; 1]

A HDD score of 6 -12 is categorised as high. At baseline, the median HDD score of the control group was 6 (range 4-10), while in the intervention group it was the same at 6 (range 3-12). At follow-up, the median score improved in the control group (7, range 5-10), and in the intervention group 7 (range 4-10).

Table 6.10: Zimbabwe: Household Dietary Diversity Scores

Category	**Baseline**				**95%CI for % difference**	**Follow up**				**95%CI for % difference**
	Control n=25		**Intervention n=25**			**Control n=25**		**Intervention n=25**		
	N	%	N	%		n	%	n	%	
Low DDS (0-3)	4	16.0	7	28.0	[-33.8%; 11.2%]	0	0.0	1	4.0	[-19.5%; 97%]
Medium DDS (4-5)	9	36.0	14	56.0	[-43.4%; 7.2%]	3	12.0	13	52.0	[59.5%; -14.2%]*
High DDS (6-12)	12	48.0	6	24.0	[2.5%; 46.3%]	22	88.0	11	44.0	[17.9%; 63.0%]

Households were also categorised into low, medium and high DD categories according to their scores (table 6.10). At baseline there were no significant differences in the percentage of participants that fell into the different categories. Only 16% - 28.0% of participants had a HDD score in the low category, while 36%-56% fell within the medium HDD category and 24%-48% into the high HDD category.

At follow-up, a slight decrease was seen in the number of households in the low DD category for both the control (0%) and intervention (4%) group. Significantly more households in the intervention group (52%) were classed as having medium DD as in the control group (12%), a difference that was statistically significant (95% CI [-59.5%; -14.2%]*). When looking at the high DD category, fewer households in the intervention group (44%) than in the control group (88%) had a high level of DD, the difference was however not statistically significant (95%CI for % difference [17.9%; 63.0%]).

6.8.5 Frequency of vegetables eaten in the household

Table 6.11 indicates the frequency of vegetables eaten by adult and children in Zimbabwe, while table 6.12 indicates the change in frequency of vegetables eaten within and between groups.

Table 6.11: Zimbabwe: Frequency of vegetables eaten

	Control				Intervention			
	Baseline		Follow-up		Baseline		Follow-up	
	N=25	%	N=24	%	N=25	%	N=25	%
Adults								
Several times a day	21	84	18	72	6	24	4	16.7
once a day	4	16	6	24	19	76	18	75
few times per week	0	0	1	4	0	0	2	8.3
once a week	0	0	0	0	0	0	0	0
rarely	21	84	18	72	6	24	4	16.7
never	4	16	6	24	19	76	18	75
Children								
Several times a day	0	0	1	4	1	4	0	0
once a day	21	84	18	72	5	20	4	16.7
few times per week	4	16	5	20	19	76	18	75
once a week	0	0	1	4	0	0	2	8.3
rarely	0	0	0	0	0	0	0	0
never	0	0	0	0	0	0	0	0
No Children in household	0	0	1	4	1	4	0	0

For adults, almost all participants reported eating vegetables several times a day or once a day even before the intervention, leaving little room for improvement.

In children very few ate vegetables several times a day, with most participants reporting that children ate vegetables once a day or a few times a week.

Table 6.12: Zimbabwe: Change in frequency of vegetables eaten within and between groups

	Change in control group (n=24)		95% CI for change within group	Change in intervention group (n=20)		95% CI for change within group	95% CI for change between groups
	n	%		N	%		
Adults							
Change for better	0	0	[-73.7% ; -32.5%]*	5	25.0%	[-69.0% ; 1.2%]	[-46.9% ; -5.5%]*
Change for worse	14	58.0%		13	65.0%		
Children							
Change for better	1	4.2%	[-71.6% ; -26.2%]*	4	20.0%	[-75.7% ; -9.1%]*	[-37.7% ; 4.2%]
Change for worse	14	58.0%		14	70.0%		

In the control group, the frequency of vegetables eaten by both adults and children, decreased significantly from baseline to follow-up (95% CI [-73.7% ; -32.5%]* for adults and 95% CI [-71.6%; -26.2%]* for children).

In contrast, the frequency of vegetables eaten improved in the intervention group. This improvement was not significant in the adults (95% CI [-69.0%; -1.2%]), but it was significant in the children (95% CI [-75.7%; -9.1%]*).

6.9. Discussion

Households from Zimbabwe were predominantly female-headed, which is a common feature in Zimbabwe. This results from an assortment of factors which include widowhood and divorce. In some instances women take on the responsibility of being household head when spouses fall ill or migrate for job opportunities (Horrell and Krishnan, 2006). In the case of the latter, households are very dependent on remittances sent from family members working elsewhere (Horrell and Krishnan, 2006).

Land is often allocated to male-headed households for the purpose of building of houses, main or crop fields for staple and cash crops to be grown and garden plots (Maroyi ,2009). Thus making it difficult for a mainly femail population to obtain land. Men and women have different parts to play in guaranteeing food security (FAO, 2016). Women add value as they are able to produce food, manage natural resources and earn an income, all while taking care of the household's food security needs (FAO, 2016; Mwaniki, 2006). Individual

empowerment, especially among women involved with gardening, has been noted in education programmes aimed at improving gardening skills (Weinberger, 2013).

An outstanding demographic feature in Zimbabwe was the high percentage of participants that were well-educated (more than 50% had completed high school or had a tertiary qualification). Musemwa*et al.,* (2013) note that an educated household head, has a better ability to use available resources efficiently. This is especially true when making decisions concerning the purchasing of food. Education has a positive effect of DD (Taruvinga*et al*., 2013), mainly because it can influence gardening practices and nutritional choices positively (Babatunde*et al.,* 2007).

Women-headed households are assumed to be affected more in terms of poverty, as they often have fewer income earners in the household and are less productive agriculturally (due to a lack of resources) compared to their male counterparts (Horrell and Krishnan, 2006). Despite the high level of education, households had high levels of poverty, as evidenced by the median poverty score between 2.2 and 2.3. This is a common finding in Zimbabwe, where political instability has had a significant impact on their economy (BBC, 2017). Female-headed households are often assumed to be at a higher risk for poverty as they have fewer income earners in the household and are less productive agriculturally (Horrel and Krishnan, 2006). However, households headed by females, are often more likely to spend a higher percentage of their income on food than on other commodities such as alcohol or cigarettes (Rogers, 1996).

Despite the high levels of poverty that were evident in this sample, the levels of food insecurity were not as high as expected. Interestingly, households in the current study reported adequate levels of food security. The MAHFP reflected good median scores (between 9 and 12) that indicate relatively good levels of food security, even before the intervention. This left little room for improvement as a results of the household food garden intervention, and at follow-up, the percentage of participants with good MAHFP was still high.

According to Thorne-Lyman, et al. (2010), studies have been able to link HDD with improved nutrient intake in both developed and developing countries and thus this tool has also been suggested as an indicator of food security. As seen with MAHFP, the median HDD scores (6 -7) in this study also revealed that most households had a relatively high level of DD, with 24% -45% of the baseline households and 44%-88% of the follow-up households in the high HDD category. In a study undertaken by Mango, *et al*. (2014) in the Mudzi District of Zimbabwe, it was determined that HDD (and thus food security), is impacted by the level of education of the household head, with improved levels of literacy decreasing the risk of being food insecure. High DD is thus positively associated with level of education (Taruvinga*et al.,* 2013).

This was also seen in terms of vegetable consumption as almost all adults' consumed vegetables on a regular basis, with the majority of children having vegetables at least once per day.

The fact that most households in Zimbabwe already had a household food garden before the initiation of the project may be considered a limitation. Those that were included probably had a garden that was not the same as the one recommended during the intervention and thus met the inclusion criteria. It is, however very possible that those gardens did produce vegetables for household consumption (as evidenced by the relatively low levels of food insecurity seen in both groups before intervention despite high levels of poverty). This is also probably the reason that significant improvements in measures of food security were not seen. Another factor to consider, would be the involvement of various governments in providing safety nets as well as service delivery – thus resulting in a higher standard of living than one would expect.

6.10. Conclusion and Recommendations

The Zimbabwe sample consisted of more female than male participants. Most of the population was married and had a fairly high level of education with more than 50% of individuals having completed high school and in possession of a tertiary qualification. As evidenced by the LPI of 2.3, the sample was characterised by high levels of poverty. Despite this, some measures of food security showed that participants were not as badly off as one would have expected. Even before intervention, the median MAHFP was 11 at baseline in the control group and 10 in the intervention group, indicating relatively good levels of food provisioning. At baseline, the median HDDS was 6 in the control group and 7 in the intervention group, indicating medium to high dietary diversity. As far as frequency of vegetables consumed was concerned, a relatively high percentage of participants reported that adults ate vegetables frequently. Although children did not eat vegetables as frequently as adults, they still had a relatively high level of vegetable consumption.

In terms of the impact of the intervention, the MAHFP improved by one point in the control group at follow-up and remained at 11 the intervention group that was exposed to the household food garden intervention. Median HDDS did not change in either group at follow-up. The main outcome of the intervention was obviously related to vegetable consumption, but due to an already high level of consumption at baseline no significant improvement was seen.

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Chapter 7

Conclusions and recommendations

7.1 Introduction

In the final chapter, conclusions are drawn from the findings of the present study. Recommendations related to addressing the identified challenges associated with food security and household food gardens are made and recommendations for future research are suggested.

7.2 Conclusions

The main conclusions of the studies undertaken in South Africa, Lesotho and Zimbabwe are included in the following section. These are followed by a table comparing the main findings of the three studies (table 7.1).

7.2.1. South Africa

The main findings related to the study in South Africa are as follows:

- The sample included in the current study in South Africa consisted of more female than male participants. Most participants were unmarried and more than 40% had completed high school or had a tertiary qualification.
- As evidenced by the LPI of 1.8-2.8 at baseline, the sample was characterised by high levels of poverty. An unexpected improvement in LPI occurred in the control group (from 2.8 to 1.8), with a small improvement of 0.3 points in the intervention group.
- MAHFP showed that at baseline about a third of participants had a low level of food security. In terms of the impact of the intervention, the MAHFP increased to a score of 11 in the control group at follow-up and improved by 2 points in the intervention group that was exposed to the household food garden intervention. In the intervention group, an improvement in the median MAHFP from 8 to 10 occurred (95% CI for the change [-2; 0]).
- At baseline, the median HDDS was 7 in the control group and 6 in the intervention group, indicating relatively high dietary diversity. Median HDDS did not change in the control group but showed a 2 point improvement in the intervention group at follow-up.
- As far as frequency of vegetables consumed was concerned, less than half of participants reported that both adults and children ate vegetables relatively frequently. The main outcome of the intervention was related to vegetable consumption, but households showed little improvement. More adults consumed vegetables a few times a day, but children's' vegetable consumption remained the same.

- Overall, the household food garden intervention had a moderately positive effect on some indicators of food security in the intervention group (MAHFP, HDD, frequency of vegetables eaten), but the improvement was not as big as anticipated and unexpected improvements were also seen in the control group.

7.2.2. Lesotho

- The sample included in the current study in Lesotho consisted of more male than female participants. About half were married and less than 20% had completed high school or had a tertiary qualification.
- As evidenced by the LPI of 2.5 – 2.8, the sample was characterised by high levels of poverty. After intervention these stayed the same at 2.5 for both groups.
- Despite high levels of poverty, some measures of food security showed that participants were not as badly off as one would have expected.
- Even before intervention, the median MAHFP was 11 in the control group and 10 in the intervention group, indicating relatively good levels of food provisioning. In terms of the impact of the intervention, the MAHFP remained at 11 in the control group at follow-up and improved by one point in the intervention group that was exposed to the household food garden intervention.
- At baseline, the median HDDS was 5 in the control group and 6 in the intervention group, indicating medium to high dietary diversity. Median HDDS did not change in either group at follow-up.
- As far as frequency of vegetables consumed was concerned, a relatively high percentage of participants reported that both adults and children ate vegetables relatively frequently. The habit of sharing that has been described in the Lesotho population, probably contributed to these findings. No improvements were noted in the frequency of vegetables consumed in the intervention group or in the control group.
- The household food garden intervention had a slight positive effect on one indicators of food security (MAHFP) in Lesotho. No improvements in any indicators were seen in the control group.

7.2.3. Zimbabwe

- The sample included in the current study in Zimbabwe consisted of more female than male participants. Most of the population was married and had a fairly high level of education with more than 50% of individuals having completed high school and in possession of a tertiary qualification.
- As evidenced by the LPI of 2.3 for both groups, the sample was characterised by high levels of poverty. After intervention it remained unchanged.

- As seen in Lesotho, some measures of food security showed that participants were not as badly off as one would have expected.
- Even before intervention, the median MAHFP was 11 at baseline in the control group and 10 in the intervention group, indicating relatively good levels of food provisioning. In terms of the impact of the intervention, the MAHFP improved by one point in in the control group at follow-up and remained at 11 the intervention group that was exposed to the household food garden intervention.
- At baseline, the median HDDS was 6 in the control group and 7 in the intervention group, indicating medium to high dietary diversity. Median HDDS did not change in either group at follow-up.
- As far as frequency of vegetables consumed was concerned, a relatively high percentage of participants reported that adults ate vegetables frequently, though less frequent than in adults children still had a relatively high level of vegetable consumption. Due to an already high level of consumption at baseline no significant improvement could be seen.
- Despite high levels of poverty, indicators of food security showed that households included in the study in Zimbabwe were relatively food secure even before intervention. For this reason, no improvements in these indicators were seen.

7.2.4 Comparison of measures of food security in the three countries

Table 7.1 gives an overview of the impact of the intervention on measures of food security in all three countries that were included in the study.

Table 7.1: Comparison of measures of food security in the three countries

Indicators	South Africa	Lesotho	Zimbabwe
Head of Household	Evenly distributed	More Male	More Female
Marital Status	About a third living together	About half were married	Mostly unmarried
Level of Education	¼ to 1/3 completed high school	Less than 20% had completed high school	More than 50% completed high school or had tertiary education
Median LPI	2.8	2.5	2.3
Median MAHFP	8 in control group at baseline, improved to 11 at follow-up 8 in intervention group, improved to 11 at follow-up	11 in control group at baseline and follow-up Improved from 10 to 11 in intervention group	10 in control group at baseline, improved to 11 at follow-up Remained the same in the intervention group

Median HDD	Control group: 7 at baseline and 7.5 at follow-up Intervention group: 6 at baseline and 8 at follow-up	Control group: 5 at baseline and 5 at follow-up Intervention group: 6 at baseline and 6 at follow-up	Control group: 6 at baseline and 7 at follow-up Intervention group: 6 at baseline and 7 at follow-up
Frequency of vegetable eaten	Less than half of adults and children ate vegetables regularly	High percentage of adults and children ate vegetables frequently	Almost all adults ate vegetables several times a day, children ate vegetables less often

In all three countries, the LPI indicated that the participants included in the current study were characterised by poverty. In South Africa, the household food garden intervention had a moderately positive effect on some indicators of food security in the intervention group (MAHFP, HDD and frequency of vegetables eaten), but the improvement was not as big as anticipated and unexpected improvements were also seen in the control group. In Lesotho, the household food garden intervention had a slight positive effect on one indicator of food security (MAHFP). No improvements in any indicators were seen in the control group. Indicators of food security showed that households included in the study in Zimbabwe were relatively food secure even before intervention. For this reason, no improvements in these indicators were seen.

7.3 Recommendations

7.3.1 Recommendations related to household food gardens

- Organisations that develop and coordinate household food gardening activities should work together to provide relevant training and support to gardeners.
- A clear definition of the purpose of the interventions should be drafted - this should focus on the specific requirements of the target group.
- Local circumstances should be taken into account. Encourage gardeners and organisations to use culturally acceptable methods/ plants to improve ownership and sustainability.
- Indigenous knowledge should not be ignored, but used to strengthen programmes and to encourage ownership.
- A comparison of the resources available to the target group on the one hand, and the resources needed to effectively implement the programme is essential.
- Programmes should adopt a holistic approach, meaning that other factors/ conditions that may influence the sustainability of the gardens also need to be addressed (e.g. water, equipment, land).

- Accurate information on vegetables and herbs and the production, processing, uses and proven qualities of the herbs should be available. Unfounded claims on medicinal properties of herbs should be discouraged.
- Relevant guidelines/ training manuals or pamphlets in the language of choice and on the literacy level of gardeners could be developed to strengthen knowledge and skills after training.
- Demonstration gardens can be very useful – successful gardeners with experience can provide training or support. Demonstration gardens also bring people with common interests together and provide support to improve sustainability.
- Information on cost effective methods of pest and disease control need to be available to support gardeners.
- Cost effective labour-saving techniques based on local circumstances need to be identified and supported.
- All guidelines should be tried and tested and based on best practice.

7.3.2 Recommendations for further research

- Sustainability considerations such as continued training and support should be built in during the planning stages of an intervention programme, as well as being an important aspect of impact evaluation.
- Future research should consider:
    - Determining quantities of foods consumed instead of only determining frequency of consumption.
    - Ensuring that the households that are recruited into the study are not involved in any form of food production, to ensure that any changes that are seen can be attributed to the intervention.
    - Including larger sample sizes that are representative of country populations.
    - Assessing measures of nutritional status, such as anthropometry of children and adults in households and determining how these are associated with measures of food security.

Appendix A

CENSUS NUMBER

SADC HOUSEHOLD FOOD GARDEN - CENSUS		
Urban food security is an emerging area of development concern, particularly in communities affected by HIV and AIDS. Gardening represents one potential household strategy to address food insecurity. A first step in informing the development and scale-up of food garden programmes is to build the knowledge base concerning urban food security and gardening in local communities. Thus we are compiling a census to establish how many households in the community have a household food gardens.		
COUNTRY:		
RECORD OF VISITS: (1 = completed; 2 = refused; 3 = not at home; 4 = premises empty)		
Date:	Time:	Visit status:
Date:	Time:	Visit status:
Date:	Time:	Visit status:
PERSONS NAME:		
CONTACT NUMBERS:	1.	2.
ADDRESS:		
CHARACTERISTICS/LAND MARK TO IDENTIFY HOUSE:		
DO YOU HAVE A HOUSEHOLD FOOD GARDEN? YES *(answer A below)* / NO		
A: IF YES: IS THE GARDEN FUNCTIONAL? YES / NO		

THANK YOU FOR YOUR VALUABLE INPUT.

FIELDWORKER NAME_______________ SIGNATURE_______________

DATE_______________

Appendix B

CONSENT DOCUMENT

CONSENT TO PARTICIPATE IN RESEARCH

PROJECT TITLE: **The Impact of Food Gardens on Household Food Security**

You have been asked to participate in a research study.

You have been informed about the study by ....

You may contact Prof Frikkie Booysen at 051-4012623 at any time if you have questions about the research or if you are injured as a result of the research.

You may contact the Secretariat of the Ethics Committee of the Faculty of Health Sciences, UFS at telephone number (051) 4052812 if you have questions about your rights as a research subject.

Your participation in this research is voluntary, and you will not be penalized or lose benefits if you refuse to participate or decide to terminate participation.

If you agree to participate, you will be given the participant information sheet, which is a written summary of the research.

The research study, including the above information has been verbally described to me. I understand what my involvement in the study means and I voluntarily agree to participate.

____________________ __________________
Signature of Participant Date

____________________ __________________
Signature of Witness Date
(Where applicable)

1

Appendix C

INFORMATION DOCUMENT

Study title:
Household Food Gardens

Greeting: Thank you for taking the time to listen to an explanation of a research study that we are planning to do in your community.

Introduction:
We, researchers from the Centre for Development Support at the University of the Free State, are doing research on household food gardens. Research is just the process to learn the answer to a question. In this study we want to find out whether food gardens can make a difference to food security in your household in order to make recommendations about scaling up of food gardens in South Africa.

Invitation to participate: We are inviting you to participate in this research study.

What is involved in the study: Urban food security is a concern, particularly in communities affected by HIV and AIDS. Gardening is a potential way in which urban food insecurity can be improved. A first step in informing the development and scale-up of household food garden programmes is to find out about urban food security and gardening in local communities. This survey is the first step in this process of building a knowledge resource base.

This study is being implemented in South Africa, Lesotho and Zimbabwe and is funded by the Southern African Development Community (SADC). The research is carried out by researchers from the Centre for Development Studies at the University of the Free State. The project's ultimate goal is to propose recommendations for improving food garden programmes in South Africa, Lesotho and Zimbabwe.

Your household has been selected to be part of this study and we would like to ask you or a member of your household to answer some questions about food security and vegetable gardens. There are no right or wrong answers. The interview will take about 45 minutes. The research team will visit your household three times over the next year to complete the first interview as well as two follow-up interviews.

Once we have completed the study, your household, if not already enrolled in government's food garden programme, will be offered the opportunity to be taught how to grow and maintain a food garden.

Risks of being involved in the study: There are no risks to taking part in the study.

Benefits of being in the study: If you agree to take part in the study your household will be taught to grow and maintain a food garden which will benefit all the members of the household. Your household, on completion of the interview, will receive a store voucher as compensation for the time you spent talking to the researchers. It will not cost you anything to take part in the study.

Persons that take part in the study will be given information on the study while involved in the project and after the results are available.

1

Participation is voluntary, and refusal to participate will involve no penalty or loss of benefits. If you agree to take part you may terminate the interview at any time and you have the right to decline to answer any questions you might not want to respond to.

Confidentiality: Your answers will be confidential and we will not be recording your name, but we will be recording your address, because the research team will be contacting you again in future to learn from you how the household's circumstances have changed in the time since this interview. Organizations that may inspect and/or copy your research records for quality assurance and data analysis include groups such as the Ethics Committee for Medical Research.

The answers will be put together with information collected from other people. Results of the study may be published or presented at a meeting. If results are published, this may lead to individual/cohort identification.

Contact details of researcher(s): Prof Frikkie Booysen at 051-4012623.

Contact details of Secretariat and Chair: Ethics Committee of the Faculty of Health Sciences, University of the Free State – for reporting of complaints/problems: Telephone number (051) 4052812

Appendix D

QUESTIONNAIRE NUMBER

SADC HOUSEHOLD FOOD GARDEN STUDY - BASELINE HOUSEHOLD SURVEY

IDENTIFICATION OF HOUSEHOLD

COUNTRY: 1 = Lesotho; 2 = South Africa; 3 = Zimbabwe

H/HOLD TYPE: 1 = intervention household; 2 = comparison/control household

INTERVIEW ADDRESS:

HOUSEHOLD NUMBER (assigned by researcher):

INTERVIEW STATUS: 1 = completed; 2 = refused; 3 = not at home; 4 = premises empty]

Date:	Time:	Status:
Date:	Time:	Status:
Date:	Time:	Status:

NUMBER OF CALLS [to household where interview actually took place]

TO BE COMPLETED BY INTERVIEWER	DATE OF INTERVIEW
TIME INTERVIEW: STARTED ___________ COMPLETED ___________	DAY [ ][ ]
NAME OF INTERVIEWER ________________________________	MONTH [ ][ ]
SIGNATURE ________________________________	YEAR 2 0 1 4
COMMENTS:	

TO BE COMPLETED BY SUPERVISOR	HOUSEHOLD QUALITY CONTROL [Yes=1; No=2] [ ]
NAME OF SUPERVISOR ________________________________	
SIGNATURE ________________________________	QUESTIONNAIRE CHECKED? [Yes=1; No=2] [ ]
COMMENTS:	

For office use only

SUPERVISOR	INTERVIEWER	FIELD EDITOR	OFFICE EDITOR	CODED BY	KEYED BY
[ ][ ]	[ ][ ]	[ ][ ]	[ ][ ]	[ ][ ]	[ ][ ]

PROJECT INFORMATION AND INFORMED CONSENT

Project Description

Urban food security is an emerging area of development concern, particularly in communities affected by HIV and AIDS. Gardening represents one potential household strategy to address food insecurity. A first step in informing the development and scale-up of food garden programmes is to build the knowledge base concerning urban food security and gardening in local communities. This baseline household survey is the first step in this process of building a knowledge resource base.

This research project, which is being implemented in Lesotho, South Africa and Zimbabwe, is funded by the Southern African Development Community (SADC) and implemented by researchers from the [Centre of Development Support at the University of the Free State]. The project's ultimate goal is to propose recommendations for scaling up food garden programmes in peri-urban and urban communities in member countries.

Consent

READ OUT ALOUD

I am working as a Researcher for [the Centre for Development Support at the University of Free State]. We are talking to people in [community or place name] about food security, gardening and health.

Programme beneficiary baseline: Your household, as a beneficiary of the [programme's name] has been selected to be part of the study and we would like to discuss these issues with yourself, or an adult member of your household.

Comparison household baseline: Your household has been randomly selected to be part of this study and we would like to discuss these issues with yourself, or an adult member of your household. /

Your opinions will help us to get a better idea about issues related to food security, gardening and health. There are no right or wrong answers. The interview will take about [30] minutes. Your answers will be confidential. The answers will be put together with information collected from other people. We will not be recording your name, and it will be impossible to pick you out from what you say, so please feel free to tell us what you think.

Are you willing to participate? (CIRCLE THE ANSWER GIVEN)

Yes…1 **No…2**

IF NO: READ OUT: Thank you for your time. Goodbye.

IF YES: IF WILLING TO PARTICIPATE, READ OUT THE FOLLOWING:

Thank you for agreeing to participate in this study. Just to emphasize, any answers you provide will be kept absolutely

confidential, and there is no way anyone will be able to identify you by what you have said in this interview. We are not recording your name, so you will remain anonymous, but we do have to record your house's address, because the research team will be contacting you again in future to learn from you how the household's circumstances has changed in the time since this interview. The data we collect from these interviews will always be kept in a secure location. You have the right to terminate this interview at any time, and you have the right to refuse to answer any questions you might not want to respond to.

Are there any questions you wish to ask before we begin?

RECORD QUESTIONS AND YOUR RESPONSES:

If you agree, please can you write your name here and sign? ....

SECTION A: HOUSEHOLD COMPOSITION

List on the grid below the details for <u>ALL</u> those people in the household who meets ALL THREE of the following criteria: **(a)** They lived under this 'roof' or within the same structure at least FOUR NIGHTS per WEEK out of the past MONTH. **(b)** When they are together they share food from a common source, i.e. they EAT TOGETHER. **(c)** They CONTRIBUTE to or SHARE in the common RESOURCE POOL, including ALL infants and children.

Note: ***See page 5 below for codes***.

PNO	1	2	3	4	5	6	7	8	9	10
Name of household member										
1a Relation to HHD head										
1b Sex										
1c Age (Years)										
1d Marital status										
1e Highest level of completed education										
1f Where was main meal eaten yesterday?										
1g Who in the household normally does each of the following: (Please mark with a X under name)										
(i) Buys food										
(ii) Prepares food										
(iii) Decides who gets food and when										
NOTE: ONLY ASK THE QUESTIONS BELOW FOR HOUSEHOLDS WHICH PRODUCED FOOD FROM THEIR HOUSEHOLD FOOD GARDEN DURING THE LAST 12 MONTHS.										
(iv) Works in the garden/grows food										

(v) On average, how much time **per week** does this person spend working in the garden? [NOTE: RECORD HOURS AND MINUTES]										
(vi) Keeps the income from selling food grown in the garden (if applicable)										

IF THERE ARE MORE THAN 10 PEOPLE IN THE HOUSEHOLD, RECORD THEIR DETAILS BELOW:

Note: Remember to only list on the grid the details for ALL those people in the household who meets ALL THREE of the following criteria: **(a)** They lived under this 'roof' or within the same structure at least FOUR NIGHTS per WEEK out of the past MONTH; **(b)** When they are together they share food from a common source, i.e. they EAT TOGETHER; **(c)** They CONTRIBUTE to or SHARE in the common RESOURCE POOL, including ALL infants and children.

Note: ***See page 5 below for codes***.

PNO	11	12	13	14	15	16	17	18	19	20
Name of household member										
1a Relation to HHD head										
1b Sex										
1c Age (Years)										
1d Marital status										
1e Highest level of completed education										
1f Where was main meal eaten yesterday?										
1g Who in the household normally does each of the following: (Mark with a X under name)										
(i) Buys food										
(ii) Prepares food										
(iii) Decides who gets food and when										
NOTE: ONLY ASK THE QUESTIONS BELOW FOR HOUSEHOLDS WHICH PRODUCED FOOD FROM THEIR HOUSEHOLD FOOD GARDEN DURING THE LAST 12 MONTHS.										

(iv) Works in the garden/grows food										
(v) On average, how much time **per week** does this person spend working in the garden? [NOTE: RECORD HOURS AND MINUTES]										
(vi) Keeps the income from selling food grown in the garden (if applicable)										

SECTION A: Codes

1a Relation to head

1 Head

2 Spouse/partner

3 Son/ daughter

4 Adopted/ foster child/ orphan

5 Father/ mother

6 Brother/sister

7 Grandchild

8 Grandparent

9 Son/ daughter-in-law

10 Other relative

11 Non-relative

97 Refused

98 Don't know

99 Missing

1b Sex

1 Male

2 Female

9 Missing

1c Age at last birthday

0 under 1 year

Whole numbers only

97 Refused

98 Don't know

99 Missing

(If respondent is older than 96, record 96)

1d Marital status

1 Unmarried

2 Married

3 Living together/ cohabiting

4 Divorced

5 Separated

6 Widowed

97 Refused

98 Don't know

99 Missing

1e Highest education

1 No formal schooling

2 Some Primary

3 Primary completed

(Junior or Senior)

4 Some high school

5 High school completed

6 Post secondary qualifications not university (diploma, or degree from technikon or college)

7 Some university

8 University completed

9 Post-graduate

97 Refused

98 Don't know

99 Missing

1f Where was main meal eaten yesterday?

1 Home (this household)

2 Small shop/restaurant/take out

3 Informal market/street food

4 Shared meal with neighbours/or

other households

5 Work place

6 School

7 Community food kitchen

8 Food provided by neighbours/ or

other households

9 Did not eat a meal

10 Other (specify)

99 Missing

1g Who in the household normally does each of the following:

96 Not applicable

97 Refused

98 Don't know

99 Missing

SECTION B: HOUSEHOLD DATA

		Household Structure	Code
1	Which of the following best describes the **household structure?** *(DO NOT read aloud - ask about household type and circle only **ONE** answer)*	a. Female Centered *(No husband/ male partner in household, may include relatives, children, friends)*	1
		b. Male Centered *(No wife/ female partner in household, may include relatives, children, friends)*	2
		c. Nuclear *(Husband/ male partner and wife/ female partner with or without children)*	3
		d. Extended *(Husband/ male partner and wife/ female partner and children and relatives)*	4
		e. Under 18-headed households female centered *(head is 17 years old or less)*	5
		f. Under 18-headed households male centered *(head is 17 years old or less)*	6
		g. Live alone	7
		h. Other *(specify)*:	8

2	**To what extent do people in your household use strategies other than jobs (regular formal employment) to survive?** *Use the code list below to record the extent to which people in the household use other strategies:* 1 = Not at all 2 = Partly dependent 3 = Mostly dependent 4 = Totally dependent *Record the appropriate code in the last column.*	**Way to survive**	**Code**
		a. Field crops	
		b. Garden crops	
		c. Tree crops	
		d. Livestock	
		e. Poultry	
		f. Marketing	
		g. Crafts	
		h. Begging	
		i. Gifts	
		j. Casual labour	
		k. Rent out space to lodgers	
		l. Formal credit	
		m. Informal credit	
		n. Self-employed at home	
		o. Other (specify)	

Living Poverty Index

3 **Over the past <u>12 MONTHS</u>, how often, if ever, have you or your family (household) gone without:**

(Read each question aloud and circle the most appropriate response. Circle only ONE answer for EACH ROW).

Conditions	**Never**	**Just once or twice**	**Several times**	**Many times**	**Always**	**Don't know**
a. Enough food to eat?	1	2	3	4	5	6
b. Enough clean water for home use?	1	2	3	4	5	6
c. Medicine or medical treatment?	1	2	3	4	5	6
d. Electricity in your home? (see note below)	1	2	3	4	5	6
e. Enough fuel to cook your food?	1	2	3	4	5	6
f. A cash income?	1	2	3	4	5	6

Note: If no electricity, please make a note that the household does not have electricity and circle 'always'.

SECTION C: FOOD INSECURITY

4 **HOUSEHOLD DIETARY DIVERSITY SCORE (HDDS)**

Now I would like to ask you about the types of foods that you or anyone else in your household ate YESTERDAY during the day and at night.

(Read the list of foods. Circle "yes = 1" in the box if anyone in the household ate the food in question, circle "no = 2" if no one in the household ate the food)

Types of food		**Yes**	**No**
1. Cereals	Maize, rice, wheat, sorghum, mageu, oats or any other grains or foods made from these (e.g. bread, vetkoek, dumplings, porridge, stiff pap or crumbly pap, mealie rice, samp, whole kernels, pasta or other grain products).	1	2
2. Vitamin A rich vegetables	Pumpkin, carrots, or sweet potatoes that are orange inside.	1	2
3. White vegetables and roots	Potatoes, sweet potato	1	2
4. Dark green leafy vegetables	Dark green/leafy vegetables, spinach or *imifino* (even if mixed with maize), leaves of carrots, leaves of beetroot, broccoli or brussel sprouts, peas.	1	2
5. Other vegetables	Tomato, onion, eggplant, cabbage, cauliflower, marrow, baby marrow, lettuce, cucumber, gem squash.	1	2
6. Vitamin A rich fruit	Ripe mangoes, apricots, papaya, peaches, guavas.	1	2
7. Other fruit	Apples, bananas, pears, wild fruit, grapes, oranges, naartjies.	1	2
8. Organ meat	Beef or sheep liver, chicken livers, kidney, heart, tripe.	1	2
9. Flesh meats	Beef, pork, lamb, goat, rabbit, wild game, chicken, duck, or other birds.	1	2
10. Eggs	Chicken, duck, hen or any other egg.	1	2
11. Fish	Fresh fish, dried fish, tin fish or shellfish.	1	2
12. Legumes, nuts and seeds	Dried beans, peas, lentils, nuts, seeds or foods made from these.	1	2
13. Milk and milk products	Milk, cheese, yogurt, sour milk or other milk products.	1	2

	14. Oils and fats	Oil, mayonnaise, fats, butter, margarine, holsum, animal fat added to food or used for cooking, cremora, ellis brown etc.	1	2
	15. Sweets	Sugar, honey, sweetened soda or sugary foods such as chocolates, candies, cookies and cakes.	1	2
	16. Spices, condiments and beverages	Spices (black pepper, salt, curry), stock cubes, condiments (soy sauce, hot sauce, aromat), coffee, tea, cold drink, water, drink-o-pop, oros, alcoholic beverages etc.	1	2

5	**MONTHS OF ADEQUATE HOUSEHOLD PROVISIONING (MAHP)** Now I would like to ask you about your household's food supply during different months of the year. When responding to these questions please think back over the last 12 months.		
	(a) In the past 12 months, were there months in which you did not have enough food to meet your family's needs? *(READ the question and circle the appropriate answer)*	Yes	1
		No	2
		(If NO, skip to Question 6 *If YES, continue with Q 5b)*	

		Months in which household did not have enough food to meet needs	**Yes**	**No**
	(b) If yes, which were the months (in the past 12 months) in which you did not have enough food to meet your family's needs? *(Do not read the list of months. Working backward from the current month:* *Circle the **one** ('Yes' column) if the respondent identifies that month as one in which the household did not have enough food to meet their needs.* *Circle the **two** ('No' column) if the respondent identifies that month as one in which the household did have enough food to meet their needs)*	a. January	1	2
		b. February	1	2
		c. March	1	2
		d. April	1	2
		e. May	1	2
		f. June	1	2
		g. July	1	2
		h. August	1	2
		i. September	1	2
		j. October	1	2
		k. November	1	2
		l. December	1	2

6	**(a) Where does this household normally obtain its food?** *Instruction: Read the list of food sources below: circle "YES" if ANYONE in the household according to the respondent obtains food from the specific food source.*		If "YES", ask the following question for the specific food source: **(b) How often does the household normally obtain its food from [*source*]?** *Instruction: Probe for frequency that food is obtained from the source and circle the appropriate number on the scale.*					
	Source of food		**Frequency Food Obtained from this Source**					
			At least five days a week	**At least once a week**	**At least once a month**	**At least once in six months**	**Less than once a year**	**Never**
	1. Supermarket	YES / NO	1	2	3	4	5	6
	2. Small shop/restaurant/take away	YES / NO	1	2	3	4	5	6
	3. Informal market / street food	YES / NO	1	2	3	4	5	6
	4. Growing it in the garden	YES / NO	1	2	3	4	5	6
	5. Growing it elsewhere	YES / NO	1	2	3	4	5	6
	6. Food aid	YES / NO	1	2	3	4	5	6
	7. Remittances (of food)	YES / NO	1	2	3	4	5	6
	8. Shared meal with neighbours and/or other households	YES / NO	1	2	3	4	5	6
	9. Food provided by neighbours and/or other households	YES / NO	1	2	3	4	5	6
	10. Community/school food garden	YES / NO	1	2	3	4	5	6
	11. Community food kitchen	YES / NO	1	2	3	4	5	6
	12. Borrow food from others	YES / NO	1	2	3	4	5	6
	13. Other (specify):	YES / NO	1	2	3	4	5	6
		YES	1	2	3	4	5	6
		YES	1	2	3	4	5	6
		YES	1	2	3	4	5	6
	Refused	97						
	Don't know	98						

7	The following pertains to questions regarding your household's consumption of vegetables. *(READ the question and categories and circle only **ONE** answer only for each question)*					
	Several times a day	**Once a day**	**A few times a week**	**Once a week**	**Rarely**	**Almost never**
a. How frequently do ADULTS in the household eat vegetables?	1	2	3	4	5	6
b. How frequently do CHILDREN in the household eat vegetables?	1	2	3	4	5	6

SECTION D: FOOD GARDENS

	OBSERVE: DOES THIS HOUSEHOLD HAVE A FUNCTIONAL HOUSEHOLD FOOD GARDEN ACTUALLY PRODUCING FOOD AND BEING MAINTAINED AND CULTIVATED? **YES** / **NO** **IF NO**, PROCEED TO QUESTION **8**, IF YES, SKIP TO QUESTION **9A**.		
8	If there was an opportunity, would you like to start your own household food garden?	1 = Yes – Proceed to question **9B** 2 = No - SKIP TO Question **10**	
9	**A.** What are the most important constraints or difficulties you face in **maintaining** your household food garden? Describe: 1______________________________ 2______________________________ 3______________________________ **B.** What are the most important constraints or difficulties you face in **starting** your household food garden? Describe: 1______________________________ 2______________________________ 3______________________________		

10	How many of your neighbours have household food gardens?	1 = Almost all 2 = Many 3 = Some 4 = Few 5 = None [Skip to Question 12] 9 = Don 't know DO NOT READ	
11	How important do you think your neighbours home garden is in ensuring their household's food security?	1 = Very important 2 = Important 3 = Neutral 4 = Not important 5 = Not important at all 9 = Don't know DO NOT READ	

SECTION E: FOOD REMITTANCES RECEIVED FROM HOUSEHOLD FOOD GARDENS

I am now going to ask you about FOOD **PRODUCED IN HOUSEHOLD FOOD GARDENS** that this household RECEIVES from elsewhere.

12	Did the household in the last **year** ever RECEIVE food from someone that is produced in a household food garden (not a community garden)?	1 = Yes 2 = No – SKIP TO Question [**21**]	
13	From whom does the household usually receive food produced in household food gardens? Note: Circle first two responses	1 = Parent 2 = Spouse 3 = Siblings 4 = Close relatives 5 = Friends 6 = Needy people 7 = Orphans (related) 8 = Orphans (not-related) Other: SPECIFY	
14	Where do the people you receive food from live?	Urban = 1 *If circled, ask question **15 (a)**.* Rural = 2 *If circled, ask question **15 (b)**.*	

15	**(a)** Approximately how often in the last **year** did you receive food from someone living in URBAN areas?	1 = Almost every week 2 = Almost every month 3 = A few times a year (2-3x)	
17	When you receive food, approximately how much money on average would the food you received in the last **year** cost if you had to buy it in a local store?	4 = When there is a special need 5 = Rarely R ________________ / year	
		9 = Don 't know DO NOT READ	
	(b) Approximately how often in the last **year** did you receive food from someone living in RURAL areas?	1 = Almost every week 2 = Almost every month 3 = A few times a year (2-3x) 4 = When there is a special need 5 = Rarely 9 = Don 't know DO NOT READ	
16	When you receive food, what kinds of food do you receive?		

18	How important do you feel this food is to the household's food security?	1 = Not important at all 2 = Somewhat important 3 = Important 4 = Very important 5 = Critical to our survival 9 = Don 't know DO NOT READ	
19	Do you think these people expect you to send them some food in return for the **food** you received from them?	1 = Yes 2 = No	
20	Do you think these people expect you to send them **something else** (other than food) in return for the food you received from them?	1 = Yes 2 = No	

SECTION F: FOOD FROM HOUSEHOLD FOOD GARDENS

OBSERVE:

DOES THIS HOUSEHOLD HAVE A FUNCTIONAL HOUSEHOLD FOOD GARDEN ACTUALLY PRODUCING FOOD AND BEING MAINTAINED AND CULTIVATED?

IF YES, PROCEED TO QUESTION 21, IF NO, SKIP TO QUESTION [**49**].

I am now going to ask you about what the household does with FOOD produced in your food garden in the last **year**.

A. REMITTANCES

21	Did the household in the last **year** ever SEND or TAKE someone food produced from your household garden? *IMPORTANT: Emphasise to the respondent that the food we ask about here EXCLUDES food bartered or traded with others (exchanged for something else – see Question **32**) AND food from the garden the household sold to anyone (see Question **39**).*	1 = Yes 2 = No – SKIP TO Question [**32**]	

22	Who does the household usually send or take food produced in your garden too? NOTE: CIRCLE FIRST THREE RESPONSES	1 = Parent 2 = Spouse 3 = Siblings 4 = Close relatives 5 = Friends 6 = Needy people 7 = Orphans (related) 8 = Orphans (not-related) Other: SPECIFY	

23	Where do the people you send or take food live? RECORD ALL APPLICABLE OPTIONS	Urban = 1 *If circled, ask question **24 (a)**.* Rural = 2 *If circled, ask question **24 (b)**.*	
24	**(a)** Approximately how often in the last **<u>year</u>** did you send or take food from your garden to someone living in an URBAN area(s)?	1 = Almost every week 2 = Almost every month 3 = A few times a year (2-3x) 4 = When there is a special need 5 = Rarely 9 = Don 't know DO NOT READ	
	(b) Approximately how often in the last **<u>year</u>** did you send or take food from your garden to someone living in an RURAL area(s)?	1 = Almost every week 2 = Almost every month 3 = A few times a year (2-3x) 4 = When there is a special need 5 = Rarely 9 = Don 't know DO NOT READ	

25	When you send or take someone food from your garden, what kinds of food do you send or take?		
26	When you send or take someone food from your garden, approximately how much money on average would the food you send or take each **year** cost if you had to buy it in a local store?	R _______________ /year	
27	Do you expect these people to later send you some food in return for the food you gave them from your garden?	1 = Yes 2 = No – SKIP TO Question [**29**]	
28	If so, when do you expect them to send you food?	1 = Next week 2 = Next month 3 = Within the next six months 4 = Within the next year 5 = When there is a special need 9 = Don 't know DO NOT READ	

29	Do you expect these people to later send you something else, not food, in return for the food from your garden?	1 = Yes 2 = No – SKIP TO Question [**32**]	
30	What do you expect them to send? *Circle all applicable.*	1 = Money 2 = Something else (not food or money) Specify what the something else is: ____________________________________	
31	If so, when do you expect them to send you money or something else?	1 = Next week 2 = Next month 3 = Within the next six months 4 = Within the next year 5 = When there is a special need 9 = Don 't know DO NOT READ	

B. BARTER / TRADE

32	Did the household in the last **year** ever BARTER or TRADE food produced in your household garden (i.e. exchange food directly, at the same time as giving it to the person or people, for something else, but not for money)? *IMPORTANT: Emphasise to the respondent that the food we ask about here EXCLUDES food you sent or took someone (without directly exchanging it for something else – see question **21**) AND food from the garden the household sold to anyone (see question **39**).*	1 = Yes 2 = No – SKIP TO Question [**39**]	
33	With whom did you normally barter or trade food produced in your garden? Note: Circle first three responses	1 = Parent 2 = Spouse 3 = Siblings 4 = Close relatives 5 = Friends 6 = Needy people 7 = Orphans (related) 8 = Orphans (not-related) Other: SPECIFY	
34	Where do the people live with whom you bartered or traded food from your garden? RECORD ALL APPLICABLE OPTIONS	Urban = 1 *If circled, ask question **35 (a)**.* Rural = 2 *If circled, ask question **35 (b)**.*	

35	**(a)** Approximately how often in the last **year** did you barter or trade food from your garden with people living in an URBAN area(s)?	1 = Almost every week 2 = Almost every month 3 = A few times a year (2-3x) 4 = When there is a special need 5 = Rarely 9 = Don 't know DO NOT READ	
	(b) Approximately how often in the last **year** did you barter or trade food from your garden with people living in an RURAL area(s)?	1 = Almost every week 2 = Almost every month 3 = A few times a year (2-3x) 4 = When there is a special need 5 = Rarely 9 = Don 't know DO NOT READ	
36	When you bartered or traded food from your garden in the last **year,** what kinds of food do you barter or trade?		

37	When you bartered or traded food from your garden, approximately how much money on average would the food you bartered or traded in the last **year** cost if you had to buy it in a local market or store?	R _______________ / year	
38	When you barter or trade food produced in your garden with someone what do you normally receive in turn? *Describe*		

C. SALE			
39	Did the household in the last **year** SELL (exchanged for money) any food produced in your household garden?	1 = Yes 2 = No – SKIP TO Question [**49**]	

-40	To whom do you normally sell food produced in your garden? Note: Circle first three responses	1 = Parent 2 = Spouse 3 = Siblings 4 = Close relatives 5 = Friends 6 = Needy people 7 = Orphans (related) 8 = Orphans (not-related) Other: SPECIFY	
41	Where do the people you sell food to live? RECORD ALL APPLICABLE OPTIONS	Urban = 1 *If circled, ask question **42 (a)**.* Rural = 2 *If circled, ask question **42(b)**.*	
42	**(a)** Approximately how often in the last **year** did you sell food from your garden to people living in an URBAN area(s)?	1 = Almost every week 2 = Almost every month 3 = A few times a year (2-3x) 4 = When there is a special need 5 = Rarely 9 = Don 't know DO NOT READ	

	(b) Approximately how often in the last **year** did you sell food from your garden to people living in an RURAL area(s)?	1 = Almost every week 2 = Almost every month 3 = A few times a year (2-3x) 4 = When there is a special need 5 = Rarely 9 = Don 't know DO NOT READ	
43	When you sold someone food produced in your garden in the last **year**, what kinds of food did you sell?		
44	Approximately how much money in total did you receive in the last **year** from selling food produced in your garden?	R _______________ / year	

45	What do you usually do with the money you receive from the sale of garden produce? DO NOT READ THE OPTIONS. RECORD ALL APPLICABLE OPTIONS AND PROVIDE AS MUCH DETAIL AS POSSIBLE.	1 = Save 2 = Clothing 3 = Entertainment 4 = School fees 5 = Food 6 = Medicine If not FOOD - SKIP TO Question [**48**]	
		Other (specify):	
46	What kinds of food do you normally buy?		
47	How important do you feel buying food with the income you receive from selling food produced in your garden is for your own household's food security?	1 = Not important at all 2 = Somewhat important 3 = Important 4 = Very important 5 = Critical to our survival 9 = Don 't know DO NOT READ	

48	How important do you feel the income from selling food produced in your garden is to your own household's overall livelihood?	1 = Not important at all 2 = Somewhat important 3 = Important 4 = Very important 5 = Critical to our survival 9 = Don 't know DO NOT READ	

SECTION G: GARDENING

49	Would you encourage other households to start a food garden?	1 = Yes 2 = No – SKIP TO Question [**51**]	
50	If YES, why would you encourage other households to start a food garden? EXPLAIN – RECORD FIRST THREE RESPONSES: – THEN SKIP TO QUESTION [**53**]	1.	
		2.	
		3.	

51	If NO, why would you not encourage other households to start a food garden? *Explain – record first three responses:*	1.	
		2.	
		3.	
52	What are the most important constraints or difficulties you face in making a living from your household food garden? Explain – *record all responses:*	1.	
		2.	

		3.	
		4.	
		5.	
		Other (specify):	

SECTION H: HEALTH

The following are questions regarding the health of household members.

53	**Has anyone joined this household during the past 12 months due to illness?** *(Circle the appropriate answer)*	Yes	1
		No	2

ILLNESS (MORBIDITY)

54	**Thinking back over the past 12 months, has any usual member of your household who lived in the household for at least 9 months been ill in the past 12 months?**	Yes	1
		No	2
		(If NO, skip to ***Q57****.* *If YES, continue with Q56. Use codes below questions)*	

55	**(a) What was the ill person's relationship to the current head of the household?**	**(b) Was the ill person male or female?**	**(c) What was the ill person's age?**	**(d) What was the illness?**	**(e) What was the primary contribution of the ill person to the household before the illness?**
a					
b					
c					
d					
e					
f					

	1 Head 2 Spouse/partner 3 Son/ daughter 4 Adopted/ foster child/ orphan 5 Father/ mother 6 Brother/sister 7 Grandchild 8 Grandparent 9 Son/ daughter-in-law 10 Other relative 11 Non-relative 98 Don't know 99 Missing	1 Male 2 Female 9 Missing	Age at time of illness in years Enter 0 for less than 1 year 97 Refused 98 Don't know 99 Missing	1 Malaria 2 TB 3 Pneumonia 4 HIV/AIDS 5 Heart disease 6 Cancer 7 Natural causes 8 Cholera 9 Accident 10 Suicide 11 Homicide 12 Diarrhoea 13 Malnutrition 14 Other (specify) 97 Refused 98 Don't know 99 Missing	1 HH Labour 2 Income from work 3 Income from grants/ pension 4 Heading HH 5 None 6 No income lost 8 Don't know 9 Missing

56	How important do you feel your household food garden has been to your household's health?	1 = Very important 2 = Important 3 = Neutral 4 = Not important 5 = Not important at all 6 = Currently do not have a garden 9 = Don't know DO NOT READ	

SECTION I: HIV AND AIDS

The following are questions regarding HIV and AIDS and anti-retroviral treatment.			
57	Do you PERSONALLY know someone who has died from AIDS?	1 = Yes 2 = No – SKIP TO Question [**59**]	
58	If yes – were they a member of this household?	1 = Yes 2 = No	
59	Do you PERSONALLY know someone who is infected with HIV?	1 = Yes 2 = No – SKIP TO Question [**61**]	
60	If yes – are they a member of this household?	1 = Yes 2 = No	
61	Do you PERSONALLY know anyone (alive) who are TAKING ARV drugs?	1 = Yes 2 = No – SKIP TO Question [**63**]	

62	If yes – are they a member of this household?	1 = Yes 2 = No	

SECTION J: URBAN FOOD AID

63	**Does anyone in this household receive food aid/support for food?**	Yes	1
		No	2
		If NO, skip to the 'End'. *If YES, continue with Q64 below.*	

64 **What kind of food aid is received, and from which source(s)?**

(Accept multiple responses for type of aid and source of aid).(Mark with X)

Type of aid	**Food**	**Cash**	**Vouchers**	**Other [Specify]**
UN agency				
Community based organisation				
Faith based organisation				
Non-government organisation				
Government				
Other [Specify]				

		Importance of food aid	**Code**
65	How important is this food aid **to the household's food security?** *(Probe for strength of opinion; circle only **ONE** answer)*	Very important	1
		Important	2
		Neutral	3
		Not important	4
		Not important at all	5
		Don't know	6

I have finished my questions. Before we end, is there anything in particular that you would like to add to what you have said or to change?

SECTION K: CLARIFICATION

66. Do you have any questions that you would like to ask?

Questions	**Office use only**
1.	
2	
3.	
4.	
5.	

We really appreciate the fact that you are participating in our study and that you have taken the time to answer our questions. As a small token of our appreciation, we would like to give you this store gift voucher of R100. You can use this voucher at any [NAME of STORE] to buy yourself or your family some food or other things. As we need to comply with the necessary financial controls, please can you sign or write your name on the line below as proof that you have received this voucher. We wish to remind you that we will be conducting two further interviews with your household over the next year in order to learn more about how your circumstances has changed during this time.

Name of respondent:

____

Name of fieldworker:

____

Signature: ______________________

Signature: ______________________

Date:

D	D	M	M	2	0	1	4

Date:

D	D	M	M	2	0	1	4

TIME INTERVIEW ENDED:

H	H	M	M

Thank you again for your time!! Good bye.

Appendix E

Research Division
Internal Post Box G40
☎(051) 4052812
Fax (051) 4444359

E-mail address: StraussHS@ufs.ac.za

Ms H Strauss/hv

2014-06-06

REC Reference nr 230408-011
IRB nr 00006240

PROF F LE R BOOYSEN
C/O DR MICHELE PAPPIN
CENTRE FOR DEVELOPMENT SUPPORT
FLIPPIE GRONEWOUD BUILDING
BLOCK D 363F
UFS

Dear Prof Booysen

ECUFS NR 94/2014
PROF F LE R BOOYSEN **DEPT OF ECONOMICS, FACULTY OF ECONOMIC AND MANAGEMENT SCIENCES**
PROJECT TITLE: HOUSEHOLD FOOD GARDENS: EFFECTIVE AND SUSTAINABLE IMPACT MITIGATION RESPONSE TO THE HIV AND AIDS EPIDEMIC IN URBAN SETTLEMENTS IN SOUTH AFRICA.

1. You are hereby kindly informed that the Ethics Committee approved the above study at the meeting held on 3 June 2014.

   [Prof Walsh did not take part in the discussion of this study]

2. Committee guidance documents: Declaration of Helsinki, ICH, GCP and MRC Guidelines on Bio Medical Research. Clinical Trial Guidelines 2000 Department of Health RSA; Ethics in Health Research: Principles Structure and Processes Department of Health RSA 2004; Guidelines for Good Practice in the Conduct of Clinical Trials with Human Participants in South Africa, Second Edition (2006); the Constitution of the Ethics Committee of the Faculty of Health Sciences and the Guidelines of the SA Medicines Control Council as well as Laws and Regulations with regard to the Control of Medicines.

3. Any amendment, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

4. The Committee must be informed of any serious adverse event and/or termination of the study.

5. All relevant documents e.g. signed permission letters from the authorities, institutions, changes to the protocol, questionnaires etc. have to be submitted to the Ethics Committee before the study may be conducted (if applicable).

6. A progress report should be submitted within one year of approval of long term studies and a final report at completion of both short term and long term studies.

7. Kindly refer to the ETOVS/ECUFS reference number in correspondence to the Ethics Committee secretariat.

Yours faithfully

PROF WH KRUGER
CHAIR: ETHICS COMMITTEE

Cc Prof C Walsh

Appendix F

SADC - INTERVENTION			
Month	Training dates	Topic	Details
June		Programme awareness & participant selection	Set criteria for selection from LEBONE community
July		Facilitator training & Garden and bed Design	
	30-Jun	Travel and Prep day	
	01-Jul	Role of the facilitator	Training - Roles and responsibilities of the facilitator and how to engage with the community.
	02-Jul	Garden and Bed Design (theory & prac)	Garden layout - design the layout of the demo garden training techniques on how to do this (aspect, slope, water movement, wind). Rain water harvesting. Soil fertility (DVD) Compost making
	03-Jul	Garden and Bed Design (theory & prac)	Garden layout - fencing/crop protectin ideas. Bed Design - various bed design options (conventional bed, trench bed, double digging, shallow trench, tower garden, container garden, tyre garden, seed beds+D14)
	04-Jul	Garden and Bed Design (demonstration)	DOFA facilitators to train the 25 participants on 1. Garden layout 2. RWH 3.Compost making 4. Bed designs
	05-Jul	travel & report writing	
September		Planting, pest & disease & fruit tree	
	01-Sep	Travel and Prep day	
	02-Sep	Planting (theory & prac)	*Planting* - seed & seedling, crop diversity *Crop Practices* -Crop rotation, mixed cropping/inter cropping *Fertility* - plant & manure brews, mulching
	03-Sep	Pest & Disease control. fruit trees (theory & prac)	*Pest & Disease control* - identifying pests, strong smelling plants, physical pest controls, herb & plant teas. *Fruit tree training* - varieties, planting methods, grafting
	04-Sep	Planting, pest & disease & fruit tree (Demo)	DOFA facilitators to train the 25 participants on 1. Planting 2. Crop practices 3. fertility methods 4. pest & disease 5. fruit trees
	05-Sep	travel & report writing	
October		Hydroponic option	
	06-Oct	Demonstrate basic hydroponic methodologies	
November		Harvesting & preserving. Nutrition	
	03-Nov	Travel & Prep day	
	04-Nov	Harvesting & preserving. Nutrition (theory & prac)	Harvesting technuqies, storage, drying, bottling, preserving & pickling. Nutrition
	05-Nov	harvesting & Preserving. Nutrition (Demo)	DOFA facilitators to train 25 participants on 1.Harvesting technuqies, 2. storage, drying, bottling, 3.preserving & pickling. 4.Nutrition
	06-Nov	travel & report writing	
January		Recap all above topics	
	12-Jan	Travel & Prep day	
	13-Jan	Recap all above topics	the topics covered here will be requested by the facilitators as areas requiring recap or additaionl training
	14-Jan	Recap all above topics	
	15-Jan	travel & report writing	
March		Seed harvesting & Saving	
	02-Mar	Travel & Prep day	
	03-Mar	Seed harvesting & Saving (theory & Prac)	Necessity of seed saving.How to harvest your own seed, store it and reuse it
	04-Mar	Seed harvesting & Saving (demo)	
	05-Mar	travel & report writing	
May		Preparation for winter crops Frost & cold damage to crops	
	04-May	Travel & Prep day	
	05-May	Preparation for winter crops Frost & cold damage to crops (theory & prac)	Winter crop selection/diversity, designing beds for winter planting. Frost & cold protection methods
	06-May	Preparation for winter crops Frost & cold damage to crops (demo)	
	07-May	travel & report writing	