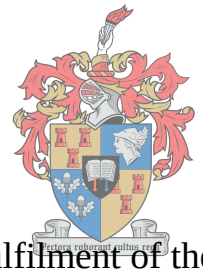
Exploring the benefits and challenges of indigenous foods in an African context using a case study of community gardens in the Western Cape of South Africa

by

Francia-Marié de Bruin



Thesis presented in partial fulfilment of the requirements for the degree Of Master of Philosophy in Sustainable Development in the Faculty of Economic and Management Sciences at Stellenbosch University

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March 2018

Declaration

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Abstract

Research suggests that the benefits and value of indigenous foods within the South African context have not been fully utilised. Their potential value to the South African food system and food security which is embedded within it, could be enhanced were their benefits to be explored more comprehensively. Therefore, the aim of this research was to systematically review literature using relevant search criteria and databases relating to underutilised indigenous crop species and foods in Africa as well as abroad (including the Oceania, South America and Asia). The intention was to provide an encompassing overview of both literature and literature gaps regarding nutritional, environmental, economic, and social-cultural benefits and challenges of indigenous food plants. The results show the need to recognise indigenous foods as a key resource in providing food and nutrition security. A major obstacle that emerged is that people are not valuing indigenous foods and thereby neglect the potential benefit of using them. This creates a space where loss of knowledge is significant from one generation to the next.

Chapter 3 examines a selection of emerging community gardens in the Western Cape that are examples of gardens where both cultivation and utilisation of a range of indigenous food species is taking place, or is intended to take place. The community gardens were used as a case study to identify and interpret the benefits and challenges related to the production and usage of indigenous foods. This was done by conducting semi-structured interviews with various stakeholders who are interacting within these gardens in different ways. The main benefits that emerged included “reconnecting with one’s roots”, “creating awareness of the significance of indigenous foods”, the perception that “indigenous foods have a higher nutritional value than their exotic counterparts” and that providing access to information and research into on the cultivation and use of indigenous foods could enable them to become more mainstream as resilient and sustainable alternatives or supplementary foods resources. The most frequent challenges identified were “a lack of knowledge in identifying which indigenous foods are edible”, “a lack of knowledge in general about these foods (finding seeds, how to cultivate and use them)”, “inadequate nutrition-based testing of indigenous foods”, “lack of market access” and negative perceptions of their status.

Indigenous and Traditional Foods (ITFCs) can have multiple uses and roles within society. Actors are attempting to diversify the food system by embracing more sustainable pathways that could provide food and nutrition security. In assessing the current climate of ITFCs and their emerging role of exploring and realising an alternative or supplementary agriculture as well as food resource, this thesis has highlighted future benefits that could be realised if the research gaps that were identified were responded to. In several instances, the benefits identified were seen, on analysis, to inherently hold solutions to the some of the challenges presented. The community gardens, as spaces of transformation and belonging and supported by research, could be demonstrating improved cultivation practices, supporting nutritional food security, providing incomes, as well as expanding the supply of alternative or supplementary resilient food resources into to the food system.

Opsomming

Die ondersoek dui daarop dat die voordele van inheemse kosse in Suid-Afrika nog nie ten volle benut is nie en dat daar groot toekomstigde voordele is vir die Suid-Afrikaanse voedselstelsel en voedselsekuriteit, indien die voordele van inheemse plante gebruik word. Daarom is die doel van die ondersoek om die literatuur te verken, deur die gebruik van relevante soek kriteria en databasisse van onderbenutte inheemse gewasse en kosse in Afrika en in die buiteland (insluitend Oceania, Suid-Amerika en Asie) en om verder ´n omvattende oorsig te bied van sowel die litratuur en die gapings daarin, met betrekking tot die omgewing, voedingswaarde en die sosiaal-kulturele voordele en uitdagings van inheemse plante.

Die resultate wys dat dit nodig is om die waarde van inheemse kosse te erken as a sleutel element wat kos- en voedingsekuriteit meebring om die volle voordele van inheemse kosse te benut. Die hoof-uitdagings sluit onder meer in dat mense nie inheemse kosse na volle waarde skat nie, en gevolglik ontbreek kennis oor hierde kosse, hoe om hul te kweek/verbou en hoe om hul te versorg. Dit skep ‘n kennisgaping wat beduidend is van een geslag na die volgende.

Die tweede artikel (gevallestudie) handel oor die ontluikende gemeenskapstuine in die Wes-Kaap waar inheemse kosse in die tuine gebruik word en wat as ´n voorbeeld dien van die verbouing en benutting van inheemse kosse. Die gemeenskapstuine was gebruik as ´n gevallestudie om deur middel van semi-gestruktureerde onderhoude, inligting te versamel waardeur die voordele en uitdagings van die verskillende akteurs, wat direk en indirek interaksie het met die tuine, ge-interpreteer kan word. Die voordele het die uitdagings beduidend oortref. Die voordele sluit in die heraansluiting van mense met hulle herkoms, die bewusmaking van die waarde van inheemse kosse en dat baie glo dat inheemse kosse ‘n hoër voedigingswaarde as eksotiesse kosse besit.

Uitdagings wat die meeste voorgekom het was ‘n gebrek aan kennis om die kosse korrek te identifiseer, ‘n gebrek aan kennis oor die hierdie kosse in die algemeen en onvoldoende voedingswaarde gebasseerde toetsing van inheemse kosse. Daarenteen lei die voordele na n alternatiewe vir, of ‘n aanvulling tot die huidige voedselstelsel, wat transformatiewe geleenthede bied vir alternatiewe kosse om gekweek te word en ook gebruik te kan word om voedsame voedselsekuriteit te bewerkstellig. Die rol van

inheemse kosse bewerkstellig wel die heraansluiting van mense met hul herkoms, maar daar is n duidelike behoefte vir meer inligting en kennis om hierdie verbintenis te versterk. Die gebrek aan kennis van inheemse kosse benadruk juis die belangrikheid van kennis oor die kwaliteit van voedsaamheid van hierdie kosse. Verder is daar die etiese oorwegings betreffende die bemarking van inheemse kosse en die groter aanvraag daarna naamlik, wat sal voortaan gebeur met die bewakers van die kennis en die heiligheid van die kulture wat hierdie kosse bly gebruik en ondersteun. Hierdie laaste oorwegings bevat ook voorstelle vir toekomstige navorsing om die inheemse kosse verder te ondersoek en antwoorde te verskaf ten opsigte van die leemtes/kennisgapings wat genoem is.

Acknowledgements

I would like to thank my supervisor, Dr Laura Pereira and co-supervisor, Loubie Rusch, for their patience, guidance and outstanding support throughout the preparation of this thesis.

Furthermore, I would like to thank the interviewees for making time to share their knowledge and experience of the community gardens and indigenous foods.

Several people contributed to the finalization of this master's thesis, whom I would like to thank for their support, i.e. Beatrix Steenkamp and Olive Zgambo.

Finally, I want to thank my family and partner, Maximillian Berger, for their unending support and patience. I want to especially thank my father for his financial support throughout my academic career.

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List of Acronyms and Abbreviations

ACGA	American Community Gardening Association
AFN	Alternative Food Networks
AFSUN	African Food Security Urban Network
ALVs	African Leafy Vegetables
DAFF	Department of Agriculture, Forestry and Fisheries
ETD	South African Theses and Dissertations
FAO	Food and Agricultural Organisation of the United Nations
FSC	Food Supply Chain
GEC	Global Environmental Change
IFAD	International Fund for Agricultural Development
IPGRI	International Plant Genetic Resources Institute
ITFCs	Indigenous and Traditional Food Crops
IWLV	Indigenous Wild Leafy Vegetables
NDP	National Development Plan
NUS	Neglected and Underutilised Species
REB	Real Economic Bulletin
WEP	Wild Edible Plants
WFP	World Food Programme
WTO	World Trade Organisation
SADC	Southern African Development Community
SANHANES-1	South African National Health and Nutrition Examination Survey
SSA	Sub-Saharan Africa
SSM	Snowball Sampling Method

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Chapter 1 – Introduction

1.1. Introduction

This thesis explores the benefits of indigenous foods to the South African Food System within the four main themes of nutrition, environment, economic and social-cultural aspects. The study commences with a systematic literature review to provide an overview of the present information available on indigenous foods and their benefits and challenges within the global context. The second leg of research uses the case study of eight emerging community gardens within the greater Western Cape, to compare and contrast the benefits and challenges experienced in the gardens growing indigenous foods. The research uses qualitative design to analyse these aspects of indigenous foods in Africa and the emerging community gardens.

Chapter one consists of general background information on the current food system, its specific characteristics and how it affects all areas of food security, the significance of urban food systems and "alternative" foods systems. The general state of the food system in terms of indigenous foods is then put into a problem statement, a research question and four research objectives. Thereafter, the research approach, design and methods are described briefly. The terms *indigenous foods*, *benefits* and *challenges* are defined for this thesis as a baseline. Lastly, the significance of the research as well as its limitations is evaluated.

1.2. Food Systems and Food Insecurity

The Current Food system

The status of food security within Africa and South Africa is at critical levels, in the North of Africa 37 million people suffer from hunger, in sub-Saharan Africa more than 239 million suffer from hunger (Sasson 2012). In South Africa, 24.9% of the population are at risk of being hungry, 11.8% of South Africans experience hunger at a household level and at an individual level 13.4% of people experience hunger (Schönfeldt & Pretorius 2011; Stats SA 2016:6). Hunger is defined "as an uncomfortable or painful sensation caused by insufficient food energy consumption" (Ghattas 2014:2). Food security (which will be discussed further below) is the absence of hunger, but it is not necessarily sufficient to guarantee optimal nutritional

status. An adequate nutritional status exists when a person has access to appropriate diet that meets the nutritional needs for an active and healthy lifestyle, together with sufficient hygienic environment and adequate healthcare services and practices (Ghattas 2014). The Figure (1) below illustrates how the different dimensions of food security are intrinsic in targeting hunger and how this overlap interacts with under-nutrition and nutrition insecurity.

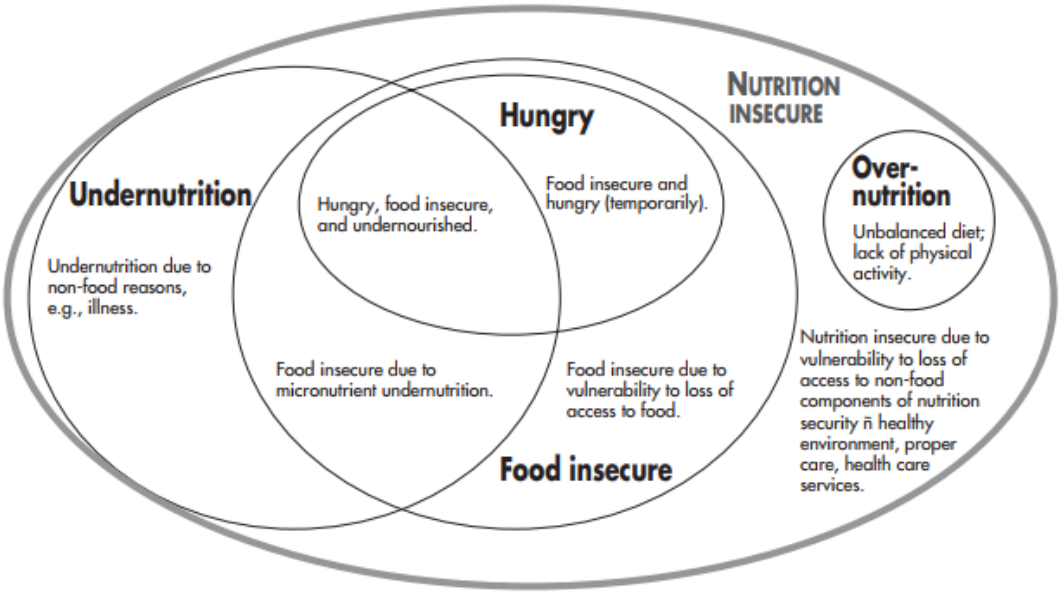

Figure 1: Distinction and Overlaps Between Under-Nutrition, Hunger, Food Security and Nutrition Security (Benson 2004:13).

Food security and food systems are severely strained due to the interlocking problem of food production and processing through the vast commercialisation of staple foods and low-nutrient, high fat cheap foods (Schönfeldt & Pretorius 2011). An exacerbating factor is the unequal food distribution and the underutilisation of Indigenous and Traditional Food Crops (ITFCs) (Borlaug et al. 2008).

There are four distinct themes outlining the benefits and challenges of ITFCs that are predominantly found in the literature. These are a) nutritional benefits, e.g., nutrient density can be higher than in other foods (Penafiel et al. 2011); b) environmental benefits, where for example, ITFCs can be drought resistant in the face of climate change (Cloete & Idsardi 2013); c) economic benefits, e.g. qualified terms of money generated due to the sales of ITFCs (Bharucha & Pretty 2010). d) social-cultural benefits, e.g. the interaction between local knowledge and nutritional value of

indigenous foods: However, despite these benefits of indigenous foods, their use within South Africa have not been recognised (Mbhenyane 2016). This means there are some significant gaps in the recognition of South African indigenous foods and more specifically the indigenous foods within the environs of the Western Cape.

The current food system globally and in South Africa is based on principles of the green revolution, a contemporary shift to a rising global industrial model for food production (Thu 2009). The green revolution was the technological advancement in agriculture where fertilisers were introduced, promoting an increase in crop yields and 'lowered' prices from farm to fork (Evenson & Gollin 2003; Thu 2009; Otero, Pechlaner & Gürcan 2013). In the 1960s, international organisations like the World Food Programme (WFP), together with leading scientists like the Nobel Peace Prize winner, Norman Borlaug, began to envision a world where modernity and science would deliver surplus food to relieve hunger. While modern agriculture has brought an increase in agricultural output, it has not necessarily brought increased food and nutrition security, for example the use of maize and soy bean as animal feed instead of for human consumption has regionally led to an increase in the number of people suffering from hunger (Kimbrell & Davis 1999).

The increases in yields have started to stagnate, creating numerous negative impacts on the environment and food systems due to the use of inorganic fertilisers and pesticides, leading to environmental problems and a lack of self-sufficiency (Otero, Pechlaner & Gürcan 2013). The evidence suggests that this has had a major role in encouraging a review of the way we look at farming and food. Although there has been an increase in food production, the current over-reliance on a limited number of major staple crops (rice, wheat, and maize) holds inherent nutritional, economic, ecological and agro-economic risks that are unsustainable in the long term (Ebert 2014; FAO n.d.). More than 1 billion people world-wide are undernourished, illustrating a failure of food systems to provide availability and access, with a mismatch between supply and demand in the Food Supply Chain (FSC) (Watts, Ilery & Maye 2005; Patel 2012; Dempewolf 2015).

The food system is defined through three key aspects. These are the a) biological, which is the living process to produce food; b) economic or political, which includes power dynamics and exposes the control that different groups exert over one another in various parts of the system, and lastly, c) social and cultural, which consist of community values, personal relationships, and cultural traditions that affect people's usage of food (Tansey & Worsley 2008). In most of the current literature, authors favour industrial food systems, however, authors such as Cameron and Wright (2014) suggest that the food system can be perceived as a violent and exclusionary system that benefits high-input, export-orientation, and monoculturally producing agricultural industries.

Figure 2 below, from Ericksen (2007), gives an indication of the various factors over time that influence the food system and illustrates how drivers in the food system affect one another. The diagram illustrates how socio-economic factors affect global environmental change (GEC) drivers and in turn the feedbacks of the environment to GEC drivers. It also shows how GEC drivers, socio-economic drivers and food system activities directly affect food systems outcomes.

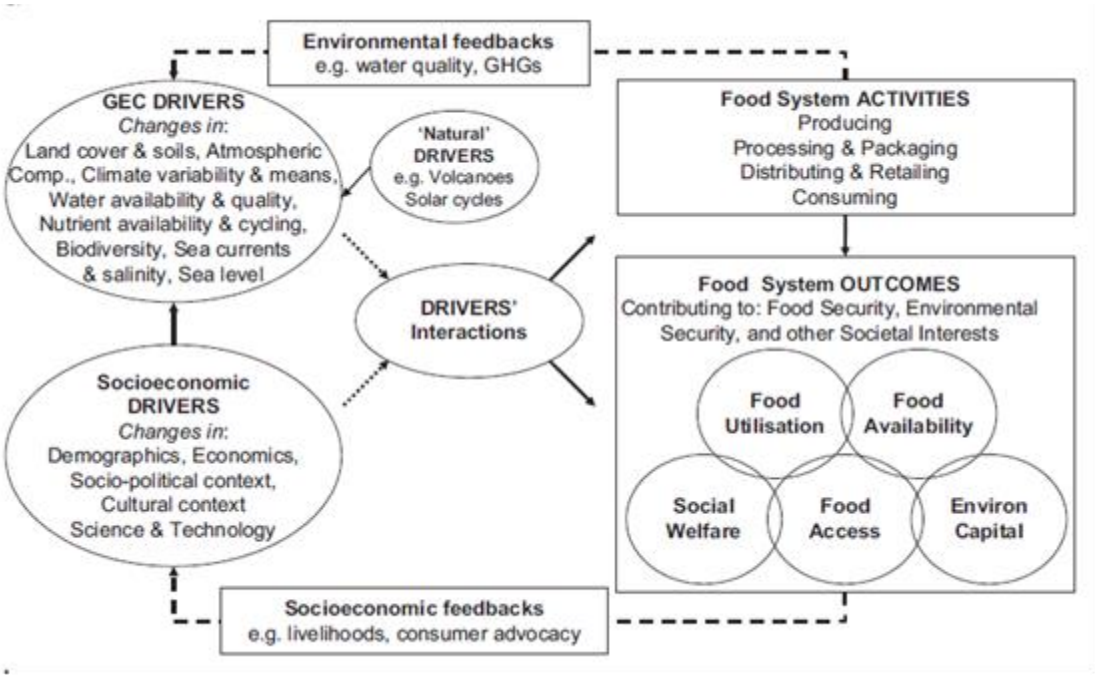

Figure 2: Global Food Systems and their Drivers (Ericksen 2007:240).

The outcomes of the food system (as exemplified in figure 2) include the availability of food, people's ability to access this food, what the utilisation of foods is, what is beneficial and detrimental in terms of social welfare and environmental capital (Ericksen 2007). According to Lang and Barling (2012), the goal of the food system is to provide food security to all people. The food system is strongly shaped by factors outside of agriculture including the international trade and finance regime, climate change, population growth, and urbanisation (Hammond & Dube 2012; Clapp 2015). These factors, especially environmentally related phenomena such as droughts, soil conditions and climate change, will be decisive for the future of the food system. As mentioned above, the food system encompasses "a complex set of interlinked activities and outcomes of the commodity chain of production through to consumption" (Pereira 2014:4).

Otero, Pechlaner and Gürcan (2013) distinguish 'North' and 'South' in terms of the food system, where the 'North' (industrialised nation-states) greatly depends on luxury foods, while the 'South' (developing nation-states) strongly depends on basic foods. The 'South' is also more reliant on import and export trade, with the volatile food price inflation from 2008 onwards developed in a working class that had to spend a greater share of their expenditure on food, reinforcing an unjust food system (Otero, Pechlaner & Gürcan 2013).

At the same time, an erosion of indigenous and traditional foods and agricultural production in the South has dramatically changed the global food system in the last 50 years. In fact, a nutrition transition has swept around the world; ITFCs once widely used is replaced with lower nutrient food, at a higher cost with an increase in health-related problems (Turner & Turner 2007). There are many examples in the African context where communities have lost their food sovereignty, losing the right to determine their own food system and its management, which has led to food insecurity (FAO 2015). This is evident in other developing country contexts, most notably Mexico where agrarian communities have encountered numerous influences that have caused a transition from self-reliance to a dependence on the industrial food chains (see Perrey 2017).

Food Insecurity

The food system approach is a way of understanding that food security is the outcome of a complex interaction of multiple factors at multiple levels. Food security can be defined as "the condition in which 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" (FAO 2003:27). This definition focuses on producing an adequate supply of food and not necessarily focusing on where the food goes after production, which inherently has inequalities built into the food system. Drimie (2016) states that a more useful definition is one that looks at access to food first and foremost, where food production is at best a route to entitlement of food. Thus, food security is embedded in a complex set of interactions in the food system of cultural characteristics, power structures, production methods, politics, economic forces based on neoliberal policies, ecological aspects, governance and social processes and etiquette inherent in society (Drimie 2016).

The FAO definition of food security includes six key factors, namely, access (affordability, allocation and preference), availability (production, distribution and exchange), acceptance, agency, adequacy and utilisation (food safety, nutritional and social value), which include environmental and social outcomes (Ericksen 2007; Lang & Barling 2012; Pereira 2014).

Food insecurity, especially in Africa, is seen as a rural phenomenon. However, with rapid urbanisation from rural areas, due in part to globalisation and job scarcity, urban areas are increasingly seen as key food security challenges in Sub-Saharan Africa (Frayne, Battersby-Lennard, Fincham & Haysom 2009). The conditions experienced in many urban areas drive many new and existing urban dwellers into poverty and change their perceptions of environment and health (Kingsley, Townsend & Henderson-Wilson 2009; Battersby 2012). Figure 3 shows food secure status of households in South Africa, indicating the differences between urban and rural and formal and informal settlements, with the informal being less food secure in both urban and rural localities. The term food desert has come up "as economically-disadvantaged areas where there is relatively poor access to healthy and affordable food because of the absence of modern retail outlets (such as supermarkets)" (Battersby & Crush 2014).

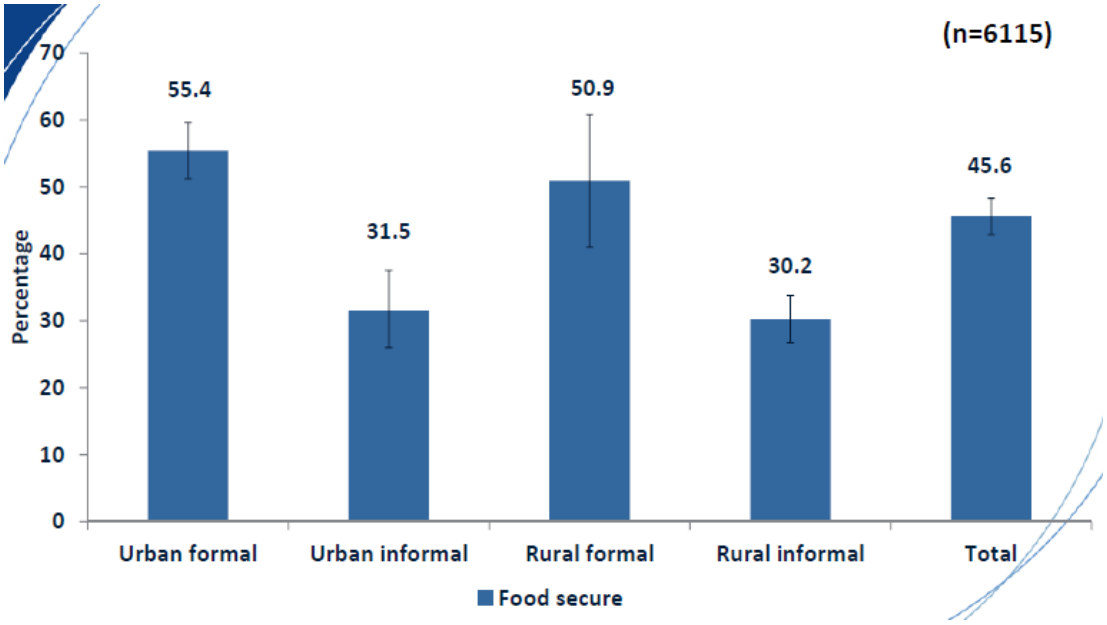

Figure 3: Prevalence of Food Secure Households by Locality, South Africa 2012 (Shisana et al. 2013:22)

The other aspect of food security, which is routinely underestimated, is nutrition security. Nutrition security is defined as "the need to secure access to an appropriate nutritious diet, comprising all essential nutrients and water, coupled with a sanitary environment and adequate health services and care to ensure a healthy and active life for all household members" (Hwalla, El Labban, & Bahn 2016:167). This is increasingly important when looking at South Africa, with statistics from SANHANES-1 (Shisana et al. 2013) illustrating the prevalence of under-and-over nutrition which South Africans suffer from, highlighting the need to investigate the benefits and challenges of nutrition in terms of ITFCs for a possible intervention. Therefore, the use of ITFCs can be seen as forming part of an alternative food system network. Alternative food networks (AFN), by their nature, challenge the status quo of ethical and ecological bases of transnational agri-food supply chains (Colin 2014). AFN is defined as the "rejection of the global, industrial, environmentally degrading conventional food system" (Follett 2009:33)[1].

[1] AFN "offer a vision that people, by eating differently, can change the worlds of food…". AFN's exist in many diverse forms, from fair trade cooperatives to local farmers markets and movements such as La Via Campensina (Goodman, DuPuis & Goodman 2012:3).

Watts, Ilbery and Maye (2005) suggest that alternatives exist on a continuum where an alternative is either a weak or strong alternative. This depends on the extent of 'alternativeness'. A weak alternative is one that focuses on the quality of food, whereas, a strong alternative is one that concentrates on the alternative food systems as well as the provision given, and how these provisions are emphasised in the networks through which they pass. Follett (2009) adds that a weak alternative is one that only looks to protect the environment. The strong alternative is that which challenges the foundation of the food system, by further looking at political and social change (Follett 2009).

The dependence on an industrial market in South Africa with the loss of small farm holders and business has resulted in a decrease in use of a developed portfolio of established domesticated wild plants and foods that had been shown to be overwhelmingly stable for decades (Wooten 2016). There has been an erosion of ITFCs, including the replacement of ITFCs and their food ways due to the value of these foods being generally reduced as a poor man's food (Demi 2014). Over millennia, ITFCs have been a main source of food for communities. There is significant risk that the knowledge around ITFCs is being lost and along with that crucial knowledge of living sustainably (Gundo 2017). This leads directly to the formulation of the problem statement.

1.3. Problem Statement

Work done by researchers such as Mbhenyane (2016) suggests that the benefits and use value of indigenous foods in South Africa has not been fully recognised, and that there may be great potential for the South African food system and its food security if indigenous plants were studied more extensively and included more often as mainstream foods. The rise in alternative food systems, community gardens and localised foods is described by Wiskerke (2009) and Colin (2014) as being due to a generalised disenchantment with the corporate-led global food system. "Growing food… opens a space to challenge the mainstream food system by offering a more equitable, ecologically sustainable and potentially socially empowering alternative" (Colin 2014:14).

There has been a growing interest in ITFCs in the Western Cape which was formerly neglected due to historic separation and removal of indigenous people from their land. This reinvigoration of ITFCs has been present within community gardens in the Western Cape, therefore creating adequate demand to compile a regional study of the benefits and challenges of ITFCs originating in the Western Cape. This thesis therefore sets out to investigate ITFCs both in literature and research, with the following research question and objectives below.

1.4.Research Question and Objectives

The research question is as follows:

Is there potential in using indigenous plants in the emerging community gardens in the Western Cape for achieving food security?

The research objectives are:

1) To explore the literature on underutilised indigenous crop species and foods in Africa, and provide a systematic overview of both literature and literature gaps regarding nutritional, environmental, economic and social-cultural benefits and challenges of indigenous food plants;
2) To evaluate the potential benefits and challenges of indigenous foods in the Western Cape through the use of a case study of emerging community gardens;
3) To examine the intersections between the broader literature review and the Western Cape gardens as a case study with regard to environmental, economic, social-cultural and nutritional values,
4) How this could be interconnected with a more just and sustainable food system.

1.5. Overarching Research Approach and Strategy

A two-pronged approach was used; firstly, a systematic literature review was carried out to investigate the current literature on ITFCs. This was done through examination of literature between January 2008 to July 2017 and creating a comprehensive list of known benefits and challenges in the African food systems. The systematic literature was reviewed in different databases to collate literature that fell into specific inclusion

criteria (See Chapter 2 for more information). Thereafter, the literature was disseminated and placed within its specific themes (nutritional, environmental, economic and social-cultural). The qualitative methodology supports nuanced descriptions, flexibility and provides specific information (e.g. stories or examples of the benefits of indigenous foods), as well as helping to uncover central themes with and around food, food systems and food security (Bryman & Bell 2014).

Secondly, a case study approach was used for field research to examine the benefits and challenges that community gardens face in the Western Cape. For the case study, semi-structured interviews were used and the baseline questions administered in a way that allowed for different responses to uncover themes, differences, perceptions and any other important information (See Chapter 3). Stakeholders were initially sought within the project (community garden) itself and or those with other connections to indigenous foods. The use of a Snowball Sampling Method (SSM) was used to acquire further interviewees (Bryman & Bell 2014).

The case study focuses on both direct and indirect cross-comparisons and intersection points between the emerging community gardens in the Western Cape and ITFCs. Thereafter, the research examines four quality determining aspects, namely the environmental, economic, social-cultural and nutritional characteristics of indigenous foods. A hybrid approach of inductive and deductive coding was applied by integrating data-driven and theory-driven codes to further develop the 3 central themes (Fereday & Muir-Cochrane 2006).

1.6. Key concepts and terms

1.6.1. ITFCs

Indigenous food is defined as foods that originated in a specific bio-region in conjunction with foods that were introduced into the country/region and are now recognised as indigenous crops due to their being integrated into the local food culture (Ayanwale, Amusan, Adeyemo & Oyedele 2016). ITFCs have been differentially defined by various authors. Mbhenyane (2016) refers to Indigenous foods as a non-commodity (therefore something for which value is not recognised) that is part of a large portfolio of genetic, agroeconomic, economic, social and cultural factors

(Mbhenyane 2016). Others have noted that ITFCs usually exist independently of direct human action, illustrating their adaptation to the environment (Boedecker, Termote, Assogbadjo, Van Damme & Lachat 2014). However, neither of these fully encapsulates an adequate definition, and consequently the definition of Bharucha and Pretty (2010) is adopted to contextualise the study.

According to Bharucha and Pretty (2010), ITFCs can be envisioned as foods existing in a continuum from entirely wild foods to semi-domesticated - noticeable human intervention is seen ranging from harvesting, propagating and transplanting (Bharucha & Pretty 2010). These two parts of the continuum are described in van der Merwe's, Cloete's and van der Hoeven's (2016) two categories of classification, conventional and less conventional indigenous foods. Conventional (semi-domesticated) indigenous foods are foods such as sorghum, cowpeas and sweet potatoes, whereas less conventional indigenous foods are those such as amaranth, pumpkin leaves, and calabash (van der Merwe, Cloete & van der Hoeven 2016).

ITFCs are often interchangeably used with wild foods and orphan Neglected, and Underutilised Species (NUS) seen as secondary crops (Mabhaudhi, O'Reilly, Walker & Mwale 2016). NUS are defined in two ways by the International Plant Genetic Resources Institute (IPGRI) where *neglected* is referring to the status of these foods as 'minor crops', yet still being utilised to a small degree for rural subsistence farming. *Underutilised* is referred to as domesticated plant species that have been used for millennia and grown intensively for its properties as foods, fodder and fibre. However, these foods have been reduced in importance particularly in usage and supply constraints. Often indigenous foods will be relegated to an NUS status (IPGRI 2002; Chivenge, Mabhaudhi, Modi & Mafongoya 2015; Mabhaudhi, O'Reilly, Walker & Mwale 2016).

A new terminology has been coined for ITFCs and NUS, namely, *new* or *future crops*. New and/or future crops refer to crops that previously did not have noteworthy industrial importance due to low levels of utilisation, but nonetheless illustrate new potential to instigate novel value chains if there is a significant increase in development and research actions (Mabhaudhi, Chimonyo & Modi 2017).

1.6.2. Benefits

Benefits refer to general advantages gained from ITFCs, with an improvement that both sustains and promotes the positive wellbeing of the environment, the social-cultural dynamics, the individual, the community and the nutrition of the community and individuals (Collins Dictionary 2013). The benefit of ITFCs is further elaborated on by Jarvis, Hodgkin, Sthapit, Fadda and Lopez-Noriega (2011), who argue that the benefits from the use of ITFCs and their diversity may come from their current use value or it may be derived from the consumption of a good (i.e. ITFCs) by either the individual or the community.

1.6.3. Challenges

The inverse of benefits and advantages gained by using ITFCs is the 'challenges', in relation to the central themes: nutritionally, environmentally, economically and social-culturally. *Challenge* can be seen as a compound of perceived difficulty and skill required to overcome the difficulties with using ITFCs. Difficulty itself will need either mental and/or physical skills in an effort to overcome the perceived challenge in a determined manner (Engeser & Rheinberg 2008). For example, "key challenges include making the elimination of micronutrient deficiencies more demand (community)- driven", this may be addressed though appropriate food behaviour change (Tontisirin, Nantel & Bhattacharjee 2002:248).

1.7. Significance of the Research

The significance of the research is far-reaching because its findings and recommendations provide a review of the current status of ITFCs within the Western Cape community gardens and as such could have local relevance. There is a need for alternative food systems to decrease food insecurity in a complex environment influenced by a range of factors.

The problems of the current food system directly affect global populations, but also at the national and local scales. Some of the inherent problems may be reduced with concentrated efforts on growing, using and accumulating more knowledge of ITFCs. These efforts also target the sustainable development goals (SDGs), notably goal 2, "End hunger, achieve food security and improved nutrition and promote sustainable

agriculture" which further translates to better health and wellbeing (goal 3) (United Nations 2015). By studying the use and uptake of ITFCs in the urban food systems, the research intends to contribute to the knowledge on the ever-pressing issues of an equitable food system.

The research suggests that the knowledge gained through the evaluations and interviews will be relevant not only for areas of the Western Cape, but also for South Africa. This justifies the given systematic evaluation of the literature and recommendations made to substantiate the use of indigenous foods and its associated benefits. It is therefore anticipated that by highlighting and promoting the use of ITFCs, more communities will be willing to adopt the growing and use of ITFCs within established and upcoming gardens.

Although research has been done on ITFCs and their benefits, most of the work has focused on only one theme or a certain aspect within the themes addressed in this thesis (nutritional, environmental, economic and social-cultural). In contrast, this thesis has collated and evaluated data covering all four themes and addressed the issues of gaps and requirements for further research. The findings are also intended for a broad audience, including academics, organisations, groups or individuals intending to help, build, or play an advisory role in communities with the aim of creating alternative food sources. Further, the findings are intended to be communicated by academic publications and lastly feedback to the interviewees and the community garden itself.

1.8. Delimitations and Challenges of the Overall Study

The following points may have limited the quality of the outcome of the research. However, with acknowledgement comes the use of precautionary steps and methods to curtail any limitation. The study specifically focused on the Western Cape's ITFCs and community gardens as a case study of the first attempts to cultivate indigenous foods within winter rainfall season. This study, however, may not be able immediately to reflect the benefits because of the limited scope of the study, which focuses only on certain community gardens. Further, the study does not look at other

spaces where ITFCs may be growing, so the study becomes very focused on a specific aspect.

Another limitation of the systematic literature review is that the search looks only at papers in English and Afrikaans, which could limit the study as it excludes literature written in other languages. Moreover, the study does not delve into the ethical implications of the dichotomy between the unsustainability of foraging and the popularisation of these foods. Another aspect of this is the concern of breaching indigenous knowledge and how to advocate indigenous knowledge, yet acknowledging and contributing the work to those entrusted with the knowledge in the broader academic field. Therefore, in this research, reflexive thinking is used on the knowledge gained to consciously acknowledge the assumptions and preconceptions that are brought into the research affecting its outcome, as well as using these experiences of each interview to reflect and keep the following interviews in mind. Further, reflexive thinking was used when analysing data and the entire research project.

Chapter 2 – Systematic Review of the Benefits of Indigenous foods

Keywords: Benefits, Indigenous Foods, ITFCs, Food System

2.1. Introduction

The overall aim of this chapter is to explore the literature on underutilised indigenous crop species and foods within Africa and to provide a systematic overview of both existing literature and literature-gaps on nutritional, environmental, economic and social-cultural benefits of indigenous food plants. A further aim is to answer the research question as to whether ITFCs might fill a gap within the broader food system.

While indigenous foods remain widely neglected, certain ITFCs are now considered to be a sustainable and satisfactory solution to the current unsustainability and one-sidedness of the global food system (Pichop, Abukutsa-Onyango, Noorani & Nono-Womdim 2016). The one-sidedness of the global food system refers to the industrial food production that is not socio-ecologically sustainable (European Commission 2011).

More than 50% of the world's daily requirements of calories and protein come from three main staples, wheat, maize and rice. What is more, nearly 80-90% of our total dietary intake comes from 12-20 species (Chivenge, Mabhaudhi, Modi & Mafongoya 2015). "While this can ensure adequate calories, it inadvertently neglects the need for dietary diversity." (Chibarabada, Modi & Mabhaudhi 2017:1). By contrast, ITFCs provide greater diversity than exotic foods, with 7000 species having been used throughout human history as food sources and multiple other uses (Jaenicke & Höschle-Zeledon 2008; Bharucha and Pretty 2010).

There is therefore a gap between the possible ITFC varieties that can be utilised for consumption and the actual varieties being consumed due to decreased use and limited knowledge of these foods (Mnguni & Giampiccoli 2015). ITFCs have been utilised and cultivated in larger quantities in the rest of Africa than in South Africa. This is due to the historical context of South Africa, where the Apartheid regime

restricted access and relocated people from their ecological environment, thereby limiting the continuation of the use of ITFCs and their associated knowledge. The ITFCs which are cultivated in South Africa are Rooibos, Buchu, Pelargonium and herbs (Blignaut, De Wit, Knot, Midgley, Crookes, Drimie & Nkambule 2014). The known literature in Africa that does exist focuses on green leafy vegetables and social studies broadly discuss the benefits. Even the World Trade Organisation (WTO) states that "Indigenous agriculture and biological resources are vitally important to the economies, cultures, environment, food security and livelihoods of sub-Saharan Africa." (AEFJN 2002:17). Therefore, it seems imperative to evaluate the literature to substantiate this claim. Mbhenyane (2016) notes that there is a scarcity of data with regard to ITFCs particularly in South Africa and that the demand for ITFCs cannot be properly realised or investigated without this crucial data.

The diversity of ITFCs is undermined by the simplification of diets, degradation of ecosystems, loss of species to degradation, and knowledge thereof (Johns & Eyzaguirre 2006). The spread of agriculture and the homogenisation of agricultural land increasingly limit the access, availability and use of ITFCs. Thus, decreasing malnutrition and supportive actions by early intervention with ITFCs may create a positive dietary intake (Pereira 2014). This may be achieved through the revitalisation of indigenous food systems, the knowledge accompanying it and concentrated effort to cultivate ITFCs sustainably is an imperative starting point in fighting malnutrition and micro-nutrient deficiencies (Smith 2013).

A definition of indigenous foods is elusive due to the encompassing variety of foods included, fruits, leaves of trees, leafy and root vegetables and herbaceous plants (van der Merwe, Cloete & van der Hoeven 2016). *Traditional* food is differentiated from *indigenous* foods by traditionally having been eaten within the last few centuries, whereas indigenous foods are not defined by a set time period (Baskarachary, Yemula, Gavaravarapu & Joshi 2015). According to Ayanwale, Amusan, Adeyemo and Oyedele (2016) indigenous food is defined as foods originating in a specific bio-region in conjunction with foods that were introduced into the country and are now recognised as indigenous crops due to their being integrated into the local food culture. Indigenous foods usually exist independently of direct human action,

illustrating their adaptation to the environment and resilience without human interference (Boedecker, Termote, Assogbadjo, Van Damme & Lachat 2014).

Indigenous foods can be envisioned as foods existing in a noticeable human intervention as seen from harvesting, propagating and transplanting (Bharucha & Pretty 2010) activities. Lastly, some indigenous foods are endemic, meaning these foods are both native to an area but also restricted to this area.

Ayanwale et al. (2016) explain that ITFCs are underutilised due to the low production by smallholder farmers. ITFCs are being partly maintained because of their social-cultural significance, their easy usage and their importance for subsistence of local communities (Ayanwale et al. 2016). ITFCs would therefore occupy a niche within the local ecology and markets in the community if better utilised. This highlights the importance of the need for establishing a viable supply and demand chain as well as a value chain for ITFCs (Will 2008). However, due to a lack of modern and industrialised markets for ITFCs, there is a tendency for low development or investment both socially and scientifically into the benefits and utilisation of ITFCs within South Africa and Africa (Mbhenyane 2016). Although there is a lack of adequate usage of indigenous nutrient sources, FAO estimates that globally about one billion people use wild and/or indigenous foods in their diets (Aberoumand 2009; Bharucha and Pretty 2010).

After a thorough description of the systematic literature review approach, rationale, procedures and analysis, a collation of benefits and challenges is documented within the current literature and gaps in knowledge are identified. The data will be described within its four themes of nutritional, environmental, economic and social-cultural benefits. The challenges facing ITFCs are also discussed. Thereafter, the findings of the review are analysed and discussed. It is intended that transferring knowledge of the benefits of ITFCs in the African context can create awareness about the relevance of these foods in the South African food system and may help to encourage the consumption of these foods.

Due to the vast amount of literature recorded below, the four themes are classified according to their significance in the food system and their relation to ITFCs as emerging themes (the nutritional, environmental, the economic and the social-cultural) (Pereira 2014). The focus on nutrition is imperative considering the world-wide statistics on over-and-under nutrition and the consequences of unsustainable diets, which are the primary reasons for health-related disease. It is here where ITFCs may provide a significant contribution. The social-cultural theme looks at the value which people give to ITFCs as well as the value they add to livelihoods. Lastly, environmental health is vital to the sustainable functionality of agriculture and in turn the food system. This chapter will look at the benefits of ITFCs and what they can do to ease the currently strained system over and above the challenges.

2.2. Systematic Review Methodology

2.2.1. The Approach and Methodological Motivation

The research design consisted of a systematic literature review of current academic and grey literature, providing an overview of the knowledge and gaps within the field of indigenous foods. To ensure that the literature review was as balanced and impartial as possible, the principles of Bryman and Bell (2014) were applied.

The systematic review is based on two assumptions. The first assumption is that there is existing literature on ITFCs as well as their benefits. Furthermore, that there is no clear overview of ITFCs (with the exception of van Wyk's 2011 paper: *The potential of South African plants in the development of new food and beverage products*) and that there are gaps in the existing literature, based on the method followed by Candel (2014) for food system governance. The systematic review was used due to its internal validity using selection and exclusion of studies to reduce bias and to summarize as objectively as possible (Petticrew & Roberts 2006). However, there are some limitations of which the most prevalent is the difficulty in making objective decisions about the quality of the data and therefore determining the inclusion and exclusionary criteria of the research and article (Bryman & Bell 2014).

The use of themes as a unit of analysis emerged from the preliminary literature review undertaken during the research scoping phase. This research scoping phase was done to determine if the intended research would be a contribution to the existing academic literature.

2.2.2. Data Collection Procedure

The following steps were used to complete the systematic literature review. First, a comprehensive inquiry of keywords to search for was set around the topic, from 2008 to 2017, aimed at accessing relevant literature. The topic criteria included *food* (and/synonyms) AND *indigenous* (and/synonyms) in the title, *abstract*, *introduction* or *conclusion*. Table 1 presents the results by database. The secondary inclusionary criteria included *literature* that showed connections to Africa, South Africa, *food system*, *nutritional benefits*, *environmental benefits*, *economic benefits*, and/or *social-cultural benefits*.

Subsequently the abstracts were reviewed, of which 215 were chosen for inclusion in the final database. Thereafter, final articles were selected based on the abstract and providing the following criteria were met, namely nutritional value/benefit/challenge, environmental value/benefit/challenge, economic value/benefit/challenge and social-cultural value/benefit/challenge with regard to ITFCs. Further, articles were selected if they provided information on the role of ITFCs in the food system, and/or food and nutrition security and/or in communities [this approach was based upon the work of Pereira (2014)].

This study was focused on foods derived from plants and therefore excluded articles on livestock and marine animals. Table 1 represents the inclusion and exclusionary criteria that were set. The inclusion criterion in terms of language was English and Afrikaans (although no Afrikaans papers came up in the search). After 30 consecutive articles searched from the databases that were not relevant within the parameters set, the keyword search was stopped for that particular database. The remaining literature was read in full to uncover themes and categorise for determining if benefits and challenges were recorded in the given papers on ITFCs.

Table 1: Inclusion and Exclusion Criteria

	Included	**Excluded**
Published between	1st January 2008 – 31st July 2017	Preceding 2008
Topic criteria	Food (and/synonyms) AND indigenous (and/synonyms) in the Title, Abstract, Introduction or Conclusion	Does not meet the topic criteria listed alongside
Secondary topic criteria	Scan of paper revealing connection to: Africa, South Africa Food system nutritional, environmental, economic and/or social-cultural benefits and challenges	Does not meet the secondary topic criteria, listed alongside

Subsequently, the peer reviewed literature on ITFCs was categorised into the subcategories of focus, namely nutritionally, environmentally, economic and social-culturally These categories were chosen since they encompass the different spheres related to ITFCs. The theme, 'environmental' looks at conserving biodiversity and agricultural ecosystems. The category of nutrition looks at the promotion of the foods themselves and what nutrition they can provide, the social-cultural aims to improve livelihoods through the improvement of economic viability, food security status, and behaviour and social concepts of ITFCs (Will 2008).

The databases used were the following (peer-reviewed articles): SUN Search (Stellenbosch University Online library, which comprises a collection of ten key domestic and international databases), South African Theses and Dissertations (ETD) portal, Scopus and Google Scholar were chosen because of their large size and access. The organisations whose websites were chosen for grey literature searches were Bioversity International, the Food and Agriculture Organization of the United Nations (FAO), the World Trade Organization (WTO), the International Fund for Agricultural Development (IFAD), and the World Bank.

The inclusionary literature (n=215) was then cross-referenced to further extrapolate literature within the given parameters (n=38); and new literature was extrapolated from the reference list of literature found. Table 2 below illustrates the databases and

websites searched, with columns reflecting the search words, limits that were set in terms of when the paper was published, what the results were, and lastly number of papers subsequently included.

Table 2: Table form of Electronic Databases Searched

Academic Search Engine	**Phrase particular to Index terms**	**Delimiters**	**Results**	**No. Included**
SUN Search	"Indigenous foods" "South Africa"	2008- 2017	572	40
Google Scholar	"Indigenous foods" "South Africa" "Useful plants" "traditional foods in Africa"	2008- 2017	1740	82
Scopus	"Indigenous foods" Benefits AND "indigenous food"	2008- 2017	121	12
South African National ETD (e-theses and Dissertations) Portal	"Indigenous food" Indigenous foods	None	6573	10
Bioversity International	"indigenous foods"	None	1360	37
World Bank	Benefits of indigenous foods	None	500	5
The International Fund for Agricultural Development (IFAD)	"Indigenous foods"	None	11	7
World Trade Organisation (WTO)	"Indigenous foods"	None	467	3
Food and Agricultural Organisation (FAO)	"Indigenous food" "Food system"	None	65	11
Cross Reference		2008- 2017		38

The systematic literature review query was based on a traditional literature review by key words, on 4 databases and 6 organisations in a concentrated effort to capture as much data as possible. The inclusion and exclusion criteria were applied to the initial results (n=11,409), which were then reduced to n=215. However, with the use of cross-referencing and requesting of further data and literature from authors and papers recommended due to proximity, the end result was n=253.

The results of the systematic literature review were sourced from journal articles (n=156), books (n=14), Master's thesis (n=17) and organisational reports and papers (n=66). The addition of grey literature (theses and reports from various organisations) provided extra data that were invaluable as both literature and as a way to obtain relatively unknown literature. The information presented here is not exhaustive. Notwithstanding this is an attempt to document the benefits and challenges with regard to ITFCs respectively.

Considering the scope of accumulated data, the results indicated that there is valuable literature on ITFCs. Although literature in South Africa is based predominantly on indigenous green leafy vegetables and their nutritional benefits, it indicates a gap in the literature for South Africa on the other benefits. Moreover, two papers were found in the systematic literature review that referred to the Western Cape's indigenous foods. In South Africa, the following provinces were mentioned: Eastern Cape, Free State, Gauteng, Limpopo, Mpumalanga, North West, Northern Cape and Kwazulu-Natal.

Numerous papers looked at ITFCs in Africa from the following nations: Benin, Chad, Cameroon, Ethiopia, Kenya, Morocco, Namibia, Nigeria, Senegal, Tanzania and Uganda. Some paper referred only to regions within Africa; these were sub-Saharan Africa, West Africa and Central Africa. The following locations were referenced from South America: Amazon, Bolivia, Brazil, Columbia, Ecuador, Guatemala and Peru, Asia: India, Malaysia, Nepal, Philippines, Turkey and Sri Lanka Vietnam and Oceania: Australia, Federal states of Micronesia and the Solomon Islands. Those of the United States and Canada were also recorded.

There is a significant gap in knowledge and literature specifically in the African continent and in South Africa. This includes the Western Cape which has large numbers of ITFCs in its unique and richly biodiverse biomes, but where there is little or no tradition of cultivation. Out of 54 nation-states in Africa only 12 had papers on particular ITFCs which showed that there is a significant English literature gap in the African ITFCs (this review did not take into account the French speaking nations in West Africa). All the studies looked only at a limited amount of ITFCs, illustrating

the gap between the enormous amounts of ITFCs which exist that was condensed to a handful of academic literature.

2.3. The Benefits and Potential Challenges Associated with Indigenous Foods

This section examines the benefits of ITFCs, with a short introduction and definition of each benefit to distinguish and categorise them within the four themes of nutritional, environmental, economic and social-cultural aspects. Although, drawing a line is problematic since the benefits are continuously interlinked and overlap with one another.

With this in mind, more than 90% of all ITFCs in Africa originate in, or are ancient introductions to the continent, with only 8% recently introduced. Moreover, there are 400 well-defined plant species that encompass 53 botanical families, primarily used as vegetables, in Africa (Ojiewo, Tenkouano, Hughes & Keating 2013). This illustrates the richness of ITFCs in Africa as well as their potential. This potential is substantiated by the following benefits.

The benefits of ITFCs are an important part of the global food basket. In part, these foods are specific to an ecosystem promoting diversity, food security, fibre, and fodder. Without usage of indigenous and wild plant species, a sustainable nutrient supply in certain rural and urban areas is at risk (Bharucha & Pretty 2010; Penafiel et al. 2011; Dempewolf et al. 2014). This is in light of an estimated 30 and 40 million Africans who will depend on food grown within the city borders to meet their daily food requirements by 2020 (Nierenberg 2012). Figure 4 below illustrates the dynamics of ITFCs with the given parameters of nutrition and health status, the social cultural traditions linked with ITFCs (especially income generation), and how the purchasing power of buying ITFCs is based upon the value and knowledge of the foods.

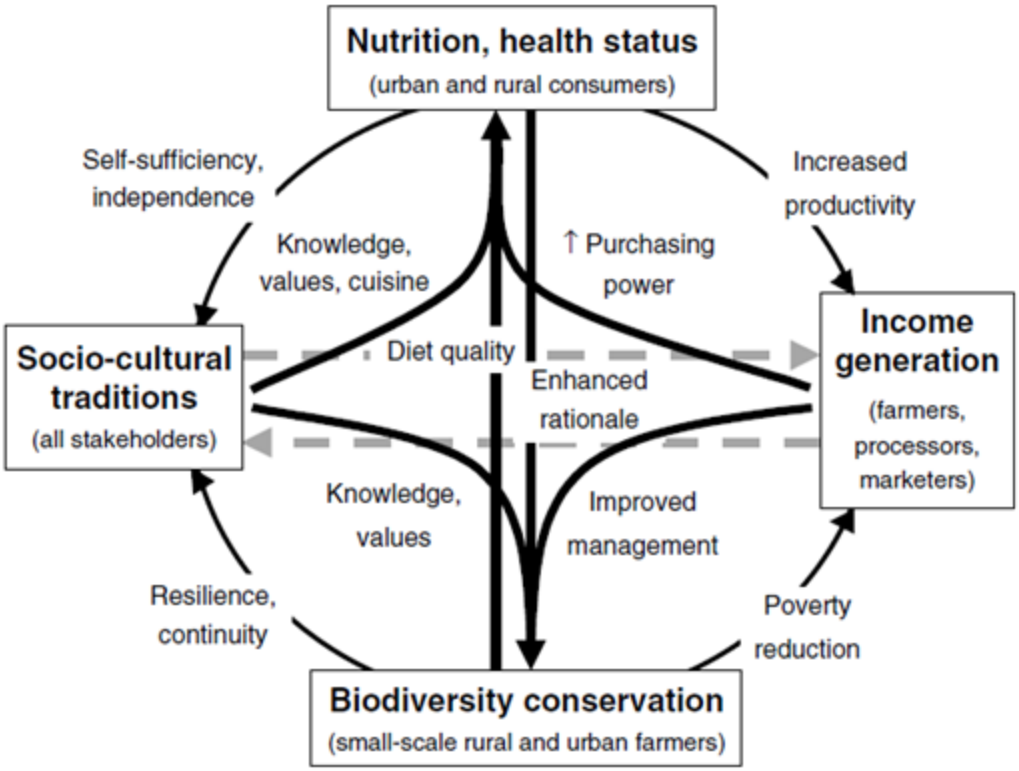

Figure 4: The Dynamics Between Nutrition; Health status; Social-Cultural Traditions; Biodiversity Conservation and Income Generation (Johns & Eyzaguirre 2006:185).

The Figure above illustrates how the following dynamics can potentially impact on one another. The benefits of ITFCs within the ~~four~~ themes can be distinguished as follows. Nutritional benefits are those that coincide with health benefits, contributing to the positive effect on people's health gained from food and activity surrounding food (Brazier, Ratcliffe, Salomon & Tsuchiya 2016). Environmental benefits are the connection between humans and the rest of nature, through the provision of resources as both ecosystems services and the cultivation of land. Costanza, de Groot, Sutton, van der Ploegl, Anderson, Kubiszewski, Farber, and Turner (2014:153) define services that the environment provides as "our natural assets as critical components of inclusive wealth, well-being, and sustainability" as the ''capacity of ecosystems to provide goods and services that satisfy human needs, directly and indirectly" (de Groot, Alkemade, Braat, Hein, & Willemen 2010:262).

Economic benefits are quantified as the money generated as a result of an action (e.g. growing ITFCs and selling them at a local market), this is determined by the consumer surplus and producer surplus. Consumer surplus is "the difference between the maximum price one was willing to pay and what they actually paid" and producer

surplus “the difference between what suppliers were paid and what they were willing to get paid for the good they produced”, the use of both these determine the market for or of a product (e.g. ITFCs) (Wells n.d.). Social-cultural benefits enhance and promote community where individuals have a sense of belonging through an increase in welfare to society that is derived from a particular source in their surroundings i.e., indigenous foods (Bishop 2013). The following section illustrates the benefits within each theme noted in the systematic literature review.

2.3.1. Nutritional, Environmental, Economic and Social-cultural Benefits

The following literature review identified both benefits and challenges of ITFCs, within the framework of this thesis, more benefits than challenges could be identified. The nutritional benefits recorded numbered 40, together with 26 environmental benefits, 5 economic benefits and 23 social-cultural benefits. These combined, gave 70 total benefits, more benefits were perceived globally (seen in addendum A, Global benefits and challenges, excludes the African continent). The challenges were as follows: 4 nutritional challenges within Africa, 5 of which were global challenges; 12 environmental challenges; 5 economic challenges and 2 global challenges; and 11 social-cultural challenges, 2 which are global challenges. The total number of challenges came to 32 challenges against 91 benefits. From the literature review only two indigenous plants were winter rainfall season species from the Western Cape, South Africa, the Raapuintjie (*Cyanella hyacinthoides*) and Tsamma Melon (*Citrullus lanatus*).

This illustrates the gap in the literature regarding seasonal winter rainfall foods, including a lack of information on foods indigenous to the Western Cape. Fifty-five sighted references in the Tables below refer to the benefits, and fourteen references to the challenges. However, this is outweighed by the African continent as a whole, which references the benefits in the Tables below ninety-two times, and the challenges referenced fifteen times.

ITFCs have a host of desirable traits, many of them are richer in protein, and other nutrients than popular non-native crops (Cernansky 2015). These benefits are outlined in Tables 3 to 7, with Table 3 showing the micro-nutritional values found in ITFCs

and their location, Table 20 in addendum A illustrates the nutritional benefits of ITFCs outside the African continent. Table 4 provides the documented, wider nutritional benefits of ITFCs, Table 21 in addendum A illustrates the nutritional benefits of ITFCs outside the African continent. Table 5 presents an overview of the environmental benefits, Table 22 illustrates the global benefits; Table 6 an overview of economic benefits with Table 23 illustrating the global economic benefit and Table 7, the social-cultural benefits with Table 24 showing the global social-cultural benefits.

Table 3: Micro-Nutrient Benefits

Description	Findings	Type of ITFCs	Location of Study	Author/s & Date	Analysis of Research
ITFCs have high micro-nutrient value, some higher than exotic counterparts (See Uusiku, Oelofse, Duodu, Bester & Faber 2010)	(B2) / Riboflavin	Baobab (*Adansonia digitata*), tamarind (*Tamarindus indica*)	Africa[2]	Borlaug, Guyer, Cunningham, Herren, Juma, Mabogunje, Underwood & Yudelman (2008);	Field analysis and review
		Amaranth (*Amaranthus spp.)*	Overview[3]	Alercia (2013a)	Qualitative review
	Calcium	*Persea americana*, safou (*Dacryodes edulis*), bush mango (*Irvingia gabonensis*), baobab (*Adansonia digitata*), *Carissa bispinosa*, marula (*Sclerocarya birrea*), tamarind (*Tamarindus indica*)	Africa	Borlaug et al. (2008);	Field analysis and review
		Amaranthus tricolor, pumpkin leaves, cowpea leaves (*Vigna unguiculata*), cat's	South Africa	Schönfeldt & Pretorius (2011);	Nutrient analysis

[2] The country or region is not specified in the given literature; however, it does indicate that the ITFCs are commonly found in Africa

[3] Overview refers to non-specific region. Rather the paper gives an overview of the benefits or challenges in the broader context, globally.

		whiskers (*Orthosiphon aristatus*), wild jute (*Corchorus*)			
		Justicia ladanoides Finger millet (*Eleusine coracana*)	Southern Ethiopia	Addis, Asfaw, Singh, Woldu, Baidu-Forson & Bhattacharya (2013);	Qualitative review
		Amaranth (*Amaranthus spp.*)	Overview	Alercia (2013a);	Qualitative review
		Amaranth (*Amaranthus spp.*)	Cameroon	Kagma, Kouame, Atangana, Chagomoka & Ndango (2013)	Nutrient analysis
		Wild mustard (*Sinapis arvensis*)	Sub-Saharan Africa	Chivenge, Mabhaudhi, Modi & Mafongoya (2015);	Qualitative review
		Soybean, dry beans, Bambara groundnut (*Vigna subterranea*), tepary bean	Semi- and Arid Tropics	Mabhaudhi, Chibarabada & Modi (2017)	Trans-disciplinary review
	Sodium	Butterfruit *(Persea Americana)*	Africa	Borlaug et al. (2008)	Field analysis and review
	Phosphorus	Baobab (*Adansonia digitata*), *Carissa bispinosa*	Africa	Borlaug et al. (2008);	Field analysis and review
		Amaranthus tricolor, pumpkin leaves, cowpea leaves (*Vigna unguiculata*), cat's whiskers (*Orthosiphon aristatus*), wild jute (*Corchorus*)	South Africa	Schönfeldt & Pretorius (2011)	Nutrient analysis
	Iron	Baobab (*Adansonia digitata*), tamarind (*Tamarindus indica*)	Africa	Borlaug et al. (2008);	Field analysis and review

		Amaranthus tricolor, cat's whiskers (*Orthosiphon aristatus*), pumpkin leaves, black nightshade (*Solanum*), tsamma melon (*Citrullus lanatus*)	South Africa	Schönfeldt & Pretorius (2011);	Nutrient analysis
		Amaranth greens, spider plant (*Cleome hassleriana*),	South Africa	van Jaarsveld, Faber, van Heerden, Wenhold, Jansen van Rensburg & van Averbeke (2014);	Nutrient analysis
		African nightshade (*Solanum*)	Kenya	Cernansky (2015);	Qualitative review
		Wild Mustard (*Sinapis arvensis*)	Sub-Saharan Africa	Chivenge, Mabhaudhi, Modi & Mafongoya (2015);	Qualitative review
		African Leafy Vegetables (ALFs)	South Africa	van der Merwe, Cloete & van der Hoeven (2016);	Qualitative review
		Eragrostis curvula	Eritrea and Ethiopia	Ghebrehiwot, Shimelis, Kirkman, Laing & Mabhaudhi (2016);	Nutritional and sensory evaluation
		Bambara groundnut (*Vigna subterranea*), soybean, cowpea (*Vigna unguiculata*),	Semi- and Arid Tropics	Mabhaudhi, Chibarabada & Modi (2017);	Trans-disciplinary review
		Dry bean (*Phaseolus vulgaris*) and cowpea (*Vigna unguiculata*)	Kwazulu-Natal, South Africa	Chibarabada, Modi & Mabhaudhi (2017)	Field analysis
	Manganese	Butterfruit (*Persea*	Africa	Borlaug et al.	Field

		Americana)		(2008);	analysis and review
		Amaranth (*Amaranthus spp*.)	Overview	Alercia (2013a)	Qualitative review
	Copper	Butterfruit *(Persea americana)*	Africa	Borlaug et al. (2008);	Field analysis and review
		Amaranth (*Amaranthus spp*.)	Overview	Alercia (2013a)	Qualitative review
	Zinc	Butterfruit *(Persea americana)*, marula (*Sclerocarya birrea*), Aizen (mukheit), tree grapes (*Jabuticaba*)	Africa	Borlaug et al. (2008);	Field analysis and review
		Wild jute (*Corchorus*)	South Africa	Schönfeldt & Pretorius (2011);	Nutrient analysis
		Amaranth (*Amaranthus spp*.)	Overview	Alercia (2013a);	Qualitative review
		Amaranth (*Amaranthus spp.)*	Cameroon	Kagma, Kouame, Atangana, Chagomoka & Ndango (2013)	Nutrient analysis
		Cassia tora	West and Central Africa	Halewood, Baidu-Forson, Clancy & Vodouhe (2014);	Qualitative review
		ALVs[4]	South Africa	van der Merwe, Cloete & van der Hoeven (2016);	Qualitative review
		Dry bean (*Phaseolus vulgaris*) and cowpea (*Vigna unguiculata*)	Kwazulu-Natal, South Africa	Chibarabada, Modi & Mabhaudhi (2017)	Field analysis
	Potassium	Butterfruit (*Persea Americana*), melon, tamarind (*Tamarindus*	Africa	Borlaug et al. (2008);	Field analysis and review

[4] African Leafy vegtables (ALVs)

		indica), watermelon (*Citrullus lanatus var. lanatus*)			
		Amaranth (*Amaranthus spp*.)	Overview	Alercia (2013a);	Qualitative review
		Nightshade (*Solanu)*	Cameroon	Kagma, Kouame, Atangana, Chagomoka & Ndango (2013)	Nutrient analysis
		Pigweed (*Amaranthus retroflexus*)	South Africa	van Jaarsveld et al. (2014);	Nutrient analysis
		Finger millet (*Eleusine coracana*)	Africa	Nierenberg (2014)	Qualitative review
	Vitamin A	Baobab (*Adansonia digitata*), melon	Africa	Borlaug et al. (2008);	Field analysis and review
		Black nightshade (*Solanum*), pigweed (*Amaranthus retroflexus*), cowpea (*Vigna unguiculata*), Tsamma melon (*Citrullus lanatus*), spider flower (*Cleome hassleriana*)	South Africa	van Jaarsveld et al. (2014);	Nutrient analysis
		Millet (*Pennisetum glaucum*), sweet potato (*Ipomoea batatas*), Taro *(Colocasia esculent)*	Sub-Saharan Africa	Chivenge, Mabhaudhi, Modi & Mafongoya (2015);	Qualitative review
		ALVs	South Africa	van der Merwe, Cloete & van der Hoeven (2016)	Qualitative review
	Vitamin C	Baobab (*Adansonia digitata*), *Carissa bispinosa*, kei apple (*Dovyalis caffra*), marula (*Sclerocarya birrea*),	Africa	Borlaug et al. (2008);	Field analysis and review

		melon, watermelon (*Citrullus lanatus var. lanatus*)			
		Amaranth (*Amaranthus spp*.)	Overview	Alercia (2013a);	Qualitative review
		Pigweed (*Amaranthus retroflexus*), Cowpea (*Vigna unguiculata*)	South Africa	van Jaarsveld et al. (2014);	Nutrient analysis
		Aillonella toxisperma, *Trichoscypha abut*, *Pentaclethra macrophylla*	Cameroon	Fungo, Muyonga, Kaaya, Okia, Tieguhong & Baidu-Forson (2015);	Nutrient and bioactive analysis
		Taro *(Colocasia esculent)*	Sub-Saharan Africa	Chivenge, Mabhaudhi, Modi & Mafongoya (2015)	Qualitative review
	Vitamin K	Amaranth (*Amaranthus spp*.)	Overview	Alercia (2013a)	Qualitative review
	Vitamin E/ tocopherols	Grain legumes	Semi- and Arid Tropics	Mabhaudhi, Chibarabada & Modi (2017)	Trans-disciplinary review
	Magnesium	*Carissa bispinosa*, Butterfruit (*Persea Americana*), marula (*Sclerocarya birrea*)	Africa	Borlaug et al. (2008);	Field analysis and review
		*Amaranthus tricolo*r, pumpkin leaves, cowpea leaves (*Vigna unguiculata*), cat's whiskers (*Orthosiphon aristatus*), wild jute (*Corchorus*)	South Africa	Schönfeldt & Pretorius (2011);	Nutrient analysis
		Amaranth *(Amaranthus spp.)*	Cameroon	Kagma, Kouame, Atangana, Chagomoka & Ndango	Nutrient analysis

				(2013);	
		Finger millet (*Eleusine coracana*), Pigweed (*Amaranthus retroflexus*)	Africa	van Jaarsveld et al. (2014);	Nutrient analysis
		Eragrostis curvula	Eritrea and Ethiopia	Ghebrehiwot, Shimelis, Kirkman, Laing & Mabhaudhi (2016)	Nutritional and sensory evaluation
ITFCs have high nutritional status (Cloete & Idsardi (2013)	High energy content	Baobab (*Adansonia digitata*), Butterfruit (*Persea Americana*), marula (*Sclerocarya birrea*), seeds of melons, monkey oranges, sweet detar (*Detarium senegalense*), Icacina, green monkey orange (*Strychnos spinosa*)	Africa	Borlaug et al. (2008)	Field analysis and review
	Beta-carotene	*Amaranthus tricolor*, pumpkin leaves, cat's whiskers (*Orthosiphon aristatus*) cowpea leaves (*Vigna unguiculata*), wild jute (*Corchorus*), cowpea (*Vigna unguiculata*)	South Africa	Schönfeldt & Pretorius (2011);	Nutrient analysis
		Black nightshade (*Solanum*), pigweed (*Amaranthus retroflexus*), spider flower (*Cleome hassleriana*)	South Africa	van Jaarsveld et al. (2014);	Nutrient analysis
		Cassia tora	West and Central Africa	Halewood, Baidu-Forson, Clancy & Vodouhe (2014);	Qualitative review

		Sweet potato (*Ipomoea batatas*)	Sub-Saharan Africa	Chivenge, Mabhaudhi & Mafongoya (2015)	Qualitative review
	Caloric contributor	Banana, cassava (*Manihot esculenta*), Baobab (*Adansonia digitata*), Butterfruit (*Persea Americana*), marula (*Sclerocarya birrea*), tamarind (*Tamarindus indica*),	Africa	Borlaug et al. (2008);	Field analysis and review
		Monkey oranges (*Strychnos spinosa*)	Limpopo, South Africa	Mbhenyane, Mushaphi, Mabapa, Makuse, Amey, Nemathaga & Lebese (2013);	Explanatory study on the consumption of ITFCs
		Green monkey orange (*Strychnos spinosa*)	Southern Ethiopia	Addis, Asfaw, Singh, Woldu, Baidu-Forson & Bhattacharya (2013);	Qualitative review
		Taro *(Colocasia esculent)*	Overview	Alercia (2013b)	Qualitative review
	Protein	Baobab (*Adansonia digitata*), balanites (*Balanites aegyptiaca*), marula (*Sclerocarya birrea*)	Africa	Borlaug et al. (2008);	Field analysis and review
		Raapuintjie (*Cyanella hyacinthoides*)	Western Cape, South Africa	Van Wyk (2011);	Review paper on the potential of ITFCs
		Senna occidentalis, Morchella esculenta	Sub-Saharan Africa	Uusiku, Oelofse, Duodu, Bester &	Nutrient analysis

				Faber (2011);	
		Cowpea leaves (*Vigna unguiculata*), pumpkin leaves	South Africa	Schönfeldt & Pretorius (2011);	Nutrient analysis
		Spider flower (*Cleome hassleriana*),	North West, South Africa	Cloete & Idsardi (2013);	Qualitative review
		Fonio (*Digitaria*)	Overview	Alercia (2013c);	Qualitative review
		Bambara groundnut (*Vigna subterranea*)	Overview	Alercia (2013d);	Qualitative review
		Coccinia grandis, Justicia flava, Celosiaargentea, Pentarrhinum Insipidum	Southern Ethiopia	Addis, Asfaw, Singh, Woldu, Baidu-Forson & Bhattacharya (2013);	Qualitative review
		Cowpea leaves (*Vigna unguiculata*)	South Africa	van Jaarsveld et al. (2014);	Nutrient analysis
		Amaranth greens (*Amaranthus spp.)*, spider plant (*Cleome hassleriana*), African nightshade (*Solanum*)	Kenya	Cernansky (2015);	Qualitative review
		Grain legume	Semi- and Arid Tropics	Mabhaudhi, Chibarabada & Modi (2017)	Trans-disciplinary review
	Dietary fibre	Watermelon (*Citrullus lanatus var. lanatus*), baobab (*Adansonia digitata*), tree grapes (*Jabuticaba*)	Africa	Borlaug et al. (2008);	Field analysis and review
		Chinese cabbage (*Brassica rapa*), black nightshade (*Solanum nigrum*), pigweed (*Amaranthus*	Limpopo, South Africa	Mbhenyane, Mushaphi, Mabapa, Makuse, Amey, Nemathaga	Explanat-ory study on the consump-tion of ITFCs

		retroflexus), Jew's mallow (*Corchorus olitorius*), spider flower (*Cleome hassleriana*), cowpea (*Vigna unguiculata*), pumpkin		& Lebese (2013);	
		Tsamma melon (*Citrullus lanatus*)	South Africa	van Jaarsveld et al. (2014);	Nutrient analysis
		Amaranth (*Amaranthus spp*.)	Sun-Saharan Africa	Chivenge, Mabhaudhi, Modi & Mafongoya (2015);	Qualitative review
		Eragrostis curvula	Eritrea and Ethiopia	Ghebrehiwot, Shimelis, Kirkman, Laing & Mabhaudhi (2016)	Nutritional and sensory evaluation
	Moisture	Watermelon (*Citrullus lanatus var. lanatus*)	Africa	Borlaug et al. (2008);	Field analysis and review
		Amaranthus tricolor	South Africa	Schönfeldt & Pretorius (2011)	Nutrient analysis
	Fatty Acids	Butterfruit *(Persea Americana)*, marula (*Sclerocarya birrea*), gingerbread plum, *Icacina trichantha*	Africa	Borlaug et al. (2008);	Field analysis and review
		Groundnut	KwaZulu-Natal, South Africa	Chibarabada, Modi & Mabhaudhi (2017)	Field analysis
	Folate	Grain legumes	Semi- and Arid Tropics	Mabhaudhi, Chibarabada & Modi (2017)	Trans-disciplinary review
	Amino Acids	*Macrotyloma geocarpum*, *Cucumeropsis mannii*, *Cyperus esculentus*	Benin	Dansi, Vodouhe, Azokpota, Yedomonhan, Assogba, Adjatin, Loko, Dossou-	Qualitative review and survey

				Aminon & Akpagana (2012)	
ITFCs not specified	High energy content Vitamin A Vitamin C and (B2) / Riboflavin	General micro-nutrient values where food is the ITFCs is not specified	Senegal & Nigeria	Bharucha & Pretty (2010)	Qualitative review

ITFCs have been compared to "Super Foods' and those ITFCs are typically more nutritious than conventional crops (Nierenberg 2014). Table 4 gives the documented, wider nutritional benefits of ITFCs and the location of these 'super foods'. ITFCs are a good source of micro-nutrients for human consumption; nevertheless, ITFCs have broader nutritional application and benefits. The many potentially beneficial attributes of ITFCs include bioactive compounds that can contribute to antioxidant activity in the body. Implementing ITFCs can have a positive effect on the reduction of the cost of daily required diet as well as making up for nutrient shortfall has been shown to be positive (Sarfo, Termote, Keding, Boedecker & Pawelzik 2017).

ITFCs also have the added benefit of creating diversification of foods grown and increasing the likelihood of diversified diets. As such, the local biodiversity contributes to a wholesome and nutritionally rich diet. ITFCs may improve bodily functions and protect against communicable diseases through nutraceutical effects (Dempewolf, Eastwood, Guarino, Khoury, Müller & Toll 2014).

Table 4: Broader Nutritional Benefits

Description	Findings	Location of Study	Author/s & Date	Analysis of Research
ITFCs can contribute to addressing gaps in nutrition	Through offering healthy and affordable nutrient dense alternatives	South Africa	Maseko, Mabhaudhi, Tesfay, Araya, Fezzehazion & Du Plooy (2018)	Qualitative systematic review
Source of gluten free flour	Example of this is *Eragrostis curvula*	Eritrea and Ethiopia	Ghebrehiwot, Shimelis, Kirkman, Laing & Mabhaudhi (20016)	Nutritional and sensory evaluation
Some ITFCs are important source of water	Especially during dry months and places with a lack of surface water	Sub-Saharan Africa	Chivenge, Mabhaudhi, Modi & Mafongoya (2015)	Qualitative review
ITFCs have nutraceutical effects	ITFCs contain phytochemicals and antioxidants that are linked to protecting against the development of communicable diseases, including diabetes, high blood pressure, cancer and hypertension	Limpopo, South Africa	Mbhenyane, Mushaphi, Mabapa, Makuse, Amey, Nemathaga & Lebese (2013)	Explanatory study on the consumption of ITFCs
ITFCs improve body functions	Drug metabolism, stimulation of the immune system and boosting tissue generation	Limpopo, South Africa	Mbhenyane, Mushaphi, Mabapa, Makuse, Amey, Nemathaga & Lebese (2013)	Explanatory study on the consumption of ITFCs
ITFCs have the potential to be applied with various technologies	Probiotics, which are live microorganisms conferring health benefits	Southern Africa	Mpofu, Linnemann, Sybesma, Kort, Nout & Smid (2014)	Laboratory analysis

to deliver probiotics	to the host when consumed in adequate amounts			
Potential for a wider spectrum of diverse foods that can be found in the genomes of wild or indigenous plants	Although harvesting may potentially be difficult, it would reduce cost of producing crops and also benefit the environment because the use of herbicides, pesticides and fertilisers are not required with ITFCs	Africa	Borlaug et al. (2008);	Field analysis and review
		Overview	Dempewolf, Eastwood, Guarino, Khoury, Müller & Toll (2014)	Qualitative review paper on the climate changes influence on ITFCs
Local biodiversity of food is an important contributor to wholesome, nutritional diets	Even small quantities of foods may be a significant benefit when the rest of the diet is void of nutrients and minerals, especially in the case of food diets based largely on starchy staples	Africa	Borlaug et al. (2008);	Field analysis and review
		Overview	Penafiel, Lachat, Espinel, Van Damme & Kolsteren (2011)	Systematic review on ITFCs and dietary diversity
The higher the species richness of ITFCs in a given area, the higher the diversity in people's diets	Lowers the frequency of diet-related diseases	Overview	Remans & Smukler (2013);	Qualitative review on diversification of diets
		South Africa	Mabhaudhi, Chimonyo, Chibarabada & Modi (2017)	Sequel to an initial study
Once-off increased cost of crop diversification	Beneficial in comparison to supplementation (drug	Africa	Ojiewo, Tenkouano, Hughes & Keatinge (2013)	Qualitative review on diversification of diets with

of ITFCs would be significant	treatment) and fortification			ITFCs
ITFCs have bioactive compounds and contribute to antioxidant activity	ALVs (Black jack and *Amaranthus spp.*)	South Africa	Mbhenyane (2016);	Review paper on ITFCs and food security
		South Africa	Tesfay, Mathe, Modi & Mabhaudhi (2016)	Comparative Study ALVs
Introducing ITFCs to young children would be to their optimum health	Belief optimum ITFCs helps children grow, strengthens the bones and helps with the mental development of children	Limpopo, South Africa	Nepfumbada, Jama & Mashamba-Thompson (2017)	Qualitative study encompassing in-depth interviews
ITFCs in conjunction with new farming techniques create stronger food production systems	In combination with indigenous knowledge, this leads to improved food security	Chad	Chianese (2016)	Qualitative review climate change adaption
Effective in disease prevention and improves health outcomes	With regular consumption of ITFCs	Limpopo, South Africa	Nepfumbada, Jama & Mashamba-Thompson (2017)	Qualitative study encompassing in-depth interviews
Using ITFCs can alleviate food insecurity	Alleviation is due to their accessibility in some areas and known nutritional properties	Eastern Cape, South Africa	Majova (2011)	Qualitative review
ITFCs can enhance longevity	ITFCs are natural, accessible, affordable and healthy	Limpopo, South Africa	Nepfumbada, Jama & Mashamba-Thompson (2017)	Qualitative study encompassing in-depth interviews

ITFCs create new narratives on farming methods and techniques for improving environmental conditions. Some of the ITFCs can be applied to various farm management systems to deliver microorganisms to the soil through probiotics and increase the natural fertility of the soil (e.g., legumes). Some ITFCs contribute to food and nutrition security through being able to grow even in drought-stricken areas.
Table 5 provides an overview of the environmental benefits of known research on the nutritional value of ITFCs, Table 22 in addendum A illustrates the environmental benefits of ITFCs outside the African continent. However, the promotion of ITFCs as a valuable food source in the broader food system can only be realised when the environment supports the growth of ITFCs. ITFCs are usually easily cultivated and require fewer inputs than exotic counterparts. Furthermore, ITFCs have a greater drought tolerance and so are more suitable with rapid climate change. For example, Slenderleaf (*Crotalaria brevidens*) has been shown to be particularly hardy during droughts due to its quickly established taproot (Cernansky 2015).

Some ITFCs can be grown under poor conditions because of tolerance to poor soils, fires, insects and pests. They can also be a source of ground cover and some have potential to purify water, overall assisting with ecosystem restoration. Some ITFCs have been shown to have up to 25 and 61% yield, more than conventional varieties, this is illustrated by indigenous barley strain (Nierenberg 2014).

Table 5: Environmental Benefits

Description	**Findings**	**Location of Study**	**Author/s & Date**	**Analysis of Research**
Ease of cultivation	ITFCs are adapted to low input agriculture, minimum production input and diverse ecological niches	North West, South Africa	Molebatsi, Siebert, Cilliers, Lubbe & Davoren (2010);	Qualitative review and survey
		South Africa	Schönfeldt & Pretorius (2011);	Nutrient analysis
		North West, South Africa	Cloete & Idsardi (2013):	Qualitative review
		Sub-Sharan Africa	Chivenge, Mabhaudhi, Modi & Mafongoya (2015);	Qualitative review
		South Africa	van der Merwe, Cloete & van der Hoeven (2016)	Qualitative review

Generally, more climate resistant than major food staples		Overview	Rudebjer, Meldrum, Padulosi, Hall & Hermanowicz (2014)	Policy Brief
Tolerant to abiotic stresses such as drought and severe temperature changes	Adapted to climatic and edaphic conditions and thereby water use efficient, example hereof is millet and Bambara ground nut (*Vigna subterranea*)	Southern Africa	Van Wyk (2011);	Review paper on the potential of ITFCs
		North West, South Africa	Cloete & Idsardi (2013);	Qualitative review
		Overview	Thormann, Alercia & Dulloo (2013);	Qualitative review
		South Africa	van Jaarsveld et al. (2014);	Nutrient analysis
		Sub-Saharan Africa	Chivenge, Mabhaudhi, Modi & Mafongoya (2015);	Qualitative review
		Cape Town, South Africa	Petersen, Thorogood & Sotshononda (2017);	Qualitative review
		South Africa	Maseko, Mabhaudhi, Tesfay, Araya, Fezzehazion & Du Plooy (2018)	Qualitative systematic review
ITFCs can be cultivated throughout drier regions	Although indigenous crops and foods generally have a lower yield than exotic foods it is an important network of food security	Overview	World Bank (2011)	Policy-oriented research
Environmental plasticity	This allows ITFCs to be planted and harvested at any time of the year	Sub-Saharan Africa	Chivenge, Mabhaudhi, Modi & Mafongoya (2017)	Qualitative review
Tolerant to poor soil	Grow even in bad conditions unlike alien	Southern Africa	Van Wyk (2011);	Review paper on the potential of

	species			ITFCs
		South Africa	van Jaarsveld et al. (2014)	Nutrient analysis
Benefit soil conservation activities	Includes lowering of soil temperatures, lessening soil erosion, increasing organic matter, nitrogen fixation (legumes) and earning carbon credits	Africa	Borlaug et al. (2008);	Field analysis and review
		Sub-Saharan Africa	Chivenge, Mabhaudhi, Modi & Mafongoya (2015)	Qualitative review
Greater tolerance to pests and fire	This is because ITFCs have not passed through the genetic bottleneck of domestic cultivations, thus have greater genetic assortment to deal with adverse effects	Overview	Maxwell & Kell (2009);	Thematic background study
		Uganda	Mulumba, Nankya, Adokorach, Kiwuka, Fadda, De Santis, & Jarvis (2012);	Qualitative review and survey
		Uganda and Morocco	Tutwiler (2013);	Qualitative review
		South Africa	van der Merwe, Cloete & van der Hoeven (2016);	Qualitative review
		Kenya	Borelli et al. (2014)	Qualitative review
Tolerance to salinity		Overview	Bioversity International (2014)	Qualitative review
Improve urban environmental conditions	Create urban greening and suitable land-scaping, integration of 'the garden' into modern civilisation	South Africa	Cousins & Witkowski (2015);	Qualitative review
		Cape Town, South Africa	Petersen, Thorogood & Sotshononda (2017)	Qualitative review
A means to supply urban dwellers with fresh food with a low	Especially in emerging urban communities	Cape Town, South Africa	Gerster-Bentaya, Rocha & Barth (2011)	Fact finding mission

carbon footprint				
Potential anti-bacterial products	Could theoretically be exploited in the search for novel antibiotics	Overview	Bacchetta et al. (2016)	Qualitative review
Purifies water		Africa	Borlaug et al. (2008)	Field analysis and review
Good ground cover		South Africa	van Jaarsveld et al. (2014)	Nutrient analysis
Valuable reservoir in terms of crop genetic assortment as well as biological diversity with regard to farming operations		Overview	Rudebjer, Meldrum, Padulosi, Hall & Hermanowicz (2014);	Policy Brief
		Overview	Bacchetta et al. (2016)	Qualitative review
Grow in low fertile soil	Can be harvested within short periods of time after planting	South Africa	van Jaarsveld et al. (2014)	Nutrient analysis
ITFCs and the gardens in which they develop help with ecosystem restoration as well as the conservation of both threatened and commercially valuable indigenous plants species		South Africa	Cousins & Witkowski (2015)	Qualitative review
Can be used as a feed for livestock	This includes cowpea (*Vigna unguiculata*) and Bambara	Limpopo, Gauteng, Mpumalanga, North West and Kwazulu-	DAFF (2013)	Qualitative review

	groundnut (*Vigna subterranea*)	Natal, South Africa		
Can be cultivated in marginal land spaces	Adopting a more diverse and sustainable land use system, coping with land shortages	Sub-Saharan Africa	Jaenicke & Höschle-Zeledon (2008);	Strategic Framework for Research and Development
		Sub-Saharan Africa	Mabhaudhi, Chimonyo & Modi (2017)	Quantitative and qualitative review
ITFCs with their variety and unusually different volatiles help protect other plants from insects	Confusing and repelling insects with the use of inter-cropping, thus allowing for less damage to indigenous and exotic crops	Chad	Chianese (2016)	Qualitative review climate change adaption
Home gardens provide a refuge for ITFCs which are constantly eradicated due to its undervaluation	From the perspective of urbanisation and deforestation	Overview of Africa	Bharucha & Pretty (2010)	Qualitative review
Potential for increased yields and quality	This is in contrast to the generally held view that many ITFCs do not display these traits	Overview study in adapting agriculture to climate change	Dempewolf, Eastwood, Guarino, Khoury, Müller & Toll (2014)	Qualitative review on the climate changes influence on ITFCs
ITFCs are exchanged, selected and conserved by farmers who want to promote hybrid vigour and maintain yields	This is also of interest as it promotes a greater variety of size, shape, taste, appearance, adaptability and maintains biodiversity of ITFCs	Africa	Fitzpatrick (2015)	Qualitative review
There is	Thus, they	Overview of	Bharucha &	Qualitative

evidence that those who forage and consume ITFCs improve resources which feed into ITFCs	intentionally sow indigenous seeds, irrigate plants, sustain soils	Africa	Pretty (2010)	review
ITFCs contribute to conservation efforts, preservation and enhancement of biodiversity		South Africa	Cloete & Idsardi (2013)	Qualitative review
Environmentally adaptive	Better adapted to growing in their surroundings, needing less chemical inputs	Kenya	Borelli et al. (2014)	Qualitative review

The cultivation, preparation and use will greatly influence urban dwellers, where what people eat is closely determined by their income (Nierenberg 2012). However, Bharucha and Pretty (2010) find that this is not the only link; there is a strong link between agrobiodiversity and cultural identity. This link could be severely affected by physical drivers (such as climate change), creating knock-on effects on both knowledge of ITFCs as well as its uses (Johns & Eyzaguirre 2006).

ITFCs can therefore contribute to the improvement of urban environmental conditions through conservation activities due to the ease of their adaptability. This adaptability translates into protecting other plants because of their unusual variety traits. ITFCs are a possible reservoir of genetic assortment and contribute to yield and vigour of hybrid exchange. ITFCs can be cultivated in marginal spaces, such as urban dwellings and home gardens creating a refuge for these plants. As well as creating an economic benefit for the person/community.

Social-cultural benefits such as food tourism can have a positive influence in the influx of economic activities. Examples of economic benefits are listed below and in Table 6. For example, production of ITFCs can result in employment, enhancement of household income, creation of business centres based on food processing cooperatives, and raised tax revenue. ITFCs could also improve access to the health food market by providing cost competitive components.

Table 6: Economic Benefits

Description	**Findings**	**Location of Study**	**Author/s & Date**	**Analysis of Research**
Trading with ITFCs can result in employment	Therefore, serving as a pivot to increase household income and enhance local economy. ITFC's can provide substantial value worth R170-190 into household's monthly income	Overview of Africa	Bharucha & Pretty (2010);	Qualitative review paper
		Benin	Giampiccoli & Kalis (2012);	Qualitative review
		North West, South Africa	Cloete & Idsardi (2013);	Qualitative review
		South Africa and Tanzania	Boedecker, Termote, Assogbadjo, Van Damme & Lachat (2014);	Scientific review of the dietary contribution of ITFCs
		South Africa	Maseko, Mabhaudhi, Tesfay, Araya, Fezzehazion & Du Plooy (2018)	Qualitative systematic review
ITFCs as a commodity are often cheaper than exotic counterparts		Kenya	Borelli et al. (2014)	Qualitative review
ITFCs help raise tax revenue	This is due to general commerce	Africa	Borlaug et al. (2008)	Field analysis and review
ITFCs can create access points into informal	ITFCs have low entry and exit cost and simple	SADC region	Mabhaudhi, O'Reilly, Walker & Mwale (2016)	Qualitative review

markets	mechanisms to sell surplus produce			
The health effects known of certain ITFCs may provide a potential cost-competitive source as raw material from primary producers	Usage as functional foods (functional food here refers to food that contains health-giving additives)	Overview	Kotilainen, Rajalahti, Ragasa & Pehu (2009)	Discussion Paper

Table 7, looks at the social-cultural benefits in regards to human interaction and nature as they are dependent on one another, Table 24 in addendum A illustrates the social-cultural benefits of ITFCs outside the African continent. Social-cultural benefits reinforce positive behaviour and culture around food, reinforcing holistic utilisation of ITFCs and creating security if there is a period of food scarcity. ITFCs also interlink people to indigenous food systems and knowledge, thus reinforcing the value of ITFCs and connecting nature and culture. As the values of the foods increase, this can lead to social upliftment and crime reduction (Cousins & Witkowski 2015). Increasing autonomy may result from the use of the communities' own seed bank from communities joining together to create food tourism around the ITFCs growing in the area.

ITFCs act as versatile foods, contributing many functions from food for both humans and animals, as well as being a connector to the land and creating a space for adaptive management to take place. Further they could aid to create new policies to readdress past imbalances within society, and emphasise the culture inherent in the production and use of ITFCs, reaffirming the identity of both the individual and the community.

Further studies into ITFCs could revitalise the interest in their usage and provide valuable data on the foods. This invigorates the basis for exploring documentation both verbal and written on these foods, creating a record of past generations. In order to bring about improved indigenous food accessibility and overall food security through addressing the above dynamics, participation of experts on multiple levels is

required (Gakobo & Jere 2016, Johns and Eyzaguirre 2006). This includes stakeholders involving the nation-states' citizens themselves, government, private sector and the health and scientific sectors. Without the greater development and regulatory frameworks for ITFCs, the use and cultivation of ITFCs cannot continue sustainably. Therefore, the ultimate goal is for conservation to be strengthened in order to ensure the sustainable usage of ITFCs (Pichop, Abukutsa-Onyango, Noorani & Nono-Womdim 2016).

Table 7: Social-cultural Benefits

Description	Findings	Location of Study	Author/s & Date	Analysis of Research
ITFCs raises awareness of the value of ITFCs	From best practise, to showing gaps and opportunities for producers, influencing national campaigns and generating effective practices around the foods	Kenya	Borelli et al. (2014);	Qualitative review
		Overview	Rudebjer, Meldrum, Padulosi, Hall & Hermanowicz (2014)	Policy Brief
Traditional food habits expressed and reinforced by holistic utilisation	Allows for the strengthening of cultural identity, community development and collective heritage	Overview	Damman, Eide & Kuhnlein (2008);	Qualitative review on nutrition transition
		Overview	Kuhnlein, Erasmus, Spigelski & Burlingame (2013);	Assessment for interventions and policy
		Overview	Baskarachary, Yemula, Gavaravarapu & Joshi (2015);	Qualitative review on ITFCs
		South Africa	Mnguni & Giampiccoli (2015);	Qualitative review
		South Africa	Merwe, Cloete & van der Hoeven (2016)	Qualitative review

ITFCs can be a source of novelty food	Particularly for speciality restaurants catering for the tourist trade	Southern Africa	Van Wyk (2011)	Review paper on the potential of ITFCs
ITFCs usage are increased in periods of food scarcity, creating safety nets (hunger survival strategy/ famine foods)	With increased frequency, quantity and number of species used, enriching the populace diet that is available at certain critical times within the year	Southern Ethiopia	Addis, Asfaw & Woldu (2013);	Qualitative review
		Limpopo, South Africa	Mbhenyane, Mushaphi, Mabapa, Makuse, Amey, Nemathaga & Lebese (2013);	Explanatory study on the consumption of ITFCs
		Nigeria	Aworh (2015)	Laboratory analysis
Food processing cooperative within urban regions using ITFCs would contribute towards promoting quality of life	Increased quality of life in a variety of ways, including income, jobs and greater demand for ITFCs	Limpopo, South Africa	Masipa & Jideani (2014)	Qualitative review paper
ITFCs have multiple uses	ITFCs can be used for livestock feed, thirst quenchers and flavourings	Overview of Africa	Bharucha & Pretty (2010)	Qualitative review paper
Close connection to land due to the awareness of ITFCs creates continued adaptive management	This knowledge and understanding is encoded into stories, norms, rules and institutions	Overview of Africa	Bharucha & Pretty (2010)	Qualitative review paper
The manifestation of indigenous food sovereignty	Therefore, allowing for a greater awareness and power	Eastern Cape, South Africa	Majova (2011)	Qualitative review

has developed its own definition of policy and rights	associated with ITFCs			
ITFCs have high social value	This is with regard to ITFCs being presented to guests at weddings and other ceremonies	Northern Namibia	Cheikhy-oussef & Embashu (2013)	Ethnobotanical survey
ITFCs can strengthen the role of women's identity	Women care for and cultivate ITFCs, therefore making a lot of money and so improving their position in society	Benin	Dansi, Vodouhe, Azokpota, Yedomonhan, Assogba, Adjatin, Loko, Dossou-Aminon & Akpagana (2012)	Qualitative review and survey
ITFCs are interlinked with indigenous food systems	This represents sustainable livelihoods, biodiversity conservation and traditions. An approach that could play an important role in addressing global food requirements	Overview	IFAD (2015);	Policy report
		Overview	IFAD RDR (2016)	Rural development report
ITFCs and the gardens where they occur help with social upliftment and crime reduction	By enhancing and strengthening social contact, although this is not necessarily experienced equally	Cape Town, South Africa	Gerster-Bentaya, Rocha & Barth (2011);	Fact finding mission
		South Africa	Cousins & Witkowski (2015)	Qualitative review
An efficient interaction	ITFCs and their food	Overview of Africa	Bharucha & Pretty (2010);	Qualitative review paper

between local knowledge and the nutritional value of ITFCs	systems create a balance between nature and culture	Overview	Suttie & Lesa (2015)	Literature review
ITFCs provide a living link with the land	"a keystone of culture"	Overview	Bacchetta et al. (2016)	Qualitative review
The upsurge in ethnobotanical studies adds impetus	Revitalising the use of ITFCs	Eastern Cape, South Africa	Kwinana-Mandindi (2014)	Ethnobotanical survey of Indigenous Wild Leafy Vegetables (IWLV)
ITFCs may provide a basis for local seed banks	Creation of farmer seed autonomy	Sub-Saharan Africa	Jaenicke & Höschle-Zeledon (2008)	Strategic Framework for Research and Development
ITFCs contribute to promoting healthy environments	For people's inner wellness offering psychological benefit	Africa	Borlaug et al. (2008)	Field analysis and review
Food tourism is of increasing relevance	Local culture becomes a tourism resource using ITFCs and encourages adventurous chefs and entrepreneurs to invest in local cuisine. ITFCs therefore will enhance local community 'brand identity'	Mpondoland, South Africa	Giampiccoli & Kalis (2012);	Qualitative review
		South Africa	Mnguni & Giampiccoli (2015)	Qualitative review
Rehabilitation of ITFC areas creates a sentiment of imbalances being addressed	Imbalances refer to the Apartheid era, which made many feel displaced in their own homes and places of	Cape Town, South Africa	Allsopp, Anderson, Holmes, Melin & O'Farrell (2014)	Qualitative review

	residence			
The use of documentation of ITFCs helps preserve the knowledge and prevents a loss of valuable information	This would make a large contribution to literature and knowledge, benefitting communities through easy access to information on the medicinal uses and allowing greater awareness of ITFCs	Benin	Dansi, Vodouhe, Azokpota, Yedomonhan, Assogba, Adjatin, Loko, Dossou-Aminon & Akpagana (2012);	Qualitative review and survey
		Ghana	Demi (2014)	Qualitative review thesis
ITFCs provide a 'hidden harvest'	Use of ITFCs as co-evolving species to supplement both earnings and food	Overview of Africa	Bharucha & Pretty (2010)	Qualitative review paper
Cultures are adapted to localities and so offer greater resilience	Therefore, communities are configured to a range of livelihoods and land use which is best suited for their resources and capabilities	Overview of Africa	Bharucha & Pretty (2010)	Qualitative review paper
ITFCs reaffirm identity	Providing assurance of the connection between nature and culture, mind and heart, foundation for cultural identity and a basis for social support networks	Overview	Kuhnlein, Erasmus, Spigelski & Burlingame (2013)	Assessment for interventions and policy

2.3.2. Potential Challenges

It is necessary to go beyond the benefits mentioned above, as they do not give a full picture of ITFCs within the food system. The following challenges serve to highlight some of the constraints and difficulties placed on ITFCs. Thirty-five challenges were recorded, of which there were 6 nutritional challenges, 10 environmental and 19 social-cultural challenges.

Table 8-11 looks at the various challenges respectively, Table 8 focuses on the nutritional challenges, whereas Table 9 looks at the environmental challenges, Table 10 at the economic challenges and Table 11 the social-cultural challenges. Table 8 explores the nutritional challenges as well as Table 25 in addendum A which illustrates the nutritional challenges of ITFCs outside the African continent. The nutritional challenges are the unpalatable and sometimes bitter taste of some ITFCs, with some ITFCs being difficult to process with regard to dehusking and threshing. Some ITFCs display a lack of change through preparation, such as a peculiar colour which remains even after cooking. What further constrains the use of ITFCs is the lack of recipes to follow as guidelines (Pudasaini, Sthapit, Gauchan, Bhandari, Joshi & Sthapit 2016).

Table 8: Nutritional Challenges

Description	Findings	Location of Study	Author/s & Date	Analysis of Research
Some ITFCs have a characteristic bitterness	This may be an indication of the presence of alkaloids, which can negatively influence the consumers acceptability of ITFCs	Sun-Saharan Africa	Uusiku, Oelofse, Duodu, Bester & Faber (2010)	Nutrient analysis
Limited availability or access to ITFCs	That leads to the underutilisation of ITFCs	South Africa	Maseko, Mabhaudhi, Tesfay, Araya, Fezzehazion & Du Plooy (2018)	Qualitative systematic review
People and the youth in particular do not have enough	With instances of ITFCs is mixed with poisonous species	South Africa	Maseko, Mabhaudhi, Tesfay, Araya, Fezzehazion	Qualitative systematic review

knowledge of wild species to harvest from the wild			& Du Plooy (2018)	
High perishability as fresh ITFCs	Therefore, it is one of the main constraint to increased production, marketing and consumption	South Africa	Maseko, Mabhaudhi, Tesfay, Araya, Fezzehazion & Du Plooy (2018)	Qualitative systematic review

Table 9 explores the different environmental challenges recorded, Table 26 in addendum A illustrates the environmental benefits of ITFCs outside the African continent. Exotic crops often lack resilience in the foreign systems in which they are grown, indicating that indigenous crops such as barley, millet and sorghum can be more resilient to changes in climate and environment than exotic crops (Oiye et al. 2009). However, climate change also affects ITFCs, but the extent of this has not been studied in depth yet. This can be seen with various issues noted with the growth of ITFCs. Several reasons can be put forward to explain the neglect of these foods. First, the number of species involved is vast. Second, many species are poorly known and/or are only used locally (Chweya & Eyzaguirre 1999).

van der Merwe, Kruger and De Beer (2011) note more reasons of neglect, because of issues of cultivation and too many other environmental challenges that are interrelated. For example, the decline in the use of ITFCs limits the knowledge space of people ~~of~~ on how to overcome the challenges of cultivation. As Cernansky (2015:148) states “A main focus has been basic problems such as difficulties with germination and a lack of information about how best to store seeds. Indigenous vegetables are not up to modern farming standards for characteristics such as uniformity of seeds and yield, so there is a lot of catching up to do”.

Also, acute water shortage due to climate change affects cultivation efforts. Farming systems using large amounts of chemicals, that negatively affect the soil as well as other soil degrading practices, have a negative impact on naturally growing ITFCs nearby. Although the foraging of wild foods or ITFCs illustrates the need for an alternative food source, it will, in the long term, decrease the amount and diversity of

naturally occurring ITFCs. Moreover, over-harvesting decreases availability, influencing the predictability of ITFCs availability and therefore food security of those who use it consistently (Bharucha & Pretty 2010; Van Wyk 2011).

Table 9: Environmental Challenges

Description	Findings	Location of Study	Author/s & Date	Analysis of Research
Issues of cultivation	A lack of sufficient rainfall, deforestation, pests, poor soil quality, seed dormancy, low yields, poor storage management, diseases, poor crop establishment, the presence of anti-nutrient factors and over-harvesting are general problems but account for major cultivation problems for ITFCs	North West, South Africa	Matenge, van der Merwe, Kruger & De Beer (2011);	Qualitative review on utilisation of ITFCs
		Sub-Saharan Africa	Mabhaudhi, Chimonyo & Modi (2017)	Quantitative and qualitative review
Decline in the use of ITFCs	In part due to low accessibility of these foods, which indicates this might be a potential challenge in the future	Africa	Gakobo & Jere (2016)	An application of the theory of planned behaviour
Seeds for most of the ITFCs is not readily available on the market		South Africa	Mabhaudhi & Modi (2016)	Qualitative review
The decline in the supply of ITFCs	Suggested to be due to a reliance on exotic foods as being	South Africa	Mavengahama, McLachlan & de Clercq (2013)	Qualitative review

within South Africa	perceived as something more fashionable to consume			
ITFCs' natural habitat is frequently threatened	Through unsustainable harvesting, largely due to population pressure resulting in a high rate of biodiversity loss	Sub-Saharan Africa	Jaenicke & Höschle-Zeledon (2008);	Strategic Framework for Research and Development
		Overview	Kuhnlein, Erasmus, Spigelski & Burlingame (2013)	Assessment for interventions and policy
ITFCs are routinely neglected	There is the danger of neglecting local knowledge that sustains food system pathways and provisioning of the ecosystem	Overview of Africa	Bharucha & Pretty (2010)	Qualitative review
Limited knowledge on the nutritional value		Limpopo, South Africa	Nepfumbad &, Mashamba-Thompson (2017)	Qualitative review questionnaire
Climate change	Creates unpredictable weather changes from extreme droughts to floods	Kenya	Oiye, Simel, Oniang'o & Johns (2009);	Qualitative review
		Overview	Kuhnlein, Erasmus, Spigelski & Burlingame (2013)	Assessment for interventions and policy
Decline in soil quality	Influences soil fertility, as well as greater soil loss, ultimately negatively affecting indigenous crops	Kenya	Oiye, Simel, Oniang'o & Johns (2009);	Qualitative review
		Nigeria	Okeke, Ene-Ebong, Uzuegbunam, Ozioko, Umeh, & Chukwuone (2009);	Qualitative review
		Overview	Kuhnlein, Erasmus, Spigelski & Burlingame (2013)	Assessment for interventions and policy
Contaminati	Chemical	Overview	Kuhnlein,	Assessment

on of the food system at various levels	contamination (herbicides, pesticides, fertilisers) and pollution from industrial development can decrease the ability of foods to grow, including ITFCs		Erasmus, Spigelski & Burlingame (2013)	for interventions and policy
Acute water shortages		Kenya	Oiye, Simel, Oniang'o & Johns (2009)	Qualitative review
Loss of genetic diversity and knowledge	Increased mechanization, demands and expectations of modern FSC[5] lead farmers to focus on fewer and fewer crops.	Overview	Padulosi, Thompson & Rodebjer (2013)	Qualitative review

Table 10 shows the economic challenges posed by using and growing ITFCs. Table 27 (Addendum A) illustrates these challenges in a global context. The image of ITFCs on the global market is perceived negatively, though may be positively influenced with proper packaging, improving the acceptability, preference and consumption of ITFCs (Maseko, Mabhaudhi, Tesfay, Araya, Fezzehazion & Du Plooy 2018).

Further, ITFCs consumption is "…influenced by price, culture, seasonality/availability, accessibility and diversity in markets" (Matenge, van der Merwe, Kruger & De Beer 2011:17). ITFCs are predominately accessed in urban areas through the informal market; however, the limited accessibility of ITFCs in both the formal and informal market has hindered cultivation on a larger scale (Matenge, van der Merwe, Kruger & De Beer 2011).

Local market trends are often influenced by wider global tendencies, from the support of industrial farming, volatility of the import/export market and globalisation. "In the current context of unpredictable oil prices and weakness in global financial and

[5] (FSC) Food Supply Chain

economic systems, and one in which climate change is expected to have an ever-increasing impact on agricultural production.", the need for economic challenges in terms of ITFCs must be investigated (Shackleton, Pasquini & Drescher 2009:3).

Table 10: Economic Challenges

Description	Findings	Location of Study	Author/s & Date	Analysis of Research
Lack of connection between ITFCs and a significant value chain and market	A strain is placed on the cultivation and utilisation of ITFCs	North West, South Africa	Matenge, van der Merwe, Kruger & De Beer (2011);	Qualitative review on utilisation of ITFCs
		Overview	Padulosi, Thompson & Rodebjer (2013);	Qualitative review
		Overview	FAO (2016);	Qualitative report
		South Africa	Mabhaudhi, Chimonyo & Modi (2017);	Quantitative and qualitative review
		Limpopo, South Africa	Nepfumbada, Jama & Mashamba-Thompson (2017)	Qualitative study encompassing in-depth interviews
Infrequent and rareness of ITFCs stocked in supermarket further decreases the consumption of these foods		South Africa	Maseko, Mabhaudhi, Tesfay, Araya, Fezzehazion & Du Plooy (2018)	Qualitative systematic review
Global trends of industriali-sation with the expansion of an industrial agriculture, monoculture, and the market economy can and has had devastating impacts	This is apparent with the development intervention s in Africa as well as with the lack of growth of ITFCs and the food systems alike	Africa	Shackleton, Pasquini & Drescher (2009)	Qualitative review
Prioritisation of commodity exports can	This occurs instead of utilising	Overview	FAO, IFAD & WFP (2015)	Review paper on food security

divert resources and land	often superior nutritional value of ITFCs			
The wider negative economic forces and external market influences are resulting in negative globalisation trends	Increased economic opportunities for a restricted number of commodities, has led to the marginalisation of local agrobio-diversity, including ITFCs	Africa	Shackleton, Pasquini & Drescher (2009)	Qualitative review

Social-cultural challenges, shown in Table 11 below, are in line with people values and behaviour towards food, with many experiencing ITFCs as a poor man's food, old-fashioned, or as weeds. Table 28 in addendum A illustrates the social-cultural challenges of ITFCs outside the African continent. This has also been seen elsewhere in the world and the challenge stated by Powell in Van Vark's (2013:1) article as: "Promoting the consumption of wild foods to counter negative perceptions and attitudes to local, traditional foods, triggering a behavioural change, requires strong awareness-raising through extension services, NGOs, schools, hospitals and health centres".

The greatest challenge to ITFC usage is their perception and the difference between intention to use and the actual practises in usage. As Mabhaudhi, Chibarabada and Modi (2016:10) state "Each time people choose food, they bring their past food choices, events, experiences, thoughts and feelings as well as historical context to the fore". This was investigated by Gakobo and Jere (2016), who did a study to identify consumer attitudes as the strongest predictor of consumption intention in Nairobi, Kenya. The findings illustrate that the intention to consume ITFCs is high, and so Gakobo and Jere (2016) determined that the consumption of ITFCs should increase. However, when this was correlated with people using ITFCs, it was found that the use

of ITFCs was actually decreasing. They concluded that for this to change, marketing practitioners and policy makers will need to understand the intention and behaviour of potential consumers of ITFCs (Gakobo & Jere (2016). Most communities and stakeholders thought that the frequency of use has declined in part because "…modernisation has led people to perceive IF (*indigenous foods*) as inferior" (Gundo 2017:49). Zobolo, Mkabela and Mtwetwa (2008) suggest that the perception and acceptability of ITFCs will change with large scale cultivation of ITFCs.

Authors such as Mushita and Thompson (2013) noted that African farmers have the farming techniques and systems already in place to sustain ITFCs and biodiversity. They argue that in the midst of increasing climate change events and policy persuasion, the international calls to mitigate and adapt with GMO's and industrial farming methods is unthinkable. Rather, alternative methods of cultivating and using food are the solutions to the current food system paradigm. Nevertheless, according to Kikuchi, Haneishi, Tokida, Maruyama, Asea and Tsuboi (2016), consideration should be given to indigenous food markets. There are two schools of thought on this: one camp affirms that indigenous food markets are insufficient and exploitive, while the second camp believes that it functions well.

Further concerns are the preservation of ITFCs. During times of low availability of ITFCs, there has been some experimentation on how to preserve these foods. Van der Hoeven, Osei, Greeff Kruger, Faber and Smuts (2013) found that storage of ITFCs (*Amaranthus spp., Cleome gynandra, Cucurbita maxima, Vigna unguiculata and Beta vulgaris*) was accomplished through washing, then some foods are made into a paste, and shaped into a ball, afterwards the food are dried in the sun, followed by storing in sacks, or alternatively just blanching the foods. Afterwards, the dried ingredients can be boiled to accompany a starch dish, or boiled as harvested. However, many have used different techniques such as supplementing ITFCs with retail foods, or using ITFCs and peanut butter together to create a soup (Majova 2011). Some ITFCs are processed into jams, pickled preserves, liquors, beer, wines (Taylor, Schober & Bean 2006; Pichop, Abukutsa-Onyango, Noorani & Nono-Womdim 2016).

Table 11: Social-cultural Challenges

Description	Findings	Location of Study	Author/s & Date	Analysis of Research
Many people who are in contact with ITFCs perceive them as a 'poor man's food'	ITFCs are associated with poverty and low self-esteem; social perceptions of the usage of ITFCs may hamper the progress and marketability of these foods in South Africa	Kenya	Keatinge et al. (2012);	Qualitative review
		North West, South Africa	Cloete & Idsardi (2013);	Qualitative review
		South Africa	Mabhaudhi, Chibarabada & Modi (2017);	Trans-disciplinary review
		South Africa	Maseko, Mabhaudhi, Tesfay, Araya, Fezzehazion & Du Plooy (2018)	Qualitative systematic review
Undervaluation of ITFCs	This has occurred because of lack of knowledge of and/or research into ITFCs	Overview	Padulosi, Thompson & Rodebjer (2013)	Qualitative review
Lack of funding for research in ITFCs which translates into a little impact for future use of ITFCs		South Africa	Mabhaudhi, Chimonyo, Chibarabada & Modi (2017)	Sequel to an initial study
ITFCs are perceived as weeds	Especially imifino (African Leafy Vegetables (AVLV's)) have been seen as a 'weed' that needs to be eliminated	South Africa	Mnguni & Giampiccoli (2015)	Qualitative review
ITFCs are perceived as an old-fashioned food and subjected to a backward knowledge	Younger generations show reluctance to learn about ITFCs and associate negative	Eastern Cape, South Africa	Majova (2011);	Qualitative review
		North West, South Africa	Cloete & Idsardi (2013);	Qualitative review
		Ghana	Demi (2014);	Qualitative review thesis
		South Africa	van der Merwe,	Qualitative

	attitudes towards it		Cloete & van der Hoeven (2016)	review
ITFCs are being ignored by bureaucracy	Negative changes in agricultural practices are occurring due to government and policy ignoring ITFCs	Morocco	Powell, Ouarghidi, Johns, Tattou & Eyzaguirre (2014)	Qualitative review and case study research
ITFCs are seen to require knowledge to prepare and consume	In conjunction with rapid urbanisation, labour migration and promotion of cash crop production, the preference for novelty convenience food increases	Overview of South Africa	Mavengahama, McLachlan & de Clercq (2013);	Qualitative review
		North West, South Africa	Cloete & Idsardi (2013)	Qualitative review
The processing methods for ITFCs are labour intensive	However, Raheem states that this can improve with the adoption of modern technologies and techniques to minimise loss of quality, increase the shelf life of ITFCs, and the continued encourage-ment of consumption	Africa	Raheem (2011)	Qualitative review
Lack of cultivation of ITFCs in urban areas	This indicates that there may be a lack of incentive to grow ITFCs in the urban setting	North West, South Africa	Matenge, van der Merwe, Kruger & De Beer (2011)	Qualitative review on utilisation of ITFCs
Inadequate initiative from governmental	Policy gaps that hinder innovation and	Overview	Padulosi, Thompson & Rodebjer	Qualitative review

sectors	marginalise indigenous seeds and foods		(2013)	
Information on ITFCs in the Southern African Development Community (SADC) region is sparse	Lack of clarity on what are ITFCs is part of the problem	SADC region	Mabhaudhi, O'Reilly, Walker & Mwale (2016)	Qualitative review

The lack of land available in the urban and rural sprawl creates not only a deficit in land for exotic crops but also for ITFCs. The farming of ITFCs becomes a costly endeavour with the increase in globalisation trends of modern farming and external market forces. Maundu, Muiruri and Adeka (2013:4) state the change of food ways as follows "in many countries, because of globalization, modernization and urbanization, traditional foodways are being abandoned for western style foodways".

2.4. Conclusion

Mbhenyane (2016:3) states that "underutilised indigenous crops provide an opportunity for incorporation of alternative sources into… the food system". The food system as a whole is experiencing greater possibilities for alternatives than previously. Alternatives such as ITFCs and their benefits across the range of environmental, economic, social-cultural and nutritional aspects are more than a 'conventional' alternative (an alternative which is based on solving a problem within the system and not seeing the system itself as a problem). Rather, they might be seen as an alternative that addresses a multitude of problems by embracing social justice (Watts, Ilbery & Maye 2005). The current lack of awareness of ITFCs, their affordability, and multitude of benefits offer a potential for successful intervention in the food system (Cloete & Idsardi 2013). Embracing social justice is needed to develop and mitigate strategies from grassroots-level up to addressing poverty, food insecurity, inequality, and social exclusion within the given food system in order to broaden the benefits of ITFCs (Gerster-Bentaya, Rocha & Barth 2009).

Importantly, the systematic literature review has shown that the findings indicate that the benefits of cultivating ITFCs outweigh the challenges. In combination with a steadily rising increase in urban migration and urbanisation in conjunction with climate change and job seeking, the way forward to secure food security lies in alternative food pathways. As a means of being careful to avoid over-exploitation of these ITFCs, Borelli (2015) suggests that farmers and movements should be actively engaged in the domestication of these plants. Implementation of ITFCs could positively impact food security by introducing these foods in emerging community gardens.

Diversifying diets in Africa with ITFCs is a sustainable way in which to supply both micronutrients and essential nutrients to fight off malnutrition and the associated health problems, particularly for poor households (Ojiewo, Tenkouano, Hughes & Keatinge 2013). It is vital to equip stakeholders of ITFCs with knowledge regarding the appropriate use of ITFCs.

Indigenous food production, harvesting and cultivation require the support, cooperation and collaboration of government to practise a different management system to sustain alternative sources of food (Kuhnlein, Erasmus, Spigelski & Burlingame 2013). In the book '**A culinary journey of South African Indigenous foods**' the Minister of Arts and Culture of South Africa, Paul Mashantile, notes that "we hope to bring to the fore nutrition as well as social-cultural benefits that can be derived from the consumption of indigenous foods and drinks" (Thema-Sethoga & Moroane-Kgomo 2015). Nevertheless, it is not only the role of governments to alleviate the unsustainability of the food system, but also the food system in itself must "shift from being part of the problem to becoming a greater part of the solution" (Voegele & Sennhauser 2016:5).

Chapter 3 – The contribution of urban community gardens to invigorate indigenous foods in the broader food system: A case study of the Western Cape

Keywords: Community Gardens, Western Cape, ITFCs

3.1. Introduction

Kehlenbeck, Asaah and Jamnadass (2013) have shown that there is high potential for ITFCs from different African regions to undergo domestication followed by on-farm production. As illustrated in the previous chapter, ITFCs have been used with greater frequency in Africa than in South Africa due to negative associations of poverty and low self-esteem (Modi, Modi & Hendriks 2006). Although the value of ITFCs has been continuously underestimated and neglected for what they can provide as a food and nutrition security mechanism, especially with the increase in the nutrition transition, it is vital for the increased awareness and usage of ITFCs. ITFCs are nutritionally, economically, environmentally and socio-culturally more resilient and therefore demonstrate alternative food sources in the food system.

Mbhenyane (2016) proposes that the use of locally available ITFCs should be part of South Africa's frontline intervention strategy in the face of the nutrition transition. Furthermore, it is imperative that appropriate and culturally acceptable food system interventions should be researched and developed, with the full participation of communities (Kuhnlein 2013).

The history of South Africa is certainly the biggest contributing factor to economic and social inequalities some of which remain, and constitute the Western Cape's most prominent challenges. The Western Cape is the second richest province in South Africa, nestling in the southernmost region in Africa with a coastline bordering the Atlantic and the Indian ocean. However, the province is afflicted, as is the rest of South Africa, with an increase in migration, a widening inequality gap and a high unemployment rate with a mismatch in skills and jobs available (Western Cape 2005). This has created numerous food system-related problems, including food and nutrition insecurity. This includes droughts exacerbated by climate change, the price increase of food, limited land ownership by the poorest, rapid urbanisation and population growth, water demand exceeding supply, urban poverty and inequality (van der

Merwe 2017). Furthermore, a lack of knowledge of which foods could thrive in the Western Cape with its annual winter rainfall season has created a severe shortage of food.

In 2016- 2017, the Western Cape has experienced a severe drought that led to the region being declared a disaster area (Dentlinger 2017). The implications of the drought include inflation of short-term crops prices (du Preez 2017). The Provincial Review of 2016, the Real Economic Bulletin (REB) stated that the Western Cape provides 14% of the GDP of South Africa, with the agricultural sector contributing 4%, and that exports from the Western Cape are still predominately agricultural products. This means that maintaining food security for the province will be difficult, and as prices increase the access to food will decrease for poorer households. Challenges like the drought highlight the importance of developing more resilient strategies for agriculture and food security in the region. This chapter proposes that ITFCs are an important strategy to pursue in the Western Cape, using community gardens as illustrative examples of how they can be incorporated into the local food system.

The overall aim of this chapter is to investigate different emerging community gardens in the Western Cape that are using or intending to use ITFCs and to find out why they have been established. The questions addressed in this chapter are: a) what are the benefits and challenges perceived by those interacting with ITFCs in these community gardens and b) what could the future hold for potential cultivation and the increased use of ITFCs.

This chapter analyses interviews conducted with a multitude of stakeholders working both directly and indirectly with ITFCs in the Western Cape. The aim of the research is to provide a comprehensive list of both benefits and challenges, nutritionally, environmentally, economically and social-culturally. Thus, to identify a selection of community gardens which are starting or have started, to use and grow a range of winter rainfall seasonal foods that are well adapted to their local poor sandy soils and rainfall conditions. The seasonal winter rainfall indigenous foods being cultivated in these gardens stand in contrast to summer seasonal rainfall ITFCs which are predominately African Leafy Vegetables (ALVs) (mostly covered in the available

literature), which are not as climatically suitable for cultivation in the Western Cape. This chapter concludes with future recommendations for both gaps in research and where further research is required.

3.2. Emerging Community Gardens

The community gardens in the late 20th century started in Europe and North America in response to food and financial insecurity, crises and times of war and conflict (Samková 2013). Since the 20th century, community gardens have evolved for various other reasons. These include the community gardens in the Western Cape. Samková (2013) found the main drivers for starting community gardens are to enhance neighbourhood social interaction and encourage mutual cooperation between the communities through the planting and harvesting of food. Community gardens came to represent a space where people came together to make things happen, i.e. galvanise social action and/or support food sovereignty and food independence (Nettle 2014). As such, emerging community gardens may be used as an indicator for not only community needs, but specifically the food needs of the community.

Authors such as Ferris, Norman and Sempik (2011) suggest that to impose a definition of a community garden is not a desirable gaol (Samková 2013). This would impose arbitrary limits on both local needs and the creative community response to these needs. A community garden can therefore be defined broadly as a piece of land gardened by a group of people (ACGA n.d.). Community garden is defined in part by a community where there is "a shared common interest or a set of characteristics" of a group of people (Hawtin & Percy-Smith 2007:7). More broadly, the community garden "can be urban, suburban, or rural". It can grow flowers or vegetables for a community. It can be one community plot, or can be many individual plots. It can be at a school, hospital, or in a neighbourhood. It can also be a series of plots dedicated to 'urban agriculture' where the produce is grown for a market" (American Community Gardening Association- AGCA 2008). The practice of community gardens has always been part of African tradition and culture (Chazovachii, Mutami & Bowora 2013), albeit underreported for historical reasons.

Community gardens using ITFCs are emerging within South Africa and worldwide. However, their utilisation in terms of food production, urban greening, and ecosystem restoration is only sometimes documented (Samková 2013). While there are numerous benefits with emerging community gardens they also pose challenges, such as a lack of funding and keeping the same members involved in the gardens and "escalating land use competition" (Pudup, 2008:1232). The benefits should be seen in terms of their increasing importance in society and for the environment, in the context of an industrialised food system, urbanisation, large population growth, global climate change and environmental degradation (Cousins & Witkowski 2015).

In Figure 5, the benefits of the community gardens are illustrated, showing the general consensus of benefits perceived with regard to ITFCs. The diagram illustrates the benefits of a shared gardening project on a community level. These benefits range from environmental, nutritional, health, education, to social and civic spheres, government and community arts and deepening of culture.

Figure 5: Benefits of Community Gardens (Mudzinganyama 2012:11).

Urban gardening can be understood as a specific form of gardening under the broader umbrella of community gardens in the urban areas (Samková 2013). "Faced with a diminishing natural resource base, climate change and inequalities of access of opportunities and income, the need to build pathways to more sustainable systems of food production and consumption is imperative" (Suttie & Lesa 2015:9). These

gardens are a more sustainable pathway to food production because it involves people without land to produce food, it is more productive than large-scale farming, it creates a food safety net through its produce and can provide a significant source of income (Gardendallas n.d.).

According to Crush, Hovorka and Tevera (2010) an estimated 5% of households are involved in urban farming and food production in Cape Town, which in comparison to other African cities is seen as extremely low. If the routine underestimation of ITFCs continues, it can lead to a further disregard of the systems that could sustain the trend of urban farming and so ITFCs. This highlights the importance of the community gardens that are emerging within the Western Cape.

The purpose of the exploratory study was to investigate why the community gardens have been established and why they are using or intending to use ITFCs. This was done through semi-structured interviews. The geographic research area comprised 8 community gardens in the Western Cape ranging from Cape Town and Gansbaai to the Cederberg region.

3.3. Study Area

Though South Africa as a country presently produces enough food, there are problems of access and availability at the household level in many areas. This results in South Africa being particularly prone to challenges of malnutrition, hunger and unsustainable food practices from farm to fork (De Cock et al. 2013). This can be seen in all nine provinces, including the Western Cape. The image below is a map of South Africa, with the Western Cape highlighted.

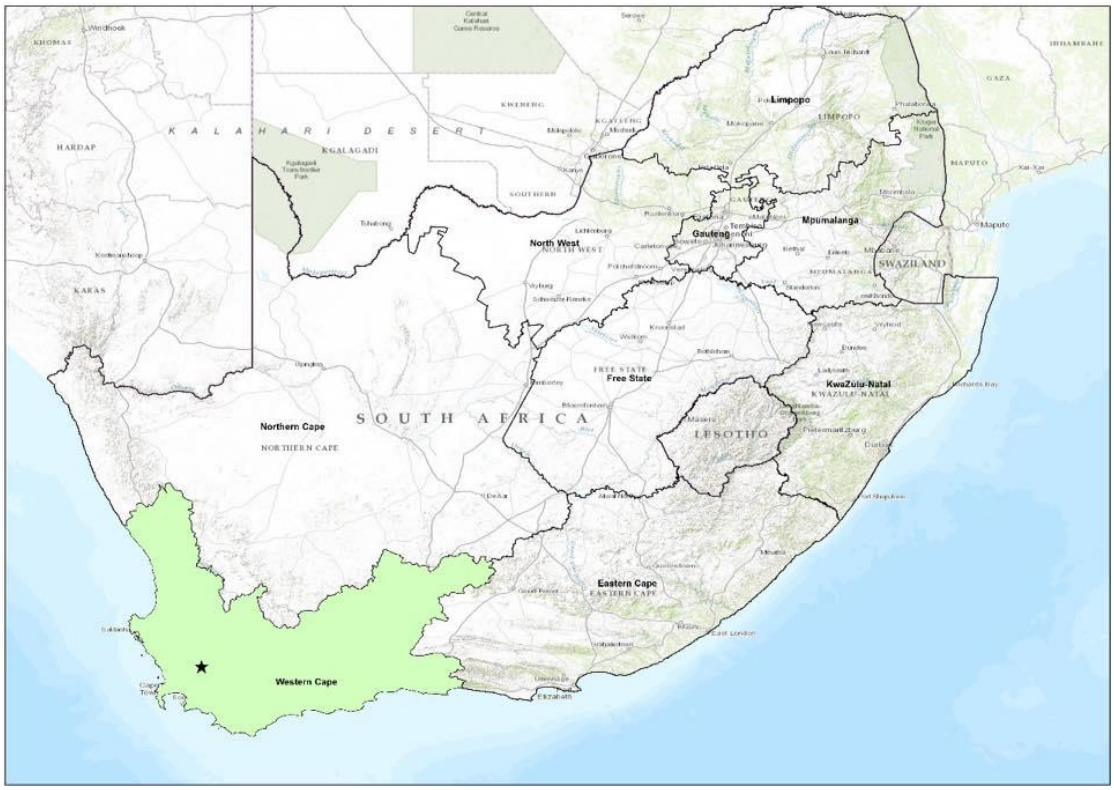

Figure 6: Map of South Africa, Highlighting the given Study Area (CSIR n.d.).

The Western Cape Province in South Africa is approximately 129,462 square kilometres in size, with an average rainfall of 650 mm per year. The Western Cape has an estimate 76.4% - 79.5% employment rate, 232 000 people are employed in the agriculture sector (REB 2016; WCG 2017). The City of Cape Town is 2445 square kilometres, in size. Within the Western Cape 60% of the provinces 4 million inhabitants live within the City of Cape Town. Cape Town plays a key role as the economic centre of the Western Cape (WCG 2016). However, 80% of Cape Town's population living in the poorer parts of the city are chronically food insecure, and 38% of households live below the poverty line (Gerster-Bentaya, Rocha & Barth 2011).

The study frame for the community gardens was identified with the help of knowledgeable key individuals with long-term experience in urban farming as key informants. These individuals allowed nonprobability sampling technique with the use of snow-ball sampling through the existing study key individual (interviewees) which recruit future subjects from among their acquaintances. These acquaintances were selected based on the principle of stratified sampling, the subset of the population that share at least one common characteristic (i.e. ITFCs) (Bryman & Bell 2014). The

gardens where selected by their connection to relevant stakeholders within the community of ITFCs as well as the ease of access within time and funding limitation and willingness of interviewees to participate. These community gardens are not representative of all community gardens in the Western Cape using ITFCs, however, these provided a range of gardens at various stages of using ITFCs.

The community gardens identified in the study range from those still in the process of being established, to those that act as pilot studies to test the viability of the cultivation of indigenous foods, and lastly those that are already established and serving the community. The community gardens in their start-up phases are the Indigenous Food Garden, Sustainability Institute in Lynedoch; Beacon organic garden, Beacon School for LSEN in Mitchells Plain; Village Heights community garden, Village Heights in Lavender Hill; and the Ravenello Garden, Oude Molen Eco Village in Pinelands. The established gardens are the Dik Delta Garden, Solms Delta in Groot Drakenstein; Masakhane Community Garden, Grootbos in Gansbaai; Cape Wild Food Garden, at Moya we Khaya Community Garden in Khayelitsha; and Ikhaya Food Garden, Isikhokelo Primary School in Site C, Khayelitsha. See Addendum C for list of indigenous plants existing and planted at the community gardens. Figure 7 below demonstrates the various locations of the community gardens within the Western Cape.

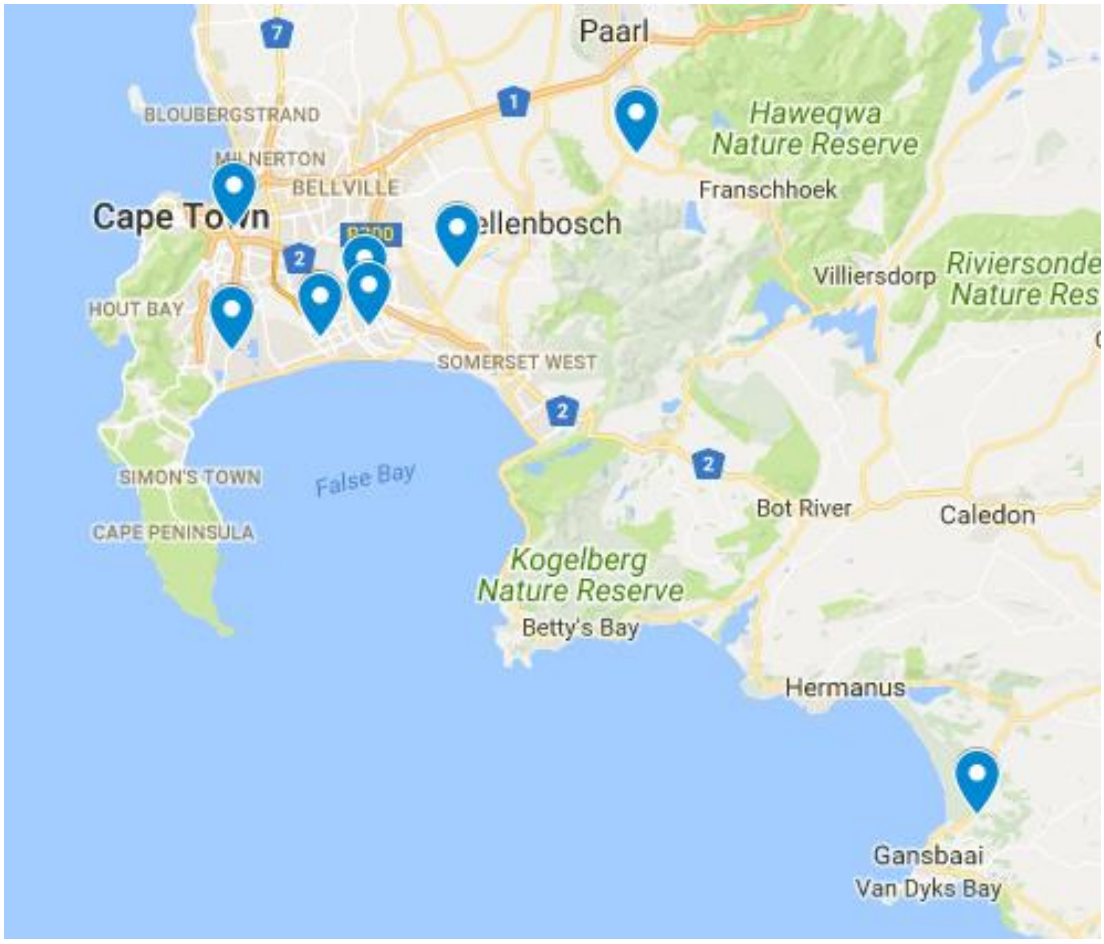

Figure 7: Location of the Community Gardens examined in the Western Cape (Google Maps 2017)

In total 8 emerging community gardens growing or intending to grow ITFCs were investigated in the case study. Each garden had its own reasons for being established, as well as different perceived benefits and challenges in establishing and continuing with the gardens.

3.4. Methodology

The research approach was of a qualitative nature, focusing on using an exploratory study to gain new insight and which is extrapolated into central constructs of ITFCs. The exploratory study was used to demonstrate causality between central themes from literature and data gathered in the fieldwork (Saldaña 2009). The case study approach is used to build a theory of why the selected community gardens are using ITFCs (Thomas 2016).

A case study is defined as ideographic research, a method employed to study individuals rather than a sample of a region's population. This method is employed to explore new ideas through careful and detailed observation and analysis (van der Merwe 1996; du Toit 2010). The limitations of using the case study are that the research cannot be generalised from one case study to another. For this reason, a range of gardens with different approaches were investigated.

A further limitation sighted in the literature was the difficulty in determining casual links due to the complexity of the system, which may cause problems with the validity of the Study. The case study however allows for the phenomenon of community gardens using ITFCs to be investigated in a detailed manner. This method includes a multifaceted view using different representatives of the wider population in the community gardens to establish a tentative representative sampling that offers rich insight of why these gardens are emerging and why these community gardens may grow in the future (Thomas 2016).

3.4.1. Data collection Approach

The date collection approach was employed to discover the different benefits and challenges that the researched community gardens experience. The community gardens were investigated due to their usage of ITFCs in comparison to other community gardens growing and solely using exotic foods. The area of interest is on the introduction of ITFCs into these gardens within a specific period (2015- current), signalling a relevant potential transition to include more ITFCs (Williams & Vogt 2011).

3.4.1.1 Semi-structured Interviews

The interview process aims at providing access to the social world of ITFCs through both the interviewee as an individual and in their broader experiences and interactions with ITFCs and the food system (Silverman 2016). This approach is used due to its validation of the interviewee's subjective experience and to understand the outcome of interaction with interviewees (Thomas 2016). The approach to the interview was an interpretive approach/inquiry for studying the community gardens and the people interacting with it to investigate the attributes and usage of ITFCs (Thomas 2016).

Thirty-nine interviews were tape-recorded, with one interviewee who was uncomfortable being recorded, thus, detailed notes were taken instead. The tape-recorded interviews allowed for the preservation of the words spoken by the interviewee and for the interviewer to return at any time to the source to re-check and re-listen to the interviews and to improve the interview technique used.

3.4.1.2 Participant Observation

Participant observation is where the researcher becomes fully involved in the setting being studied. Participant observation remains focused on the research question, but allows for unexpected information to arise through participating in gardening or general conversations both directly and indirectly related to the community gardens. Thus, the researcher observes in a participant stance that enables further field notes that record the observations perceived (Blanche & Durrheim 1999; Kawulich 2005). The data were interpreted through empathetic understanding to contextualise "behaviours, intentions, situations, and events as understood by one's informants" (Kawulich 2005:4).

3.4.3. Access and Research Partners

The use of established stakeholders (experiencing wide spread acceptance by the community garden groups) enabled wider connections with additional stakeholders within the indigenous food realm in the Western Cape. These individuals operate as a link between different facets within the garden and the different interactions outside the garden (farmer, chef etc.). Thus, while being embedded within the garden they are able to stand outside the community garden sufficiently to explain what is going on.

The study aimed to identify the viability and future of community gardens not only from a farming perspective, but also included different actors who would validate the future use of ITFCs along the value chain. The farmers have the most direct connection with ITFCs in the emerging community gardens. However, it is essential to review the indirect connections, i.e. conservationist (who was able to clarify the rules and regulations which both inhibit and promote the use and growth of ITFCs) or the chefs who work with both the garden and the consumer), academics (having both direct contact with the gardens as well as providing a connection between the practical use of ITFCs and a comprehensive understanding of existing literature) and

advisors, botanist, project managers and landscaper who ~~all~~ are all involved in and/or worked with either one or more of the gardens.

3.4.4. Data Gathering and Analysis

The case study aimed to assemble the actual perceived benefits and challenges of emerging community gardens in its current state. The research employed, qualitative methodology, was used which supports nuanced descriptions, allowing for flexibility and provided specific information (e.g. stories or examples of the benefits of ITFCs). It also helped to uncover central themes around the food system and the use of ITFCs under nutritional, environmental, economic and social-cultural benefits and challenges (Bryman & Bell 2014). This was done through the use of the case study design to compare different community gardens to see both similarities and differences between the gardens.

To collect data on the community gardens, semi-structured interviews were conducted in both English and Afrikaans. The questionnaire for the interviews included a total of 25 questions, of which 21 were open-ended and 4 were standardised, where interviewees had to choose from possible answers which they thought were apt. This process was used because, as the topic was fairly specific (i.e. ITFCs and the benefits and challenges thereof), it allowed the interviewee leeway in how to reply (Bryman & Bell 2014). The semi-structured interviewing approach was prioritised as it leaves space for more dynamic interviews and is suitable for exploratory studies because it consists of a combination of pre-determined, open-ended questions (Bryman & Bell 2014).

Furthermore, the interviews were used to probe beyond the literature to access knowledge from interviewees within practical reality (Theron & Saunders 2009). Interviewees were initially sought from those involved within the community gardens themselves, as well as from experts and academics associated within the field of food systems and specifically ITFCs (these interviewees are in the Table 29 in addendum B). Using the snowball sampling technique further interviewees were identified. Although this technique has been criticised for being opportunistic and that it will not provide an apt representation of the population (Arksey & Knight 1999), it does,

however, provide an approach to find new informants involved within the field of ITFCs and specifically within the project (Bryman & Bell 2014).

Forty interviews were conducted, with various stakeholders in different fields associated with the eight community gardens using indigenous foods. The fields were categorised as follows: knowers, users and growers, acknowledging that interviewees "are as much practitioners of experiential information construction as they are repositories … of experiential knowledge (Silverman 2016:69). Although setting these parameters differentiates the knowers, growers and users, they often are interlinked and interviewees can be involved in all the categories in one way or another.

The (sub)categorized interviewees are referred to with an abbreviation to differentiate the interviewees. The grower category consists of eight farmers (F1-8) who were interviewed. The user category consists of six chefs (C1-6) who were interviewed, three processors (P1-3) and one author (A1) of a cookbook using ITFCs as main ingredients. The knower category consists of academics, conservationists, nutritionists and advisors. Nine academics were interviewed (AC1-9), regarding food sustainability, food archaeology and botany, as well as 6 conservationists working with various conservation efforts in connection with ITFCs (CO1-6). One nutritionist was consulted on the nutritional values of ITFCs, labelled N1. Lastly, there are advisors (AD1-6) in the knower category, experts who are involved with community gardens but with a broader overview such as sustainability officers, landscaper and project managers. The interview category Table as well as the interview questions are in Addendum B.

The interviews were analysed to determine their component parts (indigenous foods, the benefits, challenges, and role in these), the relationship between the parts and their relationship to the whole food system. The analysis proceeded by examining the phenomenon of emerging community gardens using ITFCs, and dividing it into its constituent parts. These parts were the benefits, nutritional, environmental, economic and social-cultural; the challenges, and why ITFCs are emerging (Spradley 2016).

The data was approached from an inductive application so that the information being investigated could emerge as important in itself. Reduction of text was employed to easily display the data and to uncover themes. The data was then formed into a profile, the set-up for the profile was done through a story of both the interviewees and interviewer. It is therefore "in the participants words, but it is crafted by the interviewer from what the participant has said" (Seidman 2006:120). This technique was used due to the interviews themselves not being semantically analysed. The data was organised in profiles through organising passages from the transcripts into categories with systematic labelling (Seidman 2006).

Coding, in this case, refers to data reduction. Analytical coding leads to 'emergence' of a theory through creating categories and placing data into the categories found throughout the coding of the particular data (Richards 2013). Therefore, when an interviewees description was of how ITFCs as plants were water-wise, it was referred to under the category of an environmental benefit. Coding in itself is useful as it leads the researcher from "…data to idea, and from the idea to all the data pertaining to that idea" (Saldaña 2009:8). Pattern matching was used as a code tool. Pattern matching logic was used to compare why different ITFCs are emerging in different community gardens. The method was used specifically because the research itself was exploratory and aimed to provide explanations that reflect a theoretically significant proposition.

3.4.5. Ethics

Ethical clearance for the research was obtained from the Stellenbosch University's Humanities Research Ethics Committee for 2017 (DESC 2012). Verbal informed consent (8=interviewees), and written consent was received (32=interviewees). The Interviewees were informed of the purpose of the research, its procedures, potential risks, discomforts and benefits, and given the option of withdrawing at any point for any reason without risk of recourse in any manner. Further, as a researcher, the use of the four R's, accountable responsibility, respect, reciprocity, and rights and regulations of the research, were used as a guide throughout the process (Chilisa 2012).

3.5. Results

The ITFCs refer to indigenous foods specifically from the Western Cape, which are adapted to winter season rainfall between June to August due to its Mediterranean climate. The ITFCs that specifically originate from the Western Cape are foods such as dune spinach, dune celery and sourfig. Addendum C lists the indigenous plants that various gardens are cultivating and/or are planning to cultivate. Not all these plants are from winter season rainfall areas, so their maximised benefit may not be fully utilised as they are not adapted to Western Cape's microclimatic zone.

The interviewees response to the emergence of ITFCs were varied. Some interviewees believed that the emergence of ITFCs is in fact occurring due to the negative consequences of current mainstream/industrial agriculture causing discontent. The following negative consequences due to the impact of industrial agriculture were described: Soil degradation, farm degradation, issue of landless farmers, issues of land reform and in turn access to land, monoculture crops, inequality and unsustainability of agricultural system, GMOs, and the use of chemicals on crops. "*Food system is a complex system; indigenous foods seem like an elegant (simple) solution to an un-understandable topic*" (AC2). Others believed the emergence of ITFCs is due to global trends set elsewhere by chefs and activist alike.

3.5.1. Benefits

The results varied with the different interviewees viewpoints because of how they interacted with ITFCs. This variation was according to their needs and requirements. Farmers were concerned with finding a market for their foods, conservationists worried about the implications of growing ITFCs on a large scale and how this would affect both the land and the ecosystem surrounding it. Some interviewees believed that ITFCs are "*food as medicine*". Others found ITFCs to be a fall-back, or food safety net if they were unable to access or find available food: "*Indigenous food will always be there, as a natural security, insurance for you*" (CO3). The nutritional, environmental, economic and social-cultural benefits are outlined in Tables 12-15.

3.5.1.1. Nutritional Benefits

Table 12 illustrates the nutritional benefits that are outlined. The three nutritional benefits considered with the greatest similarity between interviewees, are below. The greatest similar benefit was that ITFCs have higher nutritional value than exotic counterparts "*High micronutrient value, much higher than exotic foods* (AC5)". "*Nutritional values are slightly higher than chemically fed plants*" (F3).

ITFCs are healthier than exotic counterparts, as stated by an interviewee: "*everything indigenous is natural, there's nothing added nor taken away, what you see everything is in there…health wise indigenous foods are the way forward* (F5)". According to the interviewee, it is an easily accessible source of good food, or a feast of nature which is naturally healthier: "*dis 'n makliker source van goeie kos. 'n feast of nature is baie meer natuurlik …. natuurlik is dit baie gesonder* (F3)". Lastly, ITFCs increase food security "*seasonal harvesting capacity is increased, importance on a household level for food security* (AD3)".

Table 12: Nutritional Benefits and the Similar Responses of Interviewees

Nutritional Benefits	Percentage (%) of Similar Responses
Higher nutritional value than exotic counterparts	45
ITFCs are healthier than exotic counterparts	42.5
Increase food security	42.5
Create greater dietary diversity	37.5
ITFCs as natural foods are better than exotic counterparts	32.5
Medicinal value	22.5
Greater access to nutrition	20
Seasonal variety is better than year-round availability	15
Cheaper than exotic counterparts	12.5
High in vitamins	12.5
Broaden the palate	10
Improve people's constitution	10
High in iron	7.5
High in protein	7.5
It is better for the soul	5
Low Glycemic Index (GI)	5
Increased calories compared to exotic counterparts	5
High in tannin[6]	5
Enrich soil nutrients	2.5
Create a better relationship to food	2.5
Improve people's diet	2.5
High in carbohydrates[7]	2.5

[6] Though Tannin can make foods bitter, the two interviewees believed it to be a benefit and not a challenge

High in zinc	2.5
High in calcium	2.5
High in folic acid	2.5

3.5.1.2. Environmental Benefits

The environmental benefits are illustrated in Table 13, where the following three benefits had the greatest similar responses: One, the increased usage and planting of ITFCs creates awareness of ITFCs and their benefits, in that this awareness is due to "*people are becoming very aware of where their food comes from and how it was growing, in other words what impact it has on the communities around it, who's getting the money, where's your money going to basically, and what the impacts are on the environment* (AC3)".

Secondly, ITFCs are seen as water-wise plants, instead of thirsty like their exotic counterparts, "*indigenous foods are water-wise and drought resistant in comparison to exotic foods* (A1)". One interviewee stated it as follows: "*Indigenous plants needs less water, don't have to manipulate the temperatures as with exotic crops in hothouses*" (F6). Lastly, ITFCs increase sustainable practises by "*increasing both the awareness of conservation and sustainable practices, such as sustainable harvesting* (CO6)". ITFCs were rated better than their exotic counterparts, because of being more sustainable to the Western Cape than crops from summer season rainfall regions.

Table 13: Environmental Benefits and the Similar Responses of Interviewees

Environmental Benefit	Percentage (%) of Similar Responses
Cultivation and Farming	
Water-wise	45
Increase sustainable practices	35
Better than exotic counterparts	32.5
Ease of cultivation	27.5
ITFCs are area specific	25
Require less chemicals	25
ITFCs are better adapted to climate change	22.5
Increase biodiversity	20
ITFCs are seen as organic	20
Adapted specifically to local areas	20
Need less maintenance	20
Ecologically more sound	15

[7] The 4 factors: high in Carbohydrates, Zinc, Calcium and Folic Acid came from the consultation with the nutritionist, N1

Drought resistant	15
No need for pesticides and herbicides	15
Enrich the soil	15
Resistant to pests	12.5
ITFCs are resilient in difficult conditions	10
ITFCs can be grown in degraded areas	10
Source of food	7.5
Stabilize the soil	7.5
Eliminate invasive weeds	7.5
Grow in small and marginal spaces	5
Used as a multi-crop	5
Create organic compost	2.5
ITFCs are robust	2.5
Interactions between Community Gardens and Environment	
ITFCs create awareness of the environment	47.5
Assign value to ITFCs	32.5
Increase conservation efforts	22.5
Get people to engage more with nature	20
Allow for better access to the environment and its benefits	20
Reduce carbon footprint	15
Bring new life to existing landscapes	15
Allow for new methods of preparation and processing to be developed	10
Create seed saving initiatives	7.5
Decrease the need for import and export of food	7.5

3.5.1.3. Economic Benefits

The economic benefits are illustrated below in Table 14. The highest similar response is that ITFCs can create income, therefore enabling "*livelihood creation* (AC3)" "*parts of growing indigenous foods is livelihood because… indigenous plants can grow anywhere* (F4)". Second, that ITFCs increases agriculture and food tourism within South Africa, one interviewee described it as follows "*ITFCs are a viable option in marketing for tourism spaces which do not have attraction in and of themselves" … "use of local foods as an attraction* (AD1)". Lastly, ITFCs allows for novel and greater job opportunities, as an interviewee stated *"… it leads to job creation by creating other avenues of agriculture*" (F6).

Table 14: Economic Benefits and the Similar Responses of Interviewees

Economic Benefits	Percentage (%) of Similar Responses
Creates income	50
Increase agriculture and food tourism	22.5
Allow for greater job opportunities	20

3.5.1.4. Social-cultural Benefits

Looking at social-cultural benefits the three most mentioned benefits were that ITFCs allowed for you as a person to go back to your roots "*reminds me of who I am and where I come from* (CO3)". Second, those who had the knowledge of ITFCs, felt that they are the custodians of these forgotten foods. One interviewee stated that the knowledge passed on them allowed them to be "*better custodians of your traditions, it has to have a positive impact. Both on older people and as well actually younger people, to find value in family traditions and in cultural tradition* (F1)".

According to one interviewee, ITFCs are a source of heritage from their forefathers which is an honour to work with: "…*dit kom van my voorouers af. In ander woorde om dit uit te leef, is dit n vooreg om in sulke tuine te werk*" (F3). Lastly, ITFCs create a culture of sharing, as an interviewee expressed it ITFCs create a space for "*intergenerational learning, as well as sharing knowledge through family and close relations*" (CO6).

Table 15: Social-cultural Benefits and the Similar Responses of Interviewees

Social-cultural Benefits	Percentage (%) of Similar Responses
Going back to one's roots	60
Custodians of knowledge	40
Create a culture of sharing	40
Something new in a 'mundane' world	37.5
Reclaiming one's heritage	35
Increase in knowledge	32.5
Increase cross-generational learning aspect	32.5
Bring a certain slowness	30
Increase the sense of community	27.5
Create a sense of belonging	25
Increase cross-cultural interaction and learning	22.5
Engage with new recipes and methods	22.5
Pride of knowing and being a custodian of ITFCs	22.5
Encourage the youth's participation	20
Acts as an educational tool	17.5
Create spaces for new narratives	17.5
Create a feeling of nostalgia and a sense of home	15
Create interest and something to talk about	15
Connect both the old and the new	12.5
Acts as a famine food	12.5
Reminder of one's childhood	10
Decolonizing effect	7.5
Way in which to engage with rural life	5
Change making agent	5
Bring back traditions	5
Broaden people's perception of ITFCs	5

Act as a unifier among different people and different communities	5
ITFCs act as collaborator for different stakeholders	5
ITFCs reinforce beliefs on the value of ITFCs	2.5
Encourage food justice	2.5
Encourage equality	2.5

3.5.2. Challenges

Tables 16-19 below illustrate that the benefits substantially outweigh the challenges. However, the challenges will have to be overcome and/or mitigated to create a stronger invigoration of these foods. As one interviewee stated "*Other than that, it's just opportunity, just actually making sure that nobody is done in, also not the environment and that everything is done fairly… it's something which will have to evolve and by that nature there will be mistakes made and then only will we be able to correct them* (AC2)"

3.5.2.1. Nutritional Challenges

In Table 16, the nutritional challenges are outlined from greatest to the smallest similarity in terms of responses. Nutritional challenges were the theme with the lowest challenges recorded. The challenges that were most mentioned were the *lack of reliable nutritional testing* as one interviewee stated: "*I don't know, because there is very little research available, I would like to know what the nutritional benefits would be… I would like to know if I eat this stuff what will it do for me* (P3)". Secondly, a comment on the ITFCs is that they are too bitter, "*hoe bitter is daai ding, vir eet is hy net n bietjie te bitter* (F3)".

Lastly, the *lack of data* on ITFCs was conspicuously low. This is similar to the nutritional testing, but was specifically looking at broader known nutritional data: "*what are the actual nutritional benefits, what scientific studies have been done? And then taking those scientific studies and then breaking them down into understandable information chunks* (AC1)".

Table 16: Nutritional Challenges and the Similar Responses of Interviewees

Nutritional Challenges	Percentage (%) of Similar Responses
Lack of reliable nutritional testing	27.5
Bitter taste	22.5
Lack of data	15
There is a lack of willingness to try ITFCs	15
People prefer exotic varieties of foods	10
Negative effect of secondary compounds	10
Cost involved is too high	5
ITFCs are not seen as food	5

3.5.2.2. Environmental Challenges

Environmental challenges are indicated below, the highest recorded challenges were *identification* of the right food – what are ITFCs and what are not considered foods "*I am a bit sceptical of eating things from the wild, I only generally do it once people have told that I can eat things, because I am a bit scared of what they actually are. Knowledge, is a further challenge as people don't always have the knowledge of what is edible* (CO4)". "*I need to know what plants one can pick, not all indigenous foods are palatable, and you learn the hard way*" (C3). *Cultivation* is seen as a major challenge as these foods have not been cultivated before, although there has been some experimentation with both success and failure. "*Propagation is a challenge, needs a lot of experimentation* (AD4)".

Lastly, the *lack of access* was seen as "…*the problem, who has access to land*? (CO1)". Furthermore, that access is not just in terms of land, but the "*accessibility, ease of growing indigenous foods with good soil is a limitation; climate is a limitation, water limitations and haven't found the seeds* (AD3)". Moreover, some interviewees experienced that people did not want to share their knowledge and information with others, in some part this was due to people warning against foraging. One interviewee communicated this as follows when trying to learn and share knowledge with other community garden stakeholders: "*People are not willing to share their knowledge…concern is it the right thing? It's been quite difficult getting the knowledge, it's very vague in a way, I am not a botanist, I am not a horticulturist for me to go and identify things in the field as it's not all that simple* (F2)".

An environmental challenge in terms of ITFCs is that people want *classical European-styled gardens*, however these gardens are inappropriate for the Western

Cape's climate, which is predominately winter rainfall season with a Mediterranean climate. "*Capetonians haunts are a bit stuck in their ways, with their rose gardens and sweeping lawns*" (AC6).

Table 17: Environmental Challenges and the Similar Responses of Interviewees

Environmental Challenges	Percentage (%) of Similar Responses
Cultivation and Farming	
Cultivation	27.5
Access	25
Large scale agriculture	22.5
Processing knowledge	22.5
Availability	20
Soil restoration	12.5
Water shortages	12.5
Continuation of the growth of ITFCs	7.5
Difficulty of continuation of projects when investors and academia leave	5
Lack of seeds	5
Climate change	5
Foods are seasonal	2.5
People make gardens which are inappropriate for Cape climate	2.5
Interactions between Community Gardens and Environment	
Identifying ITFCs correctly	30
Commitment of people to the community gardens[8]	17.5
Criminal activities led to the detriment of the success of the gardens, with ITFCs and equipment being stolen	7.5
The value of meat in South Africa outweighs that of vegetables[9]	2.5
Gender disparity[10]	2.5
The lack of required patience to grow ITFCs deterred some	2.5

3.5.2.3. Economic Challenges

In Table 18 below it describes the economic challenges from highest to lowest similarity in regards to interviewees responses. A suitable market for ITFCs was seen also as a major challenge, as one interviewee stated: "*limitation is accessibility, knowledge, a market for it [indigenous foods] making it popular again* (AD3)". "*There needs to be a market that demands it, you can't grow the food and then, make*

[8] Lack of commitment of investors in the garden and the community itself resuls in the determent of the fruitation of the garden

[9] Meat in South Africa represent a socio-economic standing 'to afford it' as well as a cultural preference for meat instead of vegetable and fruit consumption which is gererally low, including ITFCs (Faber, Witten & Drimie 2011).

[10] The selection and prioritization of ITFCs is influenced by whether the predominant gardener is female or male. If the principal gardener is female, she will have overcome prejudice and taboo surrounding ITFCs (Keatinge et al. 2012).

people want it and that will grow the demand, it has to be market driven, I don't think it will be production driven, you will flood the market (AC4)".

Second, time invested in ITFCs was limited or seen as a lesser priority than other daily activities, "*Time consumption of getting indigenous foods* (A1)". "*The time limitation of growing the foods, especially at a bigger scale because one starts with little quantities, compared to exotic vegetables, it would take 10 times as long* (F2)". This is all further compounded by the fact that "*Indigenous foods need more time and information for people to embrace it* (CO3)"

Lastly, the dichotomy of the rich and the poor created a broader inequality gap and illustrated the difference in approach of the socio-economic standing of the person within society, "*The divide between wealthier people being able to explore these foods, whereas it is for poor more for food security and how this bridge is gapped* (AC8)".

Table 18: Economic Challenges and the Similar Responses of Interviewees

Economic Challenges	Percentage (%) of Similar Responses
Lack of market for ITFCs	40
Time to invest in ITFCs	25
Dichotomy of rich and the poor	20
Laws	10
Lack of funding for research and the gardens themselves	5
Bureaucracy	2.5
Big 3 staples	2.5

3.5.2.1. Social-cultural Challenges

Table 19, below, illustrates the social-cultural challenges. The challenges were further sub- categorised in the themes agriculture and attitudes, knowledge and perceptions, the challenges are then in order of highest to lowest similar responses. The three most mentioned social-cultural challenges were appropriate knowledge of ITFCs "*not knowing not to cook it, easy to do this is how to cook it, knowledge to broaden oneself to eat it, need knowledge to get there* (AC4)". The negative perceptions surrounding ITFCs, "*I think perceptions and people that you surround with. Poor man's food- or reminds a person of that [poverty]. Those things I cook when I'm really broke,*

reminds you of poverty, I ate that meal because I knew there was nothing else to eat at home, this is what we have at home (CO3)".

Lastly, foraging was seen as a challenge as people are not aware of the issues of "*unsustainable collection and foraging* (AC6)" and that it may negatively impact the growth of ITFCs. "*Foraging only works in social and economic micro climates where the indigenous foods are prolific* (AC2)". As one interviewee stated that first foraging should be a mechanism that "*provides food security, foraging is for subsistence for people living under the bread line as a potential food source close by* (CO1)"

Table 19: Social-cultural Challenges and the Similar Responses of Interviewees

Social-cultural Challenges	Percentage (%) of Correlated Responses
Attitude, knowledge & perceptions	
Lack of knowledge of ITFCs	55
Negative perception of ITFCs	42.5
Status of ITFCs	22.5
ITFCs popularity	10
Lack of education creates a void	10
Ethical considerations	10
Price perception of ITFCs as more expensive	5
The negative effects of harmful human activity	5
Language acts as a barrier to the fruitful communication about ITFCs	2.5
Agriculture	
Foraging	22.5
Access to land	22.5
Experience	15
Fast foods	12.5
Urbanization	12.5
Visibility of these foods	12.5
Laws	10
Lack of research	10
Getting farmers interested in farming ITFCs	7.5
ITFCs brings complexity to the forefront	5
Increases usage of ITFCs is potentially unsustainable	5

The data analysis is presented here to outline how the benefits of ITFCs are perceived and whether the emerging community gardens reap the benefits of the usage of these foods. The nutritional benefits were the least mentioned in the interview process. This could be a potential indication that some benefits were perceived as more beneficial than others in term of ITFCs. Further, that the benefits were based on the interviewees own beliefs that environmental benefits are of greater value than social-cultural,

economic and nutritional benefits. The benefits and challenges were numerically compared in the pie chart below to determine which has the greatest similarity and frequency. The greatest challenges in terms of ITFCs in the community gardens were social challenges, second, environmental challenges, third, nutritional challenges and last economic challenges associated with ITFCs.

Figure 8 below shows the total percentage of both benefits and challenges as identified by the interviewees (for the themes nutritional, environmental, economic and social-cultural). Environmental benefits were the most mentioned benefits of ITFCs, where economic benefits were mentioned the least. The greatest identified challenge was social-cultural, whereas economic challenges were mentioned the least.

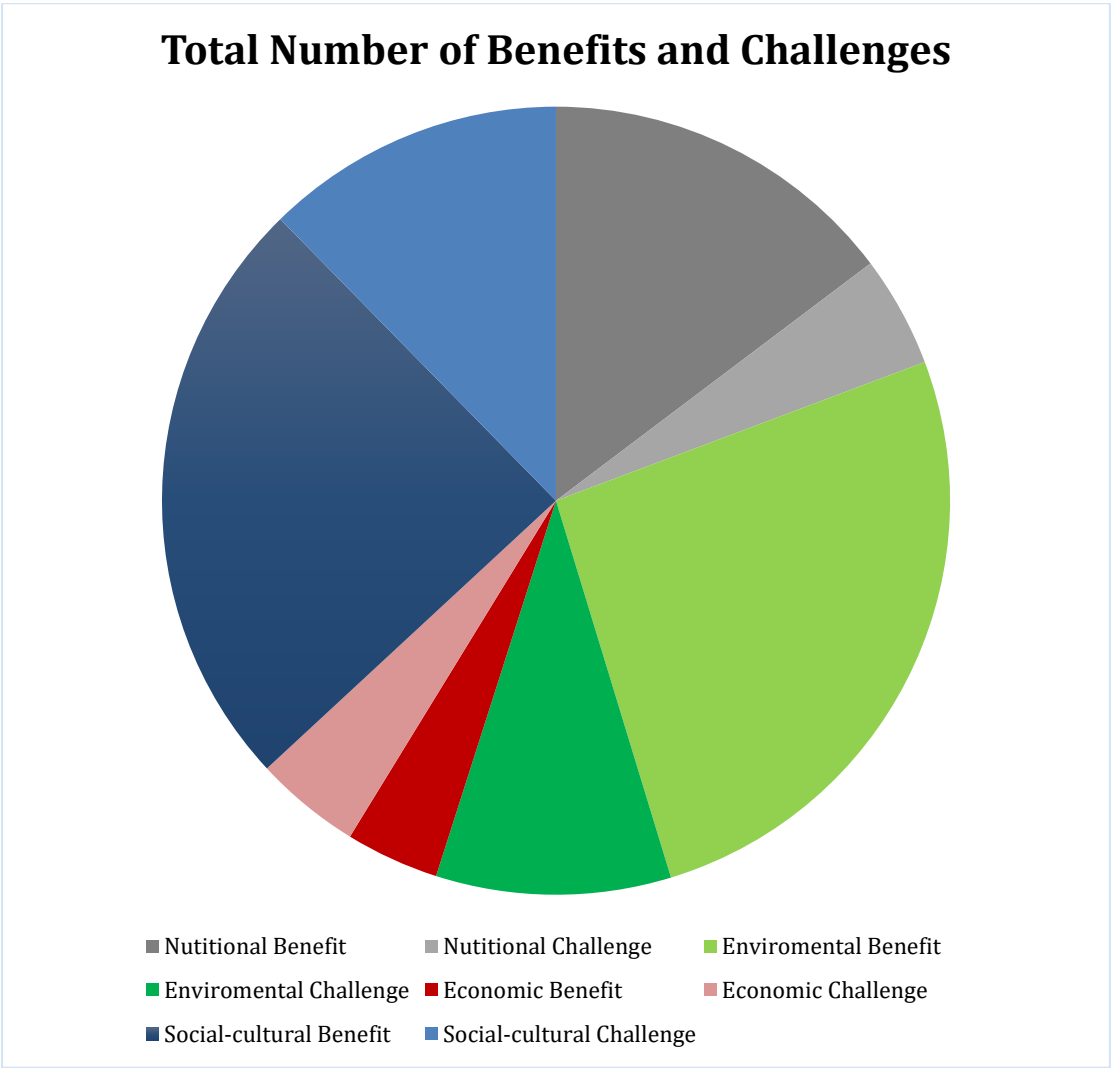

Figure 8: Total number of Similar Responses for Benefits and Challenges

Even though Figure 8 illustrates quite clearly that in each instance the challenges are outweighed by the benefits, the interviewees' concern for the future of ITFCs to need to be addressed if they are to become part of the mainstream agenda. However, when making direct comparisons across the themes, it can be seen that many of the perceived challenges do not necessarily have to have a negative impact on the uptake of ITFCs.

The fact that the lack of reliable nutritional testing was seen as a challenge within the nutritional theme, it did not necessarily hinder some of the communities from consuming or cultivating ITFCs, as there is also a perception that ITFCs have higher nutritional value than their exotic counterparts; or where the bitter taste of some of the ITFCs may be negatively perceived, this is also conversely seen as an opportunity to broaden the palate or create greater dietary diversity.

Some of the environmental challenges addressed issues of cultivation and access. The challenge that most of the ITFCs have never previously been cultivated, is counterbalanced by the recognition by several interviewees that they are easy to cultivate. Access to these foods was seen as a challenge when they were reported as not being easily available in stores, but with some access to the environment, the resulting free availability to ITFCs was seen as a benefit.

The economic challenges that relate to the current lack of market access when cultivating ITFCs can be read against the benefit of the increase in own consumption of IFTCs; the challenge of needing to invest time in their cultivation is a contribution to own income and job creation, as well as developing food tourism opportunities. The mentioned social-cultural challenge of a lack of sufficient knowledge about ITFCs and the negative perceptions and status attached to them are all being offset by the growing interest in renewing a connection to one's roots, investigating the knowledge held by past generations and elders as well as positive benefits of reclaiming one's history and identity. The increase in a sense of community and belonging is also a positive contributing factor in supporting individuals to face the range of challenges they variously cited.

3.6. Impact of Indigenous Foods

Interviewees were asked if they thought that the increase in consumption of ITFCs would have nutritional, environmental, economic or a social-cultural benefit. The scale ranged from high positive impact, positive impact, no impact, negative impact to high negative impact. Figure 9 below shows the results, with only two interviewees indicating that ITFCs would have a negative impact environmentally, and six interviewees believed it would have both positive and negative impacts and therefore chose the no impact category. "*People are started to think more responsibly about what they eat* (C5)" and therefore many interviewees believed that the effect of the use of ITFCs would be positive.

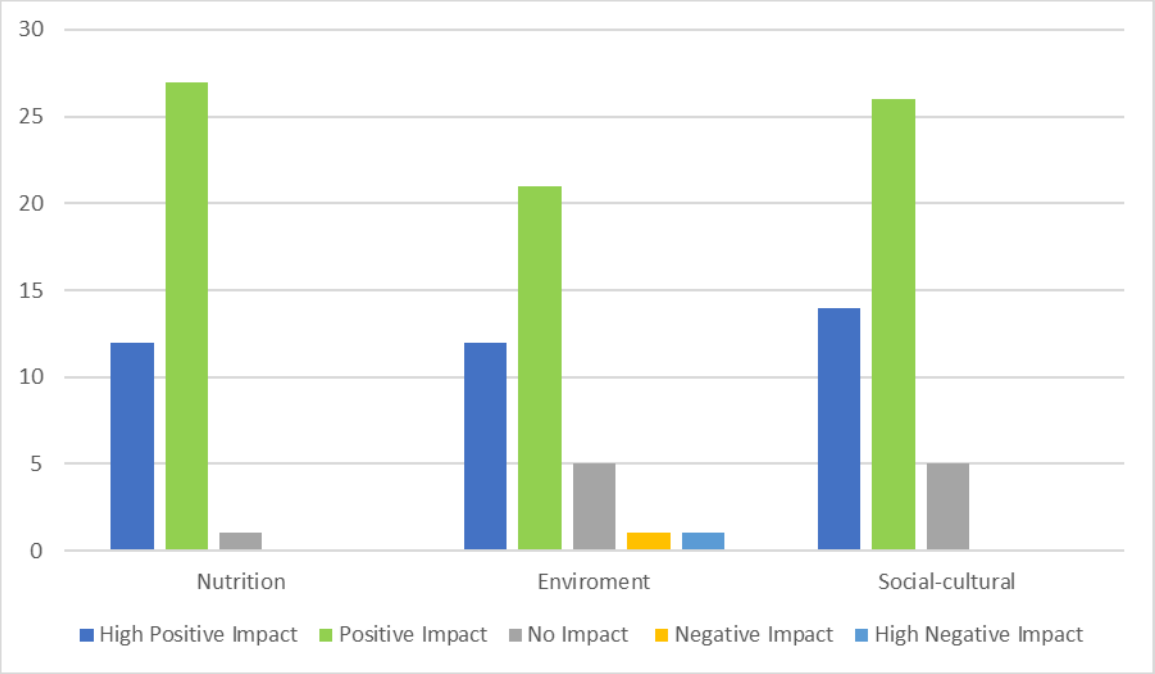

Figure 9: Documented Positive and Negative Impacts of the Increased Consumption of ITFCs

3.6.1. Are ITFCs an Alternative to Exotic Crops?

The responses of what the impact would be of cultivating and using ITFCs was overwhelmingly positive. However, this did not translate directly into ITFCs being seen as an alternative to exotic foods. The interviewees from various gardens could not decide if ITFCs could be an alternative to the current food system, whether they believed that ITFCs would be an addition, but not the panacea to the current food paradigm, or whether ITFCs are not an alternative to the current food system.

Those who believed it could be an alternative, stated that "*well, it's a difficult one, I think it is an alternative, but with resources, resourcing the foods as well, it comes with challenges also, we know that big corporates are the ones pushing not so good food* (C1)". Another interviewee stated it as follows: "*I think so, I think that is only one part. It's not just about the food, but it's about the power to who holds the food, so if we are going to replace that just with indigenous foods that doesn't necessarily mean that the power will be evenly distributed, it just means a different type of food is growing* (AC1)".

Those who believed ITFCs would be an addition cited that ITFCs currently would not be able to replace staple crops, but have the potential to replace exotic crops: "*not on its [ITFCs] own, but in combination with other things* (C6)". This would therefore release some of the pressure surrounding the current food system and allow for greater access to diverse, healthy and sustainable food. "*I would not necessarily use the word alternative because I don't think it would be sensible to think of local foods as in any way being able to replace non-indigenous foods, I think that population is such, that there is no way that this landscape can possibly support the number of people we are here now. It needs to be seen as an addition to and it needs to replace some of the very destructive farming practices we have* (F1)".

Overwhelmingly interviewees believed that ITFCs may be an alternative or at least an addition to the food system. Those who believed the foods could be an alternative to the current food system acknowledged that it would face many challenges, including the resistance of the industrial food system (C1). Other interviewees responses are as follows: "*Yes, but you would have to change mindsets, teach people what is reasonable* (C5)".

Those who thought the emergence of ITFCs would not be an alternative to the current food systems saw the foods rather as an addition to the food system. They stated that ITFCs in themselves would not be able to feed the world in its entirety (AD1). That, "*No, it's not an alternative, it went missing in Apartheid, it should be part of the food system, it has been part of the food system* (C1)".

Two interviewees believed that ITFCs would not be an alternative or an addition, rather it would have no impact. An interviewee stated that "*the Western Cape foods are not providing carbohydrates* (AD2)" therefore could not be an alternative as it does not address food security in terms of sufficient calorie intake. An interviewee phrased it as follows it has "*no impact, a disturbance to your vegetation is actually a natural disturbance to the vegetation* (CO4)", so ITFCs cannot be a stand in for exotic crops.

The questions then arose that if there is mixed consensus as noted above, whether it was at all viable to cultivate indigenous foods? Thirty-seven interviewees believed it was a viable option to cultivate ITFCs in the Western Cape and 2 interviewees believed it had potential but were not sure if it would work if the market demand was not concurrent with market supply. Another interviewee believed that it would only be viable to cultivate some species of ITFCs, for example bulbs would not be a commercially viable in the market. One interviewee thought that it was not viable to cultivate ITFCs at all.

3.7. Discussions on Findings

3.7.1. Future Discussions

The majority of interviewees believed that ITFCs were emerging due to the movement towards reconnecting with one's heritage because of an "*uncertain future*" and because "*people are fundamentally bored with the world as it is* (AD3)". People are looking for alternatives and these alternatives have been up and coming through global trends that subsequently have been adopted in South Africa with the use of social media. Awareness of, how, when, and where foods come from was also a factor which interviewees felt have stimulated the curiosity to change their consumption patterns. However, some interviewees said it is a re-emerging trend and not something 'new'.

Although the results were mixed, ITFCs could potentially be an alternative, as the identified benefits do outweigh the challenges. However, this differs with different stakeholder perspective, as the food system is seen as "*unjust food system taking place* (F8)" which is not equal and alike to all. The results suggest that winter rainfall seasonal indigenous foods are being invigorated and reintroduced into society.

ITFCs in community gardens may grow as the strategic influences due to social change agent's preliminary work and the awareness of ITFCs benefits increase, through the "*groundwork that a lot of people have been doing, locally and internationally* (P1)". The competition between the resources of the community and where they are invested will be different for different interest groups within the community.

Tracking community needs is one thing, but the decisive factor is that food availability and access are greatly influenced by the economic system and without a change in that system, the consequences may take on greater significance with the ongoing drought in the Western Cape (Du Preez 2017). The future of ITFCs has been promoted by a dedicated few. Some markets are available for the promotion and utilisation of ITFCs, restaurants introducing ITFCs onto their menus, and initiatives started by the Slow Food movement such as the Ark of Taste (a catalogue of endangered traditional foods to help preserve and protect ITFCs) (Slow Food 2015).

Many interviewees emphasised the importance of connecting the youth with ITFCs, invigorating a new generation to further a future for ITFCs. Although this aspect is being attended to, it has as yet to reach the youth. As one interviewee stated, it is still a work in progress. "*Dis nog nie deurgebring na die jonger generasie toe nie, ons werk daaraan* (F3)". One interviewee expressed the dichotomy of the urban setting and the ease of availability. On how it resonates with the youth, he stated "*if you can make the connection with young people, they might have lost the connection especially in an urban setting, where processed food is easily available and sometimes cheaper* (AC8)". One interviewee, who is also heading a crèche in their area, saw the significance of the youth, in continuing the use and knowledge of ITFCs, they said: "*How are you going to transform it to the youth, saying to the youth, this is how we have used it, to teach the child, you plant it and see the benefit*

for you, and as the child grows up becomes a young adult, a family person, start teaching it to their children (F4)".

"*The understanding of them [Indigenous foods] is in their infancy, what is required there is serious experimentation* (AD3)". Therefore, the future of ITFCs should promote the increased growth and usage of ITFCs, as well as enabling ITFC production in urban areas and greater access to markets for community gardens. Urban planning and governance will need to be better utilised to address household food insecurity through periods of droughts, floods and normal rainfall. Social safety nets are needed to ensure access for greater food security status. This will require that both government and civil society work together. Lastly, the issue of food will need to be investigated as it relates to the health and wellbeing of urban residents through food-based interventions (Lamberis 2013).

To improve the growth of ITFCs, extension services need to be improved. A possible improvement for the ITFCs growing environment could be the formation of co-operative/s better suited to the community as a vehicle through which the communities' food production takes place. Food-based interventions range from nutrition education, promotion of household and community gardens using ITFCs, making healthy foods more accessible in the informal and formal market, and mounting campaigns for greater awareness and education of ITFCs (Lamberis 2013).

The future for ITFCs, especially in the Western Cape, can be promoted with the following intervention activities recommended by the FAO: stimulate feasible production activities of foods with high nutritional value and increase accessibility; enhance women's role as well as the youth from the grass-roots level; and promote the growth of ITFCs on existing agricultural land and marginal spaces (Kuhnlein, Erasmus, Spigelski & Burlingame 2013).

3.8. Concluding Thoughts

The case study investigated the emerging community gardens and the benefits and challenges which relevant interviewee's experience. Both the biggest benefits as well as the biggest challenge overall with regard to indigenous foods were reflected in the socio-cultural theme, e.g. the challenge to erase the negative perception and lack of knowledge on ITFCs. In the case of ITFCs being an alternative to the current food system, most interviewees rather saw it as an addition which could feed directly into nutrition security.

ITFCs in community gardens may increase as the strategic influences of social change agents' increase awareness of the benefits of ITFCs. These spaces are associated with the Slow Food movement, Slow Food Youth Network, and the South African Food Sovereignty Campaign. The current economic climate was also cited as a reason why people are reviewing the food system; they are dissatisfied with what the current system is delivering. The competition between resources of the community and where they are invested will differ amongst interest groups. Therefore, these groups should in principle create a profile, "a comprehensive description of the needs of the population that is defined or defines itself, as a community, and the resources that exist within the community, carried out with the active involvement of the community itself…" (Hawtin & Percy-Smith 2007:5).

Education also needs to be targeted for increasing both traditional and academic knowledge of the nutritional values of the ITFCs. The importance and value/worth of these foods within the community needs significantly stronger emphasis. Therefore, restoring the use and maintenance of ITFCs and their environment is highly important for ensuring that knowledge will not be lost to future generations. The participation of civil society and the usage of ITFCs needs to increase through a greater use of a wider variety of ITFCs, as well as promoting activities of food preparation, and introducing new and innovative recipes with special attention to the youth, highlighting the importance of nutrition (Kuhnlein, Erasmus, Spigelski & Burlingame 2013).

The community gardens using ITFCs can be summarised in one quote from Petersen, Thorogood and Sotshononda (2017:5), "…incorporating design and support for landscaping with indigenous edibles in public parks, open space and in private

property developments would make a small but significant contribution to a more holistic approach to urban food.". The direct comparison across all themes, illustrate that the challenges do not necessarily have a negative impact on the uptake of ITFCs. However, they do need to be addressed sufficiently, for example despite a lack of nutritional testing, the interviewees none the less believed that ITFCs have a greater nutritional value. Cultivation was as both a challenge as well as a benefit, indicating that scientific research into cultivation this perceived challenge could be negated. The growing interest in ITFCs will increasingly counterbalance the lack of knowledge and the lack of access to market is being countered by the increase in own usage of ITFCs which increasingly grows a market for ITFCs.

In conclusion, though the cultivation and use of Western Cape ITFCs is in its infancy in this province, with more research and investment in these foods, they have the potential to become an important resource for both the formal and informal food supply chains as well as real assets in household nutrition security. Where the increasing awareness of the benefits of ITFCs are already provoking the revaluation of ITFCs as a valuable food and nutrition source, if research verifies their environmental resilience, they could prove to be a crucial alternative and supplementary crop with which to face future drought and climatic and change conditions.

Chapter 4: Conclusion

4.1. Introduction

Reinvigorating ITFCs is a challenge in itself, not just because of the foods themselves, but because of complexities of the social, economic and environmental values which accompany these foods. In fact, the lack of contribution of ITFCs to nutrition security has resulted in the routine undervaluation of them (Bharucha & Pretty 2010). Considering the data reported in the literature review and the case study, the diversity of ITFCs may not only have health benefits, but it demonstrates that ITFCs have a significant contribution to make towards environmental, economic and social values in communities. Moreover, spin-offs of the benefits will go a long way in protecting the environment and biodiversity of the Western Cape (Johns & Eyzaguirre 2006; Penafiel, Lachat, Espinel, Van Damme & Kolsteren 2011).

The profound changes occurring within the food system affect both the health of humans and the ecosystems. While the sustainable use of natural resources such as ITFCs holds the promise of self-sufficiency, the ethics of using these foods as an invigoration of these foods in the broader market may inevitably change the course and value of food with unpredictable outcomes (Johns & Eyzaguirre 2006). However, if the increase in promotion and consumption of these species is not matched with propagation or cultivation, this could lead to an unsustainable increase in harvesting from the wild or extinction of species in South Africa" (Maseko, Mabhaudhi, Tesfay, Araya, Fezzehazion & Du Plooy 2018:16). However, with the intent of sustainably cultivating these foods it may make this trend into a valuable food resource base and a food security net.

The Sub-Saharan Africa's food insecurity, water scarcity, and nutrition and health challenges are well documented but the efforts to address these challenges have often been disconnected (Mabhaudhi, Chibarabada & Modi 2016). This thesis has attempted to investigate the benefits and challenges with efforts already occurring at grassroots level (community gardens) and to investigate the current *status quo* on ITFCs in the Western Cape.

The conclusion provides a summary of the first three sections or chapters and then re-evaluates the role of ITFCs, critiques the study and its contributions toward the field, the challenges and limitations noted and recommendations for future research.

4.2. Thesis Summary

Chapter 1: Introduction

Chapter 1 explores the background of the food system in South Africa, asking "Is there a potential in the usage of ITFCs in the emerging community gardens in the Western Cape for achieving food security?" The introductory chapter addresses the overarching research approach and strategy, i.e. a systematic literature review and case study examination. Key concepts and terms were elaborated on in order to frame the discussion in the sections following. These terms are ITFCs, benefits and challenges. Further, concepts such as food security, the urban food system, the concept of alternative food networks were explored.

Chapter 2: Literature Review

The first objective was to explore the literature on ITFCs within Africa and abroad, and provide a systematic overview of literature on nutritional, environmental, economic and social-cultural benefits and challenges of ITFCs. The objective was met through using a systematic literature review of research done from January 2008 until July 2017, using keywords in various databases and using literature that was relevant to the topic of ITFCs afterwards. In total 70 benefits were sighted in the literature, of these, 49 were nutritional, 26 environmental, 5 economic and 23 social-cultural benefits. Significantly the total number of challenges were 32, 4 of which were nutritional, 12 environmental, 5 economic and 19 social-cultural challenges.

The findings suggest that there is a lack of scientific literature on ITFCs in South Africa and specifically in the Western Cape for predominantly winter rainfall season dependent indigenous foods. Chapter 2 demonstrates that ITFCs benefits outweigh the challenges and that the better valuation of ITFCs may have a positive effect on the food system. Furthermore, ITFCs could diversify diets, provide greater food security, be an alternative to exotic foods and be more resilient in a volatile food system.

Chapter 3: Case Study

The second objective was to evaluate the current benefits and challenges experienced of ITFCs within the Western Cape through the use of a case study of emerging community gardens. The data shows a total number of 94 benefits, 25 nutritional benefits, 35 environmental benefits, 3 economic benefits and 31 social-cultural benefits. In total 81 challenges were recorded, of which 8 were nutritional, 19 environmental, 7 economic challenges and 20 social-cultural challenges.

As in the literature review, the reported benefits outweighed the challenges. A conclusion is that it would be beneficial to invest in ITFCs with greater intensity in the Western Cape, proving the intersections between the broader literature review and the grounded Western Cape gardens with regard to the benefits to the environment.

4.3. Re-evaluating the Role of ITFCs

The role that ITFCs may play can be summarised as five key points which are extrapolated from the case study findings: ITFCs is an entryway into people's reconnection to their roots and heritage. Secondly, people do not know enough about ITFCs and are both willing and eager to have access to more information and knowledge. This ranges from nutritional value, to how to grow and harvest ITFCs, identify these foods, and know the differences between summer and winter season rainfall–indigenous food in the Western Cape. Third, people required nutritional testing (the entirety of the process by which humans obtain nutrients and energy from the given food) to verify and motivate them to further invest in the foods. Fourth, the need for market access for both farmers and consumers are required to catapult ITFCs into the formal market. Lastly, the discussion pertaining to the ethical contingencies of ITFCs was apparent by it not being discussed in-depth.

4.4. Limitations and Challenges

Very little research has been done to look at ITFCs in terms of global warming. The uncertain course of global warming on Africa's weather patterns has established a consensus that large-scale farming is a high-risk form of agriculture with concentrated reliance on very few plant and animal species. However, the diversification of small-

scale farming and the use of ITFCs may offset the lack of research on ITFCs within the context of global warming (Magdoff & Tokar 2010).

The data set on ITFCs nutritional values often offers limited content with various indicators and incomplete evaluation for robust conclusions to be drawn. Nevertheless, the studies done on South African ITFCs have shown that foods with relatively high micronutrient values may be of significance to the health of many South Africans going through the nutrition transition (van Jaarsveld, Faber, van Heerden, Wenhold, Jansen van Rensburg & van Averbeke 2014).

ITFCs in community gardens may grow as the strategic influences of social change agent's increase, and awareness of the benefits of ITFCs increases. South African government, in its National Development Plan (NDP), envision for 2030 that they "Ensure household food and nutrition security" (National Development Plan 2030 2012:34) with policy measures that aim to increase the intake of fruits and vegetables and reduce the intake of sugar, salt and saturated fat, whilst the value of ITFCs in terms of food security has not been given sufficient attention in South Africa. As such, there are no formal interventions that attempt to encourage people to use ITFCs as a source of essential nutrients (Modi, Modi & Hendriks 2006).

However, there is a lack of political will in South Africa to achieve food and nutrition security through ITFCs (Kuhnlein, Erasmus, Spigelski & Burlingame 2013). This is also exacerbated by the narrative that Genetic Modification (GM Crops) is the way forward to secure food security, especially in the South African context (Otsuka & Kalirajan 2006). This narrative is advanced by advocates of GM, who state that yields are declining and therefore demand is outstripping supply. However, the reasons for food scarcity are highly variable across space and time and GM as a solution suggests it may only be a partial response to the problems besetting African agriculture (Devereux 2007).

4.5. Recommendations for Further Research

This thesis intended to record the current status of research done on ITFCs within South Africa and in particular the Western Cape. The literature review examined selected literature on ITFCs. One of the major gaps identified was how few references to or how little information about the ITFCs of the Western Cape appeared, indicating that the shortfall in research and knowledge captured is substantial. The case study investigating the community gardens using ITFCs revealed that the current growing and use of ITFCs in the community gardens is still in its infancy, meaning that its potential development and expansion would benefit from further research and sharing of knowledge.

The spectrum of knowledge pertaining to the ITFCs of the Western Cape that is needing to be deepened and made available is wide. It ranges from scientific information on for example nutritional values of ITFCs, through to capturing traditional knowledge that would support the communities' expressed wish to reconnect to heritage and roots. In addition, practical information such as how to correctly identify ITFCs, where to find seeds or plants, correct seasons for planting, how to grow them to their optimal states and how to harvest, preserve and prepare ITFCs were identified as needs to be focused on that would support and could increase the cultivation and usage of ITFCs.

The health benefits of increasing own consumption of ITFCs needs to be supported by research into nutritional properties and benefits. Food security could further be increased by developing the potential of ITFCs to provide income or support job creation by researching how best to achieve direct market access, or access to end users through retail outlets, all of which were identified in the case study as current limiting factors.

Lastly, the case study identified that ITFCs were perceived as being easier to grow than exotic foods. Research to verify the validity of this perception could influence the future prospects for ITFCs to be brought into more widespread cultivation as resilient alternative or supplementary crops for the Western Cape, where global warming and fluctuating weather patterns have already been seen to be affecting the cultivation of exotic crops.

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Addenda

Addendum A: List of Global Benefits and Challenges, excluding the Africa continent

Table 20: Micro-Nutrient Benefits, Globally

Description	Findings	Type of ITFCs	Location of Study	Author/s & Date	Analysis of Research
ITFCs have high micro-nutrient value	(B2) / Riboflavin	Food not specified	Canada	Penafiel, Lachat, Espinel, Van Damme & Kolsteren (2011)	Systematic review on ITFCs and dietary diversity
	Calcium	Food not specified	Canada	Penafiel, Lachat, Espinel, Van Damme & Kolsteren (2011);	Systematic review on ITFCs and dietary diversity
		Bush tomato (*Solanum*), Spinach tree (*Cnidoscolus aconitifolius*)	Australia Guatemala	Bioversity International (2015);	Baseline survey report
	Potassium	Spinach tree (*Cnidoscolus aconitifolius*)	Guatemala	Bioversity International (2015)	Baseline survey report
	Vitamin A	Food not specified	Canada	Penafiel, Lachat, Espinel, Van Damme & Kolsteren (2011)	Systematic review on ITFCs and dietary diversity
	Vitamin C	Canada	Canada	Penafiel, Lachat, Espinel, Van Damme & Kolsteren (2011)	Systematic review on ITFCs and dietary diversity
	Iron	Spinach	Guatemala	Bioversity	Baseline

		tree (*Cnidoscolus aconitifolius*)		International (2015)	survey report
ITFCs have high nutritional status (Cloete & Idsardi (2013)	Beta-carotene	Palm fruits	Brazil	Bharucha & Pretty (2010)	Qualitative review paper
	High energy content	Food not specified	Canada	Penafiel, Lachat, Espinel, Van Damme & Kolsteren (2011)	Systematic review on ITFCs and dietary diversity
	Caloric contributor	Food not specified	Canada	Penafiel, Lachat, Espinel, Van Damme & Kolsteren (2011)	Systematic review on ITFCs and dietary diversity
	Protein	Food not specified	Canada	Penafiel, Lachat, Espinel, Van Damme & Kolsteren (2011);	Systematic review on ITFCs and dietary diversity
		Bush tomato (*Solanum*)	Australia	Nierenberg (2014);	Qualitative review
	Dietary fibre	Bush tomato (*Solanum*)	Australia	Nierenberg (2014)	Qualitative review

Table 21: Broader Nutritional Benefits, Globally

Description	**Location of Study**	**Author/s & Date**	**Analysis of Research**
ITFCs contribute to antioxidant activity	Malaysia	Amiziyob, Nutman, Lih, Alias, Khamis, Boon, Teng & Mei (2016)	Qualitative review and sampling of ITFCs
ITFCs have bioactive compounds and contribute to antioxidant activity	Malaysia	Amiziyob, Nutman, Lih, Alias, Khamis, Boon, Teng & Mei (2016)	Qualitative review and sampling of ITFCs
ITFCs in conjunction with new farming techniques create stronger food	Bolivia, India, Philippines and Solomon Islands	Chianese (2016)	Qualitative review climate change adaption

production systems			

Table 22: Environmental Benefits, Globally

Description	Location of Study	Author/s & Date	Analysis of Research
Generally, more climate resistant than major food staples	Federated States of Micronesia	Lorens, Taylor, Hunter & Borelli (2014)	Qualitative review
Tolerant to abiotic stresses such as drought and severe temperature changes	Seattle, Washington	Chivandi, Mukonowenzou, Nyakudya & Erlwanger (2015)	Qualitative review
Greater tolerance to pests and fire	Northern Brazil	Carvalho et al. (2011);	Preliminary assessment of nutritional composition
	Ecuador	Tutwiler (2013);	Qualitative review
	Seattle, Washington	Chivandi, Mukonowenzou, Nyakudya & Erlwanger (2015);	Qualitative review
	Brazil, Sri Lanka and Turkey	Borelli et al. (2014)	Qualitative review
Adapt well to floods and frost	Bolivia, Peru and Ecuador	Baena, Galluzzi & Padulosi (2012);	Qualitative review
	Nepal	Pudasaini, Sthapit, Gauchan, Bhandari, Joshi & Sthapit (2016)	Baseline survey report
ITFCs with their variety and unusually different volatiles help protect other plants from insects	Bolivia, India, Philippines and Solomon Islands	Chianese (2016)	Qualitative review climate change adaption
Environmentally adaptive	Brazil, Sri Lanka and Turkey	Borelli et al. (2014)	Qualitative review
Can be cultivated in marginal land spaces	Asia, the Pacific	Jaenicke & Höschle-Zeledon (2008)	Strategic Framework for Research and Development

Table 23: Economic Benefits, Globally

Description	Location of Study	Author/s & Date	Analysis of Research
ITFCs as a commodity are often cheaper than exotic counterparts	Brazil, Sri Lanka and Turkey	Borelli et al. (2014)	Qualitative review

Table 24: Social-cultural Benefits, Globally

Description	Location of Study	Author/s & Date	Analysis of Research
ITFCs raise awareness of the value of ITFCs	Brazil, Sri Lanka and Turkey	Borelli et al. (2014)	Qualitative review
The use of documentation of ITFCs helps preserve the knowledge and prevents a loss of valuable information	Malaysia	Amiziyob, Nutman, Lih, Alias, Khamis, Boon, Teng & Mei (2016)	Qualitative review and sampling of ITFCs
The manifestation of indigenous food sovereignty has developed its own definition of policy and rights	North America	Grey & Patel (2015)	Qualitative review on food sovereignty
ITFCs can strengthen the role of women's identity	Bolivia and Peru	Rudebjer, Meldrum, Padulosi, Hall & Hermanowicz (2014)	Policy Brief
ITFCs and the gardens where they occur help with social upliftment and crime reduction	Seattle, Washington	Poe, McLain, Emery & Hurley (2013)	Qualitative review
ITFCs are known for their medicinal uses	Jharkhand, India	Ghosh-Jerath, Singh, Kamboj, Goldberg & Magsumbol (2015)	Taxonomic classification and quantitative estimation of nutritive value were conducted in laboratories

Table 25: Nutritional Challenges, Globally

Description	Findings	Location of Study	Author/s & Date	Analysis of Research
Some ITFCs are known for their unpalatable bitter taste	Buckwheat was specifically noted for its bitter taste	Himalayas, Nepal	Pudasaini, Sthapit, Gauchan, Bhandari, Joshi & Sthapit (2016)	Baseline survey report
Some foods have a peculiar colour even after preparing the food	Hinders the consumption of ITFCs; one such food is Chaumase bean	Himalayas, Nepal	Pudasaini, Sthapit, Gauchan, Bhandari, Joshi & Sthapit (2016)	Baseline survey report
Some ITFCs remain hard in texture even after cooking	An example is Taichung rice	Himalayas, Nepal	Pudasaini, Sthapit, Gauchan, Bhandari, Joshi & Sthapit (2016)	Baseline survey report
Many ITFC grains are difficult to process	Threshing and dehusking required where manual labour is the only method	Himalayas, Nepal	Pudasaini, Sthapit, Gauchan, Bhandari, Joshi & Sthapit (2016)	Baseline survey report
Lack of recipes for making foods with ITFCs		Himalayas, Nepal	Pudasaini, Sthapit, Gauchan, Bhandari, Joshi & Sthapit (2016)	Baseline survey report

Table 26: Environmental Challenges, Globally

Description	Location of Study	Author/s & Date	Analysis of Research
Climate change	Colombia	Correal Zuluaga, Madrigal, Caicedo & Plotkin (2009);	Qualitative review
	Peru	Creed-Kanashiro, Roche, Tuesta Cerrón & Kuhnlein (2009);	Qualitative review
	Nunavut, Canada	Egeland et al. (2009);	Qualitative review
	Micronesia	Englberger et al. (2009);	Qualitative review
	Canada	Kuhnlein, McDonald, Spigelski, Vittrekwa & Erasmus (2009)	Qualitative review
Contamination of the food system at various levels	Colombia	Correal Zuluaga, Madrigal, Caicedo & Plotkin (2009);	Qualitative review

	Peru	Creed-Kanashiro, Roche, Tuesta Cerrón & Kuhnlein (2009);	Qualitative review
	Nunavut, Canada	Egeland et al. (2009);	Qualitative review
	Canada	Kuhnlein, McDonald, Spigelski, Vittrekwa & Erasmus (2009)	Qualitative review
Acute water shortages	Colombia	Correal Zuluaga, Madrigal, Caicedo & Plotkin (2009);	Qualitative review
	India	Salomeyesudas & Satheesh (2009)	Qualitative review
Decline in soil quality	Colombia	Correal Zuluaga, Madrigal, Caicedo & Plotkin (2009)	Qualitative review

Table 27: Economic Challenges, Globally

Description	**Findings**	**Location of Study**	**Author/s & Date**	**Analysis of Research**
Rising cost of fuel prices and equipment decrease the funds for food preparation and other necessities	Necessities such as the time to go to harvest, cooking time for ITFCs are cut short, thus affecting the use of ITFCs	Canada	Kuhnlein, Goodman, Receveur, Spigelski, Duran, Harrison & Erasmus (2013)	Pre-intervention assessment
The wider negative economic forces and external market influences are resulting in negative globalisation trends		Thailand	Sirisai, Chotiboriboo, Tantivatanasathien, Sangkhawimol & Smitasiri (2013)	Qualitative review

Table 28: Social-cultural Challenges, Globally

Description	Findings	Location of Study	Author/s & Date	Analysis of Research
Many people who are in contact with ITFCs perceive them as a 'poor man's food'		Bolivia and Peru	Padulosi, Amaya, Jäger, Gotor, Rojas & Valdivia (2014)	Qualitative review
Lack of time has meant a decrease in ITFCs being cultivated	Reduction in diversity and subsidies from government has decreased interest in cultivating ITFCs	Peru	Creed-Kanashiro, Carrasco, Abad & Tuesta (2013)	Qualitative review
Lack of access to ITFCs	This hinders consumption of these foods; suggested that if ITFCs were available at markets and super-markets, it would increase access	Canada	Kuhnlein, Goodman, Receveur, Spigelski, Duran, Harrison & Erasmus (2013)	Pre-intervention assessment
Shrinking of land availability	This reduces the community's capacity to rely on self-subsistence	Amazon	Caicedo & Chaparro (2013)	Qualitative review
Inadequate initiative from governmental sectors		Himalayas, Nepal	Pudasaini, Sthapit, Gauchan, Bhandari, Joshi & Sthapit (2016)	Baseline survey report

Addendum B: Interview candidate breakdown and Interview questionnaire

Table 29: Category of Interview Breakdown

Category	Key	Sub-category	Description	Number of
Growers	F	Farmers		8
Users	C	Chefs		6
	P	Processors		3
	A	Author	Cook books using ITFCs	1
Knowers	AC	Academia	Food security, Food systems and Archelogy of food	9
	CO	Conservationists		6
	AD	Advisors		6
	N	Nutritionist		1

Table 30: Interview Questions

1. What is the name of the garden where you get, grow or interact with indigenous foods?
2. How are you involved with indigenous foods?
3. What activities/ projects are you involved in with this garden?
4. How did you get involved with this project?
5. What are the aims and objectives of this project?
6. What is your motivation for your work or interest with indigenous foods?
7. Do you think that the increase in consumption of indigenous foods would have nutrition benefit? - High Positive Impact - Positive Impact - Both Positive and negative Impacts - Negative Impact - High Negative Impact - No Impact
8. Do you think that the increase in consumption of indigenous foods would have environmental benefit? - High Positive Impact - Positive Impact - Both Positive and negative Impacts - Negative Impact - High Negative Impact - No Impact
9. Do you think that the increase in consumption of indigenous foods would have Social-cultural benefit? - High Positive Impact - Positive Impact - Both Positive and negative Impacts - Negative Impact - High Negative Impact - No Impact

10. What nutritional benefits do you see, if you have seen any?
11. What environmental benefits do you see, if you have seen any?
12. What socio-cultural benefits do you see, if you have seen any?
13. What benefits do your see using indigenous foods in general?
14. What conditions have hindered you from engaging more with indigenous foods?
15. What are the challenges you see using indigenous foods?
16. Why do you think indigenous foods are emerging?
17. Why indigenous foods have been emerging within community gardens?
18. Do you think the emergence of indigenous foods is cropping up because of how the current food system is structured?
19. Do you think the usage or cultivation of indigenous foods is an alternative to the current food system? And why? - ITFCs is an alternative - Yes and no, ITFCs is an addition and/or a supplement - No, ITFCs is not an alternative
20. Do you think there is potential for indigenous foods to be grown (cultivated) in Western Cape?
21. What is your perception of indigenous foods (negative/positive)? If either/ or both why is that?
22. How do you perceive others perception of indigenous foods (negative/positive)? If either/ or both why is that?
23. Have the benefits benefitted you directly (work, home life, community work)?
24. Have you used indigenous foods in a novel way?
25. Do you use or interact with indigenous foods? - Daily - Weekly - Monthly - Annually

Addendum C: List of indigenous plants found and specifically planted or still to be planted at the Community Gardens

Table 31: List of ITFCs Planted in the Indigenous Food Garden or found growing at the Sustainability Institute

Common Name	Genus Name	Family
Edibles specifically planted		
Dune spinach	*Tetragonia decumbens*	Aizoaceae
Veldkool	*Trachyandra ciliata*	Asphodelaceae
Sandkool	*Trachyandra divaricata*	Asphodelaceae
Sout slaai	*Mesembrianthemum crystallinum*	Aizoaceae
Spekboom	*Portulacaria afra*	Didiereaceae
Edibles found in ornamental beds on the SI property		
Slangbessie	*Lycium ferocissimum*	Solanaceae
Num-num	*Carissa macrocarpa*	Apocynaceae
Kei apple	*Dovyalis caffra*	Salicaceae
Sour fig	*Carpobrotus edulis*	Aizoaceae
Dune crow-berry	*Searsia crenata*	Anacardiaceae
Baboon grape	*Rhoisissus tomentosa*	Vitaceae
Wild plum	*Harpephyllum caffrum*	Anacardiaceae
Milkwood	*Sideroxylon inerme*	Sapotaceae
Waterberry	*Syzigium cordatum*	Myrtaceae
White karee	*Searsia pendulina*	Anacardiaceae
Karee	*Searsia lancea*	Anacardiaceae
Sweet thorn	*Acacia karoo*	Fabaceae
Wild fig	*Ficus sp*	Moraceae
Wild olive	*Olea europea subsp africana*	Oleaceae
Wild rosemary	*Eriocephalus africanus*	Asteraceae
Dune sage, bruin salie	*Salvia africana-lutea*	Lamiaceae
Blue / wild Sage, Blou Salie	*Salvia africana-cearulea*	Lamiaceae
Rough blue sag	*Salvia chamaelagnia*	Lamiaceae
Wild garlic	*Tulbaghia violacea*	Amaryllidaceae
Lemon scented geranium	*Pelargoniun citronellum*	Geraniaceae
Rose geranium	*Pelargonium graveolens*	Geraniaceae
Rose scented geranium, kus malva	*Pelargonium capitatum*	Geraniaceae
Camphor scented geranium	*Pelargonium betulinum*	Geraniaceae
Wilde als/ wormwood	*Artemisia afra*	Asteraceae
Confetti bush	*Coleonema alba / pulchellum*	Rutaceae
Cancer bush	*Sutherlandia frutescens*	Fabaceae
Slangbos	*Stoebe plumosum*	Asteraceae
Kooigoed	*Helichrysum petiolare*	Asteraceae
Wild asparagus	*Asparagus sp*	Asparagaceae
Wild dagga	*Leonotus leonorus*	Lamiaceae

Table 32: List of ITFCs to be Planted in Beacon Organic Garden at Beacon School for LSEN, Mitchells Plain

Common Name	Genus Name	Family
List of food to be planted		
African horned cucumber	*Cucumis metuliferus*	Cucurbitaceae
Amadumbe	*Colocasia esculenta*	Araceae
Wild garlic	*Tulbaghia violacea*	Amaryllidaceae
Grain amaranth	*Amaranthus cruentus*	Amaranthaceae
Finger millet	*Eleusine coracana*	Poaceae
Sorghum	*Sorghum*	Poaceae
Pearl millet	*Pennisetum glaucum*	Poaceae
Chickpeas	*Cicer arietinum*	Fabaceae
Uintjies	*Cyperus fulgens*	Cyperaceae
Ferraria	*Ferraria crispa*	Iridaceae
Moraea	*Moraea viscaria*	Iridaceae
Livingstone potato	*Plectranthus esculentus*	Lamiaceae
Bambara groundnut	*Vigna subterranea*	Fabaceae
Cowpea	*Vigna unguiculata*	Fabaceae
Heirloom tomatoes	*Solanum lycopersicum*	Solanaceae
Wild mustard/ African turnip weed	*Sisymbrium thellungii*	Brassicaceae

Table 33: List of ITFCs Sown as Seeds at Ravenello in Oude Molen Eco Village, Pinelands

Common Name	Genus Name	Family
Raaptolle	*Cyanella alba*	Tecophilaeaceae
Geelraaptol (yellow turnip top	*Cyanella lutea*	Tecophilaeaceae
Lady's hand.	*Cyanella hyacinthoides*	Tecophilaeaceae
Wild Lily	*Morea fugax*	Iridaceae
Veldkool	*Trachyandra ciliata*	Asphodelaceae
Veldkool	*Trachyandra falcata*	Asphodelaceae
	Trachyandra hirsuta	Asphodelaceae
Sandkool	*Trachyandra divaricata*	Asphodelaceae
t'neitjie/ Stork's bill	*Pelargonium incrassatum*	Geraniaceae
Maroon cucumber	*Cucumis anguria*	Cucurbitaceae
Aardboontji, Baroe	*Cyphia volubilis*	Lobeliaceae
Skilpadbessie	*Nylandtia spinosa*	Polygalaceae

Table 34: List of ITFCs Planted at Dik Delta Garden at Solms Delta, when it was Originally Planted

Common Name	Genus Name	Family Name
Sweet-thorn	*Acacia karoo*	Fabaceae
Nara/ Gemsbok cucumber/ Herero melon	*Acanthosicyos horridus*	Cucurbitaceae
Nara/ Gemsbok cucumber	*Acanthosicyos naudiniana*	Cucurbitaceae

Buchu	*Agathosma betulina*	Rutacea
Sucker	*Albucha altissima*	Hyacinthaceae
Cape aloe	*Aloe ferox*	Asphodelaceae
Cape pigweed	*Amaranthus hybridus*	Amaranthaceae
Cape pond weeds	*Aponogeton distachyos*	Aponogetonaceae
Rooibos tea	*Aspalathus linearis*	Fabaceae
Wild asparagus	*Asparagus laricinus*	Asparagaceae
Klipuintjie	*Babiana dregei*	Iridaceae
Bobbejaantjies	*Babiana steicta*	Iridaceae
Kattekruid	*Ballota africana*	Lamiaceae
Forest num-num	*Carissa bispinosa*	Apocynaceae
Big num-num	*Carissa macrocarpa*	Apocynaceae
Vetkousies	*Carpanthea pomeridian*	Mesembryanthemaceae
West Coast sour fig	*Carpanthea acinaciformis*	Mesembryanthemaceae
Sour fig	*Carpanthea edulis*	Mesembryanthemaceae
Bushman's tea	*Catha edulis*	Celastraceae
Bietou/bitou/ skilpadbos	*Chrysanthemoides monilifera*	Asteraceae
Tsamma Melon/Wild watermelon	*Citrullus lanatus*	Cucurbitaceae
Makataan	*Citrullus lanatus*	Cucurbitaceae
Wild cucumber	*Coccinia rehmanni*	Cucurbitaceae
Cape sumach	*Colpoon compressum now Osyris compressa*	Santalaceae
Pig root	*Conicosia pungionifromis*	Mesembryanthemaceae
Bitter wild cucumber	*Cucumis metiliferus*	Cucurbitaceae
Lady's hand	*Cyanella hyacinthoides*	Tecophilaeceae
Honeybush/ Mountain tea	*Cyclopia intermedia*	Fabaceae
Uintjie	*Cyperus fulgens*	Cyperaceae
Kei appel	*Dovyalis caffra*	Flacourtiaceae
Wild rosemary	*Eiocephalus africanus*	Asteraceae
Magic guarri	*Euclea divinorum*	Ebenaceae
Common guarri	*Euclea undulata*	Ebenaceae
Wild fig	*Ficus sur*	Moraceae
Wild fennel	*Foeniculum vulgare*	Apiaceae
Beef tongue	*Gasteria disticha*	Asphodelaceae
Carpet geranium	*Geranium incanum*	Geranianceae
Kukumakranka	*Gethylis afra*	Amarylildaceae
Velvet/ Bushman raisin	*Grewia flava*	Tiliaceae
Duikerworltel/ Pietsnot	*Grielum humifusum*	Lalvanceae
Bitterghaap	*Hoodia gordonii*	Apocynaceae
Mead/ Karrie	*Peucedanum sp*	Apiaceae
Wild grape	*Lannea edulis*	Anacardiaceae
Grey conebush	*Leucadendron pubescens*	Proteaceae
Hongertee	*Leyssera gnaphalioides*	Asteraceae

Seepbos	*Monochlamys albicans*	Chenopodiaceae
Wituintjie	*Morea edulis*	Iridaceae
Wild mint	*Mentha longifolia*	Lamiaceae
Kannetjies	*Microloma sagittatum*	Asclepiadaceae
Tortoise berry	*Nylandtia spinosa*	Polygalaceae
Wild olive	*Olea eurpaea ssp. Africana*	Oleaceae
Carrion flower	*Orbea variegata*	Apocynaceae
Cape sorrel	*Oxalis pes-caprae*	Oxalidaceae
Jacket plum	*Pappea capenesis*	Sapindaceae
Rose-scented Geranium	*Pelargonium capitatum*	Geraniaceae
Celandine-leaved Pelargonium	*Pelargonium fulgidum*	Geraniaceae
'neitjie/ Stork's bill	*Pelargonium incrassatum*	Geraniaceae
Bergpatat	*Pelargonium rapaceum*	Geraniaceae
Beer root	*Peucedanum sulcantum*	Apiaceae
Mint pelargonium	*Pelargonium tomentosum*	Geraniaceae
Cape gooseberry	*Physalis peruviana*	Solanaceae
Wild sugar bush	*Physalis campestris*	Caryophyliaceae
Elephants food/ bush	*Portulacaria afra*	Portulacaceae
Purslane	*Portulaca oleracea*	Portulacaceae
Sugar bush	*Protea repens*	Proteaceae
Aroena	*Quawua mammilaris*	Asclepiadacea
Quinine tree	*Rauvolfia caffa*	Apocynacea
African sumac	*Rhus pendulina*	Anacardiaceae
White karee	*Rhus rosea*	Anacardiaceae
Frutang	*Romulea rosea*	Iridaceae
Common dock	*Rumex cardatus*	Polygonaceae
Blue/ Wild sage	*Salvia africana-caerulea*	Lamianceae
Wild sage	*Salvia muirii*	Lamianceae
Mother-in-law's tongue/ Bowstring hemp	*Sansevieria hyacinthodies*	Dacaenceae; Agavaceae
Spiky mother-in-law's tongue	*Sansevieria pearsonii*	Dacaenceae; Agavaceae
Kougoe	*Sceletium tortosum*	Mesembryanthemacea
Karoo Boer-bean	*Schotia afra var. afra*	Fabaceae
Weeping Boer-bean/ Tree Fuchis	*Schotia brachypetala*	Fabaceae
String of Bananas/ Pearls	*Senecio radicans*	Asterceae
Wild mustard/ African turnip weed	*Sisymbrium thellungii*	Brassicaceae
Nightshade	*Solanum retroflexum*	Solanaceae
Dune spinach	*Tetragonia decumbens*	Aizoaceae
Wild garlic	*Tulbaghia violacae*	Alianceae
Cape spinach	*Trachyanda ciliata*	Asphodelaceae
Bulrusch	*Typha capensus*	Typhaceae
Sourplum	*Ximenia caffra*	Olacaceae
Buffalo-thorn	*Ziziphus mucronata*	Rhamnaceae

Table 35: List of ITFCs Planted at Masakhane Community Garden in Grootbos, Gansbaai

Common Name	Genus Name	Family
Wild rosemary	*Eriocephalus africanus*	Asteraceae
Wild garlic	*Tulbagia violaceae*	Amaryllidaceae
Kei apple	*Dovyalis caffra*	Salicaceae
Wild plum	*Harpyphyllum caffrum*	Anacardiaceae
Wilde als	*Artemesia afra*	Asteraceae
Wild sage	*Salvia africana*	Lamianceae
Rose pelargoniums	*Pelargoniun citronellum*	Geraniaceae
Lemon Pelargoniums	*Pelargoniun citronellum*	Geraniaceae
Peppermint pelargoniums	*Pelargoniun citronellum*	Geraniaceae
Num-num	*Carissa macrocarpa*	Apocynaceae
Guarrie	*Euclea racemosa*	Ebenaceae
Candlewood	*Pterocelastrus tricuspidatus*	Celastraceae

Table 36: List of ITFCs to be Planted at Village Heights Community Garden in Lavender Hill

Common Name	Genus Name	Family
Sourfig	*Carpobrotus acinaciformis*	Aizoaceae
Ice plant / Sour fig	*Carpobrotus edulis*	Aizoaceae
West Coast sour fig	*Carpobrotus quadrifidus*	Aizoaceae
Ice plant, Sout slaai	*Mesembryanthemum crystallinum*	Aizoaceae
Rose-scented pelargonium	*Pelargonium capitatum*	Geraniaceae
Dune spinach	*Tetragonia decumbens*	Aizoaceae
Kinkelbossie/ Slaaibos	*Tetragonia fruticosa*	Aizoaceae
Veldkool	*Trachyandra ciliata*	Asphodelaceae
Sandkool	*Trachyandra divaricate*	Asphodelaceae
Wild garlic	*Tulbaghia violacae*	Alianceae
Dune Crow-berry	*Searsia crenata*	Anacardiaceae
Varnished Kuni-rhus/ Blinktaaibos	*Searsia lucida*	Anacardiaceae
Blue kunibush/ Bloukoeniebos	*Searsia glauca*	Anacardiaceae
Spekboom	*Portulacaria afra*	Didiereaceae
Forest num-num	*Carissa bispinosa*	Apocynaceae
Big num-num	*Carissa macrocarpa*	Apocynaceae
Wild rosemary	*Eriocephalus africanus*	Asteraceae
Tortoise berry/ Skilpadbessie	*Muraltia spinosa*	Polygalaceae
Grey bietou	*Osteospermum incanum*	Asteraceae
Blou salie	*Salvia africana- caerulea*	Lamiaceae
Bruin salie/ Dune salvia	*Salvia africana-lutea*	Lamiaceae

Table 37: List of ITFCs in Cultivation in Cape Wild Food Garden at Moya we Khaya, Khayelitsha

Common Name	Genus Name	Family Name
Dune spinach	*Tetragonia decumbens*	Aizoaceae
Kinkelbossie/ Slaaibos	*Tetragonia fruticosa*	Aizoaceae
Veldkool	*Trachyandra ciliata*	Asphodelaceae
Sandkool	*Trachyandra divaricata*	Asphodelaceae
Sour fig	*Carpobrotus edulis*	Aizoaceae
Ice plant/ Sout slaai	*Mesembryanthemum crystallinum*	Aizoaceae
Spekboom	*Portulacaria afra*	Portulacaceae

Table 38: List of ITFCs Planted in Ikhaya Food Garden at Isikhokele Primary School Site C, Khayelitsha

Common Name	Genus Name	Family
Wild fig	*Carpobrotus edulis*	Aizoaceae
Spekboom	*Portulacaria afra*	Didiereaceae
Kinkelbossie	*Tetragonia fruticosa*	Aizoaceae
Dune spinach	*Tetragonia decumbens*	Aizoaceae
Sandkool	*Trachyandra divaricata*	Asphodelaceae
Veldkool	*Trachyandra ciliata*	Asphodelaceae
Skilpadbessie	*Nylandtia spinosa*	Asteraceae
Dune celery	*Salvia africana lutea*	Lamiaceae
Wild rosemary	*Eriocephalus africanus*	Asteraceae
Rose geranium	*Pelargonium capitatum*	Geraniaceae
Wild garlic	*Tulbaghia violacea*	Amaryllidaceae
Kei apple	*Dovyalis caffrum*	Salicaceae

Table 39: List of ITFCs Found Growing in the Gardens of Algeria, at Cederberg Project

Common Name	Genus Name	Family
Sweet thorn/ Acacia karoo	*Vachellia karroo*	Fabaceae
Rose geranium	*Pelargonium graveolens*	Geraniaceae
Wild rosemary	*Eriocephalus africanus*	Asteraceae
Spekboom	*Portulacaria afra*	Portulacaceae
Kruipvygie	*Spalmanthus canaliculatus*	Amaryllidaceae