

Faculty of Agriculture and Forestry, Department of Agricultural Sciences
University of Helsinki

**RETHINKING FOOD AND NUTRITION
SECURITY AMONG A FORMER HUNTER-
GATHERER GROUP IN NAMIBIA**

THE IMPACTS OF THE LOCAL FOOD ENVIRONMENT
AND MULTI-DIMENSIONAL DRIVERS OF FOOD
CHOICES ON DIET QUALITY

Anita Heim

DOCTORAL DISSERTATION

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Supervisors:

Adjunct Professor, Dr Aili Pyhälä, University of Helsinki, Finland
Professor, Dr Juha Helenius, University of Helsinki, Finland

Pre-examiners:

Dr Amy Ickowitz, Center for International Forestry Research
Docent, Dr Katriina Soini, Natural Resources Institute Finland (Luke)

Custos:

Professor, Dr Juha Helenius, University of Helsinki, Finland

Opponent:

Assistant Professor, Dr Tessa Minter, Leiden University, The Netherlands

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ABSTRACT

The diets of former hunter-gatherers, and the diets of many Indigenous Peoples worldwide, are changing at a fast pace, and malnutrition has become a widespread problem. Several reports highlight the severity of food insecurity among the San people - a generic term for several Southern African Indigenous ethnic groups – calling for research to investigate the quality and specificities of their contemporary diet and its influencing factors.

This dissertation is the outcome of a four-year multidisciplinary study aiming to understand the underlying causes of food and nutrition insecurity among a Namibian San community, the Khwe San people in Bwabwata National Park (BNP). Experiencing rapid changes in socio-cultural and environmental settings over their recent history, and being the target of many development projects, their traditional food system has undergone substantial changes over the past few decades, and little has to date been done to examine these changes or the implications they may have.

The dissertation applies a food systems approach in an attempt to understand the contemporary food environment and food choices of the Khwe San and assesses one particular food strategy, namely crop cultivation in more depth, both from community and stakeholders' perspectives. The study began with an initial ethnographic phase, followed by qualitative and quantitative data collection throughout three extended periods of fieldwork (five months each) between 2016 and 2018 in the eastern part of BNP. Research methods included participant observation, a socio-economic survey, a dietary intake survey, structured and semi-structured interviews, and village meetings.

The findings of this dissertation demonstrate that the dietary diversity of the study population is extremely low (the average dietary diversity score was below 2.5 out of 10). No direct association was found between socio-economic variables and diet quality. Further research of the food environment provided some explanations for the low dietary diversity score, with several nutritional food groups missing from the local food environment. Among the local food sources, bush, governmental food aid and agricultural fields are perceived by the Khwe as being the most important. However, the restricted and recently denied access to bush habitats due to externally imposed conservation regulations had caused severe perturbations in the local food availability. The importance of crop cultivation was ranked highly, although its dietary contribution was found to be minimal.

In-depth interviews with Khwe elders reveal how historical and political events and cultural norms have shaped diets over the past five decades. Current preferences for traditional foods was found to be divided, strongly influenced by access, but traditional food preferences have also declined due to erosion of traditional knowledge. This study found the main determinants of current Khwe food choices to be sensory drivers, access, food insecurity,

costs, and health concerns. Nevertheless, substantial gaps in nutritional knowledge prevent many of the Khwe from making informed food choices.

Assessment of the most advocated food strategy in BNP, namely crop cultivation, reveals that both institutional factors and local practices are influencing the poor production outcome. Despite the centralised governmental support efforts, yields remain low due to the incompetence, conflicts and disharmonised approaches between the various governmental institutions. The study describes the current state of community capitals and the environmental context within which crop cultivation takes place, all of which play a defining role in outcomes, but remain largely disregarded by the highly authoritative governmental agencies.

This dissertation contributes to the growing body of knowledge on food environment and food choice studies in rural settings of low- and middle-income countries by introducing new conceptual and methodological nuances. Moreover, the principal findings point to the fact that the Khwe San lack access to adequate food in terms of quantity, nutritional value and cultural meaning. The Khwe are trapped in a vicious cycle of malnutrition due to a dysfunctional local food system in which they have no agency over the food sources, and are deprived of access to their natural food resources on their traditional lands. This violates the United Nations Declaration on the Rights of Indigenous Peoples and contradicts the human right to food.

The results of the dissertation anticipate guiding future policy and development interventions to improve dietary adequacy among San people by: ensuring access to nutritious foods in an inclusive, participatory manner; supporting informed dietary behaviour; strengthening community capitals, and; fostering positive change in the food environment. National and regional policy and practice need urgent reform in order to secure user rights over land and resources, and to ensure a just food system for the Indigenous inhabitants of the BNP.

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Anita Heim designed the study, collected the data and wrote the first draft of the paper. Aili Pyhälä provided guidance and assistance to the study design and data analysis and contributed significantly to the final draft of the article. Both authors read and approved the final manuscript.

ABBREVIATIONS

BNP	Bwabwata National Park
CBNRM	Community Based Natural Resource Management
CCF	Community Capitals Framework
CCA	Core Conservation Area
DDS	Dietary Diversity Score
DMC	Division of Marginalized Communities, Namibia
FAO	Food and Agriculture Organisation
HIC	High-income countries
HLPE	High Level Panel of Experts on Food Security and Nutrition
IFPRI	International Food Policy Research Institute
IP	Indigenous Peoples
IWGIA	International Work Group for Indigenous Affairs
ISE	International Society of Ethnobiology
KA	Kyaramacan Association
LMIC	Low- and middle-income countries
MDD	Minimum Dietary Diversity
MET	Ministry of Environment and Tourism, Namibia
MLR	Ministry of Land Reform, Namibia
MUA	Multiple Use Area
NACSO	Namibian Association of CBNRM Support Organizations
NAD	Namibian Dollars
NDF	Namibian Defence Force
NGO	Non-governmental Organization
SADF	South African Defence Force
SDP	San Development Programme
SES	Socio-economic status
TA	Traditional Authority
TENK	Finnish Advisory Board on Research Integrity
UN	United Nations
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
UNEP	United Nations Environment Programme
USD	United States Dollar
etc.	et cetera
i.e.	id est
e.g.	exempli gratia

1 INTRODUCTION

1.1 BACKGROUND AND IMPORTANCE

The diets of former hunter-gatherers, and of many Indigenous Peoples worldwide, are changing at an alarmingly fast pace (Turner et al., 2009; Kuhnlein & Receveur, 1996). Research from different parts of the world demonstrates that various forms of malnutrition-related chronic diseases have become a widespread problem among Indigenous Peoples (Alderete, 1997; Ring & Brown, 2003; Montenegro & Stephens, 2006; Dieckmann, 2018; Dounias & Froment, 2006). Malnutrition, a symptom of food and nutrition insecurity, is attributed to inadequate food intake and poor dietary quality (Azadbakht et al., 2005; Styen et al., 2006). In some parts of the world, malnutrition is manifested by diets dominated by highly processed foods, resulting in obesity and nutritional deficiency (Kuhnlein et al., 2004), whereas in other parts, such as in remote rural areas of Sub-Saharan Africa, an overall undernutrition (not having enough to eat) prevails (Oiye et al., 2009; Okeke et al., 2009), with typical symptoms being those of wasting and stunting.

Hunter-gatherer livelihoods are characterized as being highly dependent on natural resources. However, in the contemporary world, hunter-gatherers are increasingly being deprived of their access to land and natural resources (Reyes-García & Pyhälä, 2016; IWGIA, 2019). Regions where they have been living for hundreds, if not thousands, of years are increasingly being taken under the control of state authorities or other external actors due to institutionalized conservation, development, extractive, financial or other resource-driven objectives (Boyd et al., 1999; IWGIA, 2019; Hitchcock, 2002). Meanwhile, many of the local foragers have been forced to adopt a sedentary lifestyle (Page et al., 2018; Hitchcock, 2002; Reyes-García & Pyhälä, 2016), implying also new forms of livelihood activities such as animal husbandry, crop cultivation, and formal wage employment. These massive lifestyle changes have transformed traditional cultures and impacted their food systems (Turner et al., 2009). Many foods that hunter-gatherers have relied on for centuries have become unavailable, while the emerging, new types of food that have become available are no longer from their immediate environment, nor reliant on customary methods of procurement or social structures.

To date, only a few studies have offered quantitative results on dietary changes among modern hunter-gatherers (Crittenden & Schnorr, 2017). For example, Kirchengast (1998) concluded that the shift from nomadic hunter-gatherer to settled life negatively impacted the nutrition status of the !Kung San group in Southern Africa. The study showed that while traditional food had supported a nutritious diet, this has now been replaced by a simplified diet containing excessive amounts of grains and unhealthy consumption habits

(e.g., related to sugar), contributing to a nutritional deficiency (e.g., in iron, measured by Kent & Lee, 1992).

The San - a generic term for several Southern African hunter-gatherer groups – have been considered amongst the most disadvantaged groups in Namibia (Suzman, 2001). Disaggregated data on the food security and nutritional status of the San groups in official and national reports are rare. Other than the aforementioned study, since the early 2000s no quantitative studies were found that report on the nutritional status and characteristics of the diets of any San groups. This gap was highlighted in a recent report by Dieckmann (2018), stressing the need for empirical academic studies to provide a better understanding of the food situation among the various San groups.

The main concern of this PhD project is to explore the underlying food-systemic reasons for this persistently insecure food situation among the Khwe, one of the several San groups. To accomplish this, I began my research with a quantitative assessment of the current diet of a former hunter-gatherer group in North-East Namibia, followed by qualitative explorations of the contemporary food system. Specifically, this dissertation explores how the Khwe San perceive and navigate in their heavily transformed local food environment, and how they make their food choices. In addition, I examine one specific food strategy in more depth, namely crop cultivation, given that it is the most endorsed food strategy for solving food insecurity in Namibia (NDP4, 2012; NDP5, 2017).

To my knowledge, there have been no studies undertaken on San perspectives on food choice, or on the interplay of San individuals with their food environments. In addition, the impacts of the historical and socio-cultural contexts in which food choices are made are little understood. Correspondingly, a recent review (Turner et al., 2019) on food environment studies highlighted the urgency of investigating fast-changing food environments in low- and middle-income countries (LMIC), and of detecting and describing the main pathways in the local food systems to better understand the underlying causes of undernutrition. To do that, place-specific and interdisciplinary research is required that accounts for social, environmental, and economic trends, as has been pointed out by Herforth & Ahmed (2015).

1.2 THE TRADITIONAL FOOD SYSTEMS OF THE SAN

Anthropological studies underline the fact that, for the San, food is interwoven into all aspects of life (Köhler, 1989, 1991; Lee, 1968, 2013; Lee, & Daly, 1999; Marshall, 2006; Howell, 2010). Traditionally, food provided links to the environment and determined the sense of responsibility and identity in the group. Significant domains of their traditional knowledge transmission were focused on food, which also played a central role in culture and ceremonies.

The term *traditional food system* describes all the food items within a given culture that are obtainable from the local environment and its natural resources. The term also encompasses the sociocultural meanings of foods, the techniques used for their acquisition and processing, the way the food is used, and its chemical composition and nutritional value (Kuhnlein & Receveur, 1996).

Traditionally, the San relied predominantly on gathering wild vegetables for nutrition; wild meat amounted to a smaller portion of their diet (Lee, 2013; Lee & Daly, 1999). An inventory study among the Ju/'hoansi San group in Namibia found over 100 edible plants (Lee 2013). This wide variety of fruits, nuts, berries, root vegetables, beans, and leafy greens provided the Ju/'hoansi with a highly varied diet, with only an average of 20 hours of work per week spent on acquiring these foods. As for the Khwe San, in the 1960s Köhler (1991) recorded 47 different types of wild game and 53 birds that were hunted, and 84 different plants that were collected. In addition, mushrooms, honey, insects, and small vertebrates were also consumed. The traditional food acquisition techniques involved a broad set of tools and skills, ranging from using bows and arrows to trapping and digging deep holes for reaching root vegetables (Köhler, 1991).

Although the Khwe hunted and gathered all year round, there was a substantial seasonal variation due to the distribution of rains. Most of the precipitation falls between December and March, with almost no rainfall occurring in the other months. The variation in rainfall determines which edible flora and fauna are available and trackable during each season. In addition, agriculture has played an increasingly important role in their traditional food system for the last two centuries (Suzman, 2001), during which the Khwe have been actively engaged in millet farming and animal husbandry.

Hunter-gatherer groups around the globe who have managed to retain significant aspects of their traditional livelihoods are characterized as being physically fit and having diversified diets of nutritious food (Parrotta et al., 2015). Hausman and Wilmsen (1985) conducted a comparative study on three Ju/'hoansi San groups in Botswana living on different diets: 1) a traditional hunting and gathering diet, 2) a mixed diet of wild and domestic foods, and 3) a settled agro-pastoralist diet. They found that the more traditional the diet, the more meat it contained, while the settled communities had considerably smaller portions of vegetables and meat, and a larger intake of milk, maize meal, and sugar in their diet. Correspondingly, the intake of animal protein was much larger in the more traditional forager groups in other places (Colfer, 2008; Dounias et al., 2007; Koppert et al., 1993; Gupta, 1980).

However, the food systems for the San in Southern Africa have changed markedly over the past few decades (Dieckmann, 2018). Their intimate connection with traditional food was perturbed by political, social, economic, and cultural changes, resulting in a gradual erosion of traditional food-related knowledge (Bvenura & Afolayan, 2014; Modi et al., 2006; van Rensburg et al.,

2007). Moreover, several cultural practices related to obtaining, processing, preparing, and eating traditional foods have become redundant or impossible to maintain in contemporary settings.

Yet, some aspects of the ethos of the foraging culture may be more resilient among the former hunter-gatherers than the forager mode of subsistence itself. The traditional practices of most contemporary San have undergone large transformations, and foraging is today practised to a much lesser extent. However, some facets of the past way of life seem to be strongly imprinted in their social relations, attitudes, identity, perceptions of leadership, and attitudes towards non-accumulation. Barnard (2002, pp. 5) referred to this as the “foraging mode of thought”, which also drives the San’s distribution system, i.e. the practice of sharing. Based on this concept, foragers have an obligation to share their resources (especially food) with the community, even if their personal attainments are minimal.

Another typical strategy that characterizes hunter-gatherers is the immediate return subsistence strategy. Woodburn (1982, pp. 432) describes the societies who live according to this strategy as “people who obtain a direct and immediate return from their labour”. In these societies, people avoid long-term obligations and investing substantial amounts of time in productive processes that do not provide benefits instantly (Woodburn, 1982, pp. 98). On the other hand, societies that are organized in delayed return structures have an interval between the time of production and the time of consumption. The accumulation and storage of products and tools are common in these societies, who are typically pastoralists, agriculturalists, and wage labourers. Both of these modes of subsistence strategies have been found to be simultaneously present among the contemporary San (Widlok, 1999, pp. 73).

1.3 STATE OF FOOD INSECURITY AMONG THE SAN

In Namibia, approximately 38.000 San people reside in various environments (Puckett et al., 2018). The state of food insecurity prevailing among the San in Namibia has been extensively reported by Suzman (2001). Soon after this report, the Namibian Government started to implement the San Development Programme (SDP) in 2005, with a substantial and annually increasing budget (Dieckmann et al., 2014), and considerable emphasis on improved food security. One would expect some positive outcomes from these efforts over the past 15 years, yet recent comprehensive reports on the status of the San in Namibia have reported otherwise. While some overall development improvements have been achieved, mainly in access to education and clean water, the overall situation of the San remains very unstable, disadvantaged, and food insecure (Dieckmann et al., 2014). At the time of this research, most San were eating a maximum of two meals per day, and the food sources they relied on were highly variable in terms of availability. Indeed, San groups in Namibia today depend largely on food handouts from the national

government, and only to a lesser extent on locally acquired wild foods (Dieckmann et al., 2014).

The general detrimental effects of long-lasting food aid on livelihoods and diets have been discussed in numerous studies (Jackson, 2019; Puglia, 2019; Barrett, 2006), with a particularly interesting impact on a Khwe San group in Botswana reported by Taylor (2002). He argued that the food handouts, which mainly consist of carbohydrates, primarily affected the food acquisition of the women, who have been mostly responsible for the gathering of the plant foods. With carbohydrates now available in the form of maize meal, the women have started to spend more time engaging in other livelihood strategies, such as low-paid jobs in projects and selling alcohol. Overall, the food aid indirectly affected their traditional food system and reduced the amount and diversity of gathered foods in the diets of these women and their families.

In most locations where the San reside, wild foods have become scarce in the local diet due to a lack of access. The restricted access is a result of e.g.: land grabbing by farming communities from !Xun and Ju|'hoansi groups, or imposed protected area regulation in the case of Khwe and Hai||om people (Dieckmann, 2014). The implications of this are severe, as noted by James Anaya, the UN Special Rapporteur on the Rights of Indigenous Peoples, in his report after visiting San communities in Namibia in September 2012: "The precarious land situation of San people in Namibia also affects their health. Specifically, insecure land tenure and restrictions on hunting and gathering traditional foods interferes with the San peoples' ability to rely on their traditional food sources and results in many San relying on government food aid as a principle means of substance. However, food aid is often unreliable and insufficient, leading to situations of persistent hunger among San communities, which compromises their immune systems and their ability to resist disease."

1.4 AIM AND OBJECTIVES OF THE DISSERTATION

The research work presented within the scope of this dissertation is a synthesis of the findings of four scientific papers, examined through the perspective of a food systems approach.

The overarching aim of this dissertation is to evaluate the fundamental elements of the local food system of a former hunter-gatherer group, and to increase the understanding of their food and nutrition status.

The dissertation has three specific objectives:

- (1) to assess the quality of dietary intake and food sources in the local food environment among the Khwe adults in the villages of the Bwabwata National Park East
- (2) to characterise the local food environment and describe the drivers of food choices in shaping the contemporary diets of the Khwe

(3) to assess the viability of crop cultivation as a local food production strategy to contribute to food security.

1.5 SITUATING THE STUDY

This dissertation contributes to the literature on food studies, more particularly on local food systems and diets. In recent years, food studies have departed from just utilizing one particular discipline and are increasingly undertaken in an interdisciplinary manner while using theories from a broad range of academic fields (Chrzan & Brett, 2017). This dissertation follows this trend and takes an interdisciplinary approach to study the contemporary food system of the Namibian Khwe San. It thus combines methods from several disciplines, mainly social sciences, anthropology and nutrition studies.

In contrast to traditional research where the research is driven by specific research questions and a set research design, in food studies, the research is usually driven by one or more problems or issues (Chrzan & Brett, 2017). Thereby, a holistic approach and a wide range of methods which bridge disciplinary boundaries are essential to improve the understanding of the problems and lead the way for more effective solutions. The problem that was addressed in this dissertation was the food insecurity situation among the San highlighted by earlier reports (Suzman, 2001; Dieckmann et al., 2014). Yet these reports lacked the provision of quantitative dietary data as well as linkages to contextual factors. In my dissertation, the quantitative dietary assessments are complemented with structured, and semi-structured interviews and participant observations. Given the substantial socio-cultural focus of the study, it was necessary to analyse historical, cultural and demographic factors to interpret a wide range of aspects within the food system, including food choice, food environment and food quality. The interdisciplinary study was then interpreted through a conceptual framework of food system in order to advance the understanding of the complex connections between food environment, food behaviour, and the contextual factors that contribute to the dietary outcome.

2 KEY TERMS AND CONCEPTUAL FRAMEWORK

In this section, I introduce the main terms and concepts used throughout i) the dissertation (food security for Indigenous Peoples, food systems) and ii) the contributing articles (dietary diversity, food environment, food choice and community capitals). Then, based on these key concepts, I present the overall conceptual framework of the doctoral thesis (Figure 3).

2.1 DEFINITION OF FOOD SECURITY FOR INDIGENOUS PEOPLES

In the early 1980s, the state of food security was regarded as a matter of adequate calorie intake, when “all people at all times have both physical and economic access to the basic food they need” (FAO 1983). This narrow focus has been increasingly challenged, and the new definition by the FAO (FAO et al., 2012) reaches beyond the traditional notion of food security and emphasizes the importance of looking at a wider range of environmental, economic, social, and cultural variables affecting nutritional intake. In addition, in recent years, dietary quality and diversity have increasingly been considered when referring to food security (Ickowitz et al., 2019). However, according to Egeland and Harrison (2013), the above definitions of food security are incomplete when considering Indigenous Peoples (IPs). Egeland and Harrison argue that the concept of food security should also encompass the assessment of traditional food intake and the stability of access to these traditional foods. It has been shown that even a small amount of traditional food consumption can substantially increase the nutritional status of IPs (Kuhnlein & Receveur, 2007; Egeland et al., 2011; Johnson-Down & Egeland, 2010); in other words, traditional food systems play a critical role in ensuring food security amongst IPs.

2.2 FOOD SYSTEMS

Food systems, when functioning effectively, should provide food security for the people that depend on them (Nakimbugwe & Boor, 2010). Yet, when hunger and malnutrition reside, the food system is not fulfilling its function (Meybeck & Gitz, 2017). Food systems are influenced by numerous factors, and therefore can be approached from a range of disciplinary perspectives, including anthropology, nutrition, agronomy, and sociology. The available literature on the food systems approach is vast, yet vague on definitions (see: HLPE 2014, UNEP 2016). Nevertheless, one issue that is repeatedly discussed

in the literature is how food systems might be transformed to enable healthy diets for communities (Willett et al., 2019; Meybeck & Gitz, 2017).

For the purpose of this dissertation, I build on the definition of the High Level Panel of Experts on Food Security and Nutrition (HLPE, 2017). A food system gathers the elements and activities that relate to the production, processing, distribution, preparation, and consumption of food, and the dietary outputs of these activities. There are three fundamental elements that have been determined to influence dietary outcomes: 1) **food supply chains**, 2) **the food environment**, and 3) **consumer behaviour** (De Brauw et al., 2019). In this dissertation, I focus on the latter two, namely the notions of food environments and food consumer behaviours, and I elaborate on how these two elements shape local diets within the food system (see Figure 3).

Over the last five years, a handful of international reports have discussed the typology of food systems. For example, the Global Nutrition Report (IFPRI, 2015) distinguishes five types of food systems: rural, emerging, transitioning, mixed, and industrialized, while the HLPE (2017) adapt and modify their typology from Gómez and Ricketts (2013), and describe three types of food systems: traditional, mixed, and modern. These studies in their description of typologies focus on food systems that are agriculture- and /or market-based. However, food systems of many indigenous communities, whose diet and lifestyle are in transition, fit none of the above typologies. Their local food system is still possessing features of the place-based traditional food system of foraging, whilst also having already adopted some components of agriculture- and market-based food systems. Therefore, I have further devised my own typology, and in the Results section of this thesis (5.2), I describe the current drivers of food choices and characteristics of the prevailing food environment as clustered into the different food system components of: traditional, agricultural, and modern. These I conceptualize as follows, where a) *traditional* is understood according to the definition of Kuhnlein and Receveur (1996), as described in Section 1.2. ; b) *agricultural* is understood as incorporating all the place-based cultivated components of the food systems, and c) *modern* is understood as including all the packaged non-place-based foods brought into the local food environment from elsewhere.

2.3 FOOD ENVIRONMENT

Most food environment studies have taken place in high-income countries [HICs] (Turner et al., 2018) in response to diet-related chronic diseases, and therefore also the main concepts according to which they are framed originate from such settings. Yet, the definitions are inconsistent, as food environments are very dynamic, evolving, and interactive (Swinburn et al., 2005). More recently, the conceptualization of food environments for developing country settings has received special focus in the scientific literature (Herforth & Ahmed 2015; Turner et al., 2017; Turner et al., 2018, Turner et al., 2019), and

also in the international policy sphere (HLPE, 2017; FAO, 2016). In a recent Technical Brief by the Food Agriculture, Nutrition and Health Academy Food Environment Working Group (Turner et al., 2017), food environment is described as the “linkage” between broader food systems and individual diets, and thus as being a critical determinant of food security by influencing the **availability** (presence of food), **affordability** (purchasing power), **desirability** (preferences, acceptability, taste, desires, culture, knowledge and skill), and **convenience** (time and effort to produce, prepare and consume food) of foods.

As research among rural communities in LMICs has expanded, there has also been a growing need to integrate non-market based, cultivated, and wild environmental aspects into the conceptualisation and measurement of food environments. These components are particularly important when studying the food security of indigenous and local communities undergoing substantial lifestyle transformations. In a scientific newsletter, Ahmed and Herforth (2017) updated their previous theoretical framework to integrate wild and cultivated biodiversity into their food environment conceptualization. In their framework, they simply replaced affordability with diversity (variety of food). In my research, I have built on this conceptualization, and in order to grasp both market and non-market elements of the food environment, I have added diversity as an additional component to the original framework (Figure 1). This served as an analytical framework to interpret my own results (Article II).

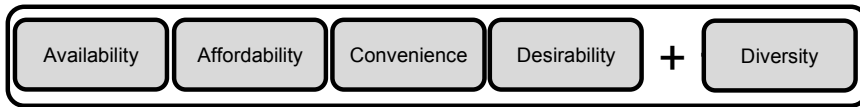


Figure 1 Modified conceptual framework of market and non-market-based food environments, building on Ahmed and Herforth (2017)

2.4 FOOD CHOICE

Food choices and dietary patterns describe an essential aspect of human societies because they have symbolic value in the development of social and cultural identities (Furst et al., 1996). Several conceptual models exist for defining and clustering food choices (Furst et al., 1996; Krebs-Smith & Kantor, 2001; Sobal & Bisogni, 2009; Story et al., 2008). In my analysis, I chose to apply one of the widely-used ecological frameworks, from Story et al. (2008), which outlines dietary behavioural drivers at four levels: macro, physical, social, and individual (see Figure 2). This ecological model has recently been used, for example, to understand food access in rural communities (Rodriguez & Grahame, 2016), to identify social norms (Raghoebar et al., 2019), and to describe the relationship between diet and health (Bleich et al., 2015).

Within the ecological framework clusters (Figure 2), **individuals** exist principally within micro-systems (e.g. families and households) and make

many of their food choices based on their personal preferences (e.g. taste, hunger, health, mood, and emotions). However, some individual choices might be influenced by their immediate kin (e.g. familiarity, knowledge and skills, attitudes and beliefs). The individuals are situated within the **social** systems of the local communities, where culturally acquired knowledge on food and social norms influence dietary behaviours. Yet, food behaviour can only be fully interpreted by considering the **physical** environment wherein it is taking place, characterised by the accessibility and availability of the foods. Finally, these are to a large extent regulated by the political context and natural factors at a larger **macro-level** scale (see Figure 2).

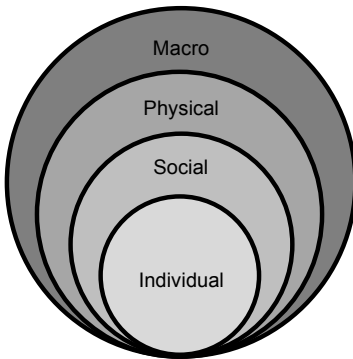


Figure 2 Determinants of food choices at different levels (Sourced from Story et al., 2008)

As mentioned above, while these concepts and inter-relations have already to some extent been studied in modern, industrialized, food-secure settings, the literature on food choice studies reveals a glaring gap when it comes to exploring the food choices of vulnerable communities who are experiencing malnutrition. This dissertation aims to contribute to filling that gap.

2.5 DIETARY DIVERSITY

Dietary diversity is the number of foods that are consumed across and within food groups over a given reference period (Arimond et al., 2008). The dietary diversity score (DDS) was found to be an effective measure of the diet quality and food security of an individual (Thorne-Lyman et al., 2010; Headey & Ecker, 2013). Namely, dietary diversity captures macro- and micro-nutrient intake, is assessable at the individual level, and has been correlated not only with nutritional outcomes, but also with the food insecurity pillars (Parappurathu et al., 2015). In addition, dietary diversity is sensitive to seasonality and shocks, and its method of measurement is affordable (Headey & Ecker, 2013).

As a term, dietary diversity score (DDS) represents the number of foods and food groups consumed over a defined time period (Ruel, 2002). With an increase in DDS, the likelihood of an adequate intake of essential nutrients also increases (Mirmiran et al., 2006). For this study, dietary recall data were assigned to 10 pre-defined food groups, according to the guidelines of FAO and FHI 360 (2016): (1) grains/roots, (2) pulses, (3) seeds and nuts, (4) dairy, (5) meat/fish, (6) eggs, (7) dark green leafy vegetables, (8) other Vitamin A rich fruits and vegetables, (9) other fruits, and (10) other vegetables. The 10-food group score can be used as a dichotomous indicator to measure the micronutrient adequacy of diets, and has been validated by nine datasets, where it was positively associated with the mean probability of adequacy across eleven micronutrients (Women's Dietary Diversity Project Study Group, 2017). For women of reproductive age, a minimum dietary diversity (MDD) score has been defined by the FAO (FAO and FHI 360, 2016) as five out of ten. Even though this indicator is measured by surveying individual women, it is a population-level indicator, and it is designed to reveal information about the groups of women in a community. In my study, I have extended the MDD to also include men, in order to act as a proxy for the overall dietary diversity of the whole study population. Moreover, as several studies have revealed that dietary diversity is linked with better nutrition and health (Hodgson et al., 1994; Hatløy et al., 1998; Ogle et al., 2001), in this research, I have also determined the dietary outcome of the presented food system through measuring the dietary diversity (consumptions of the different food groups) of individuals in the studied communities (Figure 3).

2.6 COMMUNITY CAPITALS

Communities hold a variety of characteristics, assets and resources that are closely linked to each other, and when these are invested to generate new resources, they can be referred to as certain types of capital. Flora and Flora (2008) present the community capitals framework (CCF) to map seven different types of capital, a general description of which are shown in Table 1.

Different types of community capitals are seen to play a fundamental role in determining community development, and the CCF is therefore widely used to analyse the impacts of rural development and livelihood programs (Sseguya et al., 2009; Duffy et al., 2017), and has even been used in food choice research (Flora & Gillespie, 2009). In order to assess the feasibility of crop cultivation by the Khwe San community in the BNP East, I utilized the Community Capitals Framework put forth by Flora and Flora (2008).

Table 1. *Description of Community Capitals*

Capital	Description
Social	Refers to the relationships, interactions, and level of trust among individuals.
Cultural	Encompasses the shared values, worldviews, beliefs, and meanings that become visible through, e.g. tradition, heritage, and food culture.
Natural	Refers to the natural resources available in the surrounding environment to maintain a sustainable livelihood.
Financial	Are monetary resources that can be directly invested in a given livelihood strategy.
Political	Refers to the ability of people to access power, voice their opinions, influence decisions, and contribute to the community's wellbeing.
Human	Refers to the knowledge, skills, and abilities of people, including their access to outside knowledge resources. Human capital also encompasses the health and work capabilities of the community members.
Physical	Consists of all the physical infrastructure (roads, buildings, services) that support community activities and livelihoods.

(Source: Adapted from Flora and Flora, 2008 and Emery and Flora, 2006)

2.7 CONCEPTUAL FRAMEWORK

Food systems can be examined at different scales, from local to global levels (HLPE 2017). This dissertation applies a food systems approach at the local level in order to understand the contemporary food system of the vulnerable Khwe San community. A conceptual framework (Figure 3) was adapted from the HLPE (2017) report on Nutrition and Food Systems and modified to better suit the study setting and design.

The food systems approach assists in the analysis of the problem and the quest to improve food system outcomes (van Berkum et al., 2018). Through this approach, different elements of the food system and their interactions are considered. In this dissertation, two essential elements, the food environment (Article II) and food behaviour (Article III) are studied in detail.

The dietary outcome of individuals largely depends on their food choices. According to the ecological model (Story et al., 2008), these choices are made based on multitudes of factors across different levels (individual, social, physical, macro). Some of these food choices are influenced by the contextual and socio-economic factors of the food system, but implicit choices are more influenced by the local food environment (Figure 3). Thus, improving the food environment can encourage food choices that may lead to more nutritious diets.

Food environments intercede between broader food systems and dietary outcomes (FAO 2018a, Turner et al. 2018). Food supply chains also influence

the food environment; however, they are seen to lie beyond the scope of this dissertation. That said, many of the encompassing activities (e.g. production, distribution, retailing) of food supply chains are discussed for each of the studied food sources (Article II).

All three elements of the food systems are influenced by contextual factors, and their relationship is bi-directional. The food environment and food choices are consistently shaping local culture and the physical environment, and vice versa, and in many aspects political decisions and historical events have been determinative in the accessibility and desirability of certain foods. The degree to which contextual factors alter dietary outcomes can differ from situation to situation, and inferior outcomes can often be tracked back to various root causes, which are often place-specific (van Berkum et al., 2018). Similarly, in this dissertation, I investigate the food system elements through a place-based and culture-specific case study.

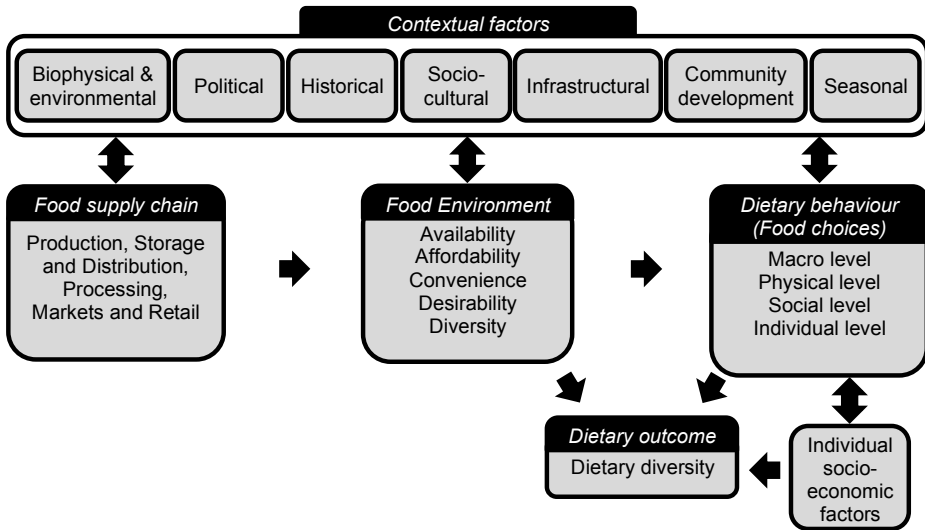


Figure 3 The conceptual framework used to characterize the local food system in the BNP East (Source: Adapted and modified from HLPE 2017)

3 THE CONTEXT OF THE STUDY: THE KHWE SAN IN THE BWABWATA NATIONAL PARK EAST

3.1 BIOPHYSICAL AND ENVIRONMENTAL CONTEXT

This doctoral study was conducted in the Bwabwata National Park (BNP), situated in the so-called Caprivi Strip between the Okavango and the Kwando rivers in north-east Namibia (Figure 4) on the ancestral land of the Khwe San people. The BNP covers 6,274km² and is located in the wettest part of the country, with an average annual rainfall of 600-700 mm, although the area is subject to frequent and serious droughts alternating with devastating floods. The soils are generally poor in nutrients and in their capacity to hold water. The vegetation is dominated by broad-leafed Kalahari woodland, which is composed of several edible species that produce fruits, seeds, tubers, and leaves (Mendelsohn & Roberts, 1997). The different habitats of the BNP serve as key wildlife areas, and an important transboundary link for wildlife migration between Angola, Botswana, Namibia, and Zambia for species such as elephant, buffalo, hippopotamus, several species of antelopes, zebra, blue wildebeest, and crocodile. The main predators in the park are lions, leopards, South African cheetahs, and spotted hyenas.

The abundance of the common game species appeared to be steady and increasing in the BNP, according to the game count results in the area (NACSO, 2018). A recent study about plant resource use (Dain-Owens et al., 2010) reported that the availability and abundance of edible food plants was neither a subject of distress among the Khwe respondents. Indeed, most food plants were reported to be abundant. While resources of both flora and fauna appear to be rich in the area, access to these for the Khwe is severely limited. Subsistence hunting is a practice of the past, and only parts of the Park area are accessible to the local Khwe San for gathering and firewood. Many traditional foraging grounds are found in the core conservation areas (CCA) of the Park, today designated only for wildlife, and thus inaccessible to the Khwe. Along the Eastern border of the Park runs the Kwando river, which is off-limits to the Park residents, be it for irrigation, fishing, or any other use.

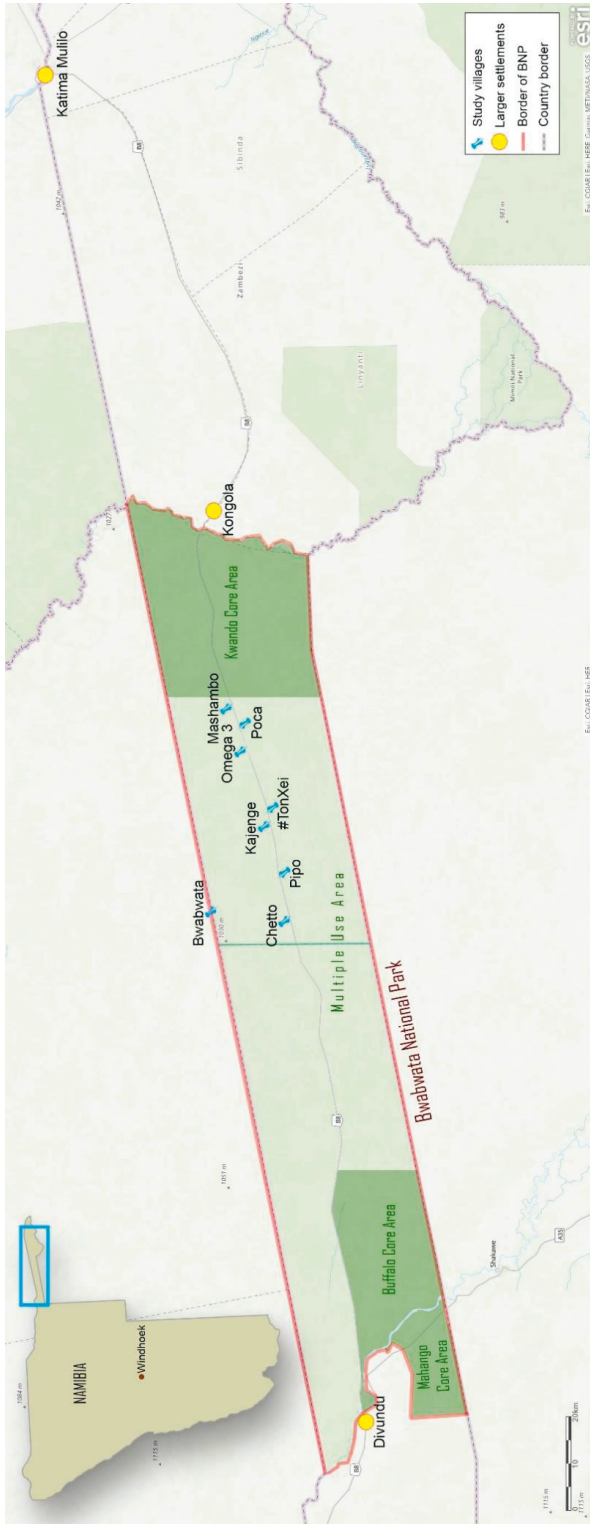


Figure 4 Study area in the eastern part of Bwabwata National Park (8 villages), Namibia
 Map created by Atrilia Paks!

3.2 POLITICAL AND HISTORICAL CONTEXT

The Khwe have long been struggling with multiple changing territorial designations imposed over their ancestral areas (encompassing today's BNP). The area was first proclaimed a wildlife conservation zone in the 1960s, with increasing degrees of protection which eventually resulted in the founding of the Bwabwata National Park in 2007. However, at the same time, the area was also important for the South African Defence Force (SADF) during the military actions of the 1970s and 1980s, fighting the liberation army of future Namibia. The SADF declared the area a military zone, decimating the number of wild animals (referred to as 'game') to their all-time lowest level, but allowing the Khwe to continue living in the area at the military bases. The military camps persisted until the advent of Namibian independence in 1990 (Boden, 2009).

Meanwhile, and increasingly after Namibian independence, different agro-pastoral ethnic groups have also been drawn to the area, with its abundant resources for animal grazing, water, and firewood. The constant battle with the intruding agro-pastoral ethnic groups and the competition for resources has been one of the major issues facing the Khwe in the west part of the BNP. In the east part, where this study took place, due to its geographical remoteness, pastoral tribes have had less presence and effect on the Khwe livelihoods.

Today, the area of the whole BNP falls under the regulation of the Ministry of Environment and Tourism (MET), and since it is legally state-owned land, customary land rights registration is prohibited for the Khwe. This struggle for rights to govern their territories, alongside rights to just political representation, have been – and continue to be - a central concern for the Khwe (Orth, 2003). In Namibia, Traditional Authorities (TAs) serve as legal institutions to represent an ethnic group and negotiate on political matters and land issues with the government. Yet the TA for the Khwe has not been recognised for over twenty years, and they therefore lack political representation and communication channels to the main decision makers (Dieckmann, 2014).

In the meantime, the MET has designated two categories of zonation inside the Bwabwata National Park, each with different levels of wildlife protection. The larger multiple-use area (MUA) is designated for human settlements, allowing small-scale agriculture and the collection of wild plants, while the core conservation areas (CCAs) are designated for nature conservation, especially for wildlife protection (Ministry of Environment and Tourism, 2013). The Khwe are permitted to remain in villages along the B8 road in the MUA, but their land and resource access are regulated by the MET. Traditional hunting remains banned, and the Khwe have had no access to their most abundant veld food collection habitats since the establishment of the BNP, as these are inside the CAAs.

In 2006, the Khwe's community-based organisation – the Kyaramacan Association (KA) – was established according to the Community Based Natural Resource Management (CBNRM) conservation model. The core

concept of the CBNRM is the devolution of rights to manage natural resources involving local communities. Through the KA, the community receives financial benefits from trophy hunting concessions, as well as occasional meat of the tourist-hunted trophy animals. The CBNRM program supports the local Khwe to collect and sell medicinal plants in line with international demand, particularly the Devil's Claw plant (*Harpogophytum zeyheri*) for the commercial market, providing a seasonal income for a sizeable number of households.

In the last years, however, the regulations on mobility have increasingly become stricter. From December 2016, following the deployment of Namibian Defence Force (NDF) units into the BNP in response to increased elephant poaching, strict restrictions were introduced related to the Khwe's access to natural resources and their free movement even in the MUA. In 2017, while foraging for natural resources, a number of Khwe were shot by police forces, having been mistaken for poachers (Begbie-Clench & Hitchcock, 2018).

The CBNRM core principle of community control of decision making on natural resource matters that affect them has only rarely been practised inside the BNP (Paksi & Pyhälä, 2018). In fact, the Khwe have not been involved in most decision-making processes regarding natural resource management in the area, rendering them utterly stripped of their biocultural and natural resource user rights as Indigenous Peoples on their own ancestral land (IWGIA, 2019).

3.3 SOCIO-CULTURAL CONTEXT

The Khwe San were the first inhabitants in the area of the BNP (MET, 2013), which is part of a larger ancestral Khwe territory including parts of Angola, south-western Zambia, the Zambezi Region, and north-western Botswana (Jones & Dieckmann, 2014). The Khwe were traditionally semi-nomadic hunter-gatherers, but they have also cultivated land and kept cattle for over a century (Suzman, 2001). Today, the Khwe have been rendered entirely sedentary – a shift that has had immense impacts on their culture, lifestyle, health and wellbeing.

The Khwe, in general, demonstrate sensitivity for “their wildlife” (as observed in several community meetings that I attended), and they express genuine support for wildlife conservation, citing cultural and historical reasons. However, most Khwe with whom I interacted perceived no socio-economic benefit from living inside a Park under strict regulations, and some highlighted the serious consequences of human-wildlife interactions, while others emphasised their distressing circumstances due to the meagre development opportunities inside the National Park.

Many members of the community still hold vast traditional knowledge on indigenous veld plants, harvested for food and medicine. However, the consumption of veld foods is in decline, partly due to restricted access, but also

because of socio-cultural changes. Cultural events and celebrations of the Khwe were traditionally symbolic of their close connection with wild animals, wild plants, and traditional practices, especially hunting (Köhler, 1991). Such ceremonies have almost completely faded away, with the exception of healing ceremonies. Today, most of the social and cultural events are incidental to payday, or to the arrival of big game meat, and these events tend to involve excessive alcohol abuse.

3.4 INFRASTRUCTURAL CONTEXT

The Bwabwata National Park is bisected by the Trans-Caprivi Highway, a tar road with heavy traffic, along which most of the villages are located. Still, the settlements remain disconnected to the electricity grid, and they have no radio network coverage and only sporadic mobile phone reception. There is one clinic in the biggest village in the BNP East, with two nurses, but some villagers have to travel 50km to reach it, and there are no ambulances servicing the Khwe community.

Water is supplied to the people living in the park by boreholes, equipped with solar-powered pumps or old diesel generators, and in other places water must be pumped by hand (Photo 3). For many households, the distance to the boreholes is quite far (considering the heavy load to carry back) – often up to 15 minutes walking distance. As a result, irrigation options are limited and only a handful of individuals have set up their own vegetable gardens (Mäkela, 2018). Moreover, the water from some boreholes is not suitable for human consumption, according to the results of recent lab tests (provided to me by a member of the Ministry of Land Reform [MLR]).

In the BNP East, three settlements have state schools providing formal education from grade 1 to 10. The access to school for children living in smaller settlements is challenging, as many of them have to walk to school 10 km each way. Although Namibia promotes mother tongue education, this has not been offered to date in BNP, reportedly because of the lack of adequate teaching materials in Khwedam, and because of the low number of qualified Khwe teachers.

Three of the eight villages have shebeens (unlicensed establishments, also referred to as local shops, Photo 1) that sell alcohol and basic food items. Once a month, a mobile shop sells food items in the villages (Photo 2), while the closest market town (featuring supermarkets, hardware stores, etc.) in the area is 160 km away (Katima Mulilo). This is also the town where most of the administrative issues are dealt with (e.g. registering for pensions or social grants), while some services (petrol station, post office) can be found in Kongola, which is 50 km away from the nearest Khwe village. There is only one government office inside the BNP East, namely the extension service office of the Ministry of Agriculture Water and Forestry which is vacant since 2017.



Photo 1 Small shop in Mashambo



Photo 2 The selection of food items at the mobile shop



Photo 3 Hand-pump-fitted borehole in #Tonxei

3.5 CONTEXT OF COMMUNITY DEVELOPMENT

In 2005, the Namibian government established the San Development Programme (SDP), later renamed as the Division of Marginalized Communities (DMC), with a core mandate ‘to ensure that the San people are fully integrated into the mainstream of the Namibian society and economy’ (Government of Namibia, 2009). The DMC coordinates the San feeding programme (Food Aid provision) and has initiated various food-related development projects (e.g. community gardening, beekeeping). In addition, various governmental agencies or NGOs set up projects to improve food security in the BNP (Paksi, forthcoming).

One result of these is that numerous community gardens have been set up in several of the villages, with the aim of providing villagers with food and some income. Yet, none of the gardens was operating during the time of my fieldwork. This is mostly due to problems with infrastructure and social relations (see details in 5.2.2.). Agricultural schemes and programmes for local communities were also very popular development projects among governmental agencies from the 1990s onwards (for more details see IV, page 5-6).

At the time of this research, a local bakery was sometimes operational (depending on when the local Councillor office had a budget for ingredients), yet the bread would often get mouldy as nobody could afford to buy it. Tens of loaves of bread would go to waste in a week in a community where almost every household is severely food insecure.

The majority of these projects are out of touch with the on-the-ground reality, and no consideration has been given to the cultural, social, or economic context in which local communities are embedded. Moreover, the projects have been designed so as to be managed according to hierarchical social structures, resulting in problems such as jealousy and vandalism in the Khwe community.

3.6 SOCIO-ECONOMIC STATUS OF THE KHWE

In 2017, in the study area of the BNP East, where my study took place, a total of 1,516 people were living in 231 households across eight villages (of various sizes). Of this population, 752 people fell in the 18+ age category constituting the focus sample of this study. A summary of the socio-economic variables of the Khwe adult population is found in article II, Table 1. The Kongola constituency, to which the BNP East also belongs, is the most economically disadvantaged region in the country (National Planning Commission, 2016). In the BNP, economic development is further restricted due to the area having been designated a national park, and at least to date, employment opportunities and prospects for alleviating poverty are few. These circumstances have left many of the Khwe hopeless with regards to sustaining their families with adequate food. In fact, a large proportion of the community has started to rely on food aid on a regular basis.

Several households have endeavoured to attempt crop cultivation, with little success over the decades. 33.7% of the households reported owning a small agricultural plot. Meanwhile, rearing goats and chickens is practised by roughly one-third of the population (35.5%), but it is often restricted to owning only one animal.

Only 13.5% of the adult population is currently employed, of which approximately half (n=51) are working locally in community-based natural resource management (CBNRM) related positions (Paksi & Pyhälä, 2018). Many fewer women than men hold formal employment, and thus women are more involved in informal means of generating income. Previously they were able to weave baskets for sale to tourists, but having limited access to resources and after complaints about unjust payments, this activity has been increasingly replaced by the brewing of alcohol for sale within the village.

The primary source of income for most households is the government-provided old age pension scheme and its social grants. However, even after adding these various forms of income together, seventy percent of individuals live on less than USD 1.90 per day - the International Poverty Line standard - indicating a high level of extreme poverty in the community. This deep state of poverty, despair, and the difficulties in adapting to rapidly changing living circumstances has led to wide-scale alcohol abuse in many Khwe settlements.

4 METHODOLOGY

4.1 RESEARCH PROCESS

My journey to the Khwe community in Namibia began in 2014 when I spent hours together with two Khwe elders at the IUCN World Parks Congress in Sydney, Australia and was invited with my husband to undertake research in their communities related to our interests (in my case food and nutrition). In 2015, we went for an initial two weeks' scoping trip to the Khwe villages in the BNP, where we were introduced to the village leaders and accompanied by a local translator. The Khwe speak a Khoisan language, Khwedam, but the youth can understand some English. The locals showed us around their villages and shared with us their concerns. We visited several households, and in most cases, as soon as we asked permission to enter, the children, afraid of us, would hide behind the adults, while the women would generally point to the men to talk with us. Most people were very thin, and I noticed many cases of eye health problems.

In one of these household visits, I saw a tall, skinny woman with a big bowl of tiny orange fruits, and I started a conversation. She said they were "ce", which she had just picked that same morning, far out in the bush (Photo 4). She offered me some to taste. The fruit was covered with a hard and dry shell, had some sweet flesh inside, though most of the fruit consisted of seeds to be spit out. Later I discovered that the vitamin C content of that tiny berry was greater than that of an entire orange. I was fascinated and eager to learn more. At that time, I had little idea that entering the deep bush to pick wild fruits would be banned from the next year onwards. Thus, my initial interest in focusing my research on traditional foods soon had to be abandoned, once I realized that it would be too risky to secretly accompany people into the bush to areas where even they were prohibited from entering.

Since my first visit to BNP, elephant poaching in the area has increased significantly. In reaction to this, in 2016, the Namibian Government introduced strict anti-poaching measures, first strengthening the anti-poaching troops and the police, and later even deploying the Namibian Defence Force (NDF) into the BNP to fight the illegal poaching taking place there. These events have had enormous consequences on the Khwe and their day-to-day life. Not only has it resulted in fear, but also injuries by the police who shoot at them on their foraging trips, mistaking the Khwe for poachers. In 2017, the Khwe were instructed in writing by the MET, without any consultation, to strictly remain within a maximum three-kilometre radius of their villages until further notice.

In 2016 we started our first (out of three) five-months long PhD fieldwork phase. Before we began, we asked permission from the village headmen to stay and undertake research in their villages, introducing and explaining our

research objectives. Previous researchers had arrived in the villages as individuals, so as a couple living in a tent, we were perceived as a separate household, and had somewhat more privacy. However, we found it difficult to spend informal time with the community members. To my surprise, it proved to be especially challenging to initiate conversations with women. Later on, I identified several reasons behind this. The language barrier definitely played a role, as I always required a translator to accompany me in the villages, all of whom were male. Initially, I aimed to work with women translators, but the women's English level was not sufficient to translate for my research purposes. When I asked the women why they refused to talk with me, I sometimes got a quick reply that they are uneducated and cannot answer my questions. I did not even have the chance to prove that many of my questions were in fact, quite easy. It took me weeks of great effort to acquire women's time and trust.

The ice-breaker proved to be conversing with the help of photos. In my first fieldwork, I tried to take photographs of everything food-related. I printed these photos, and one afternoon, when my translator had already left, I approached some women who sat in a group and showed them the photos. This created laughs, comments, interest, and some non-verbal communication among us. In the end, I asked them for an interview for the next day with my translator, to continue our communication, and they agreed. In this way, using the photo-elicitation method, I had gained an opportunity to obtain different and sometimes deeper insights (Rose, 2016, p. 315) into how Khwe women think about food. From there on, it was easier to talk with the women in this village (Photo 5).

During the first five months of my fieldwork, I organised some village meetings to introduce myself and the reason for my presence, also explaining our plan to visit each household to carry out a socio-economic survey. Over the course of the first fieldwork phase, I worked intensively with research assistants, to fine-tune my research methods and reformulate my interview questions until the appropriate wording was found to suit the local language and cultural setting. Before the core data collection, a cultural domain analysis (Zycherman, 2017) was carried out to detect cognitive categories concerning foods. The results provided background data for designing further field methodologies.

The second five-month fieldwork phase was especially eventful. Starting in February 2017, I visited farmers' crop fields to carry out semi-structured interviews. In the meantime, I trained my research assistants in the 24-hour dietary assessments and undertook several pilot tests. Then, from April 2017, we conducted more than half of the dietary recall surveys, some of which were subsequently undertaken by the research assistants during the time I was away, and the rest during my third fieldwork period, thereby accounting also for several variabilities. In 2017, I carried out over 30 in-depth interviews with the elderly, about past and present diets and about their lifestyle, in order to get a sense of what has changed in their diet over several decades and to capture most important events that impacted these. In the last few months, I

conducted the food source ranking exercises. Moreover, every time we visited the town for supplies, I booked appointments with regional actors and carried out most of my stakeholder interviews during the second fieldwork phase.



Photo 4 Freshly collected ce from the bush



Photo 5 Photo-elicitation with a Khwe woman

During the third fieldwork phase, starting in November 2017, I finished the dietary recall surveys and the food source ranking surveys, and undertook the structured data collection for Article III. During this field stage, I also conducted PhotoVoice sessions (Wang & Burris, 1997) in three villages about

food insecurity, the results of which are not included in the dissertation due to space and time limitations, but nonetheless serve as valuable triangulation and verification data to be published at a later date.

Over the course of the fieldwork, I sat in as an observant in several community meetings organized by various ministries, organisations, or consultants. These meetings were instrumental in providing insights into the dynamics, relations and communications between external stakeholders and local community members.

4.2 RESEARCH DESIGN

This study was designed as a cross-sectional mixed methods study, with the flexibility to adapt to local conditions. I applied a variety of qualitative and quantitative research techniques in order to address the main research questions. In the design of my study methodology, two main aspects have guided me: 1) the limitations of the food environment and food choice methods when used in a low-income country setting, and 2) the characteristics of the specific cultural setting.

To consider the first aspect, reviews of the topic (Turner et al., 2018; Herforth & Ahmed, 2015) have inspired a quest for novel, interdisciplinary methodologies and approaches that may broaden our understandings of the contemporary food systems in LMICs. To be even more specific, this study focuses on an Indigenous community whose diet and lifestyle is in transition, and is reliant on elements from both traditional and modern food systems. In such a setting, many of the conventional analytical methods would not have been sufficient for capturing all the nuances of these food systems at once. Therefore, I applied a mixed methods approach of survey-based dietary intake and food source records, and the gathering of local narratives taking a food-anthropological perspective.

Regarding the second aspect, while language has been a great challenge, I have encountered another cultural phenomenon. Following my initial experiences of group meetings and official community meetings, I concluded that it would be difficult to acquire data that did not simply mirror negative complaints about the topics raised. I was not the only researcher faced with this realization. For example, a master's thesis titled "To be Khwe means to suffer" put it this way: "Many Khwe conversations attend to the suffering that people feel they experience because they are Khwe" (Rousset, 2003). Given the historical hardship and the daily humiliation that most Khwe have been subject to as a marginalized minority ethnic group, it is not surprising that in each of the group meetings that I attended or organised in 2016, the negative discourse was dominant. Yet, community members were exhausted from these negative voices. Only a few community members attended the village meetings called together by the headman on various official matters, and hardly any of the women present expressed their opinions. For the focus group meeting, that

my husband and I organised, only Khwe men attended regardless of the personal invitations for women. Therefore, I decided that rather than gathering data through focus group discussions, where weaker voices or different opinions can get over-ride (Krueger, 2014), I would instead conduct individual interviews. Pilot testing ranking exercises, comparisons, and free listings led me to a positive conception of this approach. I found that while comparing or ranking items, people included topics and characteristics that they would not have otherwise shared through semi-structured interviews. To give an example, the respondents in the ranking interviews shared their positive take on being able to buy from the local shops on credit or the convenience they felt of waiting for the government to bring free food. Such nuances may not have been revealed so easily in, for instance, focus group discussions. Also, the comparison exercise enabled people to reflect on food items from various perspectives. That said, the often-referred-to negative attitudes were apparent in every single interview. It has to be acknowledged that the Khwe have lived through many serious traumas as a collective, and these traumas continue to be manifest also in their contemporary reality, further exacerbated by the continued and severe food insecurity as well as the difficult living circumstances.

In my study, I only sampled the adult members of the community, and the sample sizes were either pre-calculated (Article I) or performed until data collection reached a point of saturation (Fusch & Ness, 2015). For validating the results, multiple sources of data and evidence were used (Pilnick & Swift, 2011). Some methods provided data for triangulations of other interviews, while secondary data from reports and participant observation were used to cross-reference primary data.

4.3 RESEARCH ETHICS

This PhD research adheres to the Code of Ethics of the International Society of Ethnobiology (ISE, 2006), which is a comprehensive ethics document including 17 principles and 12 practical guidelines based on the concept of traditional resource rights. Prior to starting data collection, I acquired a Research Permit from the Ministry of Environment and Tourism (MET) to conduct research inside the Bwabwata National Park, and I obtained free, prior, and informed consent from each village Headmen and a Headwoman to camp in the villages and undertake research with the community members. All data collected involved the obtaining of free, prior, and informed consent from each participant with the help of a consent form that was read to them. All participants were informed about the purpose and meaning of the study, the subsequent plans for anonymized publication of the information, the assured confidentiality of sensitive data points, and the voluntary nature of participation, including the right to withdraw at any stage from the research, without any repercussions thereof.

According to the ethical principles of research requirements of the Finnish Advisory Board on Research Integrity (TENK, 2009), the present study did not require an ethical statement, seeing it did not involve any methods or procedures (such as exposing subjects to security risk or mental harm, collecting physical samples, studying children, or other) listed by the Board as requiring a thorough and in-depth ethical review. The ethical review request for this study was therefore waived by the Ethical Review Board in the Humanities and Social and Behavioural Sciences at the University of Helsinki.

4.4 POSITIONALITY

I am a white, upper-middle class female in my thirties, having just completed my field research in a vulnerable, traumatized rural indigenous population. In my twenties, I studied and worked in several developed countries (in other continents) and was exposed to a diversity of cultures. I was driven to undertake this study motivated by an immense interest in Indigenous Peoples' ways of life, my passion for learning about traditional food ways, and a motivation for finding ways to support better food security in vulnerable communities. Despite this, nothing had prepared me to live and conduct research with a marginalized Indigenous group in a remote African setting, given the multiple and unexpected challenges I faced during my fieldwork.

Initially, I had little idea about the complexity and the nature of challenges that will surface while researching the local food system. The social issues that I encountered during my stay in the communities evoked emotional reactions and inner ethical battles in me. How should I perceive and react (or not react) to incidents of: discrimination; seeing pregnant women abusing alcohol; children freezing in the classroom without owning any warm clothes; domestic violence, and; many obvious symptoms of hunger. How was I to remain a neutral observer in my researcher role? How was I to exercise (or not) my power and privilege, being an outsider? When was I to interfere, if at all? Would my interference make the situation any better or worse for the short and long term?

Facing all these dilemmas, and more, I had to quickly acquire some degree of cultural competence and tap into my creativity. For instance, taking the children out into the sun for some light physical exercise around the school in order to warm up, organising village meetings where a healthy meal was to be cooked for the entire village, and using photos to communicate about issues also outside my research focus, to better understand, comprehend and convey about the many challenging issues.

Most of the local Khwe individuals whom I developed a friendship with were men (e.g. some elders, my research assistants and a handful of key informants), given the language barrier between myself and the women, who hardly speak any English at all. As a white, childless female, not speaking the local language, driving a car and wearing trousers, I got the impression that

the Khwe women perceived me as an alien, even after several months of my presence there. As a colleague who was simultaneously undertaking social research among women in a vulnerable community in Asia expressed, she felt like she belonged to a third gender class. I can relate to this notion. Perhaps if I had spoken their language, it would have made a difference, but it was difficult to decide on how to invest my time and efforts during my limited field research time. Thus, I only managed to learn basic expressions in the Khwedam language, not enough to converse with Khwe. I perceived their language very difficult to learn, especially as it includes many clicks that I have never had to learn or vocalize. Thus, I acknowledge that the language barrier was a great obstacle that impacted my relationship with the locals and also in some ways my research.

Trust is another crucial element that I immediately acknowledged as fundamental in my relationship with the community members. Initially, the community members doubted that I would return after the first field trip, as they had already experienced several previous researchers not coming back. They assumed that I was also just passing by. Yet, since my first visit in 2015, I returned three more times, each time enabling many more doors, conversations and hearts to open, each time strengthening the initially fragile trust towards me and my husband (who was simultaneously carrying out his PhD research in the same communities). We have decided to return to BNP in 2020, for the fourth time, this time to share our research findings with the communities and regional stakeholders.

Overall, my stays among the Khwe communities have largely enriched my life. While I have collected more sad than joyful memories over the 15 months of fieldwork (given the very challenging situation in which the Khwe find themselves today), these memories have marked me in a strong way and will stay with me for a very long time. The challenges faced by the Khwe, while acute in BNP, mirror many problems also present – albeit somewhat hidden – in Western societies. No matter how different a society, the collective trauma that it holds needs to be addressed, and such traumas shall not be dismissed in any development project, programme or collaboration – including with the Khwe.

4.5 DATA COLLECTION METHODS

The data collection undertaken in the initial phase of the research provided background data for the dissertation project and included a socio-economic household survey and cultural domain analysis, which I elaborate on below.

4.5.1 PARTICIPANT OBSERVATION

Participant observation is an ethnographic method, commonly used in food anthropology research (Chrzan & Brett, 2017), consisting of interacting with people and observing them in their local settings while building rapport with

informants. I used participant observation during my fieldwork to collect both background and core data, and triangulate my qualitative data. The observations also contributed to refining my research questions. At the end of each day in the field, I took notes about these observations in my notebook.

It was through participant observation that I learned how farmers are using their fields throughout the rainy season for foraging-like activities. I also could observe and analyse how the different actors communicated with one another in community meetings, and this helped me to better understand the prevalent power structures among the different stakeholders.

4.5.2 SOCIO-ECONOMIC SURVEY

Data on demographic characteristics and socioeconomic status (SES) was collected by two research teams - each consisting of one research assistant and either me or my husband (who was also carrying out his PhD research in the area). Each research team visited every household in six villages during the first and second period of our fieldwork. The data recorded included age, gender, education level, monthly income, employment, household size, and ownership of agricultural fields and small livestock, for every individual in the household. The households were notified about the planned survey in a community meeting, and by the headmen of the villages. When we arrived at a household, we introduced ourselves, informed the people about the purpose of the data collection, and asked permission to record the survey. This data collection proved to be an important occasion to meet each of the community members in a more personal and relaxed setting, and to arrange further interview appointments with them.

4.5.3 CULTURAL DOMAIN ANALYSIS

In the initial phase of the research, I undertook a cultural domain analysis (Zycherman, 2017) to compile the knowledge of Khwe community members regarding the use and consumption of foods, and assemble the terms being used to describe the food domain. Free-listing surveys (Bernard, 2005) of consumed food items were conducted with thirty participants of both genders, randomly selected from a wide range of ages (between 18 and 85). They were asked to list all the foods that they usually eat. The results of the free lists provided the baseline data for the next data collection method of pile sorting. A single pile-sort exercise using photographs (of the 32 most salient free-listed food items) was conducted to identify culturally defined food groups. Respondents were asked to form as many piles as they wanted, but placing one item in only one pile (Weller & Rommney, 1988). Then, the informants provided a description of the classification criteria for each food group. To pilot test the photos, five individual interviews were carried out to test recognition and adequacy of the pictures, as well as the ideal number of pictures to work with. Following the pilot tests, some photos were omitted while others added.

4.5.4 MAIN DATA COLLECTION METHODS

To avoid repetition, the main data collection methods (see Table 3.) used to produce the results of this dissertation and its limitations are presented and described in detail in the respective Articles:

Table 2. *Main data collection methods and their place of description in the Dissertation*

Method	Place of description
Dietary assessment surveys	Article I, page 2
Community food inventory list	Article II, page 5
Food environment perception ranking survey	Article II, page 5
Open-ended interviews with the elderly community members	Article III, page 6
Structured comparison interviews about food choices	Article III, page 6
Free listing interviews	Article III, page 7
Semi-structured interviews with Khwe farmers	Article IV, page 6
Semi-structured interviews with regional stakeholders	Article IV, page 7
Participant Observation	Article IV, page 7



Photo 6 *Semi-structured interview (by Attila Paksi)*

4.6 DATA ANALYSIS

The qualitative data collected during this research were thematically analysed using the Atlas.ti software. I used an iterative coding process, guided by the

theoretical and analytical frameworks in the respective papers. In addition, inductive coding was applied, as informed by the local context. Short narratives of food choices and preferences were first tabulated and later also coded.

Quantitative data was produced by a number of data collection methods. I specify their analysis in the bullet points below, while more detailed information can be found in the respective articles listed in parentheses below:

- i. Dietary Diversity Scores (DDSs) were derived from the data of the 24-hour dietary recalls, by grouping the food items into the 10 nutritional food groups as defined according to FAO guidelines (FAO & FHI 360, 2016) (Article I)
- ii. The association between socio-economic status and DDS was statistically tested using the Spearman correlation, the Mann-Whitney U test, and an analysis of covariance in SPSS version 22 (Article I)
- iii. Food source ranking data were analysed by calculating the average rank of each food source (Article II)
- iv. From the 'good foods' free listing exercise, the saliency of the food items was calculated using the AnthroPac software (Borgatti, 1996) (Article III)

The narrative data of the food source ranking interviews and the free listing exercises were also qualitatively analysed.

Table 3. Summary of the research methods and theories used for each research paper of the dissertation

Objectives of the dissertation	To assess the quality of dietary intake and food sources in the local food environment among the Khwe adults in the villages of the BNP East	To characterize the local food environment and describe the drivers of food choices in shaping the contemporary diets of the Khwe	To assess the viability of crop cultivation as a local food production strategy to contribute to food security.
Articles	I	III	IV
Aims or Research Questions	i) to estimate and quantify the dietary diversity of the Khwe, and ii) to investigate how socioeconomic characteristics affect their dietary diversity.	To examine the current food environment and its impact on local diets and food security.	i) What are the assets and weaknesses of the community pertaining to crop cultivation? What proportion of the households are involved in crop cultivation? ii) What are the characteristics of the active farmers and their practices? What encourages them to continue farming? iii) What role do external actors play in local crop cultivation? What is the impact of their support?
Theory	Dietary diversity score as numerical indicator for food insecurity and nutritional status (Headey & Ecker, 2013)	Conceptual framework of food environments by Ahmed and Herforth (2017)	Community Capitals Framework (Flora & Flora, 2008)
Methods and Data	24-hours dietary survey (N=200) and socio-economic status (SES) survey	Cultural domain analysis (N=30), Community food inventory, Food environment perception ranking (N=128)	Socio-economic survey, Semi-structured farmers' interviews (N= 55), Semi-structured actors' interviews (N=14), Participant observation
Data Analysis	Testing association of DDS and SES using Spearman, Mann-Whitney and Analysis of covariance	Thematic	Thematic

5 RESULTS AND DISCUSSION

In this section, I summarise and discuss the results of my four research articles included in this dissertation. The findings are described in greater detail in the respective articles.

5.1 THE CONTEMPORARY DIET AND FOOD ENVIRONMENT OF THE KHWE SAN

One of the objectives of this dissertation was to assess the quality of the dietary intake of the Khwe. As quantitative data on dietary diversity among hunter-gatherers are scarce, in the following sections, I compare my results to similar studies conducted with communities of similar contexts of poverty and food situations, rather than focusing solely on hunter-gatherer societies. Where available and relevant, previous data from similar studies with Indigenous Peoples are also presented.

The dietary assessment revealed (Article I) that the 200 Khwe participants have very low dietary diversity (mean DDS=2.44), and 99% of the Khwe participants' dietary diversity does not reach the scores for a minimum adequate diet (DDS \geq 5). Given the importance of DDS in determining nutritional status (FAO, 2018b), this low dietary diversity predicts severe malnutrition and food insecurity. In Tanzania, a similar sized study of 204 participants conducted by Ochieng et al. (2017) in the poorest region of the country with the highest prevalence of child stunting used the same 10 food groups to calculate DDS. They found that 46 % of all the women had achieved the minimum DDS for an adequate diet, while 31% of women ate from only 3 or fewer food groups. To draw a comparison, among the Khwe, only 2% of women achieved the minimum DDS, and 92.7% of women ate from 3 or fewer of the assessed food groups. These results verify the extreme food insecurity among the Khwe communities, which exceeds even the poorest regions in Tanzania.

The regular Khwe diet consists of maize meal porridge and boiled green leaves (Article I). This monotonous diet, which is largely based on grains received from the governmental food aid delivery and dark green leafy vegetables from the surrounding bush and crop fields, is lacking in micronutrients and animal-source protein. While a grain-based diet is typical in many communities of the Southern African region (Kang et al., 2019; Kasimba et al., 2019), people seek to complement the staple foods with legumes, fruits, or foods from animal sources (Oniang'o et al., 2003). For the Khwe participants this is not an option, and the majority of the respondents are consuming from only two or three nutritional food groups. Very few people consume nutrient-dense vegetables, animal-source foods, fruits, nuts, and

pulses. Eggs and dairy are entirely missing from their diet. A significant deficiency of the Khwe diet that requires critical attention is the very rare occasions of animal protein intake, which is similar to the findings in dietary studies from Ethiopia, Burkina Faso, and Tanzania (Savy et al., 2005; Herrador et al., 2015; Keding et al., 2012; Ochieng et al., 2017). Such dietary profiles are typically associated with micronutrient deficiencies in LMIC settings (Drewnowski et al., 2018; Headey et al., 2018).

Having described the main characteristics of the dietary intake, I now move on to discuss the relationship of the DDS to the socio-economic variables of the participants. Results from previous studies show positive associations between for instance income and DDS (Taruvunga et al., 2013; Parappurathu, 2015; FAO, 2012), and between the level of education and DDS (Zhang et al., 2017; Savy et al., 2008; Torheim et al., 2004). Although education has been linked to improved dietary diversity due to individuals gaining greater nutritional knowledge (Rajendran, 2017), this relationship largely depends on the type of nutritional information disseminated in the formal educational system. In my study (Article I) I found that DDS was lower among the less educated, and among the elderly, however as there is already a strong collinearity between age and education level, a lower DDS could be the result of old age and not the consequence of a low level of formal education (Article I). Furthermore, Ochieng et al. (2016) highlight the need for studies that quantify dietary diversity separately for men and women to detect any differences among genders. In my study, I compare the individual DDS of male and female adult Khwe and found no significant differences between them (Article I).

According to the FAO (2012), an increase in income is positively associated with food security and micronutrient intake, yet among the Khwe, I found no link between DDS and income (Article I). Similarly, a study undertaken among contemporary hunter-gatherer communities (Reyes-García et al., 2019) found no relationship between diet and income among two of the studied communities. The explanation for the absence of this link (both in the Reyes-Garcia et al. study as well as in my research) is provided by the high prevalence of sharing in the communities. Among the San, there is a collective egalitarian ethos that defines relations between individuals and groups, and was identified by early ethnographers as being integral to the San's survival strategy (Biesele & Royal, 1997). Even today, the practice of sharing contributes to the safety net of the Khwe individuals and households. Individuals with income tend to share their assets, especially food, with their kin. I also found that agricultural harvests are commonly shared, which explains why individuals with agricultural fields do not have different diets than those with no agricultural plot.

While a strong positive association between market integration and dietary diversity has been reported in some studies among smallholder farmers (Jones, 2017; Sibhatu et al., 2015), in the case of indigenous peoples the situation is somewhat different. When foods are purchased, the diet's

nutritional quality tends to deteriorate, as traditional foods are likely to be replaced by shop-bought packaged foods (Dounias & Froment, 2006; Dounias et al., 2007; Kuhnlein & Receveur, 1996). In terms of the Khwe diet, although the process of gradual integration into the market-based economy is ongoing, the increase in individual income has not had – at least according to my research - a significantly positive or negative impact. The diet seems instead to be more influenced by the characteristics of the food environment, which I describe in greater detail in the 5.2 section. First, I will elaborate on the food items appearing in the food environment (Article II).

The community food inventory (Article II) lists all the food items in the local food environment, comprising 119 different foods, of which 56 are traditional wild foods (Appendix 1). From this inventory only 68 appeared in the dietary recalls, and only 26 of these are wild foods. It is important to note that the community food inventory was recorded in 2016 during my first fieldwork phase, but the dietary assessment was undertaken in 2017 and 2018. Between the two fieldwork periods, as mentioned above, a restriction on mobility inside the National Park was introduced, preventing most people from harvesting wild plants from the bush habitat, thus influencing the dietary intake of wild foods. Therefore, the results of the dietary surveys illustrate the general diet when a mobility restriction is applied. Nevertheless, it is important to address the results of the inventory list in two major respects. First, I discuss the food environment's potential for covering the nutritional food groups in the local diet (Article II, page 8, Table 2), and thereafter (still in this section) I elaborate on the role of traditional foods found in the food environment.

Using cultural domain analysis, six main food sources were identified in the local food environment: 1) the government, 2) crop fields, 3) villages, 4) shop, 5) trophy hunting company, and 6) bush. The food aid deliveries from the government (Photo 7) provide food from three nutritional food groups, but primarily grains. They also provide some cans of fish and pulses (5 cans per household per month), but this is a very small quantity, especially when shared amongst many individuals in the household. The government also delivers cooking oil, a food group that has not been considered in the derivation of DDS, as it does not contribute to the micronutrient density of the diet (Kennedy et al., 2011). Thus, the food aid delivery may be saving the Khwe from starvation as it provides calories from staples. However, in its current form, and with its very low monthly quantity of protein, it does not address nutritional diversity.

Crop fields inside the BNP have the potential to provide three different grains (Photo 9), various green leafy vegetables, pulses and other vegetables, and vitamin-A rich foods, adding up to 5 different food groups. Meanwhile, village environments, with their considerable spatial potential to use for livestock rearing, gardening, and even foraging, provide eight different food groups. Yet the spaces for food growing are underutilized due to cultural, infrastructural, and management reasons, as discussed in more detail in

Section 5.2. The local shops (shebeens) and the monthly mobile shops sell foods covering six different food groups, yet they offer fresh foods only in rare instances.

Trophy hunters occasionally provide game meat (Photo 10) and the meat of trophy elephants during the six-month period of the hunting season. During the remaining six months (between November and April), the Khwe receive no meat, nor are they allowed to hunt their own game. Birds, frogs, rodents, and snakes are still occasionally caught and consumed, but mostly due to the desperate hunger, not as preference. The bush habitat thus has the potential to provide seven out of the ten defined food groups (Article II, p 8, Table 2.), thus forming a critical food source for the Khwe diet, ensuring dietary diversity and the intake of both micro- and macro-nutrients.

Indeed, based on the food inventory, the Khwe have reported to consume more than 40 different wild plants across the seasons (Photo 8). Wild edible plants are not only low-cost and nutritious (Shackleton & Shackleton, 2004; Jama et al., 2008), they are also locally available, and their harvesting and utilization are informed by the traditional knowledge systems of the local people (Pardo-De-Santayana et al., 2005, Arenas & Scarpa, 2007). Wild foods play a critical role in terms of offering a buffering safety-net in times of difficulty, especially for vulnerable populations (Grivetti & Ogle, 2000; Fentahun & Hager, 2009), as they are available during times of drought (Gordon & Enfors, 2008; Muller & Almedom, 2008), and are usually more resilient to climate change than conventional agricultural crops (Humphry et al., 1993; Fentahun & Hager, 2009, p. 208).

According to Brown & Jones (1994), 25%-50% of the Khwe diet was in the early 1990s made up of veldfood. My dietary intake data from 2017-18 reveals a huge decline, as only one-quarter of the individuals consumed any veld foods (n=56). This declining trend has several worrying implications. Firstly, traditional diets have been regarded as protective against chronic diseases according to numerous studies (Uauy et al., 2001. Burgess et al., 2008; O’Dea, 1984; O’Dea, Spargo et al., 1980; Receveur & Kuhnlein, 1998). Conversely, the shift from the traditional diet towards an increased consumption of refined and packaged foods is associated with declining dietary adequacy, and therefore a higher occurrence of chronic disease (Popkin, 2006). According to my observations, the Khwe are showing visible signs of malnutrition and chronic diseases. Many children were too short for their age at school, and among both adults and children, eye-problems were very common: most individuals had brown bands in the eyes, indicating the chronic absence of micronutrients in their diet. An important further study would be to collect quantitative health-related data, something that lay beyond the scope of my research.

Overall, my research found that the contemporary diet of the Khwe is very low in nutritional quality, and simply increasing socio-economic benefits has not translated into better diet quality, unlike what has been found elsewhere (Ruel, 2002; Thiele & Weiss, 2003; Rashid et al., 2006; Taruvinga et al., 2013, Thorne-Lyman et al., 2010).



Photo 7 Food aid distribution

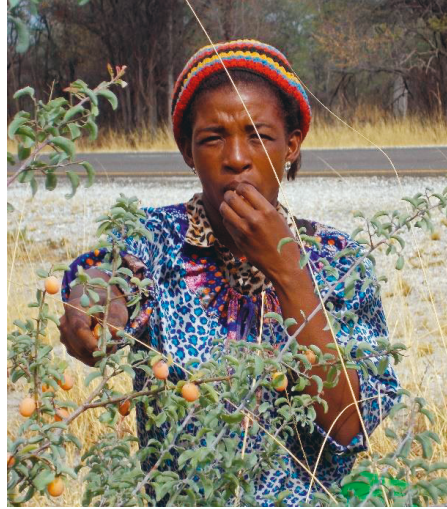


Photo 8 Gathering #ori (by Elias Peter)



Photo 9 Farmer with saved seeds



Photo 10 Trophy meat distribution

5.2 DETERMINANTS OF POOR DIET QUALITY AMONGST THE KHWE

In this section, I investigate the reasons for the poor diet quality of the Khwe. As explained in section 2.7, the food environment is a central determinant of diet, because it provides the choices from which people make decisions about what to eat. As the various food-environment and food choice assessments of this study have proved to be complementary in nature, I discuss here the findings of Articles II and III simultaneously. I describe the characteristics of the contemporary food system, clustered in the categories of traditional, agricultural, and modern foods.

5.2.1 TRADITIONAL KHWE FOOD SYSTEM JEOPARDIZED

While traditional foods (plants and animals) are still consumed by the Khwe community members, their decline in the diets was unambiguous, and several of the reasons were exposed in Article II and III.

After several decades of exposure to modern foods and food handouts, it is somewhat expected that the bush as a food source may have lessened in importance for the Khwe in the BNP East. Yet, the ranking results of food sources (Article II) demonstrate that the bush is still perceived by the Khwe as a highly important food source. More than half of the respondents reported that the bush - with its plant foods, honey, and mushrooms - was of major significance in their sustenance. This result is in line with the findings of a similar study undertaken in 2010 among the Ju/'hoansi San in Nyae Nyae (Lee, 2013), which found that wild foods persisted strongly in their food supply.

Among the Khwe, the main recurring arguments for the importance of the bush were its cultural meaning, the taste preference, and its importance as a food safety net. Several other scholars working with Indigenous Peoples (IPs) have found that traditional foods embody not only rich nutrients and key contributors to dietary adequacy (Fediuk et al., 2002; Egeland et al., 2004; Kuhnlein et al., 2002; 2006), but also a representation of identity and cultural pride, helping to strengthen social connections through shared activities, all of which are fundamental to IPs health and well-being (King et al., 2009; Egeland et al., 2009). In the present study, although the narratives of many Khwe reflect the importance of food choices based on socio-cultural reasons (Article III), preferences for specific traditional foods vary from one individual to another and depend on several other factors than culture, such as affordability, healthiness, convenience, access and availability.

Affordability has been found to be regarded as the most imperative reason for the consumption of indigenous foods across rural southern Africa, as the cost of modern foods are considered high (Faber et al., 2010; Cloete & Idsardi, 2013). Monetary cost was also found to be a leading factor in choosing traditional foods over modern foods in the case of the Khwe (Article III).

Namely, foraging for the Khwe is a food strategy that can supply nutrients for everyone on an egalitarian basis, even for the poorest households.

Elderly respondents demonstrated an intricate knowledge of the health benefits of traditional foods, perceiving them as giving strength and preventing sickness (Article III). Despite this, they reported declining consumption tendencies due to a preference for and the convenience of modern food items. In addition, the recent historical and political context presented in Article III demonstrates knowledge erosion about traditional foods, which was noticeable among the reasons for food choices given by some members of the younger generation. A few Khwe youth outright rejected the procurement and consumption of veld foods, claiming these to be a 'backward' practice. A similar tendency has been found in studies from Morocco, where wild vegetable consumption was regarded as 'uncivilized' or as 'food for the poor' (Powell et al., 2014). The absence of interest in traditional activities has also found to be negatively influencing the consumption of traditional foods among IPs in Nunavut (Chan et al., 2006). The stigma about foraging being obsolete was also strongly stated by several of the regional governmental actors who actively discourage the gathering of wild foods. A very similar negative stance was reported in a study by Brimblecombe et al. (2014) with regards to authorities relating to the traditional foodways of Aboriginal people in Australia.

Access to forest habitats has been linked to higher fresh food consumption and increased dietary diversity in several studies across Africa (Powell et al., 2013; Johnson et al., 2013; Ickowitz et al., 2014). Distressingly for the Khwe in Namibia, food choices in 2018 were often driven by the inaccessibility of their traditional food source, the bush habitat (Article III). The study respondents reflected with desperation on their current reality. Even without the imposed mobility regulation, some Khwe expressed their discontentment with regards to their access to their traditional harvesting areas, as many of these lay inside the border of the no-access, core conservation areas. The borders and zonation of the National Park and the conditions of permanent inaccessibility had not been fairly discussed with the Khwe (Taylor, 2012), leaving many confused and hesitant.

In addition to accessibility is the issue of availability. The abundance of veld foods was reported to be in decline in the multiple use area recently due to climate change, the increased population of bush pigs, and overharvesting (Article II). A few community members also stated that the decline might partly be due to the mismanagement of resources (Article II). Humphrey (2018), in her dissertation, concluded that the practice of traditional fire management, most particularly the early season burning, is of the utmost importance, as it contributes to the food security of the Khwe and simultaneously improves biodiversity conservation in the park. Yet when co-management and bush access is prohibited for the Khwe, as is currently the case, the knowledge erosion of traditional practices (like fire management) is accelerated, and sustainable management practices may be neglected or

replaced by destructive practices, such as burning in the wrong season, or harvesting in a way, that the whole plant cannot recover anymore (Article III).

Until a couple of generations ago, the bush provided all the necessary nutrients for the Khwe (Brown and Jones, 1994), yet with the ban on hunting, wild animal protein has been largely missing from the Khwe diet for several decades. Respondents referred to meat as vital for the body and key for healing the body. Today, the source of this traditional food, is solely the trophy hunting company operating inside the Park. This food source is regarded by the Khwe informants as the least important (as reported in the food source ranking exercise) (Article II). The elephant meat that the trophy hunting company most often provides is not widely coveted. A similar situation has been found among the San in the Nyae Nyae, where traditionally elephant was taboo to consume (Biesele, M., & Hitchcock, R. 2010). Yet, due to widespread hunger in both areas, people have no choice, but to eat elephant meat.

Besides, the narratives of my Khwe respondents reflect their dissatisfaction with the quantity and frequency of the meat deliveries to the communities. Koot (2019) reports that the Khwe communities in BNP receive 36 tons of meat on average annually (distributed 2 or 3 times a year) which is between 5 and 10 kg of meat per person, annually. Considering that very little meat is consumed apart from trophy meat, the average consumption may be the third of an average Namibian's meat consumption (28.3 kg/ year/person, FAO, 2013).

In contrast to the plant-based traditional foods, the socio-cultural dimensions of traditional meat were less prevalent in the reasonings given for wild meat preferences, rather health factors and taste dominated the respondents' reasonings. One explanation for this could be the method that is currently used to acquire the meat. Namely, at the meat distribution events, people are very hostile to each other, jealous and complaining about their part being too small. On a number of occasions, I witnessed this procedure terminating with verbal and physical abuse, leaving the whole community frustrated and uneasy with each other. This externally introduced manner of meat distribution has clearly placed a heavy weight on the general social cohesion of the community and may be an indirect influencing factor as to why most of the people ranked trophy meat so low, while nutritionally is a very valuable source. The handouts of a random piece of meat are very different from the traditional hunting and all the related rituals. Yet, today only a few elders remember these rituals.

Overall, the factors that keep the veld foods in the diet, like being free, healthy, culturally meaningful, is not enough to withstand the greatest obstacle, the institutional ban of the access of bush habitats by the Khwe. I argue through the findings of this study that the increasing withdrawal from traditional food is largely due to this regulation and has resulted in overall significantly greater food and nutrition insecurity.

5.2.2 AGRICULTURAL FOOD SYSTEM ELEMENTS: LITTLE CONTRIBUTION TO THE KHWE DIET

Agricultural development has elsewhere been regarded as a significant tool to strengthen food security in vulnerable communities, alleviating high food costs (Baiphethi & Jacobs, 2009). Indeed, even in Namibia, rural agricultural development has been promoted by many governmental policies to decrease food insecurity (NDP4, 2012; NDP5, 2017), but with disputable outcomes so far (Article IV).

Today crop farming, gardening, and livestock rearing provide very little food for the Khwe community (Article II, page 7 Table 2). Due to ecological constraints (wildlife, pests, poor rains), what little the Khwe might plant is frequently left unharvested. Considering the “immediate return strategy” of hunter gatherers groups, these food production activities that require strenuous work inputs are hardly plausible as they result in very little return.

Nevertheless, there is a fair amount of desire for farmed foods amongst the Khwe (Article III). Millet and maize were among the most preferred ‘good foods’ in the free list exercise, and beans and derere (a leafy vegetable growing as a weed in the crop fields) were much more frequently chosen compared to their counterparts. These preferences were explained by the perception that the volume of beans greatly expands with cooking, providing a long-lasting and filling sensation. Therefore, beans were a favoured crop, yet interestingly few Khwe have made any effort to cultivate them near their homestead, where they would have been better protected from grazing animals, as opposed to in their unguarded crop fields. Instead, courtyards (home gardens) were planted with a type of cassava, from which only the leaves were cooked and consumed. Another edible plant that is cultivated by several households are the various Rosella species, which simply regrows after the rains, and both the leaves and the petals are cooked and enjoyed as meals. These findings raise intriguing questions regarding the nature of Khwe cultivation, as the activities linked with the more successfully cultivated plants resemble gathering behaviours more than they do those of active agriculturists.

That said, many Khwe individuals are involved in externally initiated community garden projects, from which several have an incentive for gaining either immediate return financial benefits (e.g. cash work to prepare the soils), or a promise of financial benefits after selling the products. External agents have provided the necessary tools, fences, production inputs, and some training for free. While there was initial enthusiasm, the community gardens were maintained by the Khwe for only a short period of time, then abandoned. Community members in the BNP East have also started their own garden when seeds have been distributed by the MLR. Yet most of them have been left with little or no harvest, due to irrigation problems, domestic animal raiding, and vandalism (Mäkela, 2018). These matters, however, rather seem to indicate a symptom of deeper underlying issues. Cadger and Kepe (2013) examined why the San in Botswana repeatedly failed in community gardening (similar to the Khwe), and concluded that the root causes for their lack of

success lay in the development agent's (governmental or non-governmental) negligence of the true empowerment of people to make informed decisions about their own future, and about how they want to prosper. Instead, these welfare approaches maintain an authoritative dependence, leaving community members disempowered and thus also disengaged.

In the BNP East, goats and chickens are the only livestock reared. While some are consumed, the livestock is used more as financial capital, to be exchanged for money in times of need, and used as food only at special events (Article III). A large proportion of livestock is also lost to predators, road kills, and sickness.

In sum, the village and the crop fields – both as food environments - have great potential to increase place-based nutrition influx into the Khwe community. Yet, numerous gardening and agricultural projects have failed repeatedly, largely because they have not taken into account community assets, cultural preferences, and local challenges; these are explained in more detail for crop cultivation in Article IV.

5.2.3 MODERN FOOD SYSTEM: UNAFFORDABLE AND POOR QUALITY

Modern packaged food items have been part of the Khwe diet for the last several decades. The South African Defense Force was found to be the main introducer of modern, refined foods in the area, radically changing the Khwe diet from the 1970s onward and influencing their food preferences and food culture (Article II).

As for the present preferences, modern foods were described to me by my Khwe informants as appealing, desirable in taste and texture, and convenient to prepare (Article III). Many shop-purchased foods were listed among the first 20 'good foods' in the ranking exercise. These preferences were largely explained as driven by the sensation of satiation, and perceptions about health and hygiene. While health consideration led many elderly individuals to favour traditional plant foods, young educated Khwe argued that they choose modern foods because the nutritional labels on their packaging prove their healthiness. In addition, Khwe by and large considered food bought from the shop to be safer than food acquired from the village (e.g. chicken, green leaves). They regard the village environment as dirty, and foodborne diseases were a common complaint of the Khwe, who associate the diseases with the accumulation of human and animal waste in the villages and the inaccessibility of clean water.

These results, emphasizing that hygiene and food safety are important factors in food choice decisions, are in line with the findings of other food choice studies undertaken in LMICs (Grace, 2015; Rampalli et al., 2019). However, most foods sold in the local shops are packaged and contain added sugars, sodium, and preservatives – all with negative health effects of which the Khwe are largely unaware. Until the Khwe do not feel that their place-

based food is safe, they will probably continue to favour the nutritionally poor diet from the shops. That said, the drivers of food choices are complex in case of the Khwe, who actually cannot afford to buy food on a regular basis despite their preferences.

The affordability dimension of the food environment refers to the financial resources needed for food acquisition (Herforth & Ahmed, 2015). As per the census survey that I carried out on basic socio-economic and demographic factors, poverty amongst the Khwe is so severe that 52.3 percent of the households in the BNP East cannot afford to purchase their daily minimum of calories (2100 kcal, Namibian Statistics Agency, 2016), which equates to the cost of 293 Namibian Dollars (NAD) per adult per month. Yet, these results do not even take into consideration that the food prices in the local shops are on average 20-50% higher than in the towns, although paying for a return trip to town costs an extra 200NAD. Therefore, it is hardly surprising that more than 62% of the Khwe ranked the local shop as last, or second last, in importance for food sources. Most households eat from shop-bought foods for less than one week per month. This outcome is contrary to that of the Ju/'hoansi case (Lee, 2013), where half of the participants have listed store-bought foods as their main or co-primary source of food. This may be explained by the fact that the Ju/'hoansi have more diversified sources of income, including craft sales, tourism, tribal authority related governmental work, or employment at general stores (Lee, 2013, p. 220). The majority of the Khwe rely on the welfare system as their main source of income (Paksi & Pyhälä, 2018). Yet, because this income is regular, and perceived as safe among the shop owners (who are not residents in the area and are members of other tribes), pensioners are granted credit (between payments) with a very high interest rate of between 50 to 100% on top of the original price of the acquired goods. On the one hand, the Khwe respondents appreciated the credit that was offered by the shopkeepers to purchase foods in times when their finances run out; on the other hand, with the high rates of interest on top of the already overpriced goods, the Khwe ultimately end up paying two to three times the market price for a food item. This exploitative local market system contributes to keeping the Khwe in a continuous trap of poverty.

Food aid deliveries, while perhaps combatting starvation in the short-term, have created a serious dependency, only to further erode traditional food practices, knowledge systems, and safety nets. More than half of the Khwe respondents ranked the government as the first or second most important food source (Article II). In contrast, in Lee's study, the perception of the Ju/'hoansi about governmental handouts was very different, listing the government as being less important for food than shops (Lee, 2013). This difference may be explained by the fact that the Ju/'hoansi have relatively unrestricted access to the bush, and food aid deliveries have been more consistent in their area. Thus, caloric hunger is most likely not the main determinant of how people perceive the importance of different food sources, unlike the Khwe. Most of the Khwe's food choices and food preferences are, in fact, driven by hunger. Yet, food aid

has been breaking down social and food security networks that have traditionally existed and been designed precisely to mitigate risk.

5.2.4 THE EFFECTS OF SEASONALITY ON FOOD CHOICES AND FOOD SECURITY

During my data collection, discussions about food-related topics inherently included seasonality. Four seasons are recognised by the Khwe: 'Barra', the hot wet season between December and March; "Sau", after the wet season between April and May; 'Ko' the cool dry season between June and August, and; 'Klau', the hot, dry period between September and November.

Most wild fruits and vegetables tend to be seasonal, and are harvested during May and December, corroborating the findings of Dain-Owens et al. (2010). Some fruits and vegetables are dried for later consumption, and therefore these few are available all year round (tceu, /qom, #ûmbé, kyara). The wet season is rich in leafy vegetables and fresh fruits, but poor in fatty seeds. While tubers are available throughout the year, finding them is difficult in the wet season due to the dense understory vegetation.

Nowadays, however, seasons also come with new, additional meanings: the season of trophy hunting, the season of farming, and seasons of hunger. During the six-month period when trophy hunting is not active, and which coincides with the wet season, protein and fat are almost entirely unavailable from the local food environment. This is also the season of the highest exposure to malaria and other serious respiratory illnesses; therefore, the implication of nutritional stress can be extreme. I witnessed several children and adults die during the wet season, due to severely weakened immune systems. There are a few strategies to cope with wet season challenges. One is the timing of small livestock butchering at Christmas (for the few households who have excess animals to kill), the other is to fill hungry stomachs with green leaves. Especially the Khwe farmers expressed their frustration about the typical timing of this meat hunger. It coincides with the most tiring farming work: ploughing, sowing, and weeding. Thus, if the government is inconsistent with the monthly food aid deliveries (which is the case in BNP), farmers may not be able to tend to and cultivate their fields (Article IV) because they are too weak to work due to hunger.

In contrast to other studies (e.g. from the San in Omaheke) where seasonal variety was found in the number of meals eaten (Dieckmann, 2014, p. 55), during my fieldwork, I noticed a weekly variation in the number of meals eaten by the Khwe. When I enquired about when the hunger season would reach its peak, I was told: "Hunger is with us all the time nowadays, there are no differences among months. When the government is not giving us food, we starve." This signifies the decreasing role that the seasons play in determining periods of food security. Similarly, the respondents of food choice interviews expressed frustration about seasonal availability. Instead of waiting for

traditional foods to ripen, they preferred to have maize meal immediately (Article III).

Overall, periods of hunger amongst the Khwe are today largely determined by 1) the arrival of governmental food aid, 2) the provision of trophy hunting meat, and 3) payday – all three factors that the Khwe have no agency over.

5.3 LIMITATIONS OF CROP CULTIVATION

In Article IV, I have used the Community Capital framework to provide a detailed assessment of the most regionally promoted food strategy, namely crop cultivation. I examine this food strategy from multiple points of view, alongside the institutional realities of crop cultivation. Using information from the semi-structured interviews with the Khwe farmers and other stakeholders, as well as data from the census and participant observation, I have mapped a summary of the community capitals in terms of the crop cultivation (see IV, Table 2).

Crop cultivation is referred to as part of the Khwe traditional lifestyle, together with hunting and gathering, and perceived to be imperative in their culture and livelihood. The Khwe have strong social ties, helping each other in the food production work and sharing foods in the hungry season. It is interesting to note that the Khwe perceive to have plenty of land available for farming near the villages, with good soil. Thus, for the Khwe, cultural, social, and natural capitals form the fundamental underpinnings for successful crop cultivation.

However, with the advent of permanent sedentarism, the food system has changed over the last decades, and crop cultivation now requires more human capital, as the farmer's knowledge is often insufficient to deal with the previously unseen climatic changes, new pests, hybrid seeds, and increasing human-wildlife conflicts. Yet, access to training is close to none: most of the farmers are old and do not speak English, the language of the regional training. Besides, Khwe have very little financial capital, nowhere near enough to purchase the necessary seeds, fertilizers, and tools. In terms of physical capital, the Khwe are challenged by inappropriate storage facilities and undelivered support services. What little assets the community might have in terms of community capital are increasingly at risk. Social cohesion among members of the community is declining due to the growth of settlements, as well as due to alcohol abuse, and for young people, farming as a cultural capital has little attraction in comparison to other forms of employment.

This study found that one of the major challenges preventing successful crop cultivation is the weak or non-existing political capital of the Khwe community, which has long-term implications for their food system. Khwe have little or no political voice when it comes to decision-making or any kind of planning for their future, and instead of a partnership, an authoritarian relationship is maintained by the different external actors vis-a-vis the Khwe.

Overall, crop-cultivation, which is the most promoted food strategy in the BNP, is being negatively affected by the simultaneous depletion of multiple forms of capitals. These inefficiencies are not exceptional for the BNP, as many food production projects with the San have failed also elsewhere (e.g. Cadger & Kepe, 2013; Dieckmann et al., 2014, p. 138). The findings of Article IV, however, illustrate particularly the institutional malfunctions that largely contributed to the shortcomings, and very low yields, of crop farming.

While the national and regional political decision-makers and development agencies continue to perceive crop cultivation as one of the most important food strategies in the BNP in the quest to achieve better food-security, the support approach of the governmental agencies is highly authoritative and disregards local needs and preferences. Nor does it take into account the environmental context (e.g. wild animals) or the assets or weaknesses of the community's different forms of capital. My findings in Article IV reveal that the implementation by governmental bodies is disharmonized, lacking in collaboration between the different actors, and often creates frictions due to inadequate communication. The local governmental agencies are not accountable when the promised services – e.g. seed dissemination and tractor ploughing - are not delivered, and instead continue to offer false hopes for the upscaling of crop cultivation, which reinforces the cycle of dependency, expectation, and economic and social marginalization of the Khwe. Crop yields remain very low in the BNP East, but as these findings confirm, the failure to thrive in development programs should be seen as a problem not of the community members who 'fail', but of the system that produces the failure (Ninkova, 2017).

6 CONCLUSIONS AND WAY FORWARD

6.1 THEORETICAL CONTRIBUTION

This PhD thesis contributes to a growing body of literature examining food environments and food choices among rural communities in LMICs, particularly in cases of recently sedentarised former hunter-gatherers. Already in the early stages of this research, my literature review of key concepts and frameworks revealed a need to improve and further expand existing theoretical concepts and typologies in food system studies of rural LMICs. This is particularly important with regard to research in deeply impoverished rural communities, seeing that the origin of the existing theoretical concepts is predominantly rooted in studies focusing solely on HICs (Turner et al., 2018).

In my research, I have attempted to harmonise existing theoretical concepts with the empirical context of a formal hunter-gatherer group in Namibia. This necessitated the modification of some of the interpretive elements in order for these to be appropriate and relevant in a setting where traditional foraging, agricultural, and modern food systems exist in parallel. As the dietary contribution from wild and self-cultivated food sources is substantial in rural and indigenous communities around the globe, to analyse the data, I have modified the recent conceptual model recommendation of Ahmad and Herforth (2017), which considers the food environment in LMICs. I have added diversity as a fifth, additional component to the original framework of availability, affordability, convenience and desirability -instead of replacing affordability with diversity - thus enabling the simultaneous analysis of different food sources in a systematic manner. In this way, the expanded framework becomes more relevant to the contemporary rural, indigenous community contexts in which this work took place.

Regarding food choices and food behaviour, the existing literature is even more scarce for LMICs. While in HICs a wide range of theoretical frameworks exist, I chose to utilize in my analysis the ecological framework by Story et al. (2008), seeing it has already been used for addressing similar research questions – i.e. determining the drivers that affect dietary behaviours, although in urban Africa (Gissing et al., 2017). To my knowledge, there have been no previous studies applying this framework to a rural setting. In my study with the Khwe (Article III), basing my analysis of food choice drivers on the ecological framework proved to be useful, enlightening social and cultural aspects of dietary behaviours, which are rare in the literature (Gissing et al., 2017).

Overall, while this dissertation adds valuable new perspectives to the field of food systems analysis, this thesis is more of an empirical study than a theoretical one. As such, my priority was to bring forth some of the conceptual and theoretical imperfections in the existing literature rather than to

formulate specific typologies of new concepts. That said, exploring and defining these typologies further is necessary for improved future food system analyses; more suitably defined concepts can assist in better detecting the main shortcomings of food systems and thus to better understand the underlying causes of undernutrition in rural LMICs.

6.2 PRACTICAL CONCLUSIONS

This PhD project provides an exhaustive examination of the contemporary food system of the Khwe communities residing within the Bwabwata National Park East. What has emerged from the food systems analysis (Figure 3) is that the Khwe are currently trapped in a vicious cycle of malnutrition due to an inequitable, dysfunctional food system and an unhealthy food environment. Specifically, the Khwe are severely limited in terms of their access to traditional food sources, particularly to wild animal protein and fresh foods from the local food environment, further tightened by the BNP's recently imposed strict mobility regulations on the Khwe, which prevents them from continuing with their traditional foraging. Imposing a military zone and strict National Park regulation on ancestral lands have made the Khwe to discontinue their traditional lifeways and radically changing their diet, health and wellbeing. The situation is further aggravated by the poor socio-economic status of the Khwe, coupled with an unsustainable dependency both on governmental food and welfare handouts as well as on the informal, but very expensive and exploitative, local food market system. With all these factors coming into play, the situation looks grim in terms of improving food security of the Khwe.

Meanwhile, the Khwe remain politically marginalised and side-lined, even in decision-making on matters directly concerning the Khwe themselves. As for daily food and livelihood choices of the Khwe themselves, clear thinking and wise decision-making whilst hungry and malnourished is a daily challenge, leading to less effective strategies and little if any proactive initiative on behalf of the Khwe themselves towards improving their own food security. For this reason, immediate action to enhance nutrition is required. Only in a well-nourished state can the individuals and communities self-strengthen themselves and their capital for more pro-actively engaging in healthier, more sustainable food strategies.

6.3 PROSPECTS AND RECOMMENDATIONS

This dissertation fills an imperative policy-relevant gap in the literature, by exploring the characteristics of the food system elements of a vulnerable indigenous group that is nutritionally (not to mention socially, politically, culturally, and economically) under immense stress. Identifying which parts

of the food system are contributing to these concerns is vital in order to better inform the development of more adequate policy interventions aimed at improving the food security of Khwe communities. The findings of this study point towards the urgent necessity of combining context- and culturally-specific, short- and long-term approaches to increase the local food system's resilience using a rights-based approach.

Under current circumstances, it is impossible to rely predominantly on traditional foods, therefore to improve the various modern, agricultural and traditional food system elements concurrently has a critical role in providing a diverse, nutritious diet for the Khwe. Below I list my main recommendations drawing from the findings of this research, some of which are in line with suggestions already put forth by other scholars (e.g. Dieckmann et al. 2014, p. 627) for addressing cross-cutting issues amongst different San groups. However, the findings from my study also provide for more context-specific suggestions to improve the local food environment specifically of the Khwe.

First of all, this dissertation identifies gaps and shortcomings in the availability of, and access to, food groups in the local food environment that ultimately contribute to malnutrition. In the **short-term**, immediate measures need to be taken to effectively address the direct food and nutrition needs, progressively incorporating cultural elements into these steps. Immediate actions should involve:

- i. **Improving the regularity and nutritional quality of the delivered food aid.** The local acceptance of dried beans, along with their high nutritional value, makes them an ideal food type to be distributed, compared to the low quantity and disputable quality of the currently distributed canned beans. Until other healthier replacements are obtained, maize meal needs fortification in the short term, as the local preference for maize meal is overwhelmingly dominant. The currently distributed refined maize meal, with its low nutritional value, is consumed as a mono-diet in many Khwe households, harming health and wellbeing. Food aid should rather be diversified with other more nutritious local crops, such as millet and sorghum.
- ii. **Provision by MET of common game meat during trophy hunting off-season.** The lack of animal fat and protein is a huge shortcoming of the contemporary food environment, which needs urgent attention. The period between November and March, when no trophy meat is distributed and when malaria is most prevalent, is critical for adopting other measures to increase the overall immunity of community members. Adding key nutrients to the diet is vital, especially for farmers, so that they have the strength to cultivate their fields. The recent game count figures show a steady population for several game species (NACSO, 2018, e.g., buffalo, zebra), therefore the provision of game meat is a tangible quest.
- iii. **Effective policies to be instrumented in order to encourage local food sellers to increase the availability and affordability**

of fresh and nutritious food items. The food from the local shops is not only unaffordable, but it is also for the most part very poor in nutritional quality, offering little to improve the dietary diversity of local communities. Official legislation and subsidies for distribution of healthy foods to rural distribution points, like the local food shops in BNP, are necessary if such foods are to be available and affordable.

- iv. **Most importantly, eliminating the strict mobility regulation in BNP for the residents,** to enable the Khwe to continue their traditional food gathering wherever such food is available and in all seasons.

Depriving the Khwe access to their ancestral veldfoods habitat contradicts the human right to food. The right to food states that “every man, woman and child, alone or in community with others, have physical and economic access at all times to adequate food or means for its procurement.” Adequate relates to “acceptable within a given culture” (United Nations, 1999). Although Namibia ratified the International Covenant on Economic, Social and Cultural Rights in 1995, which includes the right to adequate food, the Khwe San still have no access to adequate food. Without access to natural habitats, invaluable knowledge and practices are also abandoned and, over time, lost. For example, sustainable burning practices that regenerate instead of degrading the natural resources (Humphrey 2018) have not been practised for years. This leads to erosion of the related knowledge and values, which in turn affects the abundance of veld foods, and therefore further weakens the traditional food system of the Khwe. Therefore, the acknowledgement, promotion, and support for the continuation of traditional local customary rights over their territories and resources -also encompassed in the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP; United Nations General Assembly, 2007) - needs addressing in both the short- and long-term in any political and development strategies on matters pertaining to the San.

In the **long-term**, nutrition education is vital not only to counteract misinformation about various foods, but also to avoid the loss of traditional knowledge. There is an immediate risk of long-evolved Khwe knowledge around traditional foods disappearing as the Khwe elders pass away without having transmitted their knowledge and skills to the younger generations. Meanwhile, nutritional awareness-raising is needed so as to not dispel nutritional misinformation about certain packaged foods. Yet, no amount of nutritional education is likely to make any difference if the main reasons underlying the inability of people to get nutritional food are of economic, political and environmental nature, as in the case of the Khwe. Nutritional education initiatives can only make sense if undertaken hand-in-hand with guaranteed accessibility to nutritious food items, including traditional veld foods.

Another important finding of this study is the strong dependency that the Khwe have on food aid. This can hardly be changed overnight, largely because of very poor options currently available in the food environment; hence, food

aid would need to be phased out whilst simultaneously building up community capitals for healthier, more sustainable, food strategies. However, as Article IV stresses, the various forms of community capital for crop-cultivation are currently extremely weak, with multiple institutional realities giving reasons for concern. Therefore, in any future external food interventions, local communities need to be engaged from the very start in a genuinely inclusive, participatory manner, ensuring the involvement of all members of the community (youth, elders, women, and men) in all stages of the planning, implementation, evaluation, and long-term maintenance of programmes and projects. Collaborations with researchers and practitioners who are familiar with the local context would be of great value to such development interventions, especially in order to ensure cultural and social sensitivity.

To implement any of the above recommendations requires a long-term commitment. In addition, intensive efforts focusing solely on a single area of the food environment (e.g. crop fields in Article IV) are not enough to improve food security and reduce dietary imbalances. A combination of different long-term food production strategies (e.g. agro-ecological and climate-friendly farming, or agroforestry) are much more likely to result in better and more resilient food security if community capitals, especially political, human, and physical capitals, are also reinforced.

For any type of horticulture ventures, an investment in physical capital, more specifically in the expansion of water piping, is necessary. Namely, the current poor state of water access does not enable households to successfully maintain even a kitchen garden. Moreover, plant species that are easily propagated and require minimum care are likely to lead to best results. Many tips and lessons can be learned from experiences in similar situations elsewhere. For instance, among active contemporary hunter-gatherers in Indonesia, Kramer & Greaves (2017) found that local communities successfully adapted to cultivating bitter manioc as it required similar activities to those already familiar to them from their traditional gathering of roots, with only a minimum amount of extra input in planting. Manioc, in turn, contributes a great deal to their food security in the wet season, when foraging does not bring enough returns.

Similarly, in the past, the Khwe's cultivation of millet (Article IV) seems to have been a relatively low-investment strategy. Certainly, in the case of the Khwe, where traditional hunting has entirely vanished and gathering is highly restricted, finding alternative crops to cultivate is necessary for long-term food security. That said, the findings of this study confirm that the Khwe's forager's mental make-up is still strong, and future food programs must take this into consideration in order to provide viable solutions.

Perhaps the greatest challenge is how to make a transitioning food system environmentally and economically sustainable, nutrition-sensitive, and culturally acceptable inside a National Park that is also regarded as a hotspot for illegal poaching. The Namibian government has taken a rather authoritarian approach to eradicate poaching in the Park, not only

disregarding the potential value of community partnerships and local traditional knowledge, that may help in fighting poaching (Taylor 2012, page 168), but has severely restricted the movement of the local communities in the area. With this approach, the government directly contributes to the unjust food system of the Indigenous residents in the area. Furthermore, there is currently little (if any) appreciation amongst authorities for traditional hunter-gatherer food systems, and making any changes in the food environment of the BNP requires political will at the level where decisions are currently made. The words of UN Special Rapporteur on the Rights of Indigenous Peoples, James Anaya, after visiting the San in Namibia in 2012 are just as timely today:

“Namibia should take measures to reform protected area laws and policies that now prohibit San people, especially the Khwe in the Bwabwata National Park and the Hai||om in the Etosha National Park, from securing rights to lands and resources that they have traditionally occupied and used within those parks. The Government should guarantee that San people currently living within the boundaries of national parks are allowed to stay, with secure rights over the lands they occupy. In addition, the Government should take steps to increase the participation of San people in the management of park lands, through concessions or other constructive arrangements, and should minimize any restrictions that prohibit San from carrying out traditional subsistence and cultural activities within these parks”

(Anaya, 2013, p. 19-20).

6.4 LIMITATIONS AND STRENGTHS OF THE STUDY

During the process of carrying out this research and writing this dissertation, I have identified a number of limitations and caveats that are important to point out, but also some strengths worth mentioning.

There has been recent criticism (Turner et al., 2019) on the quality of evidence provided by the food environment studies undertaken in LMICs, especially concerning the level of study design and the lack of standardized methods and metrics. Yet it is important to note that these studies are rare, and especially scarce and indefinite in concepts and protocols for rural settings. It should also be noted that there is even a lack of standardized instruments and indicators for the HICs setting (Caspi et al., 2012; Gustafson et al., 2012). The present study did not use any standardized methods for food environment or food choice assessments, as listed in review studies by Herforth & Ahmed, (2015) and Turner et al. (2019), which may pose limitations to undertaking comparisons with other studies. That said, Turner et al. (2019) in themselves pointed out the underutilization of mixed-methods in food environment studies to date, acknowledging the great potential that such an approach could have for assessing the nuances of food environments

and their impacts in a more comprehensive way. As a result, I chose to address my research aims with a mixed-methods approach, and in a somewhat unorthodox manner of using innovative but culturally adjusted methods. I believe this has been one of the imperative strengths of the present study.

This research has a number of other specific methodological limitations, which are discussed in more detail in the respective papers (Article I, II, III, IV) and, to avoid repetition, are not detailed here. In sum, however, the main weakness concerns my sampling strategy. It would have been ideal to employ all the research methodologies (both qualitative and quantitative) with the same cohort of people. In this way, I could have matched all the collected socio-economic data to the qualitative data and made more solid conclusions. Unfortunately, due to logistical limitations and the successive nature of my research methods application, I was unable to do this. The high mobility of the Khwe prevented me from finding the same interviewees where I would have expected to, meaning I had to expand my sample according to whoever was present. The strength in this is that overall, I ended up obtaining a much wider understanding of the food system instead of just gathering the perceptions of a smaller group of participants.

Another caveat in this study is the lack of a more in-depth, detailed analysis of the conservation institutions and their discourse and power dynamics over time. In this dissertation, I have only briefly touched upon the complex history of power relations in the realm of conservation in the BNP – an issue that calls for a much more comprehensive investigation, also in relation to questions of food, as currently the Khwe's food security is highly compromised by the imposed inhuman conservation measures.

Finally, I am aware that my findings are highly influenced by the strict movement ban that was imposed upon the Khwe already after my research had begun. It would have been interesting and useful had I collected the dietary and qualitative data both before and after the ban, yet there was no way for me (or the Khwe) to anticipate this change of events. The findings, therefore, represent an even more dire situation than what was the case prior to the mobility ban, yet my findings speak to the current situation as it is.

6.5 FUTURE RESEARCH

Whilst carrying out this research, and especially in drawing my conclusions, I have identified a number of important issues and questions that call for further research. Firstly, the extremely poor diet quality of the Khwe, which my findings clearly demonstrate (Article I) call for systematic dietary assessment studies among all San communities in Namibia, as the malnutrition situation is likely to be similar also amongst other San groups, and there is no national baseline for this data.

Wild plants – and veld food in general – is a hugely untapped resource base that should be brought up to play a crucial role in reducing the vulnerabilities

of the local food system. Future research could help assess the nutrient densities of the most widely consumed and available wild plant foods. While there is some nutritional information available about, e.g. manketti nuts, (Lee, 1973; Chimbelu, 1990), the nutritional value of most veld foods remains unassessed (Dain-Owens et al., 2010). Yet, they hold great potential in contributing towards food and nutrition security, as found in similar environments in Botswana (Kasimba et al., 2018).

Another critical issue of concern is that, at present, the diet of the Khwe is highly protein insufficient. As for the wild plants, there is a resource base available in the local environment that is being under-utilized to meet these needs. Further research could play an important role in helping to explore and identify ways to incorporate into local diets different sources of proteins in the form of wild game, insects, and pulses.

The occurrence of green leafy vegetables is significant in the contemporary diet of the Khwe. Previous research reviews on African leafy vegetables (Uusiku et al., 2010) suggest that they have great potential for adding micronutrients to diets, although cooking methods, drying, and storing greatly influence their actual micro and antinutrient content. Further research on the different species as well as their optimum harvesting, preparation and consumption methods would be of great value also the Khwe context, especially when undertaken in a participatory manner. Such research could provide accurate nutritional information directly to the community members, and thereby also serve as awareness-raising around the health benefits of leafy greens. In addition, studies on nutritional knowledge and incorporating traditional food systems would be highly relevant to the Khwe community, especially if carried out in the form of action research. All the above research recommendations would need to be designed so as to capture age and gender specificity in order to better inform future policies and programs. Finally, there is a clear need for more research to identify appropriate tools and frameworks that can support stakeholders' efforts to collectively and in a more inclusive, participatory way plan for and implement local food system improvement (see Brimblecombe et al., 2015), especially in settings involving politically marginalized, minority, and vulnerable groups like the Khwe.

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8 APPENDIX

Appendix 1. Food items of the community food inventory, consumed by number of individuals (N) in the 24 hours dietary recall surveys, clustered in food groups (FAO and FHI 360, 2016).

Food Group	Food items of the food inventory	N
1. grains/roots	maize meal	176
	rice	42
	bread	11
	potato	4
	pasta	3
	millet	1
	sorghum	1
	dinga* (<i>Tylosema esculentum</i>)	1
	/'iya* (<i>Vigna vexillata</i>)	1
	tcere* (<i>Dioscorea asteriscus</i>)	-
palm stem (<i>Hyphaene petersiana</i>)	-	
2. pulses	canned beans	8
	groundnuts	2
	dry beans	1
	peanuts	1
3. seeds and nuts	tceu* (<i>Guibourtia coleosperma</i>)	12
	/qom* (<i>Schinziophyton rautanenii</i>)	5
4. dairy	sour milk	-
	UHT milk	-
5. meat/fish	canned fish	28
	wild meat (elephant, kudu, hippo, buffalo, eland)	22
	canned processed meat	6
	packaged chicken	4
	goat meat	1
	village chicken meat	-
	frog	-
	snake	-
	squirrel	-
	birds	-
	rabbit	-
	tortoise	-
	beef	-
	springbok	-

6. eggs	egg	-
7. dark green leafy vegetables	16 variety of wild greens	76
	matete (<i>Hibiscus sabdarifa</i>)	73
	cassava leaves	19
	pumpkin leaves	11
	derere (<i>Corchorus tridens</i>)	10
	kale	1
	moringa	-
8. other Vitamin A rich fruits and vegetables	ce* (<i>Grewia flava</i>)	7
	axa #ori* (<i>Ximenia americana</i>)	6
	po #ori* (<i>Grewia avellana</i>)	1
	pumpkin	-
	qani* (<i>Grewia retinervis</i>)	-
	tcukx'om* (<i>Diospyros mespiliformis</i>)	-
	naxani* (<i>Parinari curatellifolia</i>)	-
	papaya	-
	carrot	-
	mango	-
	sweet potato	-
9. other fruits	#ûmbé* (<i>Dialium engleranum</i>)	18
	qonya* (<i>Strychnos cocculiodes</i>):	-
	/x'oana* (<i>Strychnos cocculoides</i>)	-
	tcinya* (<i>Diospyros chamaethamnus</i>)	-
	wini* (<i>Vangueria infausta</i>)	-
	bororo* (<i>Annona stenophylla</i>)	-
	tcindjere* (<i>Berchemia discolor</i>)	-
	twere* (<i>Vangueriopsis lanciflora</i>)	-
	orange	-
	apple	-
	water melon	-
	guava	-
10. other vegetables	deu* (<i>Termitomyces sp.</i>)	9
	fresh maize	8
	tsamma melon* (<i>Citrullus lanatus</i>)	3
	cabbage	3
	canned vegetables	3
	onion	2
	tomato	1
	horned melon (<i>Cucumis metuliferus</i>):	-
	potato	-
Insects and small protein foods	termites	-
	caterpillar	-
	grass hoppers	-

Appendix

Other oils and fats	cooking oil	149
	kiara oil	6
	mayonnaise	2
	peanut butter	-
	margarine	-
Savoury and fried snacks	fried dough	2
	chips	1
Sweets	biscuits	1
	candy	-
	sugarcane	-
Sugar-sweetened beverages	coffee/tea with sugar	32
	cordial drink	7
	carbonated sweet drinks	6
	commercial yoghurt drink	-
	condensed milk	-
Condiments and seasonings	soup powder	38
	sugar	23
	cremora	17
	tomato sauce	7
	spices	2
	honey	4
Other beverages and foods	alcohol	7

* Local Khwedam names for food gathered from the forest