An investigation of Basotho culinary practices and consumer acceptance of Basotho traditional bread

Pulane Nkhabutlane

Thesis

PhD Cons Sc (Food Management)

Study Leader: Dr. G.E. Du Rand

Co-study Leader: Prof. H.L. De Kock

May 2014

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An investigation of Basotho culinary practices and consumer acceptance of Basotho traditional bread

By

Pulane Nkhabutlane

Thesis submitted in fulfilment of the requirements for the degree

PhD in Consumer Science (Food Management)

In the Faculty of Natural and Agricultural Science

Department of Consumer Science

Study Leader: Dr. G.E. Du Rand
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DECLARATION

I, *Pulane Nkhabutlane*, hereby declare that the thesis for the degree, **Doctor of Philosophy in Consumer Science (Food Management)** at the University of Pretoria, submitted by me, has not previously been submitted for a degree at this or any other university and that it is my own work in design and execution and that all reference material contained herein has been duly acknowledged.

Pulane Nkhabutlane

May 2014

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DEDICATION

*This work is dedicated to my dear parents, '**Me` 'MaPulane Khati** and my late father **Ntate Maile Khati**. To my beloved family, my husband **Ntate Buti Nkhabutlane** for his love, and my two lovely children, **Tankiso Nkhabutlane** and **Mosa Nkhabutlane**.*

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Nothing will ever separate me from the love of God. I have seen more of him in this PhD journey. He is alive and his name is **JESUS.**

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ABSTRACT

Title: **AN INVESTIGATION OF BASOTHO CULINARY PRACTICES AND CONSUMER ACCEPTANCE OF BASOTHO TRADITIONAL BREAD**

by

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Supervisor: Dr. Gerrie E. du Rand

Co-supervisor: Prof. Henriëtte L. de Kock

Department: Consumer Science

Degree: PhD in Consumer Science: Food Management

The overall aim of this study was to investigate the culinary practices of Basotho with regard to traditional bread, to characterise breads and to apply the cultural hedonic framework to describe consumers' perceptions about the acceptance of traditional Basotho breads.

The culinary practices of Basotho have been transferred from one generation to the other without or with very limited documentation. The only sourced information was a research done by Ashton in 1939. The knowledge of traditional bread preparation and its acceptance by Basotho consumers is currently limited.

Food practices are embedded in culture and every culture has specifications pointing to the hedonic characteristics of food such as taste, appearance, flavour and aroma, which are determined by the context in which the food is selected or consumed. It was important to understand the cultural hedonic framework underlying Basotho bread acceptance.

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The study was exploratory and descriptive in nature. Food acceptance and cultural hedonic framework theories were used to explore the reasons underlying the choice of bread. The study employed both quantitative and qualitative techniques of collecting data in the three phases. Data related to culinary practices was collected by a structured questionnaire and focus groups in phase 1. Phase 2 was the standardisation of recipes obtained in phase 1. The standardised breads were characterised in phase 3 by describing selected physico–chemical and sensory characteristics of dough and breads. The responses to the questionnaire and descriptive sensory evaluation were statistically analysed and the grounded theory approach was used to analyse data from focus groups.

Ten Basotho breads prepared from wheat, maize and sorghum were identified in both rural and urban areas of Lesotho. Preparation of traditional Basotho breads involves preparation of grains (washing, sorting, soaking, dehulling, dry milling and wet milling), mixing/kneading, fermentation and cooking. Steaming method is applied to all breads, but baking and pot-roasting are used for wheat breads only.

Younger participants were less familiar with maize and sorghum breads than they were with wheat breads. Unfamiliarity with the sensory attributes of these products, contributed to their lower acceptance. The older participants were familiar with all traditional breads and valued them for use in the important Basotho cultural ceremonies. The movement from the rural areas to urban areas has also changed the traditional bread practices to modern westernised ways. This therefore placed Lesotho into both higher and lower cultural hedonic context such that rural and old people are higher context cultures and urban and younger people are lower context cultures.

The type of grain flour used influenced the sensory characteristics of breads. Red sorghum breads reflected dark red crumb and white maize breads reflected white crumb. Fine flour produced lighter breads than coarse flour of the same cereal type. Non-wheat breads were more crumbly, hard and fibrous than wheat breads. The instrumental texture analysis showed plastic deformation for wheat breads, brittle deformation for non-wheat breads and elastic deformation for standard breads.

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It is recommended that more attention be given to the development, standardisation and improvement of traditional bread recipes in order to produce bread with acceptable sensory attributes. The findings of this study help to understand and interpret the overall scope of Basotho attitude towards breads for the maximum utilisation of local grains in Lesotho. The study adds the Basotho perspective of cultural food acceptance to the excisting global knowledge of food choice regarding traditional food products.

Keywords: **Culinary practices**

Basotho traditional bread

Cultural hedonic framework

Food acceptance

Standardisation

Sensory characteristics

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ABBREVIATIONS AND ACRONYMS

AACC	American Association of Cereal Chemists
ASIRT	Association for Safe International Road Travel
$C_2 H_5 HO$	Alcohol
cm	Centimetres
CO_2	Carbon dioxide
ComRSorg	Commercial red sorghum bread
ComWheat	Commercial wheat bread
ComWhMaize	Commercial white maize bread
CWWheat	Coarse whole wheat bread
DY	Sourdough yield
EISA	Electoral Institute for Sustainable Democracy in Africa
FAO	Food and Agricultural Organisation
FWWheat	Fine whole wheat bread
h	Hour
KJ	Kilojoules
LEC	Lesotho Evangelical Church
LSD	Least Significant Difference
m	metre/s
Mcg	Micrograms
min	Minutes
ml	Millilitre
NGO	Non-government organisations
O_2	Oxygen
PCA	Principal Component Analysis
RDA	Recommended Daily Allowance
SABS	South African Bureau of Standards
tbsp	Tablespoon
TTA	Total Titratable Acidity
µm	Micrometre
WFP	World Food Programme
WRSorg	Whole red sorghum bread
WWhMaize	Whole white maize bread
WWhSorg	Whole white sorghum bread
y	Year/s

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Chapter 1:

THE STUDY IN PERSPECTIVE

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Chapter 1:

THE STUDY IN PERSPECTIVE

This chapter presents the background for the study and the layout of the whole study. It introduces the important concepts and gives an overview of the study area.

1.1 THEORETICAL BACKGROUND

1.1.1 Traditional Basotho bread

In Lesotho, traditional bread (*bohobe*) is a general term that covers different types of cereal (maize, wheat, and sorghum) meal-dumplings (*linkhoa*). The formula for Basotho bread is basically flour, starter, salt and water with exception of a few types of breads that are prepared without the starter. Traditional Basotho bread has been used as early as before 1939 as the staple food in Lesotho (Ashton, 1939).

Basotho favour the characteristics of bread and perceive bread as the most important and tastiest food compared to all other cereal products (Ashton, 1939). Bread prepared from wheat is preferred more than maize and sorghum bread by Basotho, mainly because of its desirable soft texture and high volume. The benefits associated with the use of maize and sorghum in Lesotho for bread making are due to the declining wheat production in recent years. It is therefore evident that consumption of wheat bread becomes very costly and cannot be afforded by poor families (Ministry of Agriculture and Food Security Lesotho, 2008). The use of other cereals in bread making on their own or through compositing wheat with either fermented or unfermented sorghum or maize as traditionally practiced by Basotho could make a significant difference in reducing bread costs and providing basic nutrients to the underprivileged Basotho.

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1.1.2 Culinary practices

The culinary practices or cuisine is how a food product is prepared and flavoured with certain ingredients following the method that has been tested over time for its production and then presented according to certain cultural specifications to the consumer (Rozin, Fishleler, Imada, Sarubin & Wrzesniewski, 1999; Rozin, 2000:134; Farb & Armelagos, 1980:200). The change in the culinary practices in Lesotho began many years ago; a pseudo-European diet, which includes fine meal bread, replaced the traditional ways of cooking in many households especially in the urban areas (Ashton, 1939). This shift from the traditional ways of cooking and presenting food in westernized ways is implicated in the loss of traditional food knowledge as it passes on to the younger generation (Raschke, Oltersdorf, Elmalfa, Wahlqvist, Kouris-Blazos & Cheema, 2007). The importance of documenting Basotho culinary practices was long recognized by the Principal Medical Officer of Lesotho (Ashton, 1939), but since the publication in 1939, it has never received any particular attention except for a related publication by Coetzee (1982). In Africa, the traditional ways of preparing, cooking and serving foods have been transferred from one generation to the other without or with very limited documentation (Raschke *et al*., 2007). Farb and Armelagos (1980:191) emphasise the fact that cultures are losing their originality of cuisines through unrecorded past. Documentation of culinary practices is important to encourage the pass-over of knowledge and technical culinary skills to the younger generations and to promote utilisation of local ingredients to prepare foods reflecting ethnicity and environmental well-being.

In China, where steamed wheat bread is widely prepared, efforts have been made to document the culinary practices with regard to steamed bread (Wu, Chang, Shiau, & chen, 2012; Wu, Liu, Huang, Rayas-Duarte, Wang & Yao, 2012; Wen, Lorenz, Martin, Stewart & Sampson, 1996; Ang, Liu and Huang, 1999:15; Rubenthaler, Huang & Pomeranz, 1990; Sun, 2007). A few studies on steamed wheat bread have also been conducted in South Africa (Lombard, Weinert, Minnaar & Taylor, 2000; Manley & Nel, 1999). In Ghana, Nche, Odamtten, Mout and Rombouts (1996); Nout, Kok, Vela, Nche, and Rombouts (1996) also published studies of steamed maize bread (Kenkey). These studies focussed on breads prepared according to culinary peculiarities of the countries. In view of the fact that the literature on traditional Basotho bread cuisine is limited, and very old (Ashton 1939), this study considers the importance of documenting the methods of preparing breads at household level and factors influencing the acceptance of bread.

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1.1.3 Factors affecting traditional Basotho bread acceptance (sensory characteristics and culture)

The general culinary practices (type of ingredients, processing techniques and flavourings) are important determinants of physical and sensory characteristics of breads. Besides ethnicity, traditional foods are also consumed for their interesting sensory attributes, which include taste, appearance, texture and flavour (Cayot, 2007). These attributes can be described and quantified using sensory and physical instrumental analyses (Stone & Sidel, 2004:201). To our knowledge, no scientific study to characterise traditional Basotho bread has been published. This study among other aspects seeks to document and explore the reasons for changing culinary practices with regard to traditional Basotho breads.

Wansink, Sonka and Cheney (2002) examined the influence of culture on behaviours and attitudes towards unfamiliar foods. This study adds another dimension to answer the question on how culture affects perception of consumers towards a traditional staple food product. There are variations regarding food habits within the same culture (Stankovic & Zevnic, 2011). For example, people of different social classes or occupations eat differently. Differences in food habits are also seen on special occasions or during mourning, as well as at household level. Within the same culture, there are different religious groups that also exhibit varying eating patterns. People of different sex also differ in eating habits and generally, different individuals have different tastes (Frewer & van Trijp, 2007:321; Cleveland, Laroche, Pons & Kastoun, 2009). Identifying these differences in Lesotho, explaining them, and relating them to other facets of social life will make a valuable contribution to existing theory.

1.2 PROBLEM STATEMENT

FAO/WFP Crop and Food Supply Assessment Mission (2007) reported widespread poverty in Lesotho in relation to gender, household size, livelihood patterns, access to basic services and geographic location. The mountain areas of Lesotho, which are occupied by approximately one-third of the population, are significantly poorer on almost all selected indicators. The number of people suffering from hunger is very high. About 39 percent of Lesotho's population needs food assistance (WFP, 2012-UN World Food Programme).

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Apart from old information (Ashton, 1939; Coetzee, 1982) about the culinary practices of Basotho, no up–to-date–data about Lesotho has been sourced on culinary practices and food acceptance. For example, it is not known whether Basotho still prepare different types of traditional breads using three types of local cereals (wheat, maize and sorghum) or whether the traditional breads are prepared in rural areas or in urban areas. With this background, it becomes clear that there are gaps in relation to studies conducted on food practices and food acceptance by Basotho. For a food to be successfully produced, not only the variations involved in the preparations are important, but also the understanding about factors underlying consumer food acceptance. This study seeks to address this problem, in order to encourage utilisation of traditional Basotho bread among the rural and urban and among the old and the young generations. The study intends to highlight the culinary practices of Basotho regarding traditional Basotho bread, the standardisation of bread recipes, sensory attributes, physico-chemical properties and acceptability of bread.

According to Tsepa (2008), the Basotho culture is continually modified by many factors such as modernisation and urbanisation, which lead to loss of traditional knowledge, values and beliefs. Tsepa (2008) articulated that Basotho cultural and indigenous knowledge is regarded less important even throughout the curricula guides. Research done about the importance of traditional knowledge indicates that, the loss of traditional food knowledge could negatively impact dietary diversity, culture related food activities, socio-economic conditions, health status, cultural integrity and the general quality of life (Raschke *et al*., 2007).

1.3 CONTRIBUTION OF THE RESEARCH

Food plays a major role in the life of consumers. However, consumers are faced with a challenge to make decisions on a daily basis before they could eat. The main question is what the culinary practices of Basotho regarding traditional bread are and which factors influence acceptance of bread among them? Factors affecting Basotho acceptance of traditional bread are unfolded. The study uses the final conceptual framework to explain more fully the contribution of culture to traditional Basotho bread acceptance in Lesotho. Such a matrix of factors influencing traditional bread acceptance together with

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consideration of culture will produce the final conceptual framework that will facilitate understanding of how people in Lesotho make decisions to accept traditional bread. The findings from this study could provide understanding of differences that exist between different groups of people in relation to traditional bread acceptance. It is hoped that the information from this study might provide valuable information to nutritionists and health practitioners of the Lesotho governmental and the non-government organisations (NGO) engaged in food assistance and nutrition intervention measures in the country.

1.4 JUSTIFICATION OF THE STUDY

The information compiled in this study may provide insights and understanding about culinary practices of Basotho in relation to traditional bread and factors influencing consumers' choice of traditional Basotho bread. The information could be useful as the basis for further investigation regarding introduction of new foods or encouraging consumption of traditional foods to the Basotho for the improvement of nutritional wellbeing and food security.

The information documented in this study could serve as a reference point for generations to come and therefore form the basis for further research to improve the qualities of traditional Basotho breads. Improved traditional breads could encourage their consumption among all generations (old and young) and enhance wider utilisation of staple cereals. Utilisation of staple cereals for bread making could be of high significance for food security for meeting basic nutritional needs.

Traditional Basotho breads are prepared from whole cereals, a factor associated with good health because of fibre. It is hoped that the information from this research would provide recipes that could not be sourced anywhere else for housewives to try in Lesotho and in other developing countries in order to improve their menu variety and break the monotony of consuming cereals like maize in the form of stiff porridge (*papa*) only. For people that are already health conscious and are aware of celiac disease and other intolerances associated with wheat, they may benefit from this research and have the information on different recipes for preparing reduced or gluten free breads.

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Many consumers in Europe want to see industries produce food of olden days, which reflects their ethnic and environmental well-being (Van Bladeren & Martin, 2007). As a result, the European food sector is faced with the challenge to collect and compile information on food composition and consumption patterns and the benefits of ethnic and traditional foods (Van Bladeren & Martin, 2007). This information may enhance knowledge and encourage traditional food production and consumption, mapping the eating patterns of both Europeans and immigrant consumers living in Europe (Van Bladeren & Martin, 2007). Similarly, Lesotho could explore the benefits of traditional foods; the information from this study pertaining to yield percentage of traditional bread and the nutritional analysis may contribute to the compilation of the nutrient composition tables in Africa and Lesotho and therefore help to alleviate food insecurity in the country, as suggested by Van Heerden and Schönfeldt (2004).

To the best of my knowledge, the methodology employed in this thesis is one of the first to investigate Basotho culinary practices with convergent mixed methodology design, using different generational groups from both the rural and urban areas of Lesotho. This research is also the first in Lesotho to apply the multiphase approach in which the previous phase helps to develop the next phase on culinary practices and food habits related matters. Merging the qualitative and quantitative approaches in this study enables comparisons and interpretations of results and this makes the methodology of this study to be useful and to form the reference for future research.

1.5 AIM OF THE STUDY AND SPECIFIC OBJECTIVES OF THE STUDY

1.5.1 Research aim/goal

The overall aim of this study was to investigate the culinary practices of Basotho with regard to traditional bread, the standardisation of recipes, sensory attributes and physico-chemical properties of bread and to use a cultural hedonic framework to describe consumers' perceptions of traditional Basotho bread and describe how these perceptions influence the ultimate acceptance of traditional Basotho bread.

The study was designed to meet the following objectives:

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1.5.2 Primary objectives and sub-objectives

PHASE 1

Primary Objective 1:	**To identify and describe different types of traditional breads prepared in Lesotho.**

Sub-objective: 1.1	To identify names of traditional Basotho breads.
Sub-objective: 1.2	To provide a description of the different types of traditional breads.
Sub-objective: 1.3	To investigate the sensory descriptions of traditional breads according to consumers.

Primary Objective 2:	**To investigate past and current culinary practices related to Basotho traditional bread.**

Sub-objective: 2.1	To identify and describe the ingredients used for traditional Basotho bread making in both rural and urban areas.
Sub-objective: 2.2	To identify and describe the flavouring techniques used for traditional Basotho breads in rural and urban areas.
Sub-objective: 2.3	To describe preparation and cooking methods for traditional breads in rural and urban areas.
Sub-objective: 2.4	To identify and describe serving techniques of traditional Basotho breads in rural and urban areas.

Primary Objective 3:	**To investigate the factors that influence Basotho peoples' consumption of traditional Basotho bread.**

Sub-objective: 3.1	To determine the reasons why rural and urban participants continue to prepare the breads and the reasons for not preparing some of the traditional Basotho breads.
Sub-objective:3.2	To describe the younger and older generations' perceptions that determine the traditional Basotho bread acceptance.
Sub-objective: 3.3	To investigate consumption of different types of breads in Lesotho.

Primary Objective 4:	**To investigate the impact of Basotho culture on traditional bread acceptance, using a cultural hedonic framework.**

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Sub-objective: 4.1	To investigate the influence of culture on traditional Basotho bread consumption.
Sub-objective: 4.2	To investigate and describe the role of traditional Basotho bread in special Basotho cultural occasions.
Sub-objective: 4.3	To investigate and explore context in which bread is consumed.

PHASE 2

Primary Objective 5:	**To standardise a selection of traditional Basotho bread recipes from regional variations.**

Sub-objective: 5.1	To describe traditional Basotho bread recipes in terms of the title, ingredients, equipment used and preparation method.
Sub-objective: 5.2	To evaluate traditional Basotho bread products in order to test their authenticity.
Sub-objective: 5.3	To adjust the quantities of ingredients in order to produce the required yield.

Primary Objective 6:	**To investigate total bread yield and the nutritional composition of breads with regard to:**

Sub-objective: 6.1	Macronutrients
Sub-objective: 6.2	Fatty acids
Sub-objective: 6.3	Vitamins and Minerals

PHASE 3

Primary Objective 7:	**To characterise selected traditional Basotho breads.**

Sub-objective: 7.1	To determine the pH and a Total Titratable Acidity (TTA) of sourdough and bread dough for Basotho breads prepared from wheat, maize and sorghum flour.
Sub-objective: 7.2	To determine the sensory attributes of Basotho breads prepared from wheat, maize and sorghum flour.
Sub-objective: 7.3	To determine the physical characteristics (texture, volume and colour) of Basotho breads prepared from wheat, maize and sorghum flour.

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1.6 STUDY AREA

1.6.1 An overview of the country - Lesotho

Lesotho is a mountainous small country, covering a land area of 30,355 square kilometres. The country is landlocked, surrounded by the Republic of South Africa (Figure 1.1). Lesotho has a population of approximately 1.87 million according to the Bureau of statistics Lesotho (2006). Lesotho was founded in the early 1800s by the Great King Moshoeshoe I, who won many wars against many invading nations who had settled in traditional Basotho land, which was then referred to as Basutoland (EISA, 2007; Osseo-Asare, 2005:75). Lesotho gained independence from British rule in 1966, at that time the royal monarch was headed by King Moshoeshoe the II, the successor to the first king's descendants. The royal bloodline has continued to the present day. In Lesotho, traditional authority is exercised firmly through a system of chieftaincy extending from the paramount chief who is the current king; His Majesty King Letsie III, and his government, down through senior chiefs and sub-chiefs, to headmen and sub-headmen at the local level (EISA, 2007). Traditionally, families and clans cluster together as units in small villages. The chief's hut would be in the middle and all other huts would radiate from there.

Nowadays Lesotho is a constitutional monarchy with a democratically elected parliamentary form of government comprising of the Prime Minister as head with executive authority (The lower house) and the Senate (The upper house) comprising of appointed hereditary chiefs from the communities. The king (Letsie 111) no longer possesses any executive authority, and is prohibited from participating in political initiatives. He serves primarily in a ceremonial capacity (Wikipedia, 2007; Country profile: Lesotho, undated). The people of the kingdom of Lesotho are referred to as Basotho and the official languages are Sesotho and English.

Lesotho is divided into ten districts located in two distinct geographical areas referred to as the highlands and the lowlands. The climatic conditions vary in these regions, with hot summers and very cold winters. The lowlands can get a temperature of up to −7°C (19.4 °F) while the highlands can get as cold as −20°C (−4.0 °F) Sometimes. The country is very high in altitude (almost 3,500 m above sea level at highest point). The lowest point is between 1,200 - 1,400 m (FAO/WFP, 2007).

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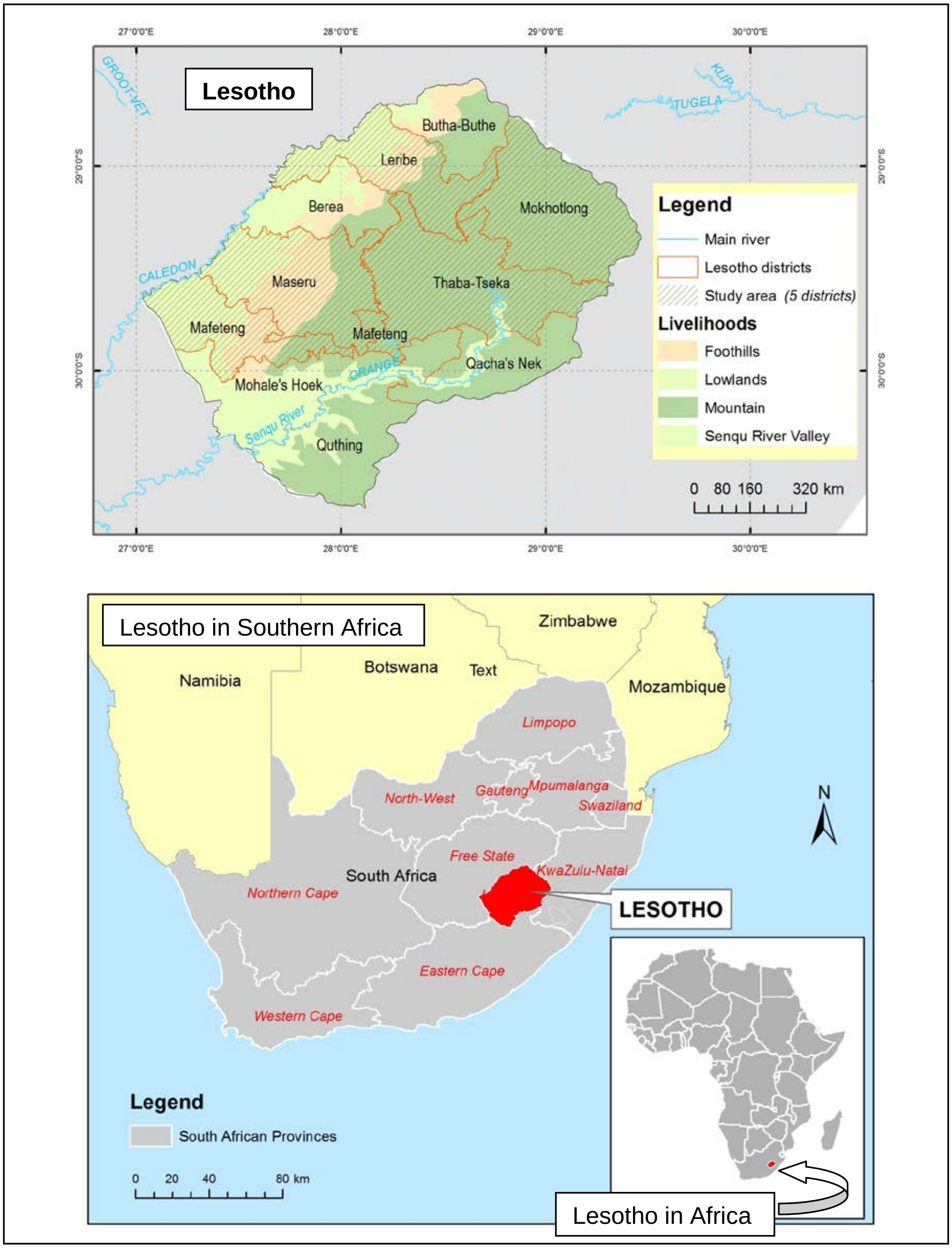

Figure 1.1: The map of Lesotho showing the 10 districts of the country. The five districts in Lesotho from which data was collected are highlighted.

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The climate is generally temperate. Snow falls frequently in the highlands in winter. Hailstorms are common in all regions in summer. The country suffers from erratic rainfalls, which leaves it prone to natural disasters, such as severe droughts in the dry seasons, floods and severe soil erosion in the rainy season (FAO, 2005). Road conditions are poor. Many villages in the highlands can be reached only on horseback, by foot or light aircraft. Many roads are rough and become impossible during the rainy season (ASIRT – Road Travel Report: Lesotho, 2004).

Resources such as wood are very scarce in the highlands because of the harsh environmental conditions. Poverty in Lesotho is alarming; nearly 40 percent of the population lives below the international poverty line of US$1.25 a day. The main natural resource in Lesotho is water, most of which is sold to South Africa. The country's economy heavily depends on this surrounding country (FAO, 2005).

1.6.2 Study regions in Lesotho

In addition to the rural and urban locations, Lesotho is also divided into 3 geographical areas being the North, South and Central (FAO/WFP, 2007) (Figure 1.1). Five focus groups were conducted, from the 5 districts (Mafeteng, Maseru, Leribe, Mokhotlong and Qacha's Nek) as indicated on the map of Lesotho in Figure 1.1. A typical study site within a district is shown in Figure 1.2. The five districts were selected to provide maximum variations with regard to rural/urban and northern, southern and central parts of the country. Based on dissimilarities in cereal yields it was assumed that culinary practices and consumer acceptance of traditional bread differ. Pars, Osler & Bjerregaard (2001) reported that people living in villages generally show a higher consumption of traditional foods than people living in towns. The nutrition extension officers helped to identify the specific sites within a district to study. The study regions and sites were as follows:

District		**Study Site (village)**
• Mafeteng	-	Makaung
• Maseru	-	Thaba–Bosiu (Lihaseng)
• Leribe	-	Maputsoe
• Mokhotlong	-	Phahameng
• Thaba–Tseka	-	Mohlakeng

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Figure 1.2: Typical Basotho village in the rural areas where data was collected. Photograph by Pulane Nkhabutlane, April-2011. Mohlakeng village (Thaba–Tseka).

1.6.3 Cereal production in Lesotho

Agriculture in Lesotho is a major source of livelihood for about 80 percent of the rural households. However, the contribution of agriculture to livelihoods has shown a negative trend because of varying weather conditions (Ministry of Agriculture and Food Security, 2008). The most important crops in Lesotho are maize, sorghum and wheat. However, their production declined from 77 percent, 80 percent and 52 percent respectively in 2011, due to drought and late rainfall (WFP, 2012). Climatic differences in the regions induce disparities in cropping patterns in various regions, wheat yields more in the mountains than in the lowlands (Ministry of Agriculture and Food Security, 2008). Although maize is the dominant cereal in the northern lowlands, the weather conditions allow multiple cropping and quite higher yields compared to other regions (Ministry of Agriculture and Food Security, 2008). The southern lowlands are faced with variable and lower rainfall patterns, which restrict productivity, and only sorghum serves as a principal cereal because it can withstand drought (Taylor, undated). Sorghum can grow and produce high yields under adverse dry heat and low soil fertility conditions sometimes experienced in the low lands of Lesotho (FAO/WFP, 2007). Unlike sorghum, maize cannot withstand these harsh conditions. It, however, generally yields much higher than

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wheat in Lesotho (FAO/WFP, 2007). Adverse climatic conditions prevailing in the country make it difficult for the country to produce enough wheat for both commercial production and household preparation of bread. As a result, Lesotho depends on foreign sources for 73 percent of its wheat flour (FAO/WFP, 2007).

According to tradition, sorghum is the oldest grain known and was regarded as the most important cereal. Maize is also an old Basotho crop and the bread made from maize was more appreciated for its appearance and taste more than the sorghum bread (Ashton, 1939). Wheat is a new crop in Lesotho compared to maize and sorghum. The first missionaries who arrived in Lesotho in 1833 introduced it to the Basotho. Before then, the Basotho prepared their traditional varieties of breads (*Bohobe ba monepola / ba linkhoa*) from maize and sorghum (Ashton, 1939).

1.7 OVERVIEW OF METHODOLOGY

1.7.1 Population and data collection procedures

The nature of this research was exploratory and descriptive. The aim of the study was three fold. It was intended to gain new information about culinary practices with regard to Basotho bread as well as to standardise and characterise traditional Basotho bread. In order to achieve the aim and objectives of this study a mixed methodology design was found to be the most appropriate to be employed. This approach involved different techniques of gathering data; it provided different perspectives in terms of analytical skills and interpretation of data (Creswell, 2013:218).

A preliminary study was conducted in order to identify the different types of traditional Basotho breads and to finalise techniques of collecting data for the main study.

Data collection for this study was done using a multiphase-mixed methods design (Creswell, 2013:228) in which a mixed methods convergent design and sequential approaches were employed. Data was collected in three phases in order to allow triangulation, to enhance the reliability of the study and to enable the results of one phase to form a base for developing the strategy for the next phase as follows:

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Phase 1 - A quantitative technique using a structured face to face questionnaire (n=253 female respondents) was used concurrently with a qualitative method involving five focus groups of 10 women participants from five regions of Lesotho. Purposive sampling was used to recruit women following a specified criterion. The first four objectives were addressed in phase 1.

Phase 2 - Selected traditional Basotho bread recipes collected in phase 1 were used for the standardisation process. The purpose of standardising the recipes here was to achieve new formulas using the bakers' percentage method, in order to use them for further analysis on characterisation of traditional Basotho bread.The nutritional content and the bread yield of the standardised recipes were computed in order to address objectives 5 and 6.

Phase 3 - Phase 3 employed a quantitative research approach in which descriptive sensory evaluation and physico-chemical analyses were performed in order to profile and characterise standardised Basotho breads. Objective 7 was addressed here.

1.7.2 Data analysis

Quantitative and qualitative data were analysed independently in this study.

1.7.2.1 Quantitative data analysis

Quantitative data from the structured questionnaire and characteristics of bread were performed using SAS ® version 9.3 (SAS Institute INC, SAS campus Drive, Cary, NC 27513) under Microsoft Windows XP (SP3) on a desktop computer. To determine frequencies, percentages, and means and Analysis of variance (ANOVA) determined the effect of independent variables on dependent variables. The findings and results were presented in tables, bar charts and graphs.

1.7.2.2 Qualitative data analysis

Qualitative data analysis commenced immediately after each focus group discussion. The researcher and assistants sat together for debriefing to fill the gaps and clarify points on the notes recorded during the focus group discussion. The written notes and information from different methods of recording were transcribed, firstly, by translating data from Sesotho to English. Transcripts were read several times in order to clarify relationships between concepts that explain a specific phenomenon. The researcher,

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who conducted the discussion, analysed data manually following the ten steps of qualitative data analysis suggested by Krueger (2009:1190) and referred to as classical or scissor-and-sort technique to grounded theory analysis in order to identify categories, sub-concepts and concepts. Finally, the guidelines, according to Henning, Van Rensburg and Smith (2004:109), were used to identify emerging themes. The findings of this study were presented in a discussion and in table formats following specific questions as asked during the focus group sessions, similar to what Dicks (2007) had done in her PhD thesis.

1.8 STUDY PLAN

The study plan used is presented in Figure 1.3 to illustrate the steps taken to initiate the study, and procedures followed to carry it out until to completion. Details are provided in relevant sections.

1.9 STUDY LAYOUT

The thesis is divided into eight chapters. The categorisation of this work was done such that there is a clear link establishing the relationship between chapters. The description of what is contained in each chapter is presented as follows:

Chapter 1: Introduction and background to the study

Chapter 1 provides an overview of the study area (Lesotho). This chapter also presents the background information to the study and the problem under investigation. The significance of the study is also presented in this chapter to justify the contribution of the study in the literature. The aim and research objectives of the study are also included in this chapter to indicate exactly what the study aims to achieve.

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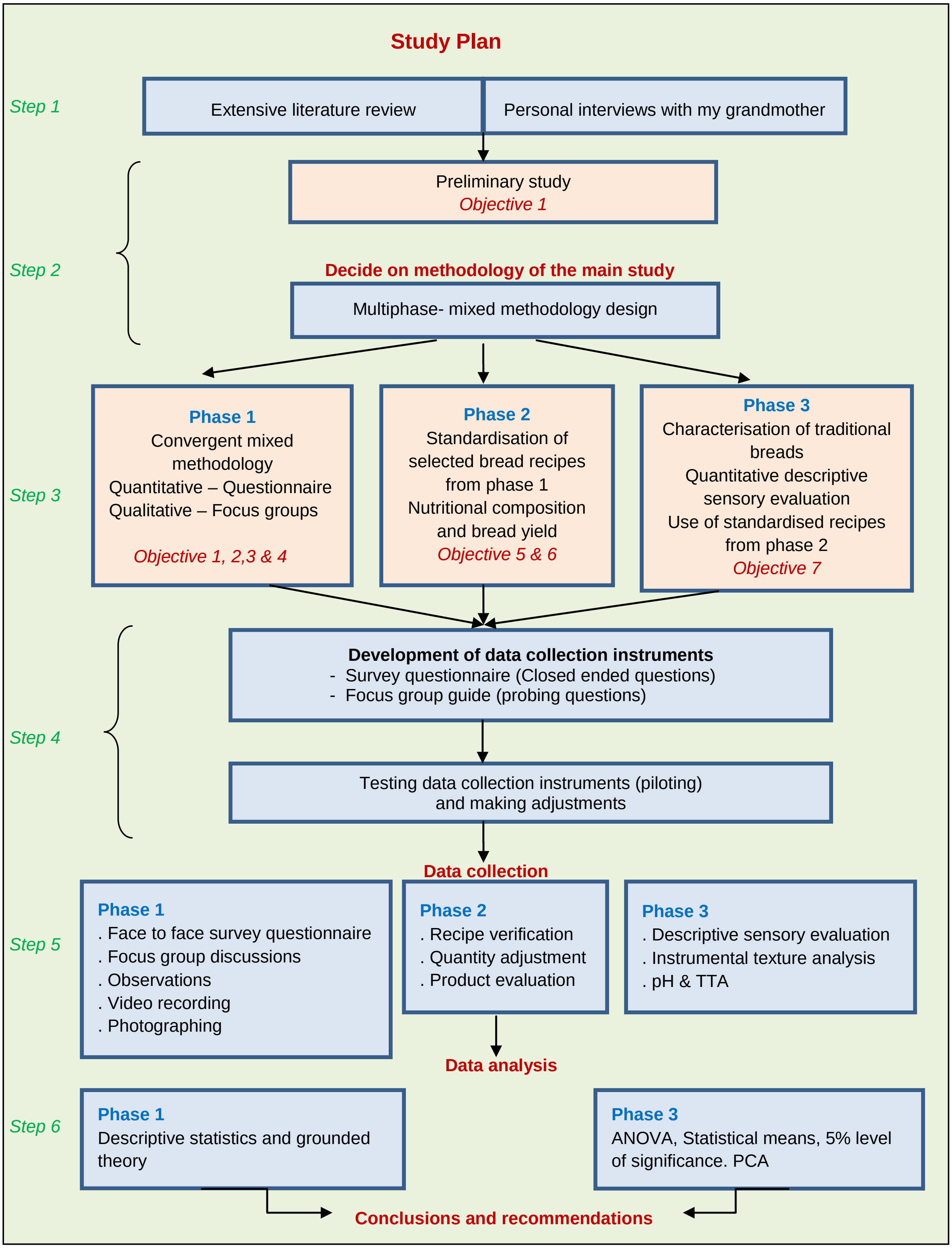

Figure 1.3: Study plan indicating steps employed to conduct the study

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Chapter 2: Theoretical perspectives of the study

This chapter reviews literature needed for the theoretical foundation of the study. The chapter presents the two theories guiding the study as food acceptance by Cardello (1996) and cultural hedonic framework. These theories are described in depth to provide understanding and interpretation of the findings in this chapter. Descriptive sensory evaluation is explained and the most critical sensory characteristics are addressed.

Chapter 3: Supporting literature review

Chapter 3 examines the main components of culinary practices with regard to preparation of bread. They include; ingredients, manipulation techniques, flavouring principles and serving principles. The literature covers the standardisation process and the bakers' percentage method used to adjust bread formulas. This chapter highlights the main concepts and indicates how the conceptual framework for the study was developed.

Chapter 4: Research Methodology

Chapter 3 provides the research methodology adopted for this study. It gives an outline of the research design and sampling procedures. The mixed methodology technique used in this study is explained and justified. This chapter also entails the ethical considerations for respondents and measures employed to ensure validity of the study. The techniques used for data analysis are also described in this chapter.

Chapter 5: Phase 1 (Questionnaire survey and focus group) findings

Focus group and questionnaire findings on culinary practices regarding traditional Basotho breads are discussed in this chapter. A description of ten types of traditional Basotho breads identified is given. This chapter also highlights the perceptions of Basotho about the sensory qualities of different traditional breads. The influence of culture on traditional Basotho breads acceptance is addressed. The differences between rural and urban areas and between young and older generations about bread preparation and acceptance are highlighted in this chapter. The importance of bread in Basotho diet and how it is used during special occasions is highlighted. The findings are discussed and presented in 4 sections

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Chapter 6: Phase 2 - Standardisation results

This chapter presents the findings for the standardisation process. The table indicating the differences between the traditional Basotho bread original recipes and standardised recipes are presented to summarise the adjustments performed with regard to quantities, equipment and yield. The nutritional value of breads and yield percentage are presented here.

Chapter 7: Physicochemical properties of steamed breads

In this chapter, the work on Sensory and physical characteristics of steamed Basotho bread is presented. The work mainly focuses on the characteristics of sourdough, bread dough and bread. The main characteristics covered include pH, TTA, colour, texture, volume, flavour and aroma.

Chapter 8: Conclusions, limitations to the study, contributions to theory and recommendations for further research.

This is the final chapter in this study and it presents the conclusions, limitations to the study, contributions to the theory and recommendations for further research. The chapter also gives the implications of the findings and describes the importance of the study and its theoretical contribution. Recommendations and suggestions for further research are given.

1.10 DEFINITION OF TERMS

Basotho: Members of Sesotho speaking cultural group who chiefly live in Lesotho

Mosotho: Singular for Basotho (one person)

Sesotho: Language spoken by all Basotho

Traditional foods: Food products that are considered part of a defined space and express a set of culture, history and lifestyles that ensure its continuity over time (Jordana, 2000). The food should have specific characteristics that specify its uniqueness from other similar products (Weichselbaum, Benelan & Costa, 2009).

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Consumption of traditional foods does not only serve the purpose of satisfying hunger but it involves a chain of culturally meaningful processes such as harvesting, processing, distribution and preparation of these foods (Trichopoulou, Soukara & Vasilopoulou, 2007; Trichopoulou, Vasilopoulou, Georga, Soukara & Dilis, 2006).

Culture: The set of norms, beliefs, values and other conventional understandings shared by members of a specific identifiable social group, such as an ethnic group and it affects what is eaten, when it is eaten, how it is prepared and with whom it is shared (Bryant, DeWalt, Courtney & Schwarts, 2003).

Cultural hedonic framework: The concept of cultural hedonic framework used in this study is based on the cultural perspective defined by Wansink *et al*. (2002); it considers the main factors that influence a culture or consumers' acceptance of a food product, in relation to the strength of cultural attitudes and traditions in daily life.

Consumption: The quantities of a food product eaten.

Bakers' percentage: A formula for flour mixtures in which all the non-flour ingredients are calculated as a percentage of the weight of flour. In this regard the weight of flour is always equal to 100 percent (Labensky, Martel & van Damme, 2009:127).

Physico–chemical properties of food: The physical properties of bread as used in this study, include size, shape, texture, volume, cell structure, and colour. The *c*hemical components include pH, TTA, the type of protein in cereal flours, carbohydrates in flour, and water.

Food acceptance: The overall perception of food resulting from the interaction that occurs between an individual and the food. The consumer tastes the foods and decides whether the food is liked or not (McEwan & Thomson, 1988).

Bread formula: The relation between ingredients in a recipe. Presenting the formula in proportions allows flexibility of increasing or decreasing the quantities during the standardisation process of bread recipes. The formula provides precise ingredients weight measurements in relation to the weight of flour. The formula may consist of a list

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of ingredients only, without instructions as always done in a recipe (The Bread Bakers Guild of America, 2001).

Recipe: A set of instructions for preparing food. It consists of two main parts that include a list of ingredients with quantities and the instructions to turn the ingredients into the final product. The other minor parts of the recipe include the title and the yield (Orr, 2000:12; Reed & Schuster, 2002).

Ingredients: Substances that form part of a mixture in order to prepare a specific dish. Ingredients are presented in the easiest possible unit of measure.

Whole grain flour: During milling, grain is ground to produce flour, if the bran, germ and endosperm components are retained during the milling process; the resulting flour is classified as whole grain (Franz & Sampson, 2006). Whole grain flour consists of ground caryopsis, whose principal anatomical components – the starch endosperm, germ and bran are present in the same relative proportions as they exist in the intact caryopsis (AACC, 1999).

Commercial flour: Maize, wheat and sorghum flour bought from local supermarkets. *Impala* special maize meal (Premier Foods, Isando, South Africa) and *Monati Super Mabela: pure* grain sorghum fine meal (Nola Foods (Pty) Ltd South Africa) were bought at a local supermarket in Pretoria South Africa. *Easy Bake* wheat flour (Lesotho Flour Mills Company- Maseru) was bought at a supermarket in Lesotho. The finest flour to prepare breakfast for the King and his family, Letlotlo Royal Choice Easy Bake was launched by the Lesotho Flour Mills as a commemoration of the royal wedding on 02/18 /2000 (Mopheme/The Survivor, 1999).

Commercial breads: Baked Sasko whole wheat bread and Astoria 100% rye bread bought from the local supermarkets.

Mealie: Green maize on the cob

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1.11 SUMMARY

The objective of chapter 1 was to highlight the perspectives pertaining to the background, problem statement, justification of the study and to give an overview of methodology. The study area and the overall study plan was given. The outline of the study chapters was spelled out with reference to the contents in each chapter. Finally, conceptualisation of the main terms was dealt with in this chapter.

In chapter 2 a literature review is presented, main concepts are highlighted and the theoretical framework of the study is described.

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Chapter 2:

THEORETICAL FRAMEWORK FOR THE STUDY

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Chapter 2:

THEORETICAL FRAMEWORK FOR THE STUDY

This chapter presents the two theories guiding the study

2.1 INTRODUCTION

In this chapter, the theoretical framework, based on the food acceptance model of Cardello (1996:2), helped to organise and indicate relationships among factors influencing food acceptance. These factors are represented in four categories as physical, sensory, perceptual and hedonic (Cardello, 1996:2). It is acknowledged that culture and ethnicity are essential foundations of the study of food and people. In order to successfully address the culinary practices and bread acceptance of Basotho, this study considers it appropriate to include the cultural perspective which encompasses the context and social interactions of an individual. Food habits are among the most important and deeply ingrained aspects of culture. People are exposed to diverse cultures as they grow up. These cultures largely determine their level of food acceptance. In view of the importance of culture in the determination of food acceptance, the cultural hedonic framework theory is used to describe and understand consumers' perceptions of a food product and how these perceptions influence the ultimate acceptance of food. This chapter therefore attempts to provide an overall picture of the relationship between the food acceptance theory and the cultural hedonic framework theory.

The literature review of this study is guided by the main factors indicated by the theories discussed. The supporting literature to the theories follows in Chapter 3.

2.2 FOOD ACCEPTANCE THEORY

Food acceptance or acceptability is the degree of liking/disliking of the tasted food by the consumer (Cardello, Schutz, Snow & Lesher, 2000; Cardello, 1994:254). The consumer

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tastes the food and rates the perceived level of liking. The implication for this definition is that food acceptability is the result of the interaction of an individual and food, which covers the overall human behaviour towards the characteristics of food (McEwan & Thomson, 1988). With reference to Figure 2.1 a stimulus (food) interacts with the organism (human) to cause a sensation leading to a response (behaviour) towards food. The sensory characteristics of food, namely appearance, aroma, taste and texture at this stage play a major role for the consumer to be able to make a decision on whether the product is liked or not. The aspect of wanting to enjoy food mostly influences the liking of a food product (Clark, 1998). However, there are other important factors such as nutritional characteristics, characteristics of the consumer, beliefs and opinions on food choice in the acceptance or rejection of a food product (Sobal, Bisogni, Devine & Jastran, 2006:2).

The process of food acceptance consists of many interrelated factors that result in a complex and dynamic structure. It involves a multi-disciplinary network of sciences such as food science and technology, nutrition, biochemistry, physiology, psychology, marketing and catering (Barriors & Costell, 2004; Costell, Tarrrega & Bayarri, 2009; Cardello, 1994:253; Shepherd & Sparks, 1994:202). Figure 2.1 presents these interrelated factors of food acceptance in four categories as: physical, sensory, perceptual and hedonic. More details and explanations of each category are provided in respective sections of this chapter. The individual interaction with the physico-chemical structure of food, which appears as the first stage of the food acceptance model, results in the sensory properties of appearance, texture and flavour, classified under the sensory stage in Figure 2.1 (Cardello, 1994:253). In the context of this study, consumers develop perceptions about Basotho traditional bread based on the intensity of sensory properties and determine whether they like or dislike the product under the perceptual stage (III).

The perceived information through the influence of the cognitive variables produces a stage of hedonic response (stage IV). The hedonic response gives an indication of pleasantness/unpleasantness or like/dislike, and leads to food acceptance/rejection (Cardello, 1994:254; Cardello, 1996:2). The hedonic response is sometimes referred to as food acceptance. It can be defined as the degree to which individuals or a group of people find a food product to satisfy or not to satisfy their expectations and requirements

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as influenced by personal factors and the food characteristics (Cardello, 1996:254). Consumer characteristics include genetic, age group, gender and physiological (hunger, thirst) and psychological state together with cultural aspects (Asp, 1999; Gellynck, Kühne, Van Bockstaele, Van de Walle & Dewettinck, 2008).

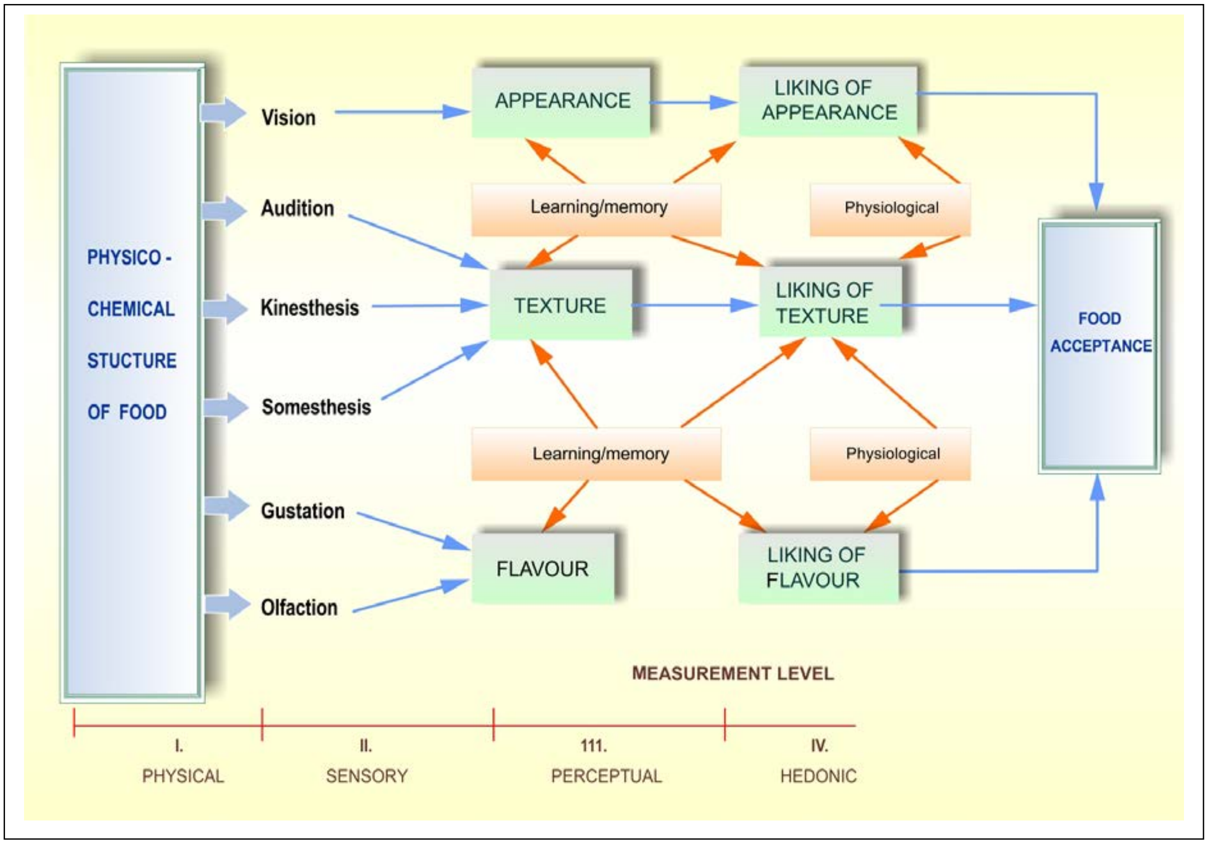

Figure 2.1: The food acceptance model of Cardello (1996:2). Schematic diagram showing the basic sensory, perceptual and hedonic stages involved in the processing of information about the physicochemical structure of food and resulting in food acceptance behaviour.

Apart from the four stages indicated in the model (Figure 2.1) and considered to influence the acceptance of food, it is important to remember that food preferences are largely determined in early life by culture in which beliefs and values about a food product are established. Culturally, foods are consumed in specific combinations (Bryant *et al*., 2003). In this context, liking or disliking of a food product is highly governed by learning, memory, context and expectations, which serve to recall attitudes and beliefs important for suggesting pleasantness or unpleasantness of the product (Kihlberg, Johansson, Langsrud & Risvik, 2005). The description of these factors is given in more

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detail in chapter 3. Food acceptance is also dependent on consumers' differences with regard to which sensory attributes are considered important by each individual.

The food acceptance theory was also summarised by Costell *et al.* (2009), who described the four features of consumers attitudes towards a food product as: 1. The sensory characteristics of a food product as perceived by the consumer. 2. An affective element that covers either positive or negative general feelings of a consumer towards a given food product. 3. A cognitive aspect which is about the consumers' knowledge on a food as well as how consumers' beliefs and attitudes affect the overall hedonic ratings of a food product and the degree of like and dislike of a food item. 4. The behavioural component that describes the consumers' willingness to use a product as reflected through actions (Costell *et al*., 2009).

2.2.1 Physical properties

The physical properties of foods comprise of size, shape, volume, density and porosity and they affect consumer acceptance of food (Sahin & Gulum Sumnu, 2005). According to the model (Figure 2.1) physical structure of food appears as stage 1 and these properties can be determined by sensory modalities listed in stage II (Sensory). The physico-chemical properties of food are dependent on the variety of ingredients, the preparation method applied and storage variables, which form part of the culinary practices (Cardello, 1994:252). An important quality of physical property regarding acceptance of bread is the nature of cellular structure. There are two components of the crumb cell structure; the cells and the cell walls (Cauvain & Young, 2010: 384). Crumb cell structure is an important physical property, characterising the texture of bread (Sahin & Gulum Sumnu, 2005:25). The physical and sensory properties considered important in this study are described in the sensory attributes section that follows.

2.2.2 Sensory attributes

The sensory stage in Figure 2.1 deals with the human senses used to evaluate food. The sensory evaluation of food was defined by the Sensory Evaluation Division of the Institute of Food Technologies as *"The scientific discipline used to evoke, measure, analyze and interpret those reactions of characteristics of food and materials as perceived through the sense of sight, smell, taste, touch and hearing"* (Stone & Sidel,

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2004:13; Linda *et al.,* 1991). Sensory evaluation results can be applied in quality control of raw materials e.g. sourdough for preparing bread, to evaluate a finished product and to evaluate the acceptability of a product by consumers. Descriptive sensory evaluation is the description of products based on the perception of a group of qualified consumers, usually a trained panel (Stone & Sidel, 2004:14). The descriptive vocabulary to describe sensory characteristics of food is generated by the trained panel (Stone & Sidel, 2004:14).

Food is prepared basically to be eaten and enjoyed by human beings. Therefore the appreciation of a food product relies entirely on the acceptance of the sensory attributes thereof (Wilkinson, Dijksterhuis & Minekus, 2000; Kihlberg *et al.,* 2005). The acceptance of food is highly controlled by its sensory attributes both before the food is tasted (in appearance and smell) and also in the mouth due to the taste, texture and aroma as perceived by the consumer (Ritson, Gofton & McKenzie, 1986; Costell *et al.,* 2009; Willows, 1996). In bread making the most important sensory attributes are texture and flavour (Heinio, 2006; Kim, Eves & Scarles, 2009). Bread preference and choice are mainly based on its freshness (Heenan, Dufour, Hamid, Harvey & Delahunty, 2008). There are six classes of sense modalities which work together to identify and characterise food, including bread. The sensory modalities are listed by Cardello (1996:4) as **vision, audition, kinesthesis, somesthesis, gestation and olfaction.** The description for these sensory modalities follows:

Visual identifies the first information about the characteristics of food (size, shape, colour and texture) (Cardello, 1996:4). Visual characteristics are perceived prior to eating the food. Vision gives an impression of the expected texture in the mouth or in the hands (Kälviäinen, 2002).

Audition (hearing) is a sensory modality responsible for detecting the textural properties of food by listening to the sounds produced when biting food. Audition is normally applied to determine crispiness or crunchiness of food (Kälviäinen, 2002).

Kinesthesis is movement. It is the sense that detects the position and movement of body parts (mandible) in order to determine the size and shape of food before and during mastication (Kälviäinen, 2002).

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Somesthesis is responsible for the detection of sensory attributes associated with touch, temperature and pain using unique receptor modalities (mechanoreceptors, thermoreceptors and noceceptors). These receptor modialities are heavily concentrated in the oral cavity of a human being. The oral cavity consists of lips, palate and tongue in which the nerve fibres are deeply embedded. The sensory attributes in this category are perceived through contact with skin and food material (Kälviäinen, 2002).

Gestation (gustatory system) deals with the taste of food. Food is tasted by the sensitive areas referred to as papillae found on the surface of the tongue. The papillae consist of taste buds and taste receptor cells, which carry the taste message through the axons into the brain (Kremer, 2006). The gustatory system serves as the last sensory modality to enable the consumer to differentiate between palatable and unpalatable food in order to make a decision about accepting or rejecting the food (Meilgaard, Civille & Carr, 2007:18).

Olfaction (The olfactory system) is responsible for detecting the odour of food. The olfactory system is situated at the upper nasal cavity. There are three types of cells (ciliated olfactory receptor neurons, supporting cells and basal cells) making up the olfactory system. The odorous molecules dissolve in the olfactory mucus layer and travel through the olfactory receptor neurons, which send the odour information to the olfactory bulb of the brain (Kremer, 2006).

The sensory characteristics of food are normally the result of multiple effects brought by various sensory modalities. As soon as the food is touched and enters the mouth, it is chewed. During the chewing process, it is tasted and aroma is released while texture and temperature are also determined by the tongue (Cardello, 1994:260). Sensory evaluation techniques have successfully been used to investigate the quality and consumer's acceptability of different types of breads (Waters, Kingston, Jacob, Titze, Arendt & Zannini, 2013; Bakke & Vickers, 2007; Lotong, Chambers & Chambers, 2000).

When food is consumed, the brain receives messages about the sensory attributes from the sensory modalities. The brain then integrates and interprets the information from these sensory modes through the nervous system and neurons that convert physico-chemical characteristics of food into neurochemical and neuroelectric information in

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order to give the final sensory perception of a food product (Cardello, 1996:2; Costell *et al.,* 2009).

The description of the various sensations that can be perceived during tasting is a very difficult task. Every food has its own combination of sensations and people have their own way of describing sensations. As a result, several descriptors are selected to describe different aspects of the same characteristics of food. These descriptors are very often related or correlated (Stone & Sidel, 2004:208). For the benefit of this study descriptive of sensory analysis is explained in the next section.

2.2.3 Descriptive sensory analysis

These techniques attempt to provide a quantitative specification of all the sensory attributes of a food product. In a quantitative descriptive approach, panellists work together to elicit product attributes. This method relies on the training of panellists to have a common understanding of specific elicited attributes describing a food product in order to yield comprehensive reproducible results (Stone & Sidel, 2004:211; Murray, Delahunty & Baxter, 2001). A set of scales, providing numerical responses for the perceived intensity of given attributes is used. In its most common form, a group of trained individuals examine the products. Different scales can be used to measure the perceived intensity of sensory characteristics to a food product (Stone & Sidel, 2004:216).

The structure or category scales provide the panellists with an actual scale showing several degrees of intensity or magnitude of perceived characteristics. An unstructured scale, also called line or visual scale, is an alternative to structured scale. In sensory analyses, the unstructured scale most often consists of a horizontal line of 15 cm long with anchor points 1.5 cm apart. Each anchor point is usually labelled with words or expressions. Panellists are asked to make a vertical line at the point across the line that best describe their perception (Hootman, 1992:18).

The most important sensory attributes in bread, normally evaluated using descriptive sensory analysis including colour, volume, texture and flavour and their discussion, follows.

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2.2.3.1 Bread colour

The colour of bread is the result of the type of flour used (Mondal & Datta, 2008) and the colour grade of the flour. For example, flour of lower extraction or milled from white wheat will produce a lighter crumb colour. On the other hand, bread made from whole meal/flours result in dark crumb and crust. This explains why the traditional fermented sorghum bread dumplings produced by the Pedi in South Africa are characterised by reddish brown colour (Quin, 1959). The crust and the crumb of wheat bread have different colours because the crust colour depends on the effect of Maillard reaction which occurs during the baking process (Callejo, 2011). Colour determines the decision to accept or reject bread. South African consumers expressed the desire for off-white to cream coloured traditional steamed wheat bread (Lombard *et al*., 1999). Other factors contributing to the colour of bread include moisture content, baking time and baking temperature (Lombard *et al*., 1999). The bran in whole wheat contains flavour pigments (tricin and xanthophylls) but the carotene, responsible for the yellow colour, is lacking in whole wheat flour (Cauvain & Catterall, 2007:356).

2.2.3.2 Bread volume

According to Ang *et al.* (1999) steamed wheat bread is generally characterised by large volume. Breads made from whole grain flours have reduced loaf volume, dense crumb and reduced crumb softness, when compared to bread made from white flours (Heinio, 2006:288). This is due to the disruption of the gluten matrix caused by large amounts of fibre, which cause reduction in the ability of gluten to stretch (Heinio, 2006:288; Wang, Rosella & De Barbera, 2002). Dietary fibre increases water absorption and contributes to the dilution of the gluten network, which affects its ability to retain gas (Stojcceska, 2011; Cauvain & Catterall, 2007:356; Sluimer, 2005:27). The bran and endosperm particles in wholemeal also have an effect on the uniformity of the starch gel and causes wholemeal gluten-free breads to have low volume (Taylor, Schober & Bean, 2006).

The volume of bread is improved by the use of sourdough (Katina, 2005). Results from the study conducted by Corsetti, Gobbetti, De Marco, Balestrieri, Paoletti, Russi, & Rossi (2000) revealed that the acidic sourdough produces higher volume bread than yeasted starter; however, as the acidity of sourdough increases, the bread volume decreases. Studies have noted the effect of different flours on bread volume. For example, there

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was a slight increase in the weight of bread when sorghum flour levels were increased in the bread formula, but the volume decreased as sorghum levels increased (Elkhalifa & El-Tinay, 2002; Dewettinck, Van, Bockstaele, Kühne, Van De Walle, Courtens & Gelleynck, 2008).

2.2.3.3 Bread texture

Texture is also an important determinant of acceptability and preferences of a food product (Gellynck *et al*., 2008; Blanshard, Frazier & Galliard, 1986:36). Texture is defined as the characteristic of a substance as a result of an impression given by a combination of physical properties, as perceived by the skin and muscle senses (kinesthesis and mouthfeel), the eyes (sense of sight), and hearing (Cauvain & Young, 2007:14).

Bread is a product characterised by two main parts being crust and crumb (Dewettinck *et al*., 2008). The texture of wheat bread is the result of the type of gluten network present in the flour and its ability to trap gas during the process of fermentation. The extensibility of this protein together with the gas produced form the structure of the bread crumb (Katina, 2005). The crumb structure of bread determines various sensorial properties such as texture and storage stability. Consumers also associate crumb softness or firmness with bread freshness (Mondal & Datta, 2008). On the contrary, Ashton (1939) noted that many Basotho dislike refined bread because of its light weight, and they argue that light weight bread passes through the stomach quickly and does not provide needed satiety. Basotho, therefore, prefer wholemeal breads from flour ground by themselves because of their heavy texture.

A process showing the involvement of human senses in the determination of texture perception is illustrated in Figure 2.2.

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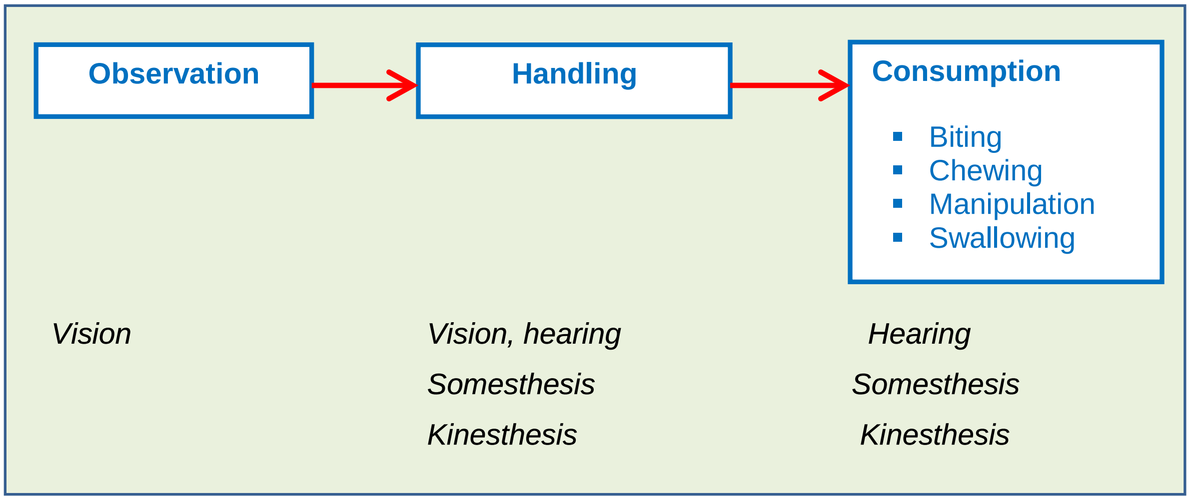

Figure 2.2: The involvement of the senses in texture perception during the process of food consumption (Adopted from Wilkinson *et al.,* 2000).

i. Bread texture by observation/vision

The judgement of texture starts from the visual point of view by looking at surfaces of food products to get the impression of smoothness, shine, lumpiness (Kim, Huang, Zhu & Rayas-Duarte, 2009). The texture of bread can be evaluated by looking at the pore size and their distribution in a crumb (Mondal & Datta, 2008). However, each type of bread has its own unique cell structure characterised by sizes, number and distribution of air cells in the crumb (Cauvain & Young, 2007:14).

ii. Texture by touch/handling

Touching food with fingers falls under tactile senses (somesthesis) and gives quality characteristics of food such as roughness of the surface (Kim *et al.,* 2009). The first impression about freshness of bread is its firmness. This is an attribute detected by hand-squeezing bread, because as bread becomes old, the crumb becomes dry and hard up to the stage where it crumbles (Pomeranz & Shellenberger, 1971:251). The general attributes for wheat breads are softness, moistness and springiness. The fresh bread crumb should have a characteristic of springing back immediately when pressed with the finger (Heinio, 2006:289; Sluimer, 2005:10). Lombard *et al*., (2000), described South African steamed bread as round–shaped with large air spaces, a soft and spongy texture. On the other hand, sorghum breads from various experiments were found to be less spongy (compact) and quite dry (Elkhalifa & El-

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Tinay 2002; Anglani, 1998). A dry texture is described as the most undesirable characteristic of bread (Quail, 1996). Similarly maize bread prepared without addition of eggs, was dry and crumbled when sliced (Sanni, Onilude & Fatungase, 1998).

iii. Texture by consumption /mouth feel

Auditory texture perception takes place in the mouth as a result of the sound produced by food during biting and chewing. It results in quality attributes such as sticky, grainy, crunchy, crispy, brittle and fibrous (Kim *et al.,* 2009). A dense flat bread crumb makes the bread stiff and has a coarse mouth feel (Quail, 1996). Consumer acceptability of bread based on mouth feel varies because different types of breads differ in mouth feel, for example, thick breads are characterised by a soft texture with smooth mouth feel than the thinner breads that have the tough and chewy feel characteristics (Cauvain & Young, 2007:14). One important characteristic is that bread should form some resistance to chewing. It should not form one lump in the mouth, which results from sticky bread (Cauvain & Young, 2007:14).

2.2.3.4 Bread flavour

Flavour is a unique blend of experiences from aroma and taste that includes a combination of sensations of temperature and pain (Heinio, 2006:288). In bread making, one of the most important sensory attributes is flavour (taste and odour). Flavour determines the acceptability of bread (Heinio, 2006:288; Kim *et al*., 2009). However, bread flavour is very complex and this has posed a challenge for researchers even after 30 years of intensive research because apart from the lactic acid produced, there are other factors that lead to specific flavours (Diowksz & Ambroziak, 2006; Katina, 2005). These factors include a number of compounds formed during the bread-making process from raw materials, fermentation and cooking (Katina, 2005).

The general flavour attributes of bread are associated with the intensity of cereal flavour in crumb and crusts, sweet, fresh flavours and bitterness, which are found in fermented sourdough breads (Heinio, 2006:289). Freshly baked bread has an appetizing flavour,

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which for some reason is lost within a very short space of time (Pomeranz & Shellenberger, 1971:165). The overall flavour of bread is associated with products of the fermentation process that occur during bread making, although some compounds formed during fermentation are volatilized during baking and may not contribute to the final bread product. It is assumed that these compounds undergo a reaction that forms other products, which give the characteristic flavour of bread (Gellynck *et al.,* 2008, Quail, 1996).

Dewettinck *et al.* (2008) stated that traditional breads have an acidic sharp taste different from other breads. The sourness, according to Hansen and Hansen (1996), is due to the lactic acid, acetic acid and volatile flavour compounds such as alcohols, esters and carbonyls produced during fermentation. The production of these acids is enhanced by longer processes of fermentation, which include increased floor time compared to bread produced using short bread-making methods (Quail, 1996). According to Katina (2005) sourdough has a great influence on bread flavour because of the three main factors that occur during the process of fermentation: Production of acids, production of flavour precursors such as amino acids and production of volatile compounds. The acid taste of bread increases with the increase in the amount of sourdough: 15% sourdough produced bread with higher acidity than 6.5% in the study conducted by Bolourian, Khodaparast, Movahhed and Afshary (2010). Sourdough bread contains increased levels of lactic bacteria, as a result of concentrated sour cultures found in them (DiMuzio, 2009:68). The lactic acid bacteria produce acetic acid and lactic acid in the ratio of 20% and 80% respectively. This lowers the pH of the dough which in turn stops the growth of mould (Balestra, 2009). The dough should have pH range of 4.0-4.6 because a higher pH (above 6.0) encourages spoilage bacteria (Balestra, 2009). The typical acidity of bread should be around pH 4.9 and Total Titratable Acidity (TTA) 6.0 (Katina, 2005). According to Heinio (2005:289), the sour flavour is strengthened more in the bread crumb than in the crust by the process of fermentation and this can even reduce the amount of salty taste in the bread.

In the study conducted by Bolourian *et al*. (2010) on evaluating the effects of different concentrations of sourdough on the flavour desirability of bread, the highest liking score was given to bread with concentration of 5% and there was a significant decrease of score of flavour with increase in sourdough concentration. These results gave an

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impression that sourdoughs at high concentrations (15%) produced bread that consumers did not like, probably because of high intensity of sour taste in it. Consumers in South Africa prefer steamed bread with a uniform blend of sour, salty and sweet taste (Lombard *et al*., 2000).

According to Czerny & Schieberle (2002) wholemeal flours are known to produce high amounts of volatile compounds which contribute to the flavour of bread. In addition, the use of whole flours has a tendency to increase production of lactic acid in sourdough (Katina, 2005). Flavour is also influenced by the texture of bread such that a close, compact crumb gives a stronger taste sensation than soft bread with a fine, silky crumb (Cauvain & Young, 2007:14). The amount of fermentable carbohydrates and the endogenous α-amylase activity, have a high contribution to the acidification properties of the breads. White flours are reported to contain very low amounts (1.55-1.8%) of free sugars and wholemeal flours have the highest α- amylase activity which helps to increase the sugar level (Katina, 2005).

The consumer can perceive the sensory characteristics described above, in stage III of the model (Figure 2.1). The description of perceptual state follows.

2.2.4 Perception of sensory attributes

According to the food acceptance model (Figure 2.1), perception is the consumers' judgement based on appearance, texture, flavour and suitability for use of a food product (Cardello, 1996:2; Moskowitz, 1995). In order to understand an individuals' food acceptance, perception of consumers about a food product should be considered. The perceptual stage represents the process whereby the consumer perceives sensory information (Cardello, 1996:2). Perception is generally the outcome of the processes involved in determining the attribute differences encountered during consumption of a food product (Schiffman & Kanuk, 2004:158; Cardello, 1994:254). Perception of food thus covers the selection, organisation and interpretation of the information about a food product (Cardello, 1996:4). Perception is a major determinant of food acceptance and is the result of three main factors that include physiological effects of the food, perception of sensory attributes and influences from the environment (Du Plessis & Rousseau,

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2003:117; Biloukha & Utermohlem, 2000; Roux, Le Couedic, Durand-Gasselin, & Luquet, 2000; Steenkamp, 1997).

The sensory attributes interact to produce a perception, for example, the level of liking a flavour may be influenced by the appearance and texture of the product (Costell *et al.,* 2009). This therefore renders it difficult to figure out the individual contribution of each sensory attribute to food acceptance. The consumer is unable to differentiate among the sensory attributes of appearance, flavour and texture when evaluating the overall liking. However, on the average, consumers consider taste/flavour as the most important attribute of food. Texture liking is the second most important attribute and appearance is the least important attribute (Costell *et al.,* 2009; Moskowitz, 1995). The basic principle to understand consumers' judgement of product acceptance is that people differ from one another, some people may consider flavour liking only and quite a few may accept a product on the basis of appearance alone (Moskowitz, 1995). These arguments present literature gaps regarding the understanding of the perceptions of a certain group of consumers towards accepting a food product, and reveals opportunities for further investigations to explain the relationships of characteristics of food as a result of consumer perceptions.

The perceptual process begins the moment a piece of food is picked to be eaten, when the consumer recognises the size, shape and colour as well as the smell through the olfactory stimuli called retronasal olfaction. The consumer then chews the food in the mouth and recognises the texture, temperature and pain by the somatosensation of the oral cavity (Verhagen & Engelen, 2006; Duffy & Bartoshuk, 2000). The mastication process further releases other sensory attributes such as odour and true taste (salty, sweet, sour and bitter). On the other hand, audition, kinesthesis and somesthesis organise information to give rise to the perception of texture of food according to descriptions of sensory modalities given under the sensory attributes section.

It is important to note that during the perceptual process, the previous information already stored in the memory of the consumer creates an expectation about a food product, and it is integrated with the current perception formed to enable the consumer to evaluate the food in terms of accepting or rejecting it (Marreiros & Ness, 2009; McEwan & Thomson, 1988). According to Booth (1995), food acceptance is affected by

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the fact that the consumer compares the tested food item in the context of testing with the highest quality standards of the same product in the context of the consumer. According to Schiffman and Kanuk (2004:158), individual consumers differ in the way they perceive food due to the uniqueness of processing that happens in each individual's brain to select, organise and interpret properties of a food product, coupled with values, needs and the previous knowledge. Figure 2.3 illustrates the process of food perception.

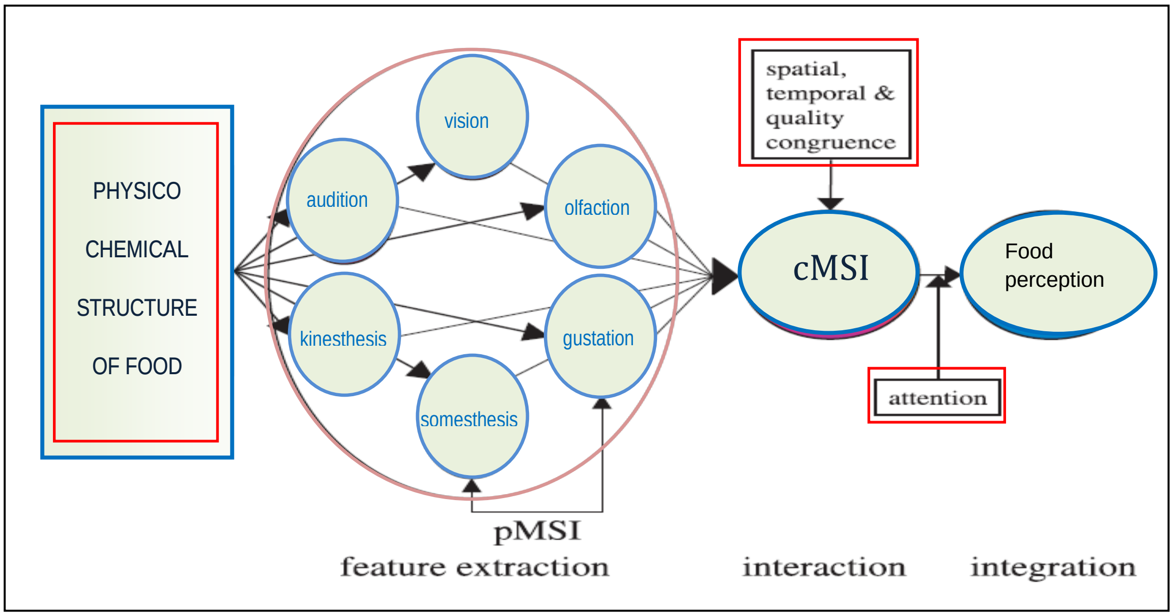

Figure 2.3: The perceptual process (Adopted from Verhagen & Engelen, 2006) – indicating the interactions between the oral senses and vision, audition or olfaction in investigations of multisensory integrations (MSI). The MSI is divided into peripheral (pMSI) that occurs between somatosensory and gustatory inputs and central MSI (cMSI) which depends on quality between taste and smell.

2.2.5 The hedonic perspective

The hedonic perspective is presented as the 4th stage in food acceptance model (Figure 2.1). According to Figure 2.1, the perceptual attributes (appearance, texture and flavour) evoke a hedonic response that can result in pleasant/unpleasant or like/dislike of a food product (Cardello, 1996:2). Hedonic is a term associated with pleasure and it influences the individuals' behaviour towards a food product (Cardello, 1996:7; McEwan & Thomson, 1988). The hedonic aspect is certainly related to acceptability according to the degree of liking or disliking of the product. A food substance that is highly liked by one consumer may be disliked by another. It is important to note that pleasure and

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displeasure, liking or disliking, are not solely based on sensory attributes alone. Hedonic perception and food choice is influenced by a number of factors (Figure 2.1) that involve psychological factors, previous experience, context, culture, economic, expectations and physiological status (hunger, thirst) (Bisogni, Connors, Devine & Sobal, 2002; Cardello, 1996:8).

Hedonic is the last stage in food acceptance theory (Figure 2.1). This stage describes food acceptance in relation to the the liking of the characteristics of food. The study also includes the cultural hedonic framework theory in order to describe the acceptance of food as influenced by culture. The description of cultural hedonic framework follows.

2.3 CULTURAL HEDONIC FRAMEWORK THEORY

The cultural hedonic framework is used to understand the influence of culture on food acceptance of a group of people in a specified country. Risvik, Rodbotten, Oslen (2007:305) stated that it is important to find out whether people in one culture perceive food differently from people in a different culture. That is, whether a cultural group puts more emphasis on preference for texture, taste, colour or flavour than another (Risvik *et al.,* 2007:305). The cultural hedonic framework was applied to investigate the acceptance of unfamiliar foods into different cultures (Wansink *et al.,* 2002). For this study, it was assumed that traditional Basotho bread would be familiar to the elderly generation and unfamiliar to the younger generation. The acceptance of a food product according to this framework depends on its value in relation to consumers' cultural perceptions (Wansink *et al.,* 2002). The cultural hedonic framework is comprised of two distinct categories referred to as *higher context* and *lower context cultures* (Wansink *et al*., 2002).

2.3.1 Higher context cultures and lower context cultures

Context was explained by Thomas (2003:152) as the information surrounding an event and that every person is affected by the level of context. A country which strongly believes in traditions and culture and whose food habits are strongly controlled by culture is referred to as *higher context*. A country whose food habits do not rely heavily on culture is referred to as *low context* (Wansink *et al.,* 2002). However, individuals within each culture also differ in terms of context (Thomas, 2003:153). It was found that

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traditional tortilla (arepa) was more preferred in Colombia, a nation known to be of higher cultural context. The characteristics of the two categories of cultural framework are listed in Table 2.1. In a higher context culture, the choice of food is based on what is known about the food, such that even the nutritional point of view that could have been important is ignored (Risvik *et al.,* 2007:310; Thomas, 2003:152). A lower context culture may be due to the movement of people because of migration and immigration patterns where people tend to abandon their traditional eating habits and adopt the local cuisine and eating habits (Bell, 2007:289).

Table 2.1: Characteristics of Higher context cultures and lower contest cultures. Cultural hedonic framework (Adapted from Wansink *et al.,* 2002).

	Characteristics of Higher Context Cultures	*Characteristics of Lower Context Cultures*
How cultural context impacts food choice	• *Value placed on traditional food dishes* • *Food presentation and texture are considered as important as taste* • *Preference for complex and involved food dishes* • *Unwillingness to try foreign and not culturally accepted foods* • *Tendency to favour taste over nutrition*	• *Value placed on functional, practical nutritional foods* • *Preference for simple, quick food dishes* • *High willingness to accept new foods and adapt personal eating habits accordingly*

2.3.2 Utilitarian and hedonic views on food acceptance

Generally, cultures eat food for different reasons. Some cultures eat food for their nutritional benefits so that they stay healthy, as stated in Table 2.2. These cultures are referred to as **utilitarian**. Other cultures eat food as a means to express their culture and they are referred to as **hedonic** (Table 2.2). In a hedonic culture, complexities of preparing traditional foods are enjoyed, certain meanings are attached to food and methods of preparation and cultural traditions influence choice and acceptance of food (Wansink *et al.,* 2002). Characteristics of utilitarian and hedonic perceptions of food consumption are represented in Table 2.2.

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A cultural hedonic framework provides understanding of food preferences of different countries by assessing the country through lower cultural context versus higher cultural context, and also by assessing the country in terms of utilitarian versus hedonic perceptions. The category of the country gives an impression about acceptance of traditional bread.

Table 2.2: Characteristics of utilitarian and hedonic perceptions of food consumption. Cultural hedonic framework (Adapted from Wansink *et al.,* 2002).

A Utilitarian Perception of Food Consumption Involves ….	*A Hedonic Perception of Food Consumption Involves ….*
• *A focus on functional aspects of food* • *A preference towards simple cultural foods and dishes* • *A desire for practicality in food consumption* • *A focus on the end benefits of eating, such as energy, calories, or nutrition*	• *An emphasis on the taste of food* • *A preference for cultural eating practices* • *A desire for complex cultural food dishes or for elaborate and extravagant foods* • *A focus on the cultural practice of eating food, as well as the ends benefits*

2.3.3 Cultural perspective

In order to successfully address the culinary practices and traditional Basotho bread acceptance, this study considers it appropriate to include the cultural perspective, which encompasses the context and social interactions of an individual. Food habits form the most important aspect of culture (Guerrero, Claret, Verbeke, Enderli, Zakowska-biemans, Vanhoncker, Issanchou, Sajdakowska, Granli, Scalvedi, Contel, Hersleth, 2010). People are exposed to diverse cultures as they grow up, which to a large extent determine their level of food acceptance. The experience of food is gained from cultural traditions, family practices and peer influences (Rozin, 2006; Damman, Eide & Kuhnlein, 2008). Culture comprises values, beliefs, attitudes and practices that are perhaps even stronger determinants of what is desirable and undesirable food and those that are considered to be of high esteem. Culture is a continuously learned process and this implies that food habits are slowly internalised over a long period and they become so strong in an individual (Willows, 1996; Frewer & van Trijp, 2007:316; Cleveland *et al.,* 2009).

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Culture and ethnicity are essential foundations of the study of food and people. The country where a person is born and resides shapes the food patterns of the individual and families. The geographic realities of climate and terrain suitable for productive agriculture, social, psychological, religious, economic and political factors define the local foods that may be available and consumed (McWilliam & Heller, 2003:15, Fieldhouse, 1995).

Culture is conceived as emerging from a group's history. It is the result of collective sense–making and action developed over time. Culture is "the way we do things around here". A common core referring to a shared frame of reference, including, among other elements, beliefs, values and norms expressed in symbols and artefacts through which members of a society make sense of their world. The cultural perspective looks at the unique combination of cultural elements or traits such as information, meanings, taste preferences and symbols transmitted through generation of the same group to characterise a cultural group and distinguish it from other social groups (Bryant *et al*., 2003:86). For example, culture to a large extent, plays an important role specifying what smells good and what smells bad (Anderson, 2005:73). The emphasis is based on the how and why certain cultural artefacts are produced and used. People sharing a common culture are nested within their immediate social and material settings and they are exposed to a variety of intangible and tangible products such as customs, habits, language, housing, tools and the arts (McWilliam & Heller, 2003:16). The cultural perspective approach, in addition to interpreting the cultural meanings associated with these products, also focuses on how people relate and use the products. The cultural perspective emphasises that apart from the fact that individuals are influenced by culture they are responsible for creating their own culture that serve as a coping mechanism in everyday social living (Bryant *et al*., 2003:86).

The fact that foods are important components of culture, the characteristics and beliefs of a culture influence the behaviours and peoples' decisions about a food product. Wansink *et al*. (2002) examined the influence of culture on behaviours and attitudes towards unfamiliar foods using a cultural hedonic framework. The same principles that provide an understanding of the influence of culture on unfamiliar food are going to be used in this study to examine how culture affects traditional bread acceptance in Lesotho.

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2.3.4 Propositions of how culture influences food acceptance

As a means of understanding how culture influences human food behaviour, a number of characteristics of culture common to all cultures are illustrated in Fieldhouse (1995:2). The following characteristics are applicable to this study:

1. **Culture is a learned experience; people acquire it as they live their everyday lives.**

The process by which we learn the beliefs, attitudes, behaviours, standards and even body movements of a society is called enculturation. Food habits are acquired early in life and, once established, they are likely to be long lasting and resistant to change. Children learn to like what is prescribed by the culinary culture in which they are raised. Rejection of certain foods is normally a result of unfamiliarity with the food because the food has not been tasted before (Asp, 1999; Bryant *et al.*, 2003).

2. **Culture is not biologically determined and therefore can be modified or unlearned.**

As children grow older, they are exposed to diverse experiences and viewpoints and to multiple influences from different environments such as school. The food habits, which have been informally learnt at home, may be reinforced or contradicted by the school formal learning. However, research proved that the behaviours learnt early in life are most likely to persist.

3. **Culture is a group phenomenon, not an individual one.**

Culture is transmitted from one generation to the next and in the absence of socialization processes, it would not be continued. Food practices are closely related to social groups. As people interact, they develop guidelines to help them divide food-getting tasks, distribute food, eat together and determine what people occupying different positions in society should and should not consume (Bryant *et al.,* 2003:190).

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4. Culture may be transmitted formally or informally by verbal cues and through personal example.

In all societies the family is the major vehicle for informal training of the young to fit into society. The informal teaching occurs through relatives, friends and the media. The formal teaching takes place in schools.

5. Culture involves change.

Culture is not static; it preserves traditions but also builds in mechanisms for change. Food habits are part of this dynamic process in that whereas they are basically stable and predictable they are, paradoxically, at the same time undergoing constant and continuous change. Fieldhouse (1995) argued that without denying the fact that food habits change, every culture has its resistance mechanisms to prevent change so that food habits can be preserved to identify behaviours for a chosen culture. It can therefore give experiences that allow an opportunity for immigrants to learn, and honour the traditions of the host country, that may include table manners and cooking methods (Fieldhouse, 1995).

6. Cultural behaviours are unconscious.

People have become so accustomed to culture that their behaviours have turned into routines and they happen without thinking. Ideology, representing the most important beliefs and values for a cultural group, happens on daily basis, without being questioned. This ideology can be interpreted with ease because of a common meaning across the group (Kaiser, 1997:49). The unconsciously learned behaviour is resistant to change. Therefore, any effort made to change a food habit should consider a learning mechanism that was involved in shaping the particular food habit (Koster, 2009; Ritson *et al.,* 1986:94).

7. Culture has a value system.

Different cultural groups value foods differently. Some foods are regarded as good and others as bad, although the bad foods such as high fat content foods can be more desired. Culture determines, to a large extent which foods taste good, and which do not. Thus, which foods are preferred and accepted, including quantities and

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accompaniments for such foods as well as for what purpose they are used and different ways of serving them are all important points to consider (Willows, 1996).

8. Culture contains symbols that are understood by the group.

Food, as a material artefact, carries certain cultural values that convey symbolic meanings. Humans use foods symbolically, due to relationship, association or convention. According to Kittler and Sucher (2008:3), bread is an excellent example to describe this phenomenon. It is called the "staff of life" because of its importance as a food substance to satisfy hunger. Bread also represents the body of Christ in the Christian sacrament of communion. As a symbol for status, the colour of the bread is an important indicator of the class of an individual eating it. For example, people in the upper class consumed white bread in the past. Nowadays, the whole trend has changed. Higher income health-conscious people currently consume whole wheat bread.

Status foods are usually consumed on special occasions and by notables of the community (Bryant *et al*., 2003). It has been observed that high status is associated with consumption of exotic foods, complex dishes which are usually more expensive. Specific examples abound, especially in the developing world where manufactured foods are substituted for locally grown foods. In Southern Asia, increases in family income are associated with a shift in consumption from sorghum or millet to rice (often commercially polished rice). In quite a number of cultures, animal foods are usually considered to be of high prestige because of their high purchasing price. Plant–based foods are associated with low status (Southgate, 1996).

2.4 SUMMARY

This chapter presented the food acceptance and cultural hedonic theoretical perspectives, which helped to guide the literature on the main factors influencing the choice and acceptance of food. The supporting literature to the theories follows in Chapter 3. It is presented in 3 sections A, B and C.

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Chapter 3:

SUPPORTING LITERATURE REVIEW

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Chapter 3:

SUPPORTING LITERATURE REVIEW

This chapter provides a review of the literature related to culinary practices, standardisation, sensory evaluation and factors affecting food acceptance.

SECTION A

3.1 INTRODUCTION

This chapter presents a review of the literature pertaining to specific areas considered important in supporting the theories previously described in chapter 2. The supporting literature is presented in three sections as follows: Section A – Culinary practices, section B – Standardisation of recipes and section C – Other factors affecting food acceptance. Section A focuses on the four areas of culinary practices regarding bread (ingredients, preparation, flavouring and serving). Each of these areas is explained in detail with sub sections in order to gain in depth understanding of their importance in the culinary practices. The supporting literature also covers the standardisation process (section B) in order to provide information needed to address phase 2 of the study, which requires the use of standardised recipes. Characteristics of individuals and the context are covered in section C as other factors affecting food acceptance.

3.2 CULINARY PRACTICES

In all cultures there are specifications determining ingredients and skills on how to collect, prepare, combine and consume foods. These specifications are termed culinary practices (Chen, 2011). Four components of culinary practices include:

- **Selection of ingredients** based on availability in the region as a result of environmental variables, the nutritional value of food, palatability and the amount of energy needed to obtain the food.

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- **Preparation (Manipulation techniques)** which pertains to all activities, involved in preparing the ingredients to transform them from their raw basic state to a state at which they are considered ready for consumption.
- **Flavouring principles** involve the alteration of the original flavour of food. This can happen in two principal ways the first being addition of specific flavouring agents such as seasoning additives. Secondly, the flavour of food is changed by the processing techniques such as application of the fermentation process and/or cooking. Flavouring provides unique flavour in food that reflects the culinary identification and a sense of familiarity for a certain cultural group while it sets a clear boundary from a group with different ways of flavouring techniques.
- **Serving principles** consists of a set of rules regarding the number of meals per day, whether food is consumed on its own or with accompaniments or whether food is served for special occasions or ceremonies (Farb & Armelagos, 1980; Rozin, 1992).

These four components of culinary practices together form a cuisine and the literature that follows is based on them.

3.2.1 Selection of ingredients used for bread making in Lesotho

The selection of ingredients is normally the first element in culinary practices. It is based on the staple foods that are found in a certain area, due to environmental conditions such as climate, soil, ease of production and yield (Farb & Armelagos, 1980:200; Rozin, 2000:134). In Lesotho, traditional Basotho breads are prepared from staple cereals (maize, sorghum and wheat) (FAO/WFP, 2007).

Although the steamed bread can be successfully produced from wheat with its unique characteristics of gluten (Mondal & Datta, 2007; Khan & Nygard, 2006:101), employment of strategies to supplement wheat flour with other types of locally produced cereal flours such as sorghum could make a significant difference in terms of reducing the costs and of nutritional value (Elkhalifa & El-Tinay, 2002). The Lesotho food composition table compiled by Lephole, Khaketla and Monoto (2006:21-24) stated that baked wheat bread contains higher energy compared to steamed wheat bread. The metabolisable energy conversion factors suggested by Greenfield and Southgate (2003) was used to calculate the nutritional composition by Lephole *et al.* (2006).

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3.2.1.1 Non-wheat flours

Many studies have shown that maize and sorghum flours can replace certain quantities of wheat in bread making but they are responsible for producing bread with a reduced volume and dense crumb texture. Unlike in wheat bread, the type of protein present in non-wheat flours does not help the dough to rise (Duodu & Taylor, 2012). The interaction of starch, water and protein, present in non–wheat flour, may contribute to the swelling and gas holding ability of dough during fermentation (Duodu & Taylor, 2012). The bread crumb colour is also affected depending on the type of flour used (Elkhalifa & El-Tinay, 2002; Keregero & Mtebe, 1994; Sanni *et al.,* 1998). It has been reported that the non-wheat flours do not enable satisfactory dough development (Sanni *et al.,* 1998). According to the study conducted by Abdelghafor, Mustafa, Ibrahim and Krishnan (2011) on composites of wheat and sorghum flour, when wheat is replaced with levels of sorghum flour in bread making, the cohesiveness and resilience are reduced. The proteins of non-wheat flours are hydrophobic in nature, insoluble and cannot form a framework that holds air during dough development; As a result, non-wheat breads are characterised by low specific volume (Duodu & Taylor, 2012; Brites, Trigo, Santos, Collar & Rosell, 2010). Flour fineness and level of starch damage influence the quality of non-wheat breads (Duodu & Taylor, 2012).

- **Sorghum flour**

  According to Kebakile, Rooney, De Kock and Taylor (2008), sorghum cultivars have different colours varying from tan to purple. These colours are responsible for the type of sorghum kernel colour, which may also have an effect on the food colour as a result of the leaching of polyphenolic pigments into the pericarp (Taylor, & Duodu, 2009:207). Sorghum flour contains tannins that are associated with bitterness and a dark colour in foods (Yetneberk, Rooney & Taylor, 2005). Kobue-Lekalake, Taylor and De Kock (2007) reported that tannin-free sorghum is slightly bitter and astringent due to bran infusions. The tannins may also have a tendency to inhibit the fermentation process because they are known to be anti-microbial, containing an enzyme-inhibitory activity (Yetneberk *et al.,* 2005). Sorghum grain has hard vitreous endosperm cells that normally remain intact after milling such that the flour produced gritty, coarse and rough characteristics in biscuits (Serrem, De Kock, & Taylor, 2011).

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- **Maize flour**

Maize flour lacks gluten protein, which encourages good water holding capacity, cohesiveness and viscosity (Ozola, Straumite, Galoburda & Klava, 2012). Addition of boiling water to maize flour caused slight gelatinisation of starch, which increased viscosity in the dough (Brites *et al*., 2010). Due to the lack of gluten in maize, Sanni *et al.,* (1998) found that maize bread prepared without the presence of protein such as from eggs, crumbled when sliced. White maize flour contains carotenoid, which contribute to the yellow colour of maize bread. However, the finer the flour, the lighter and less yellow it becomes (De la Hera, Talegon, Caballero & Gomez, 2012). Maize flour is normally characterised by larger particle sizes than wheat and sorghum, probably because the maize kernel is harder and difficult to mill. The larger particles of maize meal produce bread with a rough surface and reduced level of daylight reflectance (Oladunmoyo, Akintso & Olapade, 2010). According to Nche *et al*. (1996), dry milled maize flour has poor pasting properties because dry milling results in high levels of mechanical starch damage.

3.2.1.2 Wheat flour

Wheat flour is characterised by unique components responsible to produce bread with desirable attributes that include a high volume, elastic crumb and fine cohesive texture. This is a behaviour of wheat flour. It contains proteins which, when hydrated with water and the dough is mechanically handled, form a viscoelastic protein structure called gluten (Pomeranz & Shellenberger, 1971:65). Gluten forms the framework of wheat-flour dough that is responsible for elasticity and extensibility in the dough due to its ability to retain carbon dioxide gas produced by fermentation. Gluten produces light leavened products (Mondal & Datta, 2008; Sluimer, 2005; Pomeranz & Shellenberger, 1971:65). During baking the gluten proteins are coagulated by heat and they set the structure. Huang, Yun, Quail and Moss (1996) reported that the type and amount of protein present in wheat flour determined the quality of steamed bread in China. Wheat flour also contains starch which during baking gelatinises and forms the network structure molecules, which contribute to the formation of bread crumb (Sluimer, 2005:231). The gelatinisation of starch also makes the cooked starch susceptible to enzymatic breakdown, which improves the texture of bread (Dewettinck *et al*., 2008).

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According to Fieldhouse (1995: 80-81), when white wheat flour came into the market for bread making, everybody liked it and it immediately replaced coarse dark whole wheat flours, although it is nutritionally poorer. The fact that production of white wheat flour involves complex techniques, which make it more expensive than brown flour, was linked to the level of civilization. In the past, consumption of white bread was an indication of high status and consumption of dark bread was a symbol of poverty, but nowadays the trend has changed and dark whole wheat bread is associated with high status and consumed by persons that are health conscious (Kim *et al.*, 2009; Kittler & Sucher, 2008;). In addition, Elwert – Kretschmer (2001) recorded the wide spread of white bread served at breakfast during weekdays in Benin.

Flour processing

The literature about flour processing is reviewed, based on the following milling techniques applied to cereals for flour production:

- Dry milling which is applied to all grains
- Wet milling which is applied to sorghum and maize grains
- Debranning which is applied to all grains (FAO, undated).

- **Dry milling**

Grain is dry milled to produce coarse or fine flour (FAO, undated). According to Basotho tradition, flour was obtained by grinding grain between two stones with the fineness of the meal depending entirely on the skill of the worker (Tsikoane, 2007). The Basotho women use a flat stone called *Leloala.* The woman kneels behind this flat stone and grinds the grain with a to-and-fro motion over the flat stone with a cylindrical stone called *Ts'ilo.* The meal is collected at the front of the flat stone with a Basotho mat called *Sethebe* and the remaining meal is swept with a small broom made of tightly woven grass (Coetzee, 1982:90). Tsikoane (2007) reported that stone grinding is nowadays practiced by only a few people because of the introduction of small–scale hammer and roller mills found around the country, even in the remotest areas of Lesotho. A few people who did not use hammer or roller mills for grinding could not afford to pay because they were not working (Tsikoane, 2007).

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In Africa, milling of grains has been traditionally done with a pestle and a mortar, but nowadays grains are milled mechanically using roller mills, hammer mills, stone mills and small scale mechanical hand dry milling (Taylor, undated) which are found in African and Latin American villages. There are differences in the operation of these mills, for example stone milling produces whole flour because the whole grain is ground completely without separating the endosperm, bran and embryo (Taylor & Dewar, 2001). Unlike the stone mill, the roller mill separates bran from the endosperm and enables flour to pass through different levels of sieves for the desired fineness of flour (Cornell & Hovering, 1998). The milling process causes damage to the starch granule, which leads to changes in the starch properties such as the ability to absorb more water and proneness to (fungal) enzymatic hydrolysis (Goesaert, Brijs, Veraverbeke, Courtin, Gebruers & Delcour, 2005). During the milling process, if the germ is not removed from the endosperm it may result in a product that goes rancid quicker and becomes less palatable because it is rich in oil content (Delcour & Hoseney, 2010:121). The milling process has a greater effect on the sensory properties of whole-grain cereals, even more than the cooking method. Bread prepared with roller-milled wheat flour was found to be sweet, juicy and compact, while bread prepared from stone-milled wheat was salty, deformed and had a roasted flavour (Heinio, 2006:288).

- **Wet milling**

Wet milling is a process in which maize or sorghum grains are steeped in water prior to milling, in order to toughen the bran and soften the endosperm for easy separation (de Mesa-Stonestreet, Alavi & Bean, 2010). In Ghana, cereal grains of sorghum and maize are coarsely ground and the milled grits are soaked in water for fine milling (Nche *et al.*, 1996). The process of wet milling separates the components of the entire grain into germ, bran, fibre and starch (de Masa-Stonestreet, Alavi & Bean, 2010). The South African Sotho prepared bread (*bohobe ba senyahatso* or *ba monepola* or *ba linkhoa)* by coarsely grinding the grain first (*haila*), then partially cooking and grinding again as a wet mush (Mo*nepola*) (Coetzee, 1998). The long preparations involved in this type of bread made it more appetising but less economical. Wealthier families therefore more often used this bread than poor families (Ashton, 1939).

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- **Debranning**

Debranning is defined as the removal of the outer covering of grain, which may adversely affect the characteristics of a food product due to high pigment, tannin and fat content. Traditional dehulling in Nigeria is done by soaking the grain in 20% weight of water and letting it stand to soften for about 5 minutes. The grain is then pounded using a wooden pestle for about 10–15 min. The dehulled grain is subjected to drying and winnowing to enhance the removal of bran. The whole process may be repeated twice or thrice depending on the extraction rate desired (Reichert & Young, 1976).

3.2.1.3 Water

The second most important ingredient in bread making is water (Cauvain & Young, 2007:31). Water helps to hydrate flour proteins and assists in the development of gluten in wheat breads. It is also responsible for the gelatinization of starch. A higher water content gives rise to more CO_2 bubbles and a coarser bread crumb (Mondal & Datta, 2008). However, large quantities of water result in undesirable dough handling properties. Water also forms a base for other substances (salt, sugars) to be dissolved or dispersed during bread making (Cauvain & Young, 2007:31).

The recommended water temperature for ideal rate of fermentation is 25.5–26.7^{o}C for wheat bread making (Gisslen, 2009:122). Control measures for water temperature need to be employed, such that during cold days the water has to be warmed while during warm days the water could be cooled by mixing with crushed ice (Gisslen, 2009:122).

3.2.1.4 Sourdough

A sourdough starter (natural sour/natural starter) is dough fermented by wild yeast and bacteria present in the air or in the flour itself (Gisslen, 2009:134; Suas, 2009:90). In the past, a mixture of flour and water was left to stand until it was fermented by wild yeasts and bacteria (Gisslen, 2009:134). This is an ancient method; it was used before commercial yeast became available to expand bread dough through spontaneous fermentation (Stear, 1990:347; Sadeghi, 2008; Sanni *et al.*, 1998). Sourdough enables the optimum swelling of the flour components in the dough coupled with desirable

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structure for baking and the development of aroma and flavour precursors (Stear, 1990:347). It produces a unique flavour (during fermentation) which gives desirable taste and aroma to the bread end product (Kim *et al.,* 2009; Katina, Arendt, Liukkonen, Aution, Flander & Poutanen, 2005).

It is important to note that wild yeasts present in sourdough starters differ from organisms present in commercial yeasts (Gisslen, 2009:134). At the same time, different regions and different environments have different wild yeasts. Therefore, starters prepared using the same formula may have different sourness in different regions (Gisslen, 2009:134; Suas, 2009:93). However, the sourness in sourdough is also the result of fermentation temperature, length of fermentation and dough yield (Katina, 2005). The higher the temperature, the higher the speed at which fermentation occurs. Longer fermentation time increases the production of acids in sourdoughs (Katina, Heinio, Aution & Poutanen, 2006).

The dough yield is the proportion of flour to water in sourdough; it varies from a firm dough or liquid mixture of flour and water. The sourdough yield % (DY) is derived as follows:

$$DY = \frac{\text{(amount of flour + amount of water)}}{\text{Amount of flour}} \times 100$$

The values obtained from DY determines the consistency of sourdough for example if wheat sourdough DY = 160 it means the dough is firm. The firmer the sourdough the more acetic acid is produced and the less lactic acid (Decock & Capelle, 2005). However, If DY = 200 then the sourdough is liquid implying that a relatively large amount of water was used for sourdough (Simpson, Nollet, Toldra, Benjakul, Paliyath & Hui, 2012:605). A higher DY is associated with faster acidification, which probably encourages better diffusion of the produced organic acids into the environment. The DY of sourdough influences the acidic flavour of bread (Chavan & Chavan, 2011).

Bacteria such as *L. mindensis,L. crispatus* and *L. Panis,* are also important in fermenting sourdough starters; they act on the sugars present in the dough and produce CO_2 and both lactic acid and acetic acid. These acids, together with alcoholic fermentation, give sourdough the characteristic sourness (Gisslen, 2009:134). The normal value for an acidic wheat sourdough ranges from pH 3.6-3.8 and TTA 8.13 (Katina, 2005). According

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to Hou & Popper (undated) and Jekle, Houben, Mitzscherling and Becker (2010) the fermented sourdough should have a pH 3.7-4.0. Chavan & Chavan (2011) also recorded variation of pH values as 3.5-4.3. The Chinese use a neutralizer to increase the pH to 6.4-6.7, however, if the dough is not sufficiently neutralized, the steamed bread result in undesirable characteristics such as sour smell and taste, small volume, poor appearance and a dense structure (Hou & Popper, undated; Jekle *et al.,* 2010).

Other benefits of sourdough are linked to improving texture and storage stability of bread (Katina, 2005; Sadeghi, 2008). The storage stability of bread is partly associated with the volume and texture of bread. During sourdough fermentation, lactic acid bacteria give rise to metabolites, which contribute to the improvement of texture that could withstand the staling process. In addition, sourdough fermentation process causes the lowering of pH, which might create uncomfortable conditions for growth, and multiplication of microorganisms and that would lead to reduced staling (Sadeghi, 2008; Katina *et al.,* 2006).

- **Manufacturing the sourdough culture (preferment)**

  Sourdough is a mixture of flour and water, it is left to ferment for 2-7 days to develop the characteristic an acidic–sharp taste and it is used to make bread from cereal flours (Sanni *et al.,* 1998; Suas, 2009:91). Kim *et al*. (2009) outlined the method for preparation of a preferment as a ratio of 1:1.25 w/w wheat flour: water. It is mixed completely to remove lumps and is fermented at 30^{o}C for 12–36 h. According to Suas (2009:91), there are six steps involved in the process of using a sourdough (Figure 3.1).

- **Developing the culture**

  The microorganisms present in the culture make use of nutrients present in the flour and oxygen incorporated during mixing. The culture is then left at favourable conditions such as warm temperature to ferment. The sourdough rises to double its original size (Suas, 2009:92).

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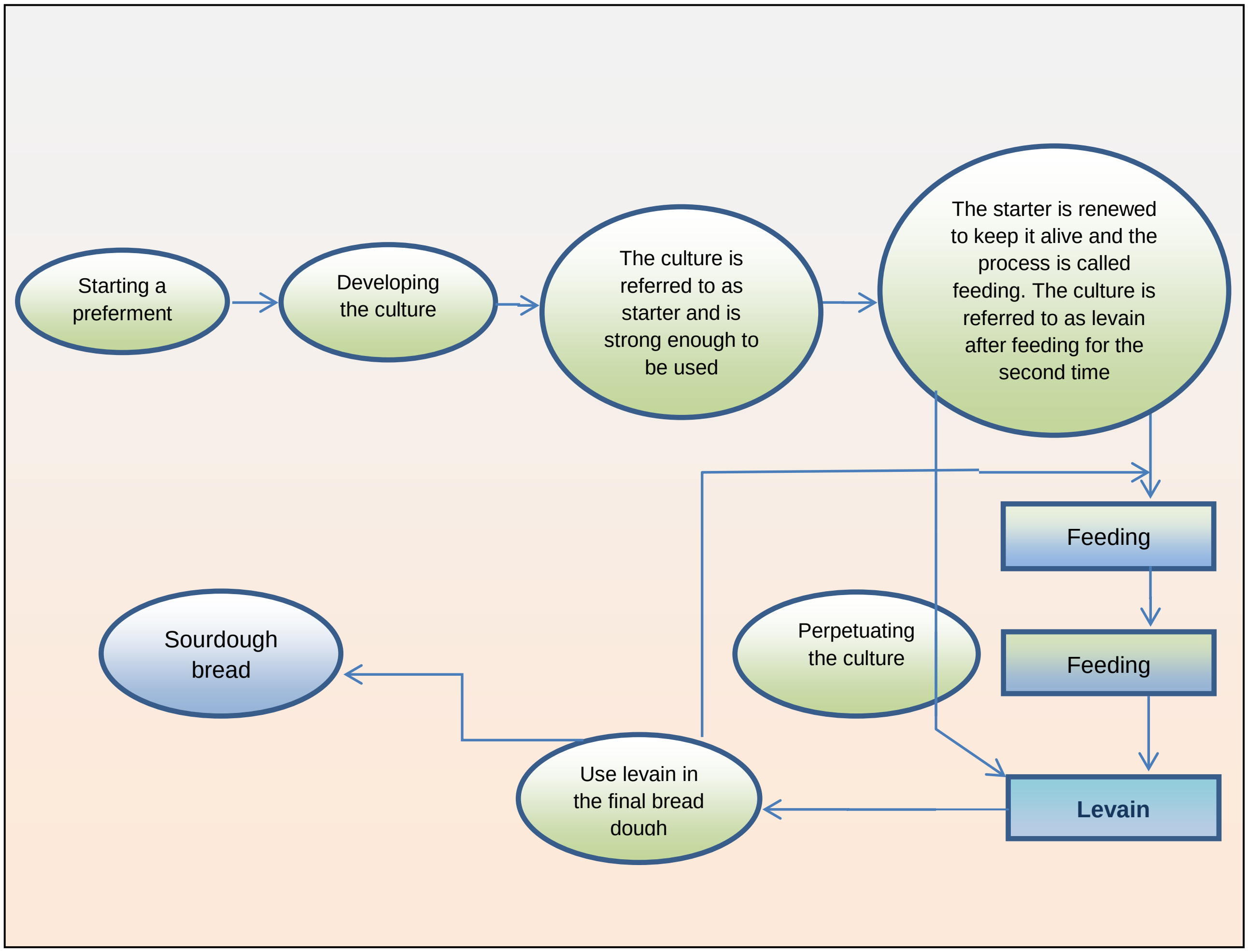

Figure 3.1: The general sourdough process (adapted from Suas, 2009:91)

- **Feeding/refreshing**

During the fermentation of sourdough from beginning stages and further on, it is imperative to refresh the starter to provide nutrients to the microorganisms so that they are able to grow and multiply and so that they can be able to handle the fermentation process for a large proportion of dough (Gisslen, 2009:135). The process of renewing the vital conditions for multiplication of microorganisms is called feeding. Only flour and water can be used to refresh sourdough, but not sugar, salt or cooking oil (Holm, 2002:37). The sign indicating that the sourdough needs to be renewed is a concave surface (collapsed in the centre) (Suas, 2009:93; Holm, 2002:37). If the sourdough turns orange in colour it is a sign of spoilage then it has to be discarded (Holm, 2002:37). According to Suas (2009:93), if culture has been provided with all the necessary conditions to ferment, it should rise to four times its original size in 6-8 hours and once it has reached this level it will be called starter or

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levain which means it is capable to start the sourdough process. In order to keep the starter alive, the feeding process using flour and water should be repeated as often as possible depending on fermentation time between the feeding intervals (Suas, 2009:94).

- **Perpetuating the starter**

Perpetuating the starter is whereby a small piece of dough is set aside from the starter or levain in order to be used to maintain the starter (Suas, 2009:94). The left over dough is referred to as the scrap dough and it differs from the other pre-ferments because of the presence of flour, water and yeast that were used as ingredients in the bread.

- **Sourdough storage**

Sourdough should be refrigerated until it is needed for use (DiMuzio, 2010:67; Holm, 2002:39). It can also be frozen for a long time (Holm, 2002:39). Suitable containers for storing sourdough are a bean pot, butter crock, plastic containers and glassware. A metal container should not be used to avoid a chemical reaction that may take place between the sourdough and the metal; this reaction can result in discolouration of sourdough to blackish blue or a pink liquid. These colours are an indication that the starter is killed. The sourdough storage container should have a loose fitting lid to allow some gas to escape because the gas produced by sourdough can cause a heavy pressure that blows off the lid if the lid is too tight (Holm, 2002:32).

- **Incorporation of levain in bread dough**

A small percentage of scrap dough is normally used in relation to the flour and may not be enough to facilitate the process of fermentation. In order to counteract this problem, scrap dough is used together with fresh addition of commercial yeast that enhances dough fermentation in the method called mixed fermentation (Gisslen, 2009: 133).

- **Variations in manufacturing the starter**

In some parts of the world commercial yeast is added to the flour and water mixture for a starter. In Poland, the starter (preferment) is called ***poolish or poolisch***. It is

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prepared from 1:1 w/w flour and water with different quantities of yeast, depending on the desired speed of fermentation (Gisslen, 2009:132). However, a poolish prepared from a small amount of yeast takes a longer time to prepare and to develop the desired sourness. The characteristics of a poolish include bubbles, double in size, a slight fall back and wrinkled top surface (Gisslen, 2009:132). Italians prepare a preferment called ***biga*** which is a mixture of 1: 0.5-0.6 flour and water with higher quantities of yeast when compared to poolish because stiff mixtures take long to ferment (Gisslen, 2009:133).

3.2.1.5 Salt

Salt is added primarily to improve flavour (Sluimer, 2005:46). It also has the ability to strengthen gluten and to regulate the speed of fermentation during dough expansion (Mondal & Datta, 2008; Sluimer, 2005:46). Addition of salt in bread helps to improve texture, making it stronger and less sticky. Salt controls the rate of the fermentation process, causing it to progress at a more consistent rate because salt absorbs some of the water so that fermentation does not happen too rapidly. The ability of salt to absorb water also makes water to affect the shelf life of bread. Salt can keep bread moist in a dry environment and delay staling while it can cause bread to be soggy and to spoil easily in a humid environment (Branch, 2011).

3.2.2 Bread preparation

Preparation is the second element in culinary practices. In bread making, ingredients are weighed to obtain correct proportions for the desired consistency. Preparation also involves sifting of dry ingredients in order to break up lumps and to remove unwanted materials. The ingredients temperature is also monitored to optimise the final dough temperature (Quail 1996:50). Traditional Chinese steamed bread is prepared using three main methods including the **sourdough starter** method, the **sponge and dough** method and **the straight dough** method (Rubenthaler *et al*., 1990). In the sponge and dough method, yeast is mixed with the largest portion of flour and water to form a thick dough and then allowed to ferment until it has doubled its size. The risen mixture is then pressed down (traditionally called punching) to allow addition of the rest of the flour and other ingredients and it is further kneaded to form a uniform smooth dough (Gisslen, 2009:115).

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The straight dough method involves mixing all ingredients, including yeast, at once in the mixing bowl to form the dough (Gisslen, 2009:115). This method is shorter than the sourdough and sponge and dough method. As a result, it is commonly used by industries to produce convenient, good quality bread products. Although the method has proved to result in products that are not as fine textured as those prepared from the sponge and dough method, the straight dough method also produces bread that does not have a pleasant sour flavour (Hou & Popper, 1996).

3.2.2.1 Dough mixing and development

The most important step in bread making is dough mixing. This is the stage where flour, water, yeast or levain, salt and other specified ingredients are added. During mixing, the dry ingredients are blended together. When water is added to the dry ingredients, the components of flour are immediately hydrated, water moves into the centre of the flour particles by diffusion (Delcour & Hoseney, 2010:184; Gisslen, 2009:103). The hydrated flour particles are then exposed to friction by rubbing against each other, against the mixing bowl or the hands or machine blades. This consequently removes the hydrated surfaces. As a result of this friction the flour particles become worn out and completely hydrated to form homogeneous dough referred to as "*optimally mixed dough*" (Delcour & Hoseney, 2010:184). However, if mixing of wheat dough continues, the gluten network is weakened and this leads to a sticky and stingy dough that results in poor bread volume. The energy applied during the kneading and mixing helps in the development of gluten structure and in the entrapment and dispersal of finely divided air bubbles through the dough. Proper mixing also helps to produce dough of appropriate consistency of subsequent operations (Quail 1996:51).

The procedure applied to non–wheat (maize and sorghum) breads for dough development is different from the normal procedure applied to wheat bread, because of the absence of gluten in these cereals. Gelatinisation of starch is the most important step in the preparation of non–wheat breads (Duodu & Taylor, 2012). According to Taylor and Anyango (2011:136) the interaction between molecules of starch and water may cause the non-wheat dough to hold air that helps in the expansion of dough during fermentation and expansion of bread while cooking. The same idea was applied by Satin (1988) who completely cooked the non–wheat flour (cassava) in water and added the other ingredients such as the leavening agent when the cooked mixture had cooled. The

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experiment was based on the fact that when starch granules are cooked in water they swell, break, leach out and gel, this could be a good characteristic for the non–wheat breads. The non–wheat breads use more water, than wheat breads, which results in greater hydration and swelling of starch granules. Mixing, proofing and baking of non–wheat breads generally require a shorter time than wheat breads (Duodu & Taylor, 2012).

3.2.2.2 Fermentation/leavening of dough

Bread involves quite a number of traditional systematic complex processes such as leavening of dough, which is the process of fermentation. Starch is hydrolysed by natural flour enzymes (Mondal & Datta, 2008). Fermentation helps gluten to become smoother, and therefore encourages further stretching which help the dough to hold more air (Gisslen, 2009). Fermentation is the process by which as soon as flour, water and either yeast or bacteria come into contact with one another, in the presence of O_2 and warmth, sugar (or dextrose, starch converted into sugar) is changed into alcohol (C_2H_5HO) and carbon dioxide (CO_2). If this alcohol fermentation continues for too long then acetic fermentation sets in. As the process continues, the volatile compounds that are supposed to be responsible for the distinctive characteristics associated with bread flavour are over produced and bread becomes too sour (Katina, 2005). The products of fermentation are the same ($CO_{2,}$ lactic acid) and fermentation proceeds throughout the entire dough-making process (DiMuzio, 2009). Lactic acid modifies composition of carbohydrates in cereals and may improve digestibility and nutritive value by eliminating indigestible carbohydrates and antinutrional factors (Refstie *et al*., 2005).

Dough that ferments for too long or that ferments under a high temperature becomes difficult to work with and develops a sour taste and sticky texture (Gisslen, 2009:103). On the other hand under-fermented dough gives bread of lower volume with a coarse texture. Depending on the length of fermentation, an under fermented dough is referred to as a young dough, while an over fermented dough is called an old dough (Gisslen, 2009:103). Dough fermentation times vary, therefore the clock time may not be a good indicator on the readiness of the dough. Gisslen (2009:122) suggested appearance and feel of the dough as good indicators of readiness.

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3.2.2.3 Fermentation temperature

A warm temperature of around 21-27°C is ideal for gluten development (Gisslen, 2009:103). Temperature conditions have a direct effect on the quality of dough and bread. Excessively cool conditions hinders the process of fermentation and stop the dough from producing enough CO_2 bubbles, thus resulting in dough that is rigid, tough and flat. A low fermentation temperature of about 22ºC decreases the amount of lactic acid and gives the bread characteristics of astringent flavour that is sharper in the mouth and tastes like vinegar. The characteristics of this bread also include a compact crumb, thick and chewier crust. Bread from this type of dough has a reduced volume and uneven crumb texture in which the centre becomes denser than the outside with irregular holes. The bread dries out sooner and becomes quite hard. Moreover, bread has a dark colour and an undesirable aroma and flavour characteristics with short shelf life.

If excessively warm conditions have been applied to the dough, the air bubbles are produced at a very high rate such that wheat dough reaches its optimum gassing power during the kneading stage. It is for this reason that the dough cannot hold the gas bubbles. It has reduced elasticity and results in bread of a reduced volume. Other undesirable qualities of this bread are pale and whitish crust and a gray crumb, dry crumbly texture, large air spaces and a short shelf life (Commess, 2011).

According to Katina (2005) a temperature above 27ºC can increase the rate of fermentation drastically, resulting in higher content of lactic acid which causes wheat bread to have a round, mellow flavour that fills the back of the mouth, and resembles the flavour of buttermilk or yogurt. The bread with higher acidity level also has a porous crumb and a thinner, crispier crust. When the dough has fermented it is cooked. The next section focusses on cooking bread.

3.2.2.4 Cooking bread

When the dough is well risen and ready to be cooked, it is divided into small round or pillow like shapes and then steamed in a steamer (Rubenthaler *et al*., 1990). In the Western and Southern Cape of South Africa, lower-income families prepare steamed wheat bread by boiling water in a saucepan using the top of the stove or an open fire

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(Manley & Nel, 1999). The dough is boiled in a plastic bag in the water (Lombard *et al*., 2000).

In Lesotho, fermented dough was steamed in a traditional steamer; the construction of a traditional steamer was done by placing sticks, mealie cobs or grain stalks in an inter-lacing style to form a mesh-like structure in a clay cooking pot (Ashton, 1939). The pot is filled with water up to the level of the sticks and water brought to a boil and replenished as needed throughout the cooking process (Coetzee, 1982). When the water boils, the dough dumplings are placed quickly on top of the sticks and grass. The pot is covered immediately and left to cook for about 2-3 h depending on the size of the dumplings. The pot is not opened during cooking unless water has to be replenished. When the bread is ready, the pot is removed from the fire and opened for about 5 min to cool. According to Coetzee (1982) steam cooking has always been more applicable for cooking all types of traditional Basotho bread while baking is most appropriate for cooking wheat flour bread only. In the baking method, the flat three legged iron pot is used with fire underneath it and live coals heaped on top (Ashton, 1939). Steaming bread is the normal practice in different parts of China (Rubenthaler *et al*., 1990).

The fermented sorghum bread is shaped into round balls and steamed over the steamer before it is dropped into boiling water. The bread is steamed in layers and the lower layer is allowed to boil a few minutes before the next layer is added to prevent them from sticking to each other (Coetzee, 1982).

The cooked traditional Basotho bread is served following certain principles covered in the following section.

3.2.3 Flavouring

Flavour is the third element in culinary practices. It includes flavours of food, ingredients added flavours to the original flavour, as well as flavour development as a result of the cooking method applied. Flavour is considered as the most important identification of ethnicity for sensory characteristics peculiar to a certain cultural group (Rozin, 2000:135). Every food substance has its own flavour, which is enhanced by culinary practices such as addition of seasoning, application of certain processes such as

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fermentation and the cooking method. Traditional bread in Lesotho has a sharp sour flavour because of the use of sourdough and long fermentation processes (Ashton, 1939).

3.2.4 Serving

The serving of food involves different cultural rules stipulating who eats the foods, when the food eaten, what type of foods can go along with the particular foods, how the food is presented and the number of meals served per day (Rozin, 2006). Ashton (1939) noted that the Basotho meal times are pleasant, sociable affairs where men squat on their haunches or sit with their knees around food dishes. While women sit flat on the ground, with their legs folded sideways under the body. In Lesotho, men normally sit on a stool made from the indigenous aloe stalk (*lekhala*) and women sit on a mat (*moseme*) prepared from grass (*leloli*). According to Ashton (1939), in Lesotho when bread is well cooked, the housewife cuts the dumplings into thick slices and presents the bread normally with beans, peas, milk or boiled chicken to the rest of the family members, starting with the man. Children normally eat together regardless of the number. Basotho dishes are normally served cold mainly because Basotho do not have enough cutleries and therefore use fingers for eating. This makes it impossible to serve hot dishes (Coetzee, 1982:144-147). Bread is generally served in households and it is used as a provision for travelling because it can remain fresh and moist for a number of days (Coetzee, 1982:144; Quin, 1959). Bread is also served at feasts and on special occasions.

Ashton (1939) revealed that Basotho consume large portions of bread per serving. There are various reasons associated with this practice. First of all, Basotho find wheat bread tastier than other cereal foods and this encourages large quantities to be served. They also claim that wheat bread is a lighter food, which does not satisfy hunger easily unless quite large quantities are consumed in order to feel well-replenished (Ashton, 1939).

The section on culinary practices regarding traditional bread is followed by the literature pertaining to recipe standardisation in order to get a clear picture of how the traditional recipes can be standardised.

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SECTION B

3.3 RECIPE STANDARDISATION

A recipe refers to a list of ingredients with instructions on how they are combined to produce a particular dish (The American Culinary Federation, 2006). Recipes are powerful communication tools with quantities of ingredients to enable the transfer of the same information from one individual to the other concerning preparation of a food product. Recipes are available from different sources but each recipe cannot be prepared and produce the same results at different places. A slight difference in the ingredients or equipment can result in a completely different product (Orr, 2000, Reed & Schuster, 2000). Each recipe is therefore tried several times, standardised and adjusted according to the type of equipment available, personnel and the consumers targeted (Payne-Palacio, 2005:261). A standardised recipe is one that has been tested and that incorporated all the necessary adjustments in order to serve in a particular situation (Payne-Palacio, 2005:261). The advantages associated with using a standardised recipe include the fact that ingredients and cost have to be known in advance, the recipe will consistently produce the same results in the same kitchen, quantities are easily predicted (Gregoire, 2010:185). Important information concerning the recipe include preparation steps and specific directions, preparation time, the number of servings, the type and size of equipment/utensils (Reed & Schuster, 2002).

A recipe should be a simplified tool with steps that are easy to read and to follow. The simplicity can be achieved through the use of a specific format. For example, numbered and bulleted preparation steps are easily followed at household level (Reed & Schuster, 2002). It is convenient for foodservice institutions to follow a block format in which ingredients and methods are written side by side opposite each other in a table form (Gregoire, 2010:182). A recipe should have a reasonable number of ingredients specified with an appropriate unit of measure (Hullah, 1984:54). In this regard, household units such as teaspoons, tablespoons and cups are suitable for small quantities of ingredients but for any recipe preparation of more than 48 portions then metric measurements should be used. Gregoire (2010:184) suggests that ingredients be listed and grouped according to the order of use. In addition, the recipe should always carry specific information facilitating its use and these include the name of the food item,

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the yield, portion size, time and temperature for cooking, a clear method and suggestions for serving (Gregoire, 2010:184). The important basic rule about the recipe is that it should be reproducible in order to produce the same results consistently when prepared repeatedly under the same conditions (Hullah, 1984:54).

Recipes with a wide variety of ingredients, methods of preparation, cooking methods, measuring techniques, equipment, and yield and portion sizes need to be adapted in order to maintain a consistent quality of the product (Hullah, 1984:24; Spears & Gregoire, 2007:216). Adapting a recipe involves either scaling it up or down in order to produce the amount needed (The American Culinary Federation, 2006). For example, home size recipes for 6 – 8 servings may be adjusted to 100 servings or even more, while in the context of this study, home size recipes have been adjusted to even smaller quantities for the sensory evaluation purpose. It is important however, to note that when adjusting homemade recipes, the original size must be prepared first to ensure that all ingredients are available and that the method is clear (Spears & Gregoire, 2007:235).

Standardisation is a process that requires repeated recipe-testing to ensure standard quality and quantity for a particular purpose (Spears & Gregoire, 2007:225). Particular attention should be given to careful weighing and measuring of ingredients and notes about mixing, combining procedures, preparation and cooking time, temperatures, equipment and utensils, and the method of serving as well as total yield, number of portions and portion size should be recorded (Spears, 2000:403). The fact remains that the greater the weight, quantity and volume of food the more cooking time is required. The thick or dense and less consistent texture food also requires longer cooking time (Hullah, 1984:28).

As much as the recipe may be standardised, it is important to try and use the same quality of ingredients because inferior ingredients can have detrimental effects on the final product (Spears & Gregoire, 2007:225). Standardised recipes can also be affected by other varying factors about food, such as climate, maturity, growing regions and age of food (Spears & Gregoire, 2007:225). According to Spears and Gregoire (2007:226) recipe standardisation is a process involving three phases: recipe verification, product evaluation, and quantity adjustments, as shown in Figure 3.2:

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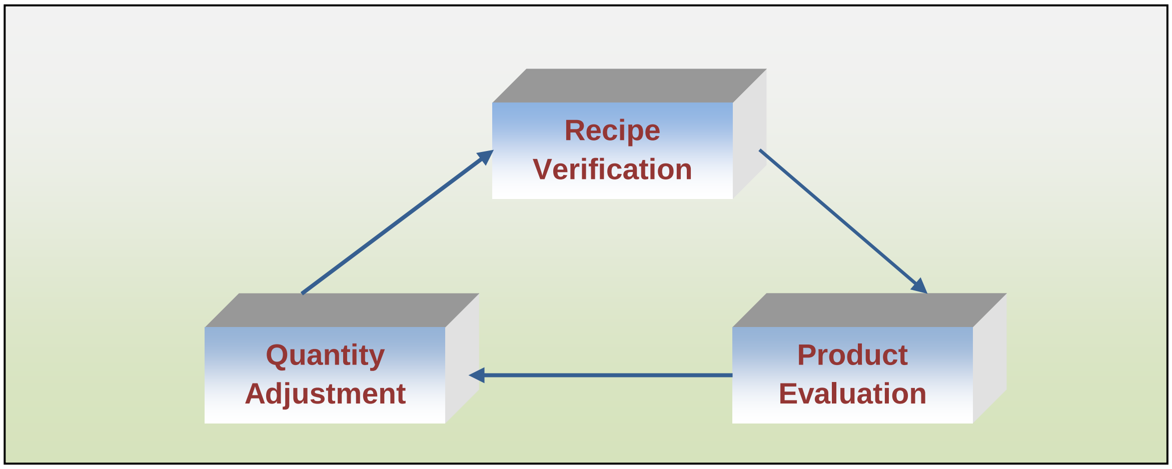

Figure 3.2: Recipe standardisation process: Adopted from Gregoire (2010)

3.3.1 Recipe verification

The most important step before the recipe is prepared is to review its title to ensure that it is correct and that it describes the food product explicitly. The recipe category is checked so that it fits in the appropriate category in order to facilitate its location in the filing system. Furthermore, the ingredients are reviewed to verify their names and form for example whether fresh, dry or cooked before they are used. It is important to also confirm that the advance preparation procedures such as ground, wet cleaning, sieving are indicated. The type and proportions of ingredients need to be checked first to determine if the required yield will be met or whether the necessary equipment is available to handle the quantities. The procedure to be followed has to be checked to ensure that it is clear and easy to follow, because the success of a recipe depends on the understanding and skill level of the individual using it (Payne-Palacio, 2005:261). Recipe verification ensures that equipment and utensils, cooking temperature and time for preparing and cooking are in order. The recipe is prepared following the stipulated method and all the changes that are made at this stage are recorded (Spears & Gregoire, 2007:235; Reed & Schuster, 2002).

3.3.2 Product evaluation

Product evaluation is considered the most important part of the recipe standardisation process. The product is subjected to testing by consumers familiar with the product in order to test its authenticity. The results will give an indication of whether further adjustments are needed on the recipe or not. The product evaluation phase involves completion of an informal evaluation tool consisting of the main points of focus at this

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stage which include the sensory characteristics, availability of ingredients and the cost involved with regard to labour, time and equipment (Gregoire, 2007:225; Gregoire, 2010:187). The procedure is repeated several times until the recipe is consistently producing the expected results according to consumers (Orr, 2000). Once the informal results prove that the product is truly representative of the original product or that the recipe has the potential to be accepted, then the formal evaluation is conducted in triplicate using an evaluation panel to complete a prepared evaluation instrument (Gregoire, 2010:187).

3.3.3 Quantity adjustments

The quantities of ingredients are calculated and adjusted in this stage in order to produce the required yield. The most consistent and easy to follow step by step procedure for standardising bread formulas is the baker's percentage (Healea, 2007).

3.3.3.1 Bakers' percentage

Bakers' percentage is a formula in which the ingredients are presented in basic proportions expressed in percentages. A formula expresses the relation between ingredients in a recipe. The bakers' percentage is an important tool that establishes the relationship of one ingredient to another and can therefore facilitate creation of a new formula. Presenting the formula in proportions allows flexibility of increasing or decreasing the quantities during the standardisation process of bread recipes. In this way, different quantities of dough can be produced from the same proportions. Furthermore, the bakers' percentage is useful in identifying and fixing problems in a formula, to lower the amounts of ingredients that are too high or to increase those that are too low (The Bread Bakers Guild of America, 2001). The difference between a formula and a recipe include the fact that the ingredients in a formula are listed in decreasing order while in a recipe the list of ingredients is presented according to the order of use. The formula provides precise ingredients weight measurements in relation to the weight of flour. The formula may consist of a list of ingredients only, without instructions as is always done in a recipe.

All measurements including liquid ones are presented by mass such as kilograms, in order to ensure consistency of measurements and proportions every time the formula is

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used. In the bakers' percentage, the weight of flour is equal to 100%. The other ingredients are calculated as a percentage of the weight of flour (Labensky *et al*., 2009:127).

$$\text{Ingredient \%} = \frac{\text{Weight of ingredient (IW)}}{\text{Total flour weight (TFW)}} \times 100$$

When more than one type of flour is used in a formula, the weight of these flours are added and the total amount is used as 100% of the formula, bearing in mind that each and every type of flour carries a certain percentage in the total amount. For example a formula may consist of 400g flour 1 and 100g flour 2 to give a total weight of 500g flour, in this case flour 1 is 80% while flour 2 is 20% of the total flour (Labensky *et al.,* 2009:133).

3.3.3.2 Sourdough starter in bakers' percentage

If the formula requires the use of sourdough starter, special consideration should be given to calculations regarding the quantities of the main ingredients (flour and water) of the starter. Two methods may be used to include the starter in the bread dough formula; the first method would be to treat the sourdough as a separate ingredient using the same method previously discussed, to express sourdough as percentage of flour weight (Table 3.1: Example 1).

Table 3.1: Example 1: Bakers' percentage calculated on sourdough formula - Adopted from Northwest Sourdough, 2010

	Weight of ingredients (g)	Bakers' percentage (%)
Warm water	115	166
Flour	69	100
Total	266	184

The second method starts by considering the weight of flour and water in the starter and then the starter flour weight is added to the weight of flour in the formula in order to get the total flour of the formula on which all the other ingredients proportions will be based

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(Table 3.2: Example 2). The weight of water from the starter is also added to the water of the bread formula to give the sum weight of water in the formula.

Table 3.2: Example 2: Basic bread formula with sourdough and bakers' percentage

	Weight of ingredients (g)	Bakers' percentage (%)
Flour (339 g + 69g from sourdough)	408	100
Warm water (144 g + 115 g from sourdough)	259	63.5
Oil	5	1.2
Salt	8	2

It is worth noting that the percentage of water in a formula is based on the type of flour used, because different flours have different levels of absorbing water, for example whole wheat flour absorbs more water than white flours.

The standardisation literature is followed by the other factors affecting acceptance of food as presented in Section C.

SECTION C

3.4 OTHER FACTORS AFFECTING FOOD ACCEPTANCE

In addition to the food acceptance theory and the cultural hedonic framework theory, the study also provides details of other important factors contributing to food acceptance. These factors were mentioned under the description of the hedonic stage (liking or disliking) of the food acceptance model (Figure 2.1). In order to maintain the flow of the model, it was decided that they would be explained later, in this section.

3.4.1 Context

Food acceptability is influenced by the context (environment or situation) that covers the physical surroundings and social circumstances in which the food or beverage is selected or consumed. The context encompasses a set of all activities and experiences such as time of the day or time of the year season associated with the consumption of a

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food product even if they are not part of the food themselves (Meiselman, Johnson, Reeve, Crouch, 2000; Furst, Connors, Bisogni, Sobal & Falk, 1996). According to Meiselman (1996:238-261) context can be categorised into three main areas (Figure 3.3).

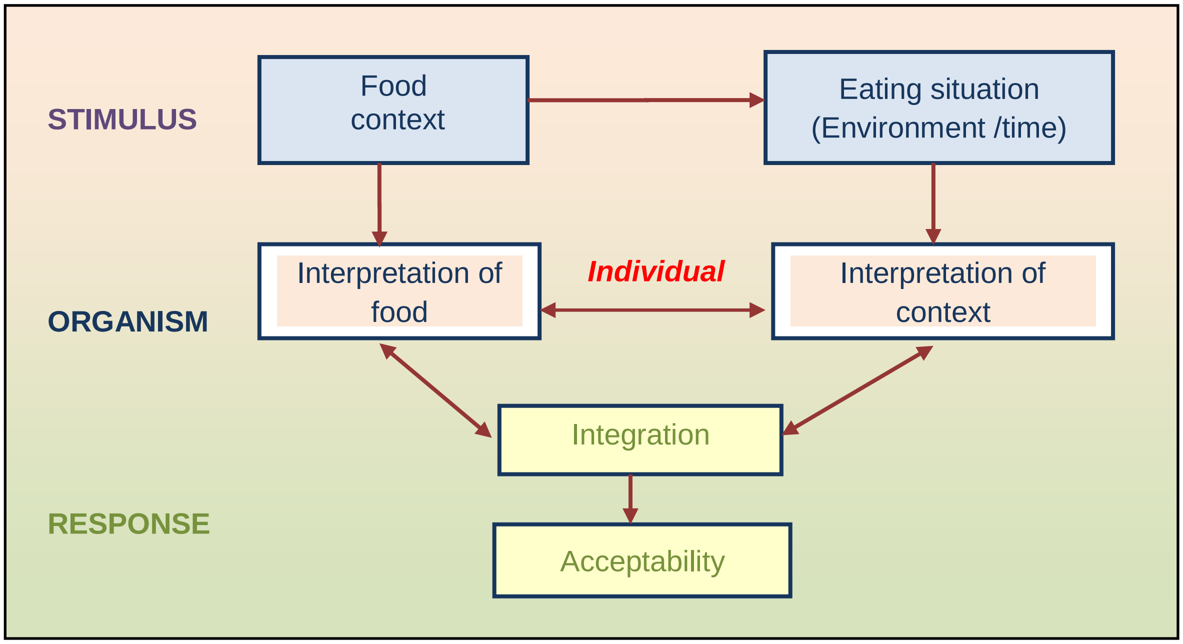

Figure 3.3: The interaction between consumer and food in a context to form a food acceptance response (behaviour) Adapted from Gains, 1994:68).

i. *"The food context – Combinations with other foods, culinary tradition and culture, food packaging naming and labelling.*

ii. *The eating situation – the social and physical environment in which the food is eaten.*

iii. *The individual – Food preferences and aversions, variety seeking tendencies, neophobic – neophobic attitudes, restrained eating tendencies and food expectations of the individual consumer".* (Figure 3.3 illustrates these 3 areas).

3.4.2 The food context

The food context includes both the physical and social environment of the eating situation. The type of food available in the environment is a result of the season and climatic conditions and market factors that are all part of the food context (Furst *et al.*, 1996). The availability of food from one market to the other or from one season to the other is an important factor in the choice of food because people may crave for certain

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foods but only find that they are not available in the market or they are out of season. The absence of food in the market may lead to changes in the menu items and may limit individuals' food choices (Furst *et al*., 1996). According to Pars *et al*. (2001) and Willows (1996), acceptance of traditional foods depends on factors such as time of the year and food availability in stores. In their study, consumers indicated difficulty in obtaining traditional foods. The high prices for traditional foods were one of the main reasons for low consumption frequency of traditional foods. Food consumption is closely related to the context in which it is served. The socio-cultural context influences consumption and includes different settings such as restaurants, markets, work parties and households. Geographical regions, referred to as spatial context, also influence food consumption (Orlove & Schmidt, 1995). Food context includes the family structure such as size of family, which influence shared responsibilities in preparing meals and the cost of meals (Lee, Sobal & Frongillo, 1999).

The food context also includes cuisine, which entails the use of staple foods that are cooked following certain methods and specific flavouring combinations as practised by a particular cultural group (Rozin, 2000:134). With this description of cuisine in mind, individuals develop tastes, mixing techniques of food from an early stage of life. If they are served anything that does not fall within the scope of their cuisine, it may be rejected (Rozin & Tuorila, 1993).

3.4.3 The eating situation

The interaction between a consumer and food in a context can also be explained through the eating situation (Figure 3.3). The social facilitation effect causes people in a group to consume more food than individuals eating in situations where they are by themselves. In most situations, individuals eat their meals in the company of other people (Rozin, 1996). From a family point of view there are various interpersonal relationships affecting food choice. Family members, especially mothers, are normally faced with the challenge of having to compromise their needs in order to accommodate the needs of other family members. However, the social facilitation effect with family members and friends is quite high (Wansink, 2004). In addition, entertainment at household level and in the workplace calls for individuals to consume certain foods more than they would consume in their normal eating environment (Furst *et al.*, 1996).

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Cardello *et al.* (2000) in one of their experiments reported a contradiction where participants were allowed to eat hors d'oeuvres "alone" and "with others". The consumption for the alone situation was found to be higher than where eating was with others. However, they argued the fact that social facilitation effect is higher with familiar individuals that could be the cause of eating less with strangers, as it happened in this experiment. They further argued that if food is easily accessible consumption increases and participants exposed to eating alone did not have to share with others (Cardello *et al.,* 2000).

3.4.4 Influence of environment

The place of residence (urban or rural) has an influence on the consumption of traditional foods (Pars *et al*., 2001; Damman, Eide & Kuhnlein, 2008). Pars *et al.* (2001), in the study conducted in Greenland, found that people living in villages generally showed higher consumption of traditional foods than people living in towns.

Environmental factors have a significant influence on food choice (Meiselman, 2007:79). These include seasonality, urbanization and the geographical location, which enables accessibility of the food as well as the social context of an individual (Frewer & van Trijp, 2007:322 & Fieldhouse, 1995). It has become clear that food habits do not exist in isolation, any attempt to modify them must be made within the total ecosystem in which they operate. Environmental factors influence human behaviour in a complex and interactive fashion, and the need to change one component might cause all of them to change (Bryant *et al*., 2003). According to Bryant *et al.* (2003) bread consumption in developing countries is affected by the extent of government controls on wheat trading and the movement from more rural to more urban locations. When people move from rural to urban areas, their salaries normally increase and this increase is associated with influences on food habits, possibly due to the change in the type of wheat flour bought for bread making (Kittler & Sucher, 2008).

Urbanisation and employment of women outside the home are two social changes that have contributed significantly to changes regarding eating patterns and nutrient consumption. Other contributing factors include the opening of new roads between rural areas and large urban areas (Bryant *et al.*, 2003). The rise in agribusiness and

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international trade in foodstuffs brought about by ecological and economic changes facilitate food habit modifications (Fieldhouse, 1995). In Lesotho, Ashton (1939) reported that wheat bread consumption draws a line between the poor and the rich because in the rural areas people who earn wages such as teachers and chiefs generally consume bread.

3.4.5 The individual's expectation

Individual consumers develop specific needs because of the interaction that takes place between food and the consumer in a certain context (Sijtsema, Linnemann, Van Gaasbeek, Dagevos & Jongen, 2002). The individual choice of food can be shaped by the past contextual conditions which include what was consumed previously in relation to the location in which food is consumed (King, Weber, Meiselman & Lv, 2004). The memories formed in the brain of the consumer play an important role in decisions about food. Consumers can often recall a place and time when a product was eaten even if they cannot identify the flavours and odours of a product (Koster, 2004). The tendency of consumers to rate the level of food acceptance based on expected properties gives an indication that eating the environment is quite powerful in food choice (Meiselman *et al*., 2000). Most individuals are looking for variety, both in the diet and in day-to-day intake. Variety is normally found in natural eating situations (Rozin & Tuorila, 1993).

During the eating process, as the consumer assigns a food context and expectations, he or she recalls information about the food product. Consumer attitude towards a food product is the result of a cognitive aspect based on what the consumers already know as well as the opinions formed regarding the product (Costell *et al.*, 2009; Booth, 1995). Familiar foods are more readily accepted and considered pleasant and are usually the ones more regularly consumed than unfamiliar foods (Asp, 1999; Bryant *et al.*, 2003). Pars *et al.* (2001) reported that people who live in towns but had an experience of traditional foods from villages during youth were found to have higher preference for traditional foods than people who grew up in towns and never experienced traditional foods. Pars *et al.* (2001) and Cleveland *et al.* (2009) documented that the experience of food habits at a younger age are responsible for adulthood food habits and they become very resistant to change.

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Expectations occupy the major place in food acceptance. In sensory evaluation, expectations can be classified into two kinds, being a belief about the sensory characteristics of a food product and the hedonic expectation, which entails the belief about the like/dislike of a food product (Cardello, 1994:277). However, the hedonic measurement is influenced by other factors such as consumer characteristics that may be classified into individual and environment (Cardello, 1994:254; Shepherd & Sparks 1994:204).

3.4.6 Characteristics of individuals

A variety of personal factors have an influence on food acceptance. They include age, socio-economic factors and culture.

3.4.6.1 Age

According to Kim *et al*. (2009) modern ways have replaced the traditional food purchasing behaviours and consumption. This has led to the differences in the food choices between the younger generations and the older generations. The younger generations are exposed to food choices that were not available in the past. This determines differences in food purchasing patterns. The age of the consumer may significantly influence the types of food chosen for consumption. Several studies have indicated differences in attitudes toward food among consumers of different ages. Age is a good predictor of consumption of traditional foods (Pars *et al*., 2001). Preference for traditional foods increases with increase in age (Kihlberg *et al.,* 2005; Pars *et al.*, 2001). The general feeling is that older people prepare and consume traditional foods because they have knowledge, skills and time to prepare such foods (Kuznesof, Tregear & Moxey, 1997). Younger consumers more often choose foods that claim health properties unlike older consumers who are more concerned with the taste of food and natural resources. In addition younger consumers have the desire to experience the food of foreign cultures (Kim *et al.,* 2009).

3.4.6.2 Socio economic factors

Socio economic status is a critical measure of an individual's lifestyle that significantly influences food choice (Southgate, 1996). The cost of a food is a determining factor on

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whether or not it is purchased and, if so, what is done with it. As families gradually derive better incomes, they start to change their food habits by introducing new products or replacing some of the local ones. Higher incomes have such an impact on the behaviour and social attitudes of people that a change in economic status alters even the staple food produced and makes new products likely to be adopted (Bryant *et al.*, 2003). Improved economic status of the poor in many cultures leads to an increase in the amount of money that they spend on food (Southgate, 1996). However, of all the sources, grains (mainly in the refined form) and added fats have contributed to the greatest increase in calories since 1950s (Grotto & Zied, 2012).

3.5 THE CONCEPTUAL FRAMEWORK OF THE STUDY

The conceptual model in Figure 3.4 is developed, following the literature review and the theory discussed in the earlier sections of this thesis. The proposed model starts with culinary practice variables, which have an impact on the quality characteristics of food. The physicochemical properties of a food product are influenced by a variety of ingredients used together with the flavouring, preparation and methods of cooking applied to Basotho traditional bread. For example, when non–wheat flours are used in bread making, the volume of bread decreases, as these non-wheat flour levels increase (Elkhalifa & El-Tinay, 2002). The physical characteristics such as size, shape, volume and texture form the first impression in the mind of the consumer and they are fundamental in the ultimate decisions to accept food. The chemical properties result from various reactions during the preparation and cooking of food (Barrios & Costell, 2004).

The model integrates the characteristics of food and the characteristics of individuals because the decision to accept food results from the perceptual judgement after the individual has interacted with the sensory characteristics of food. The consumer interacts with food through human senses vision, audition, kinesthesis, somesthesis, gestation and olfaction and gives the basic sensory description of food such as appearance, texture and flavour (Cardello, 1994:253; Cardello, 1996:2). Sensory evaluation is a process whereby food is analysed using human senses (Clark, 1998). It is at this stage that the individual draws an input from both learning and memory, depending on whether the individual is from a rural or an urban area, or whether the individual is young or old, in order to form a recognisable flavour, sound or texture of food (Cardello, 1996:2).

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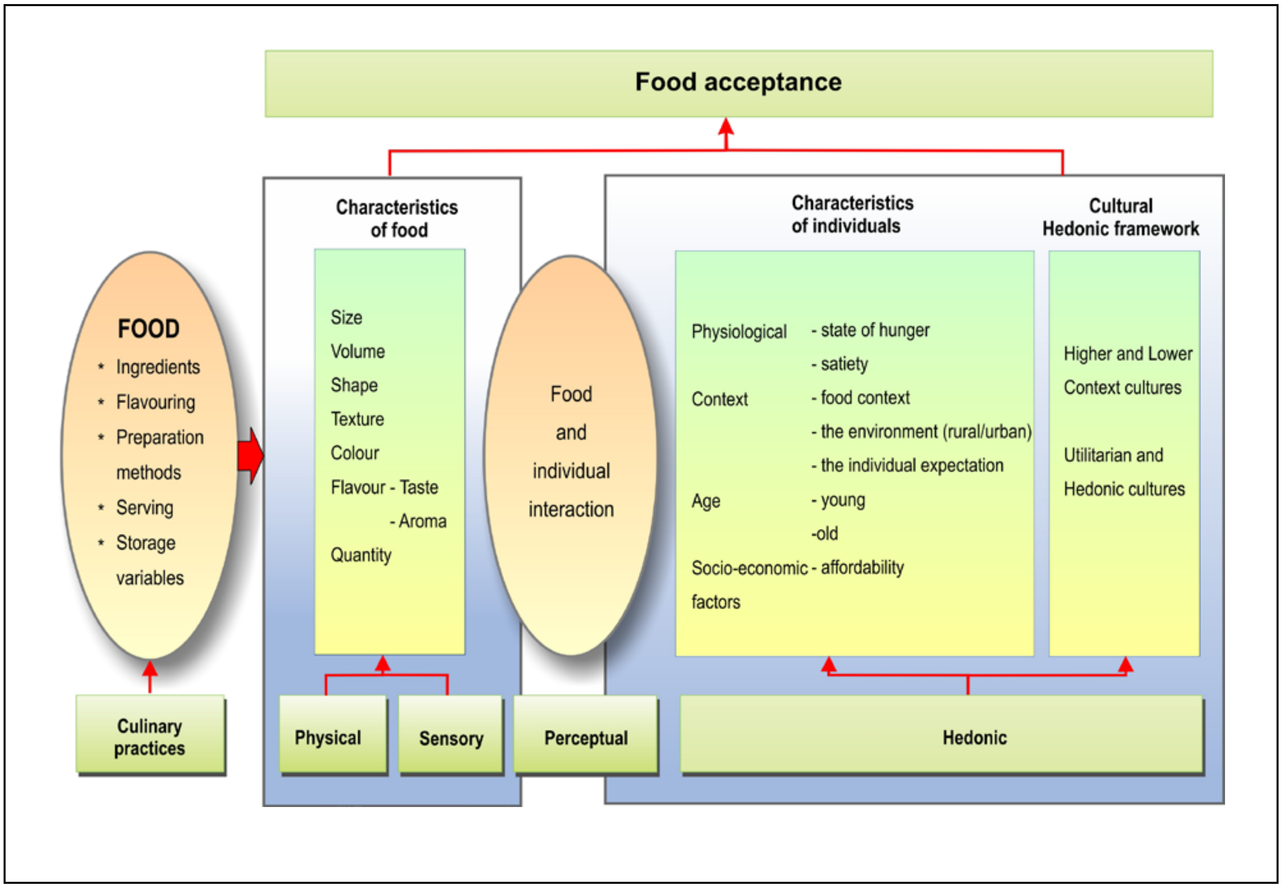

Figure 3.4: Conceptual framework

Consumers' acceptance of food is largely, determined by perceived sensory characteristics (appearance, texture and flavour). Appearance is the first attribute that the consumer uses to measure the quality of a food product. It includes colour, size, and shape, and surface texture, clarity in terms of presence or absence of visible particles (Meilgaard *et al.,* 2007:8). Texture is determined by the sense of touch, sight and hearing. Other than taste, texture can be detected by feel in the mouth (Meilgaard *et al.,* 2007:9). Texture is a physical property that is assessed through the surface appearance of bread in terms of its "*dullness or shininess of a surface, roughness or evenness and wetness or dryness"* as suggested by Meilgaard *et al. (*2007:8).

Food taste preferences have always been associated with culture and cultural factors, which seem to have the most significant influence towards consumption of food (Wright, Nancarrow & Kwok, 2001). Culture is a factor of characteristics of individuals, as shown

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in the conceptual framework. Cultural hedonic framework, used as the second theoretical perspective of this study, employs the matrix of higher as opposed to lower cultural context and utilitarian as opposed to hedonic cultures to help to understand cultural differences of a certain cultural group. These cultural differences play an important role in determining the type of food products that are liked or disliked by a cultural group. The factors presented in Figure 3.4 are interrelated and meant to point to the most important variables about food acceptance in this study.

3.6 SUMMARY

The model of Cardello in Meiselman & Macfie (1996:2) was applied in Chapters 2 and 3 and the cultural hedonic framework was used to describe the theoretical framework of the study. Concepts pertaining to culinary practices regarding traditional Basotho bread are classified as ingredients, flavouring, preparation and serving and they are discussed in chapter 3. The supporting literature on other factors that affect food acceptance and the standardisation of recipes are also described in chapter 3. Physico-chemical structures of food, sensory characteristics and perceptions have an influence on the decisions about traditional bread acceptance. A cultural group can either be classified as high or lower cultural context or utilitarian or hedonic. The conceptual framework is derived from the literature of the study.

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Chapter 4:

RESEARCH METHODOLOGY

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PHASE 2: METHODOLOGY FOLLOWED FOR RECIPE STANDARDISATION

PHASE 3: METHODOLOGY – CHARACTERISATION OF THE STANDARDISED RECIPES OF TRADITIONAL BASOTHO BREAD

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Chapter 4:

RESEARCH METHODOLOGY

This chapter presents the research methodology of the study; it provides details of the multiphase mixed method design employed in this study.

4.1 INTRODUCTION

In this chapter the research methodology employed in order to investigate the research problem is outlined. It outlines the design, methods and procedures followed to achieve the aim and objectives of the study. This chapter further provides justification for conducting the preliminary study and for using a mixed methodology design (quantitative and qualitative) and the rationale for dividing the study into three phases. Data collection methods, study area and study population are dealt with. Data analysis strategies for qualitative data and quantitative data together with strategies to ensure reliability and validity are addressed. An overview of ethical consideration is included.

4.2 PRELIMINARY STUDY

A preliminary study was conducted in January 2011 (Table 4.1), prior to data collection for the main study that took place in March 2011–April 2011. The main aim of the preliminary study was to identify traditional Basotho breads, which could not be found anywhere in the literature and to find out if traditional Basotho breads were well known or not known to people in Lesotho. The results of the preliminary study were needed to help the researcher to finalise the decision on the type of methodology to use for collecting data during the main study (Quantitative or Qualitative). In addition, the preliminary study helped to identify Basotho women suitable for participation in the data collection of the study.

A total of n=120 women from 6 regions of Lesotho participated in the preliminary study (Leribe, Mafeteng, Mokhotlong Thaba-Tseka, Maseru, and Qacha (n±20 from each region). The results of the preliminary study also helped to finalise the number of regions needed for

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data collection in the final study and only 5 regions were used for the final study. The questionnaire used for the preliminary study is attached in Addendum1.

Table: 4.1: Summary of the preliminary study conducted in January 2011 prior to the main study.

Date of Interview	Regions (districts)	Frequency - (people interviewed in each region)	Percent (%)	Contact persons & numbers
12-01-11	Leribe	20	17	Paballo : +266- 58155036
13-01-11	Mafeteng	19	16	‘Makhotso: + 266-59055146
14-01-11	Maseru	27	22	Puleng : +266–58517344
18-01-11	Mokhotlong	22	18	Paulinah : +266- 58765718
19-01-11	Thaba-Tseka	23	19	Kampong :+266- 63010644
20-01-11	Qacha	9	8	Market Place was used to encounter costs - people from Qacha that work in Maseru Market were interviewed.
Total		120	100	

4.3 RESEARCH DESIGN

The study was descriptive and exploratory in nature. The researcher designed a technique that best suits the aim and objectives of this study as suggested by Babbie & Mouton (2002:49) that a research design and its application is chosen on the basis of the aim and objectives of the study including the consideration of the phenomenon being investigated and the researchers’ expectation. Research design helped to provide guidance to the researcher about the methods to implement during the data collection stages and to establish direction for data analysis and interpretation of results (Creswell, 2011:53, Boeije, 2010:19). Fixed mixed methodology research design using qualitative and quantitative methods were decided upon from the beginning of the research and were conducted according to the plan as suggested by Creswell (2011:54) as shown in Figure 4.1.

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The mixed methodology research design was chosen for this study in order to provide complete understanding of culinary practices regarding traditional Basotho bread and investigate traditional bread characteristics through different methods complementing one another (Creswell, 2013: 219-229; Creswell, 2011:54; Ivankova, Creswell & Clark, 2007:15; Babbie & Mouton, 2002:277). There are different versions within the mixed methods design.

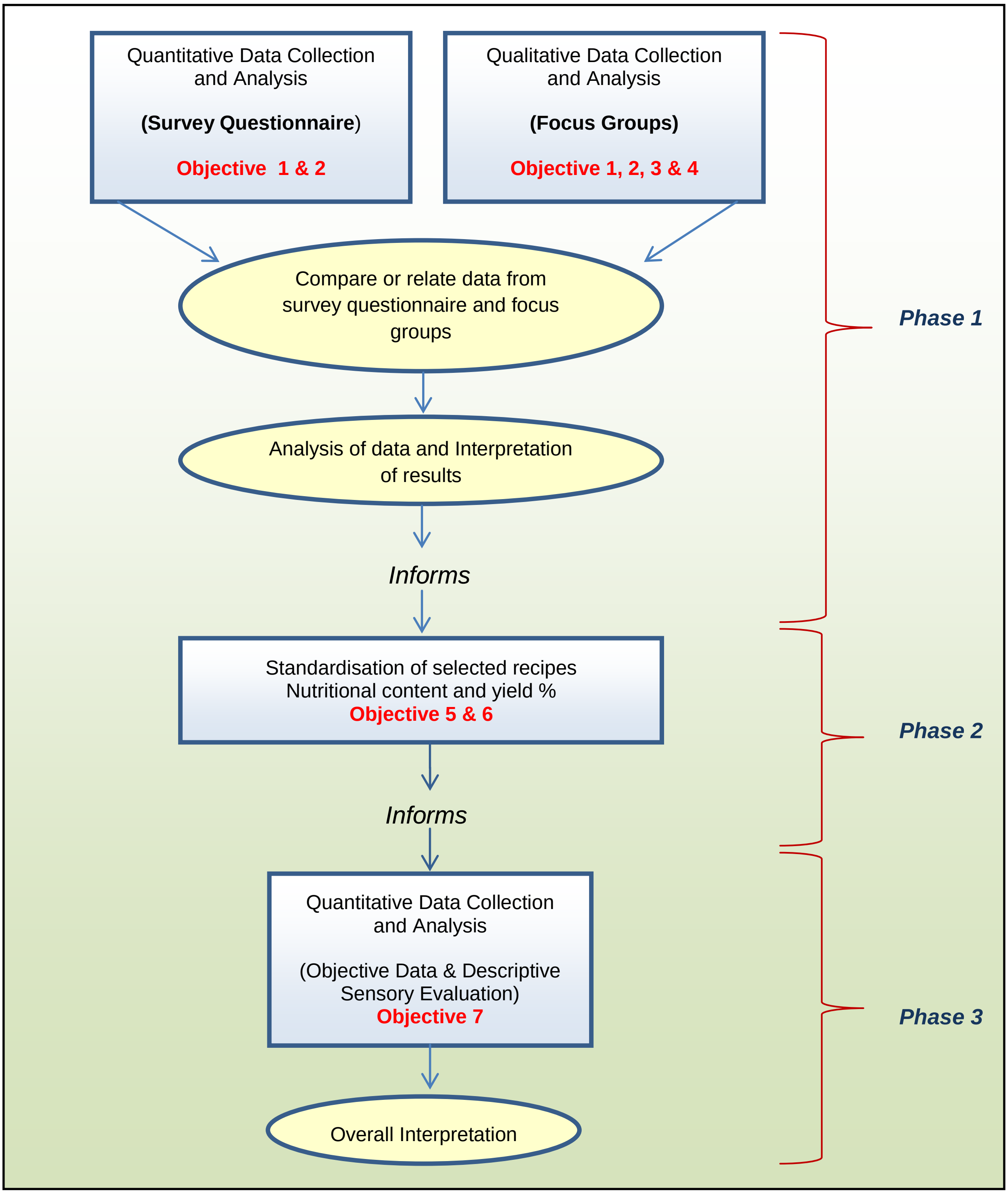

Figure 4.1: The multiphase mixed methods design (Convergent parallel mixed design and sequential mixed methods (adapted from Creswell, 2011:69) used to collect data for this study.

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This study used **multiphase mixed methods** (Creswell, 2013:228). It was conducted in three phases as shown in Figure 4.1. These included both the convergent parallel mixed method design and the sequential mixed method design. The convergent parallel design version was used in phase 1 from which the quantitative method, through the use of a survey questionnaire and qualitative method using focus groups was employed. According to the convergent design the two different methods used in phase 1 occurred concurrently, following the steps of each method (survey questionnaire and focus groups) independently (Creswell, 2011:54; Ivankova, Creswell & Clark, 2007:15).

Phase 1 also included observation and photographing techniques of collecting data. These are also useful methods to complement data from both the questionnaire survey and focus groups in order to enable the researcher to bring more clarity into the area under investigation. Observation was used in line with focus groups during the demonstrations of culinary practices by housewives. It facilitated collection of data through watching the participants' actions without interfering with what they were doing (Clough & Nutbrown, 2002:46; Meiselman & MacFie, 1996:109).

The results of one method in convergent parallel mixed method design were analysed accordingly without interfering with the results of the other method (Creswell, 2011:54; Ivankova, Creswell & Clark, 2007:15). The data was merged within the discussion by presenting the qualitative data in the form of themes and comparing them with the quantitative statistical results. According to Creswell (2013:222), presenting both quantitative and qualitative data within the discussion is referred to as a side-by-side approach in data analysis.

The sequential mixed method design in this study occurred such that the results of the first phase were analysed and used to inform and plan the second phase, and the findings of the second phase were used to develop phase three (Creswell, 2011:54; Mouton, 2001:107).

Data collection of phase 1 occurred in stages and lasted for 5 days in each region as follows:

Day 1 -	Administering the face to face questionnaire to n=253 participants
Day 2 -	Focus group (n=10) discussion and pre-preparation steps for bread making in each region making a total of n=50 focus group participants from 5 regions
Day 3 -	Preparation of 5 types of breads
Day 4 -	Preparation of the other 5 types of breads
Day 5 -	Focus group discussion on perception of sensory qualities of breads

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The order in which breads were prepared in regions differed depending on the availability of ingredients and the other materials such as pots, grinding stone and fuel.

Phase 2 involved the standardisation of recipes collected from phase 1. The study further determined the effect of recipe formulation on sensory characteristics (appearance, colour, odour, texture and flavour) of traditional Basotho breads. The descriptive sensory test was conducted using the traditional bread recipes standardised in phase 2. Table 4.2 illustrates how the methodology chapter is presented.

Table 4.2: Summary of methodology chapter for phase 1, 2 & 3 presentation

<table>
<tr><th colspan="2">Phase 1</th><th>Phase 2</th><th>Phase 3</th></tr>
<tr><td colspan="2">Accessing the study regions
Participants recruitment</td><td>Selection of breads from phase 1</td><td>Characterization of standardised breads</td></tr>
<tr><td>Questionnaire Survey
- Designing the questionnaire
- Pre – testing and piloting the questionnaire
- Data collection
- Data analysis</td><td>Focus groups
- Designing the focus group guide
- Pre-testing and piloting the focus group guide
- Focus group size
- 3 parts/sessions of focus groups
- The procedure for collecting data in each part/session of focus group
- Debriefing
- Data analysis</td><td rowspan="2">Standardisation of selected recipes</td><td rowspan="2">- Flour particle size
-Total Titratable Acidity (TTA) & pH.
- Specific volume
- Crumb texture
- Bread colour
- Crumb cell structure
- Descriptive sensory evaluation</td></tr>
<tr><td colspan="2">Validity and reliability
Incentives
Ethical consideration</td></tr>
</table>

PHASE 1: METHODOLOGY

4.4 ACCESSING THE STUDY REGIONS

Letters were written to the chiefs and the nutrition extension officers in charge of these regions to solicit permission for access into the communities and to inform them about the aim and objectives of the study. Permission was solicited from the chiefs because Tsepa (2008) reported that a chief in Qachas'Nek Lesotho expressed her dissatisfaction about

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researchers who enter the village and continue with their investigation without the chief's consent. Gathering women was easily handled through the nutrition extension officer and the chief of the village, who are always handling all matters related to food preparation and nutrition in the communities as the extension officer of the Ministry of Agriculture, Lesotho. The chief played the role of gate-keeper and ensured that respondents' rights were not violated. The position of the researcher as a Mosotho woman, born and raised in Lesotho presented itself as an advantage to approach the chief and the people in the community because of the familiarity with acceptable manners for both the rural and the urban areas and also for speaking the Sesotho language fluently.

4.4.1 Participants' recruitment for phase 1

The recruitment of participants took place in January 2011 prior to data collection, which took place between March 2011 and April 2011. Respondents were recruited from 5 regions of Lesotho. These regions are a true representation of the country in relation to rural and urban components. Chiefs and the Nutrition extension officers of the regions assisted by arranging meetings in central places such as church, chiefs' place and Ministry of Agriculture offices to introduce the researcher and inform women of the community about the purpose of the study. All willing women that were knowledgeable about the information needed to achieve the objectives of the study were asked to participate (Babbie & Mouton, 2001:288; De Vos, Strydom, Fouche, Poggenpoel & Schurink, 2001:253). Women are traditionally responsible for culinary practices in Lesotho (Tsikoane, 2007). Bread making in particular is an important skill taught to females from young age in Lesotho. Participants were chosen on the basis that they had prepared at least one of the traditional Basotho breads before.

Inclusion of participants in this study was also based on guidelines suggested by Babbie & Mouton (2006:288). These are:

- Thorough enculturation – Participants were supposed to be Basotho women born and raised in the area under investigation, because the study required distinctions in preparing traditional Basotho bread in different areas. This was done to avoid using women that were born and raised in other regions of Lesotho, but married in the region investigated. If a woman was raised in an area under investigation it meant familiarity and knowledge about culinary practices regarding traditional Basotho bread with respect to the chosen area.

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- Current Involvement – Housewives still preparing traditional Basotho breads in their households were chosen in order to be able to show traditional ways as practised in the past as well as current practises. This therefore enabled incorporation of changes over time in terms of equipment, ingredients and serving techniques.

4.4.2 Questionnaire survey participants' recruitment

The non-probability sampling technique for a quantitative survey questionnaire as described by Fox and Bayat (2007:59) and Bless, Higson-Smith and Kagee (2006:105) was found appropriate to use in this study. The sample size from each area was n±50, which conveniently made it possible to include all women in the small villages of Lesotho. Two hundred and fifty three Basotho women (n=253) participated in this survey from 5 regions.

4.4.3 Focus group participants' recruitment

For qualitative studies, De Vos *et al.* (2001:253) also suggested a non–probability sampling method. Purposive sampling was used to identify participants representing their regions because the most important point about qualitative research is that the sample should bear the typical characteristics of the population and be able to provide enough information that would assist the researcher to meet the purpose of the study. Participants for focus groups were also asked a few questions regarding age, citizenship and traditional bread by the researcher in a preliminary interview in order to ensure suitability of participants for the focus group. When subjects were interviewed, the researcher reviewed the characteristics of participants in terms of age, location, interest in cuisine, depth of knowledge the subject could provide, availability of traditional equipment and facilities in her household and her availability for further investigation.

The following criterion was particularly important for selecting participants for the focus groups:

- Adults between the ages of 25-85 years - This age group consists of housewives regarded as well informed and skilful in the area of traditional bread making. The age group accommodated the older people with more insights about culinary practices and with energy to handle the labour needed to demonstrate the preparation and cooking steps for traditional Basotho bread. The age group also included younger people who are already practising the modern ways of preparing traditional Basotho bread. These women were therefore experts in at least one of the 10 traditional Basotho breads.

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- Participants had to have energy to do hard work – Preparation of traditional Basotho bread involves long processes that also require labour to perform activities such as dry and wet milling.
- Participants had to be regular consumers of traditional Basotho bread - Consumers of bread are able to identify the good qualities of bread and also to describe the failures in traditional Basotho bread making.
- Adequate time – The fact that focus groups needed four (4) days for discussions and demonstrations led to the decision to select participants who would be available for the entire period.

4.5 QUANTITATIVE QUESTIONNAIRE SURVEY

A structured questionnaire was used in order to provide more depth and a better understanding of culinary practices with respect to traditional Basotho bread. This survey questionnaire was specifically meant to address objectives 1 and 2.

4.5.1 Designing the survey questionnaire

The questionnaire was designed based on a comprehensive literature review to identify the most relevant questions. The questionnaire was developed in English (Addendum 6) and then translated to Sesotho, - the language used by Basotho, to enable all participants to understand the questions. The questionnaire was mainly of closed format technique. This closed format style is associated with more advantages because the questions are easier to follow by all respondents, regardless of their education level (Hamilton, McIlveen & Strugnell, 2000). The questionnaire consisted of the various sections as illustrated in Table 4.3.

4.5.2 Pre-testing and piloting the questionnaire

The questionnaire was first checked to ensure that the instrument measured what it was purposed to measure. The statistician ensured that data was fitting into the statistical analysis, to facilitate data analysis and interpretation of results. The questionnaire was then pilot-tested on 10 Basotho women – 5 of them studying at the University of Pretoria and 5 working as domestic workers around Pretoria. Piloting facilitated clarity of questions, it ensured that participants easily understood the language used, that concepts were following each other sequentially and it helped to estimate the time needed to complete the questionnaire. All the necessary adjustments pertaining to the findings of the pilot study were incorporated in the questionnaire.

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Table 4.3: The summary structure of the questionnaire (refer to the questionnaire - Addendum 6)

Section	Aspect Measured	Question Number	Type of Question
Personal information and contacts	Name	1	Open ended
	Date	2	Open ended
	District	3	Closed ended
	Contact number	4	Open ended
A. Demographic information	Location	5	Closed ended
	Educational level	6	Closed ended
	Birth date	7	Open ended
B. Types of traditional bread	Traditional breads that participants have prepared	8	Open ended
	Breads still prepared and reasons for continuing to prepare them	9 &10	Open ended Open ended
	Traditional breads no longer prepared and reasons for stopping to prepare them	11	Open ended
	Season of the year a particular type of bread is prepared	12	Open ended
		13	Open ended
	Reasons for preparing this bread in this season	14	Open ended
C. Traditional bread consumption	Frequency of consumption	15	Open ended
	Important ceremonies in which bread is served	16	Open ended
	At what state is traditional Basotho bread liked	17 & 18	Open ended
D. Obtaining ingredients for traditional bread	Availability of cereals	19	Open ended
	Obtaining flour	20	Open ended
	How to obtain flour	21, 22 & 23	Open ended
	Reasons for means of obtaining flour		
	Which wheat flour is bought and the reasons for buying it	24, 25 & 26	Open ended
	Compositing bread	27	Open ended
E. Raising agent	Type of raising agent and reasons for choice	28 & 29	Open ended
F. Fuel used	Type of fuel used to cook bread and reasons for choice	30 & 31	Open ended
G. Storage stability	Keeping traditional bread	32	Open ended
	How long can bread be kept	33 & 34	
	Means of preserving traditional Basotho bread	35	

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4.5.3 Data collection – questionnaire survey

The questionnaire was administered face to face during data collection between the researcher and the respondents.

4.5.4 Data analysis – questionnaire survey

The quantitative data was numerically coded for statistical analysis. Data was computed to establish means, frequencies and percentages of variables. The data processing was performed using SAS ® version 9.3 (SAS Institute INC, SAS campus Drive, Cary, NC 27513) under Microsoft Windows XP (SP3) on a desk top computer. Descriptive statistics was used to illustrate and describe the effect of age and region on the knowledge and consumption of traditional Basotho bread.

Relationships between variables and certain demographic characteristics, such as region, and age were determined with inferential statistics.

4.6 FOCUS GROUPS

Focus groups are systematically structured discussions meant to obtain information in a non-threatening environment (McNamara, 2006) and can be used effectively for generative research to develop ideas with consumers (Grag & Saguy, 1991). Focus groups technique was particularly chosen for this study because apart from the fact that it can stand on its own it can also be used concurrently with other methods including surveys and observations (Barbour, 2007:119). Focus groups were important in this study because a group of Basotho women provided quality information on culinary practices regarding traditional Basotho bread under the guidance of the researcher and the assistant moderator, as suggested by Morgan (1996). Focus groups enabled the researcher to collect large quantities of data from different people within a relatively short period. The elaborative and informative data of focus groups was the result of varying ideas from different people participating in a group in terms of background, age, education and experiences (Denzin & Lincoln, 2008:397).

4.6.1 Designing the focus group guide

A guideline designed using open-ended questions to probe different aspects about participants' opinions and to allow participants to elaborate on the main issues of traditional bread (Babbie & Mouton, 1998:289) was followed. This guide also ensured that every area of interest was dealt with (Barrios & Costell, 2004). The focus group guide was formulated in

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English and then translated to Sesotho, the local language spoken and understood by people living in Lesotho, and then each interview session lasted for 1-2 hours (Grag & Saguy, 1991). The preliminary study information helped to design a focus group guide used to probe different aspects of culinary practices of Basotho regarding traditional bread. Questions in the focus group guide were meant to achieve the main aim and objectives of the study. They included the following aspects:

1. Ingredients used for preparing different kinds of traditional Basotho breads
2. Equipment used to prepare, cook and serve traditional Basotho bread
3. Preparation procedure
4. Cooking procedure & steamer
5. Serving of traditional Basotho bread
6. Perception of sensory qualities of traditional Basotho bread
7. Beliefs and symbolic values of bread in Basotho culture.

4.6.2 Piloting the focus group guide

A pilot study was considered important in the procedures employed to develop the focus group guide for this study. Piloting the focus group guide was conducted using a small group with similar characteristics to the larger group of the main study (Terre Blanche, Durrheim & Painter, 2006:490). The focus group pilot study was conducted in October 2010 after the development of the focus group guide. The pilot study was conducted using a group of 10 women from Lesotho who work around Pretoria. The reasons for conducting this pilot study were to determine the time that would be needed for one meeting of focus group discussion, to check if questions of focus group guide were in a flowing order and also if they would be easily understood by participants. As part of the pilot study the focus group plan was reviewed and adjusted.

4.6.3 The number of focus groups

The number of focus groups was based on the recommendation by Morgan (1996) that data saturation is likely to occur between 4-6 groups and therefore there is no need to add more groups because researchers would predict what participants would say even before it is said and this would result in waste of resources like time. On the other hand, fewer groups are likely to result in some important information not captured (De Vos *et al*., 2009:306). With this background, 5 focus groups were found sufficient for this study.

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4.6.4 Focus group size

Focus groups consisting of ten housewives in each group were selected for this study because the culinary practices of Basotho are considered a neutral topic on which housewives would feel free and comfortable to share their knowledge and skills without feeling intimidated by other members (Morgan, 1996). The fact that a larger group involves lower levels of participation from each member helped the researcher to control the flow of discussion (Morgan, 1996). The decision to have 10 people in each group was also made on the basis that there were 10 traditional breads to be demonstrated and each participant demonstrated one traditional bread in which she was an expert. The number of participants in a focus group was also decided on the basis that a typical number of focus group participants is usually 6-10 people and a focus group of 4-6 people is considered a small group (De Vos *et al*., 2009: 305; Greeff, 2005:305). However, the literature seems to have a wide variation of recommended number of participants in a group. In this respect, 6-8 participants in a focus group is a recommendation made by Finch and Lewis (2005:172) while quite a number of authors recommended 8-12 (Neuman, 2003:253; Hanna & Wozniak, 2001:43; Steward & Shamdasani, 1990:60). According to Krueger (2009:67) the most appropriate number of focus group participants ranges between 5-8 participants. Krueger (2009:67) further emphasised that a focus group with more than 10 participants is not easily handled and participants may not feel free to share their ideas in a large group. On the other hand, a small number of people in a focus group allow maximum participation of each individual to share his/her own opinions and experiences about the topic under investigation (Morgan, 1996).

4.6.5 The three parts of focus group discussion

1. The first part was a discussion based on the semi-structured guideline (Addendum 7). The researcher introduced herself to participants, thanked participants for attending and allowed self-introductions by participants. The purpose of the research was explained here and the discussion continued on culinary practices regarding traditional Basotho bread covering the type of ingredients, flavouring techniques, equipment, preparation steps, cooking procedure and serving.

2. In the second part, participants demonstrated bread preparation methods. They provided explanations for what they were doing. An observation method was used during the demonstrations accompanied by videotaping and photographing.

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3. Thirdly, the focus group members were presented with samples of sliced breads and were allowed to taste the samples. Focus group members were asked to describe the sensory characteristics of prepared breads and to give reasons for liking or disliking certain flavours, appearance and texture of various breads.

4.6.5.1 Commencing part one of the focus group discussion

The researcher led focus group discussions. At the beginning of the discussion the researcher used the first 3-5 min to set the stage that encouraged maximum participation from focus group members, in this way a typical introduction proposed by Krueger (2009:96) was followed in this study and it is outlined below:

i. The welcome
ii. Research overview
iii. The ground rules
iv. The opening question.

i. The welcome

The researcher thanked the participants for agreeing to participate and be part of the evaluation task. She made each one of them feel important by telling them that they had been chosen on the basis that they are Basotho women, born and raised in the region, and also that they proved themselves to be knowledgeable about the culinary practices regarding traditional Basotho bread. When they were all settled, the researcher gave a short introduction of herself that included the name, nationality and short background of occupation. At this point the assistant moderator and the audio-visual assistant were also introduced (Krueger, 2009:97). The floor was opened for participants' introductions and the moderator explained how the discussion in a focus group would be carried out.

ii. Research overview

A brief background and purpose of the study were explained to participants in order to furnish them with information on what the study was all about. A definition of traditional Basotho bread was given and it was explained that the information needed was on the preparation of breads prepared from the three cereals (wheat, maize and sorghum). Participants were informed that the discussion and demonstrations would be videotaped and notes taken by the assistant moderator and the nutrition extension officer. They were also told that photographs would be used to capture all the processes of making different kinds of traditional Basotho bread. Participants were assured confidentiality and anonymity of

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information collected from them (Rubin & Babbie, 2007:167). The researcher then obtained their written consent. Ethics approval was obtained from the Faculty of Natural and Agricultural Sciences of the University of Pretoria and participants signed a consent form. The chiefs' places in the rural areas, Ministry of Agriculture projects sites and a church in urban areas were used as venues for focus groups. These are normal gathering places for people in Lesotho communities and they provided participants with more relaxed and comfortable atmosphere that allowed free interaction. These environments also allowed the researcher to place herself in the shoes of participants and understand them better (De Vos *et al.,* 2001:270).

iii. The ground rules

Participants were advised that there were no right or wrong answers. They were therefore expected to feel free to share their views and experiences regardless of whether it is similar or different to what had been mentioned already (Edmunds, 1999:81, Krueger, 2009:97). Participants were encouraged to contribute on all matters raised in a discussion and made aware that their input would add great value to the overall objectives of the study (Edmunds, 1999:81). Participants were also cautioned that everybody had to speak clearly and that only one person would be allowed to speak at a time (Edmunds, 1999:81, Krueger, 2009:97). There would be no interruptions when someone was speaking and that they were encouraged to avoid communicating to each other during the discussion. Each participant was to mention her name every time she spoke. They were told that the idea was to have all of them participating and that if some of them would seem to be too quiet, they would be invited to say something. Those who would talk non-stop would be asked to give a chance to others. They were also asked to remember to switch off their cell phones while a focus group discussion was going on (Krueger, 2009:97). In addition, participants were told that they were not allowed to bring their small children to the focus group meetings and proceedings as children might make noise and also demand attention. The time factor was also emphasised to participants. They were told that they should always be on time in order to be able to complete the work planned for each day.

iv. The opening question

Participants were also given an opportunity to kindly introduce themselves and each was asked to tell the group what came to her mind, when the term "traditional bread" or "Basotho bread" was mentioned? They were asked to mention their names every time they answered a question, according to the suggestion by Krueger (2009:97). Each individual was given an identification tag labelled R1 (Respondent 1) for the first one in the row and R10

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(Respondent 10) for the last one by the assistant moderator and who in turn recorded their names and corresponding tag labels as the discussion continued. The first question was meant to break the silence and to give each one of them an opportunity to talk at the beginning of the discussion. This, according to Krueger (2009:98) and Edmunds (1999:81), is a technique used to encourage participation from all participants throughout the discussion. The discussion then started and continued with brainstorming of ideas by the participants.

4.6.5.2 Data collection in part 1 of the focus group discussion

The data collection in part 1 of the focus groups was approached with caution as advised by Sim (1998) that the focus group data collection is complicated and should be handled with care due to a number of reasons including:

- The fact that data collection is two-fold, from participants' views that occur concurrently with their interaction
- Extra care is needed to match quotations with corresponding individuals in a group. In this study this point was observed by using the identification tags, which speeded up the recording process rather than to write names.
- Data collection should go hand in hand with group coordination
- Group members should feel at ease and not be distracted by the method of recording data. Different methods of recording data helped to allow free talk by participants and they were not asked to stop for recording purposes.

In part 1 of focus groups, participants discussed the recipe verification of traditional bread. Participants provided information regarding recipe title, recipe category, ingredients, weight/measure for each ingredient, preparation instructions, the cooking method and the length of cooking time, recipe yield and equipment to be used (Spears & Gregoire, 2007).

The funnel principle method was employed when asking questions from which the wide perspective about the topic was generated at the beginning and then narrowed down to the most specific issues of the topic. Each focus group was led by the researcher to direct the flow of the discussion and also to make sure that all important issues were covered. At the end of the discussions, the researcher asked participants to add any information that might have been left out on traditional bread in order to add more value to the research (Babbie & Mouton, 1998:293). The focus group discussions lasted for 1-2 hours depending on the participant's ability to understand questions and the amount of information they were able to provide in different regions.

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4.6.5.3 Data collection in part 2 of focus group discussion

Part 2 of focus group proceeding involved the preparation of the breads.

i. Preparation for demonstrations

Participants volunteered to provide ingredients (grains, flour and different types of leavening agents), equipment and fuel such as wood (*patsi*), dry cow dung (*lisu/likhapane*) in order to perform demonstrations. Each participant brought materials for the traditional bread that she was going to demonstrate. The researcher helped to collect materials using a vehicle for heavy materials such as pots and grinding stones and also for those housewives who had to walk long distances to the meeting place. Although the researcher had a tentative working schedule for five days, participants in each region drew their work plan depending on the availability of resources in that area and therefore the order of breads to be prepared differed from region to region.

ii. Observation and recipe collection

The experts demonstrated the procedure for making bread and discussions continued during the bread preparation time. Questions were based on the procedure for preparing and cooking traditional Basotho bread. Observations were used to substantiate the findings from the focus group discussions. Observational methods enabled the researcher to collect data through watching the participants' actions without interfering with what they were doing (Meiselman & MacFie, 1996:109). During observation and demonstration of recipes, the researcher could only use a measuring scale to record the exact quantities of ingredients in order to facilitate the next phase of the study on standardisation. Observation helped the researcher to think about all activities as they occur and to probe participants to explain what they were doing (Babbie & Mouton, 2002:294). Prepared recording forms were used as a guideline for note taking (Babbie & Mouton 2001:294) (Addendum 8). In this regard, suggestions given by Creswell (2007) about the observation technique were followed:

- Participants were followed every step of the way in order to take notes as demonstrations proceeded.
- Identification tags were visible from a distance and were captured easily in order to match participants with their actions.
- The researcher and moderator controlled movement from a non-participant to a participant.

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- The researcher and moderator divided participants such that different participants were followed at the same time while trying to avoid being overwhelmed with information from one participant.
- Observations started from a funnel broad picture to a narrow one.

Observation occurred concurrently with video taking and photographs during the bread making demonstrations and focus group discussions as well as during sensory evaluation of bread samples by consumers. Facial expressions as well as other body movements such as the head, were observed and noted. During observation, the researcher wrote notes on how Basotho experts get ready for bread preparations, which include their personal hygiene, preparation of utensils, preparation of ingredients, and the procedure from mixing, kneading, and fermentation, up to the time the bread is cooked and served. Prepared recording forms were used as a guideline for note taking, in order to assist the researcher to make meaningful observation that covered the most important events (Babbie & Mouton, 2002:294).

iii. Photographing

Photographing was used as a method of collecting data for this study, to complement the questionnaire survey, the focus group and the observation methods. Photographing was considered for its importance to provide visual images, which could be used and referred to every time when clarity is needed during the data analysis stage. Photographing occurred informally in a natural setting while participants performed their actions about preparation of traditional breads. The researcher moved around from one participant to the next, with a digital camera hung around her neck, in order to perform other activities such as writing and measuring of ingredients while taking photos. Photographing helped to capture activities, which occurred very quickly and could not be easily captured by mere writing and recording. A digital camera took pictures of raw materials, equipment, steps for culinary practices and all the activities involved. As much as ethical consideration for photographing was followed, this proved not to be a problem in all the regions. All participants wanted to appear on the photo and even requested duplicates of their photos in order to show to their husbands and children.

iv. Documenting qualitative data during data collection

The data was documented by writing notes on which the assistant moderator and the Nutrition extension worker of that site recorded detailed notes while the researcher noted

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few points. Prepared focus group note-taker form (Addendum 8) was used. It included the date and the name of the note taker as well as space for the details of the question, responses and observations. In addition, Silverman (2010:240) explained that the researchers' memory cannot be relied on to recall everything said, including pauses, overlaps and in breaths. Therefore, each focus group discussion was video – taped and prepared for use in the analysis. A video camera was used to record the discussion and the demonstrations.

4.6.5.4 Data collection in part 3 of focus groups

Consumers' perception of the sensory attributes of traditional Basotho breads

Ten traditional Basotho breads prepared from wheat, maize and sorghum were presented to focus group participants. They described the sensory quality of the breads and why each attribute came out the way it did. The discussion included the importance of each sensory attribute in Basotho culture and the criteria for choosing bread.

4.6.6 Debriefing

The moderator and assistants conducted a debriefing meeting immediately after the focus group participation in order to clarify issues concerning questions, comments and emerging topics. Debriefing is an important step that, if done properly, helps the researcher to make adjustments and improvements for the next focus group (Krueger, 2009:116, Babbie & Mouton, 2001:277). In this study debriefing helped to clarify written notes and to add missing concepts while the information was still fresh. The most important points of the discussion were highlighted and new questions were considered for the next group. Debriefing also helped to identify similarities and differences between the current group and the previous ones and discussed changes that needed to be implemented before the next focus group meeting (Krueger, 2009:116).

4.7 DATA ANALYSIS

Analysis of data is a process consisting of systematic steps that include 'breaking up' the data into themes, patterns, trends and relationships that could easily be worked out (Mouton, 2001:108). After the discussion of the focus group, the written notes together with video tape transcripts were enhanced by an elaborated report, and these helped to provide data for analysis (Mouton, 2001:107). The main principle for analysing qualitative data lies with the purpose or objective of the study in order to maintain focus. However, the type and quality of

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methods (audio visuals and written notes) used for collecting data have an impact on the analysis of data because it is information from these media that is transcribed and analysed (Halkier, 2010). The strategy to analyse data was carefully developed because focus groups produce a large volume of data that comes in different forms while the other even emerge during analysis (Social, Assessment Training Workshop, 2003; De Vos, 2005:333). The analysis of data for this study therefore had to encompass the data reduction step described in Miles and Huberman (1984:21).

4.7.1 Data reduction

Data reduction occurred on the data collected from the field. Data reduction helped to identify the concepts according to the conceptual framework of the study and to identify themes (Figure 4.2). Data was in the written form from observations, discussions and transcripts of video tapes. The stage that followed was to group concepts into categories, which further reduced data into manageable forms to describe a common phenomenon (Straus & Corbin, 1998:114). Categories were given names according to the description of the phenomenon discovered in the data. The data was read and re-read several times to gain an understanding of data and to identify emerging concepts that were added to the categories. The process continued until the researcher felt the categories were saturated and no new concepts were emerging (Strauss & Corbin, 1998:136). This is the procedure described by Strauss & Corbin (1998:12) as grounded theory. However, the researcher considered the fact that any effort to analyse a focus group's data reflects analysis of content (Stewart, Shamdasani & Rook, 2007:117). In addition, Henning *et al. (*2004:109) made it clear that content analysis could serve as a base for other forms of qualitative data analysis.

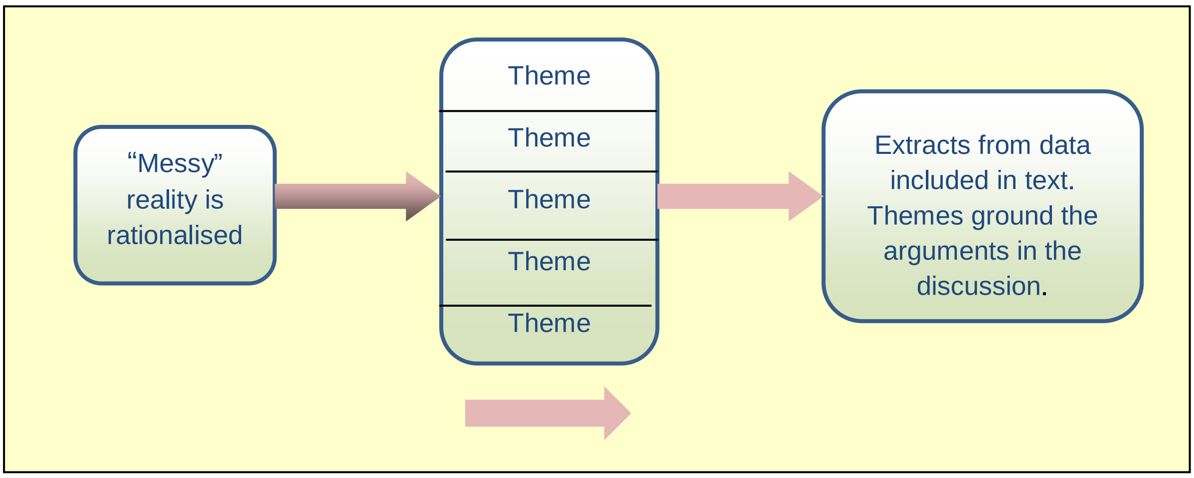

Figure 4.2: From data to text. Adapted from (Henning *et al*., 2004:109; Holiday, 2001:100) Movement away from 'reality' to re-contextualisation in research text.

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In this regard the framework adapted from Henning *et al*. (2004:109) and Holiday (2001:100) was used to illustrate the process of identifying themes from voluminous focus group data and using them as the foundations for understanding and interpreting data for this study (Figure 4.2).

4.7.2 Grounded theory

An inductive grounded theory approach was considered the most suitable method to use in data analysis of this study as it mainly features in the generation of theory from data (Silverman, 2010:236, De Vos *et al.*, 2001:265, Strauss & Corbin, 1998:12). The analysis of focus group discussion was therefore solely based on the observed reality of how Basotho prepare their traditional bread. However, Hayes (2000:184) emphasised that grounded theory does not only end at generating theory but it also involves discovering new insights that are tested to discover how they could be integrated with the data and produce new theories. This process is referred to as **iterative**. To work inductively is to create categories and sub-categories from the data (Schreier, 2012:88; Henning *et al*., 2004:115). The grounded theory steps used included breaking down, conceptualizing and reconstructing in the analysis of data and these include open coding, axial coding and selective coding (De Vos *et al.*, 2001:271).

4.7.2.1 The classic analysis strategy

The researcher for this present study followed the 10 steps of analysing qualitative data according to the recommendation made by Krueger (2009:119) on the use of classical approach. On the other hand, Stewart *et al*. (2007:116) referred to the same method as The Scissor-and-Sort Technique because it involves the cut and pasting techniques. The method is considered effective to analyse focus group data because of the following advantages:

- It is easier to work with the cut and pasting techniques for both experienced and inexperienced researchers
- It is systematic
- It breaks the data into manageable portions
- It gives the researcher 100 percent involvement and feel of data during analysis

The following materials were used:

- Walls
- Doors

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- Two copies of transcripts
- A pair of scissor
- Markers
- Bostik
- Sheets of white paper (Krueger, 2009:119)

4.7.2.2 Preparation of transcripts

An effort was made to transcribe data of one focus group as soon as possible before proceeding to the other one, as suggested by Krueger (2009:116) and Henning *et al.* (2004:76). This exercise helped to write the details of the discussion and fill in all the gaps while information was still fresh in the memory and also to identify questions that were not well answered in order to apply improvements in the next session (Silverman, 2010:221). Transcribing data is preparation of data based on the fact that the grounded theory approach analysis begins with organising the data in such a way that it flows logically to enable the researcher to easily review it over and over again (Hayes, 2000:174). Transcribing the data started with the process of translating data from Sesotho to English by the researcher. Transcripts also included page and line numbers to speed up the process of locating points on the text (Hayes, 2000:184). The researcher, who conducted the discussions of the focus groups, was responsible for transcribing data and this placed her in a better situation to understand and interpret the signs and the tones of participants and, therefore, to avoid omissions in the data (Richards, 2005:53; Henning *et al.,* 2004:76). Transcribing data was done in such a way that speakers' ideas could be differentiated. The moderators' comments bolded to identify them from the participants' comments (Krueger, 2009:119).

Data from each focus group, recorded by writing and videotaping, was transcribed on the background that there are many advantages associated with the use of transcripts and tapes. These include:

- An organised record that enhances qualitative data analysis. It serves as a record which can be accessed any time to be used by the researcher and other interested parties
- Videotapes can be replayed any time and transcripts can be read and re-read to make improvements
- Transcripts and videotapes can be used by more than one researcher (Silverman, 2010:240; Stewart *et al.,* 2007:110).

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Immediately after transcribing data, the researcher went through a process called **immersion** which involved familiarising herself with the details of data by reading and re–reading data several times and by playing video tapes, while reading transcripts, over and over again. In this way the researcher was able to interpret the meaning behind spoken words, facial expressions and other tones of participants (Hayes, 2000:212).

4.7.2.3 Coding

One of the most critical steps in grounded theory method of analysis is coding (Strauss & Corbin, 1997:179; Miles & Huberman, 1994:56). The main purpose of coding data was to move the data to a conceptual level (Strauss & Corbin, 1997:179). Data was coded by assigning meanings to pieces of data using labels and signs easily understood by the researcher (Charmaz, 2011:165). Codes were derived entirely from the data through the researchers' immersion in the data by coding of data results in phrases, sentences and exchanges between respondents (Strewart *et al*., 2007:116). The data from all the focus groups were used to form concepts and categories into different text files for use in the first stages of analysis. This involved coding and indexing as well as labelling the data into terms that would be meaningful to the researcher. Coding for this study followed the suggestion by Miles and Huberman (1994:58) to use a conceptual framework as guide for coding. The labels of data were made in terms of different themes in order to allow the researcher to locate and retrieve information of similar concept with ease (Miles & Huberman, 1994:56). Apart from enabling the researcher to work on different parts of the category at the same time, coding also helps to develop new categories from data (Richards, 2005:86). In grounded theory, different types of coding are used as conceptual tools to perform the following tasks:

- *"To fragment the data*
- *To define processes in the data*
- *To make comparisons between data"* (Charmaz, 2011:165).

i. Open coding

As the name implies, open coding means to uncover transcribed data and to dig into it in order to discover the meaning associated with concepts (Strauss & Corbin, 1998:102). The first step in open coding was to break data into specific topics in terms of similar and dissimilar concepts, it involved labelling the phenomena, discovering categories, naming a category, developing categories based on their properties and dimensions and writing notes (Strauss & Corbin, 1998:102, De Vos *et al.*, 2001:271-273). The researcher went through the process of putting similar concepts together and separating them from other, different,

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meanings in order to complete categorisation of concepts (Henning *et al*., 2004:131). Apart from the classification act of this process categorisation also helped to reduce data to manageable chunks that were easily handled by the researcher. "Categories are concepts derived from data" with an ability to tell the meaning of data (Strauss & Corbin, 1998:113). However, it is important to note that in open coding quite a number of categories were discovered. Some of them ended up as sub-categories later (Strauss & Corbin, 1998:129). While data was being viewed closely for similarities and differences, it was further differentiated among categories (Strauss & Corbin, 1998:102). For the purpose of this study the text files categories included: the concepts on ingredients, flavouring, preparation and serving of traditional bread, factors influencing the choice of traditional bread, bread consumption and influence of culture on traditional bread consumption. In order to provide a framework upon which data and ideas were stored and explored the formulated text files were coded according to each participant and the grouping based on the place of residence (rural or urban) and age. Then the ideas from each participant were grouped together in one paragraph for each text file.

- *Two copies of transcripts*

Once the transcripts were completed, two copies of each transcript were made. One was used for cutting out information while the other one remained intact for reference. On both copies of transcripts, a straight line was marked right in the middle of all pages using one colour for one region. This signified it from the rest of the other regions. Therefore, different coloured markers were used to identify data from different regions as suggested by Krueger (2009:119). Table 4.4 presents regions and the colours used for identification of data.

Table 4.4: Colours used to identify focus group data from the five investigated regions

Region	Colour Identification
Leribe – Maputsoe	Yellow
Mafeteng – Makaung	Orange
Mokhotlong – Phahameng	Blue
Thaba-Tseka – Mohlakeng	Green
Maseru - Thaba-Bosiu - Lihaseng	Red

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- *Organisation of transcripts*

Transcripts were then grouped according to the regions. As the process continued, the differences and similarities between the regions were noticed.

- *Re-reading of transcripts*

Transcripts were quickly read to refresh the researchers' memory about the contents of transcripts, to gain more understanding of data and to continue to fill in the missing data (Marshall & Rossman, 2011:113).

- *Putting information on large sheets of paper*

The questions from the focus group guide were written on top of clean white sheets of papers (one question on its own paper) and the papers were placed on the walls with one question following the other.

- *Cutting and sticking*

The responses were then cut and placed under relevant themes. The cutting and sticking continued until the themes were completed.

ii. Axial coding

Axial coding followed after open coding. In this case, the coded data was cut out and rearranged such that the sentences or phrases dealing with the same topic were grouped under the same heading (Stewart *et al*., 2007:117). These were the data dismantled during open coding and then reassembled in new ways to create relationships between categories and codes (Henning *et al*., 2004:132; De Vos *et al.,* 2001:273; Strauss & Cobin, 1998:124). A link was formed between the categories and their sub-categories in a pattern of relationships showing how each affects the other based, on interactions and correlations of concepts (De Vos *et al.,* 2001:274). This relationship of categories and sub-categories gave the explicit meaning of the idea (Strauss & Cobin, 1998:124). Analysis occurred in two levels in the axial coding where participants' responses and the interpretation of participants' responses by the researcher were taken into consideration (Henning *et al.*, 2004:132).

- *Theme identification*

For the themes to emerge, all items, which seemed to deal with a similar concept, were grouped together. In this way, transcripts were cut into small pieces according to the responses of the same question and then placed under corresponding questions on the

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sheets of papers, such that at the end small pieces of paper formed a group of similar ideas that in turn, formed a preliminary theme (Hayes, 2000:176; Krueger, 2009:119). The information in each category was further carefully looked into and rearranged from one theme to the other according to Krueger (2009:121). Participants' responses could not always all fit into the categories formed by questions. In such cases the researcher created the storage bank of unclassified responses. As the rearrangement continued, new categories emerged and the responses in the storage bank were used.

- *Summarising a theme*

When the researcher was satisfied with the grouping of ideas, themes were then given temporary names depending on the common meaning reflected in a question. The final stage of theme identification was to read the information appearing under one theme several times to ensure that each theme contained the information needed to achieve the objectives of the study (Hayes, 2000:176). When the researcher was satisfied with the contents of the theme a summary of what each group of responses contained was written and comparisons across the regions of culinary practices regarding traditional bread was implemented. The themes were then given final names (Hayes, 2000:176; Krueger, 2009:119).

- *Data display*

The data was displayed in table form. This display allowed the researcher to follow and to understand the meaning of the data clearly. It further facilitated summarising and making conclusions from the results (Miles & Huberman, 1984:21).

iii. Selective coding

In selective coding the researcher looks at the core concepts of the study as they relate to the rest of the categories (De Vos *et al.,* 2001:274). In this study culinary practices of Basotho with regard to traditional Basotho bread formed the main concept and were systematically linked to factors affecting Basotho consumers' choice of bread. Ths included culture, environment, demographic characteristics, traditional knowledge and sensory characteristics of bread. Then the relationships established between main concepts and sub-concepts were validated and further clarified (De Vos *et al.,* 2001:274). Selective coding consisted of a number of steps that include: identifying the story, moving from description to conceptualisation, making a choice between two or more salient phenomena, determining the properties and dimensions of the core. However, these steps were not written according

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to the order of application in the data analysis. The researcher moved back and forth between them in order to build theories from the data (De Vos *et al.,* 2001:274).

- *Continuation of the analysis process*

The analysis continued with rearrangements of ideas within questions until the researcher was satisfied that all the needed themes were forming a "research chunk of reality' and could be used as bases for arguments around their meanings (Krueger, 2009:121; Henning *et al.*, 2004:107).

- *Taking a break*

The researcher took breaks in between the whole process of qualitative data analysis in order to avoid getting overwhelmed. The breaks ensured that most of all-important areas of research were included and not overlooked due to fatigue. Krueger (2009:121) suggested that the moderator should take a break and rethink about the aim and objectives of the research during data analysis.

- *Preparation of the report*

A detailed report was prepared in the form of tables based on different themes discovered from data. The tables were formed from participants' responses, concepts and categories.

- *Conclusion drawing and verification*

Conclusion drawing and verification is the last stage in qualitative data analysis. However, it is worth noting that all the three stages occurred concurrently during the analysis. This means that the researcher was able to note conclusions related to certain concepts of data from the beginning of the analysis but held them until the end in order to draw conclusions at a well-informed stage (Miles & Huberman, 1984:21).

4.8 MEMOS

Memos are an effective way of storing records of events in a research. They store occurring thoughts, emerging concepts and ideas that seem to be adding more value and which might need further clarification at a later stage (Richards, 2005:74). In this study memos proved to be an effective strategy that enhanced the grounded theory approach because notes were written from the beginning of focus group interviews until the identification of themes, using coded data. Their use differed in relation to the stage of research and what was considered important at that stage (Strauss & Corbin, 1997:181). In order to facilitate the memo writing

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process, brief notes were written in the margins of field notes and transcripts in order to catch the insight of an idea at its prime impression (Richards, 2005:74; De Vos, 2005:337). Memo writing was carried out throughout the process of the grounded theory approach in order to keep track of what data was revealing at each stage of analysis (Henning *et al*., 2004:132). In this regard, memos were categorised in relation to the main stages of the grounded theory data analysis. Code memos were done during open coding, theoretical memos took place during axial and selective coding while operational memos were a guide to the emerging research design (Henning *et al.,* 2004:132).

4.9 CONCEPTUALISATION AND OPERATIONALISATION FOR PHASE 1

Table 4.5 outlines the conceptualisation and operationalisation for phase 1 in order to achieve the primary and sub-objectives. Phase 1 was specifically meant to address primary objectives 1, 2, 3 and 4 with their sub–objectives. The main concepts guiding the study also appeared next to the objectives. These concepts are discussed thoroughly in chapter 2. Two methods (quantitative survey questionnaire and qualitative – focus groups) of data collection occurred concurrently to complement each other in phase 1. Table 4.5 shows that there were questions from both instruments of data collection meant to address one objective. Dimensions, indicators and methods of data analysis are discussed in their respective sections and subsections of this study.

4.10 QUALITY OF THE DATA

Certain control measures were taken to ensure the quality of the study as follows: The validity and reliability of the qualitative and quantitative data were observed for the trustworthiness of research. The aspects that were involved to ensure trustworthiness of quantitative data include: Representativeness, content, construct and face validity. Trustworthiness in qualitative data was ensured through credibility, transferability, dependability and conformability (Litchmen, 2006:194 & De Vos, Strydom, Fouche & Delport, 2005:160).

4.10.1 Representativeness

The respondents were recruited from 5 regions in an effort to have a sample that represented the country in terms of rural and urban, south, north and central parts. The sample therefore gave much variability and credence to the data required.

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Table 4.5: Conceptualisation and operationalisation for phase 1

Primary objective 1: To determine and describe different types of traditional breads prepared in Lesotho					
Objective	Concept	Dimensions	Indicators	Measuring Instrument	Data Analysis
1.1 To identify the names of traditional Basotho breads. 1.2 To provide a description of the different types of traditional Basotho breads	Traditional Basotho bread	. Steamed wheat bread . Baked wheat bread . Roasted wheat bread . Wheat + maize composite . wheat + sorghum composite . Steamed dry maize bread . Steamed green maize bread . Steamed pre-gelatinized maize bread .Steamed dry sorghum bread .Steamed green sorghum bread	General description of each bread in terms of: .Basic ingredients . Specific preparation techniques for each bread . How the bread is used in Basotho diet	Questionnaire Q 8 Focus groups Q1 Questionnaire Q13, 14	Descriptive statistics – frequencies and percentages Grounded theory – coding, themes & categories Descriptive statistics – frequencies and percentages
Primary objective 2: To investigate traditional and current culinary practices related to Basotho traditional bread					
Objective	Concept	Dimensions	Indicators	Measuring Instrument	Data Analysis
2.1 To identify and describe the ingredients used for traditional Basotho bread-making in both rural and urban areas. 2.2 To identify and describe the flavouring techniques used for traditional Basotho breads in rural and urban areas 2.3 To describe preparation and cooking methods for traditional Basotho breads 2.4 To identify and describe serving techniques of traditional Basotho breads in rural and urban areas	Culinary practices	Ingredients Flavouring Preparation Serving	Flour :Types of flour - -wheat, maize and sorghum Obtaining flour – homely ground or commercial flour Leavening agents -Sourdough -Traditional beer -Sour porridge supernatant - Commercial yeast Salt sugar Kneading Fermentation Preparing the pot and the steamer Cooking Accompaniments Portioning Presentation	Questionnaire survey Q19, 20, 21, 22, 23, 24, 25, 26, 27 Focus groups Q2, 3 Questionnaire survey Q 28, 29 Focus groups Q4, 5, 6, 7, 8, 9, 10 Focus groups Q11	Descriptive statistics – frequencies and percentages Grounded theory – coding, themes & categories Descriptive statistics – frequencies and percentages Descriptive statistics – frequencies and Percentages Grounded theory – coding, themes & categories Descriptive statistics – frequencies and percentages

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Primary objective 3 To investigate to what extent regions and generations affect preparation and consumption of traditional Basotho bread.					
Objective	Concept	Dimensions	Indicators	Measuring Instrument	Data Analysis
3.1 To determine reasons for rural and urban participants to continue to prepare the breads and the reasons for not preparing some of the traditional breads	Preparation and consumption of traditional Basotho bread	Influence of region	Rural and urban participants	Questionnaire survey Q 9, 10, 11, 12	Descriptive statistics – frequencies and percentages
3.2 To describe the generation's perceptions that determines the traditional bread acceptance 3.3 To investigate consumption of different types of breads in Lesotho		Influence of generations on bread acceptance Bread consumption	Liking of appearance Liking of flavour Liking of aroma Older generation Younger generation Frequently Regularly Occasionally Rarely	Focus group Q13, 15, 16 Questionnaire survey Q9, 10, 11, 12 Questionnaire survey Q15	Grounded theory – coding, themes & categories Descriptive statistics – frequencies and percentages
Primary objective 4: To investigate the impact of Basotho culture on traditional bread acceptance using a cultural hedonic framework					
Objective	Concept	Dimensions	Indicators	Measuring Instrument	Data Analysis
4.1 To investigate the influence of culture on traditional bread consumption	Acceptance of traditional bread	Influence of culture	The importance of bread in Basotho culture	Questionnaire survey Q16	Descriptive statistics – frequencies and
4.2 To investigate and describe the role of traditional Basotho bread in cultural occasions 4.3 To investigate and explore context in which bread is served		Special occasions Food context	Sunday Christmas Traditional feasts Physical environment - Rural and urban Family structure Size of family Composition of family Number of meals per day	Focus groups Q17 & 18 Questionnaire survey Q 5	percentages Grounded theory – coding, themes & categories Descriptive statistics – frequencies and percentages

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4.10.2 Content validity

An extensive literature review ensured that the instrument covered all the necessary components to meet the objectives of the study. The main concepts pertaining to culinary practices and traditional bread were identified and described. The content of the questionnaire was also evaluated by the two supervisors and experienced statistician to ensure that various areas are covered and none is neglected. They also checked that all questions were relevant in relation to the aim and objectives of the study. The wording was checked to ensure that questions were not leading or suggesting (Fox, 2007:96). Pilot–testing of the questionnaire was done using a small group of Basotho women in Pretoria. They represented the actual population of the study, to ensure clarity of questions and suitability of the language used.

4.10.3 Construct validity

The questionnaire was constructed based on the theory of the study which suggested the logical relationships among variables (Babbie & Mouton, 2001:122-123). According to Bless *et al*. (2006:159) validity can be achieved by establishing a strong relationship between the instrument and the existing theory.

4.10.4 Face validity

Face vadility is an important characteristic of a measuring instrument, it helps the instrument to be structured in such a way that it appears to measure the attributes meant to be measured (De Vos *et al.,* 2005:161). Both the focus group guide and the questionnaire were checked to ensure that the appearance appropriately reflected the purpose of the instrument.

4.10.5 Credibility

An inquiry was conducted in order to ensure that participants were clearly identified and described (De Vos *et al.,* 2001:331). The researcher allocated ample time to the field work from which varied field experiences were gained including establishing rapport for data collection and continuously studying the subjects in order to gain their full meanings, attitudes and understanding of the concepts. Focus group discussions were held until data saturation was reached. Credibility was also ensured by using well prepared field notes and transcripts to demonsteate understanding and also to ensure that data was correctly transcribed and interpreted. Triangulation was employed in order to compare field notes with

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audio recordings and transcribed data. At the end of every discussion, members were given a concluding question to ensure that all issues on culinary practices regarding Basotho bread were covered.

4.10.6 Transferability

Transferability is the extent in which the research findings can be transferred to different situations or used with other participants (De Vos *et al.,* 2001:331). Purposive sampling was used to minimise bias and to include major regions representing variability of the population in Lesotho as well as subjects of varying age groups.

4.10.7 Dependability

In this study, dependability was achieved by involving an editor to help the researcher refine the instrument and to ensure accuracy in the results. For dependability, the step-by-step research processes were well defined and involved replications during data collection. The researcher conducted all the focus group discussions.

4.10.8 Conformability

Conformability was employed in order to make sure that the findings are totally the result of subjects, and are not influenced by anybody's interests or ulterior motives so that biasness could be avoided (De Vos *et al.,* 2001:331). Field notes, transcripts audio recordings and photos were kept to ensure accuracy in writing the conclusions, interpretation and recommendations of the study.

4.11 INCENTIVES

Participants were engaged in data collection for this study for five days from 8:00 – 5:00 and the amount of work done was considered when determining how much work each participant would be assigned (Krueger, 2009:78). At the end of the qualitative data collection, the researcher thanked the individuals for their time and positive contributions/participation and gave them a prepared incentive for their participation. Each participant was thanked with R100.00, given to her as cash in a sealed envelope. A prepared form including the participant's name, date, amount received and signature was signed (Krueger, 2009:78). Money exceeds other types of incentives because its contribution is easily translated and

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interpreted by participants. This view was confirmed with positive statements in the regions. For example, after receiving her incentive one participant from Mokhotlong said these words:

> *I thank God very much. My daughter is very sick in the house now and I did not know what to do because I do not have money. I am going to give this money to my daughter so that she can pay for a taxi to take her to the hospital. She cannot walk. She will also be able to pay the clinic fee and I will still be left with some change. Thank you.*

Another participant from Thaba-Bosiu said:

> *I was not expecting anything from this exercise, I only volunteered to help this Mosotho child with her research but now this has helped me very much. I borrowed some maize meal from my neighbour this morning, in order to cook for my family and I did not know how to repay her. I am going straight to the shop to buy maize meal and give her back her portion. Thank you very much.*

In addition, money communicates that the sponsor has high regard for the study and values the participants' time (Casey & Krueger, 1994:84). When money is used as compensation, it should be referred to as reimbursement for each participant forfeited her other important commitments and may have also incurred expenses (Casey & Krueger, 1994:84). This incentive was not mentioned during the recruiting stage in order to increase the possibilities of willingness to participate. Participants were also paid in relation to the amount of ingredients and other materials they provided for the study. Participants who filled the questionnaire were rewarded with a pre–prepared combination of 1 packet of biscuits and a small packet of peanuts.

4.12 LUNCH TIME DURING FOCUS GROUP DATA COLLECTION

Literature and the preliminary data collection stage proved that preparation of Basotho traditional breads involves long processes. The researcher planned to keep participants from 8:00 in the morning to 5:00 in the afternoon in order to complete the activities of the day. This length of time, suggested that participants would need to have lunch. In order to provide lunch, the researcher brought along a small gas cylinder and a 2 burner gas plate. Thick maize meal porridge (*papa*), chicken stew and green vegetables were prepared for lunch every day. This lunch also served as an incentive to participants because some of them said they do not even have meat in their households and it is a privilege for them to have participated in this research where they were given food, especially meat.

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4.13 ETHICAL CONSIDERATION

A study that considers ethics ensures a harmonious interaction between the researcher and participants. Research approval was obtained from the University of Pretoria through the research ethics committee of the Faculty of Natural and Agricultural Sciences as stated by Henning, Van Rensburg and Smit (2004:73). Permission was sought from the chiefs of the villages of all participating members of the focus groups for interviews and also from the local government representatives to continue with interviews in the villages. The researcher took some time to explain the purpose of the study, the criteria used to include participants in the panel and information on how the interview was going to be performed. The researcher, through the help of the chief and the nutrition extension officers obtained informed consent from each research participant to take part in this study. The safety of the research participants from the risks and benefits associated with research were of primary concern. Participants were informed of the different audio-visual methods of collecting data and their consent for taping and photographing was sought. They were informed at the exact time when recording and photographing occurred (De Vos *et al,* 2001:330). Participants were given assurance of their privacy and sensitivity protection and what would happen with their information after recording. The researcher allowed some time for the participants to ask questions (before the discussion as well as during the interview) for clarity (De Vos *et al.,* 2001:26).

Table 4.6: The summary of dates, number of participants and respondents, regions and specific venues for phase 1 data collection.

Focus groups (n)	Questionnaire survey (n)	Date (Week beginning)	Region (district)	Specific venue in a region
10	50	07- 03 – 2011	Leribe	Agriculture resource center (Khomokhoana project) Maputsoe
10	51	14 – 03 – 2011	Mafeteng	Makaung LEC church
10	50	21 – 03 – 2011	Mokhotlong	The chiefs' place (Phahameng)
10	51	28 – 03 – 2011	Thaba-Tseka	The chiefs' place (Mohlakeng)
10	51	04 – 04 – 2011	Maseru	Agriculture resource centre (Thaba-Bosiu-Lihaseng)
n=50	n=253			

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Participants were allowed to give informed consent to participate by signing a consent form. The consent form was accompanied by a letter in which the University of Pretoria stamp and signatures of two supervisors were included (Heinning, Van Rensburg & Smit, 2004:73).

Both techniques of collecting data were used with participants from each of the five regions. Ten women who participated in the focus groups were selected from the 253 that filled in the questionnaire.

PHASE 2: METHODOLOGY FOLLOWED FOR RECIPE STANDARDISATION

4.14 CHOICE OF BREADS FOR PHASE 2

The focus group and the survey results obtained from phase 1 formed a basis for the development of the methods for the standardisation of recipes. Of the ten recipes collected in phase 1, only three were chosen for the standardisation phase to form the base for adjustments which led to a total of 8 standardised recipes. The choice of recipes was based on the criterion presented in Table 4.7.

Table 4.7: Criterion used to choose breads for standardisation in phase 2

Criteria	Reason
i. Recipes should vary in terms of cereals used in order to include the three types of cereals (wheat, maize and sorghum) available in Lesotho.	During the reviewing of the literature, the researcher found that information on maize and sorghum traditional breads was scarce and therefore concluded that there was need to investigate and document literature on traditional breads using all the local cereals in Lesotho.
ii. The results from phase 1 indicated that the percentage of housewives who prepared maize and sorghum bread has decreased drastically in comparison to the ones who still prepare these breads.	With these results in mind, the researcher considered a call, which expressed the need to explore traditional foods that are currently underutilised in developing countries (Raschke *et al*., 2007; Woodley, 2006).
iii. Housewives of 28 years of age and younger have not prepared traditional Basotho breads before from sorghum and maize.	It was necessary to include breads that were less known by the younger generation in order to characterise them while the older generation is still around.

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4.15 RECIPE STANDARDISATION

According to The American Culinary Federation (2006) recipe standardisation is a process that involves increasing or decreasing the quantities of a recipe in order to achieve the required yield. In the context of this study, home size recipes were adjusted to even lesser quantities with the objective to use them for the next sensory evaluation exercise. In this regard particular attention was given to careful weighing and measuring of ingredients and taking notes about mixing, combining procedures, preparation and cooking time, temperatures, equipment and utensils, and the method of serving as well as total yield, number of portions and portion sizes were recorded (Spears, 2000:403). In addition, recipes in this study were standardised to produce products with similar characteristics as the original products (Hullah, 1984:56). The sensory attributes (flavour, taste, texture and appearance) described by the focus group participants in phase 1 served as bases for products evaluation. The three phases of recipe standardisation process as suggested by Spears and Gregoire (2007:226) as well as Spears & Gregoire (2010:211) were used in this study.

Standardisation is a process that requires repeated recipe testing to ensure standard quality and quantity for a particular purpose (Spears & Gregoire, 2007:225).

4.15.1 Recipe verification

Recipes obtained from the five regions of Lesotho in phase 1 were grouped together in a table according to the type of bread. The percentages of ingredients in proportion to flour were calculated for the original recipes. Similarities and differences regarding quantities and types of ingredients were noted. The reviewed literature stated that recipes with a wide variety of ingredients, methods of preparation, cooking methods, measuring techniques, equipment, yield and portion sizes need to be adapted in order to maintain consistent quality of the product (Hullah, 1984:24; Spears & Gregoire, 2007:216). The breads were prepared according to quantities and procedures of the original recipes. The researcher then decided to use a recipe from one region, which seemed to be authentic and a true representation of the original in terms of flavour, texture, taste and appearance. Quite a number of changes occurred to the recipes at this stage including the type of equipment used, the ingredients and cooking time.

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4.15.2 Product evaluation (Informal)

The researcher organised a group of five Basotho women studying at the University of Pretoria and two post doctorate students from Nigeria who worked with sourdough and sensory evaluation to take part in the preliminary evaluation stage of the eight bread products. These people were chosen on the basis that they were familiar with the products and could therefore determine the sensory attributes of the traditional Basotho bread. The panel was given a short evaluation form (Addendum 4A) that they filled in and made recommendations for the needed changes in the recipes. The criterion for designing the evaluation form was based on the authentic sensory attributes of the original recipes.

The researcher made adjustments, prepared and cooked the recipes several times to reach the expected authenticity of the breads.

4.15.3 Quantity adjustment of ingredients

The pilot plant of the department of Food Science University of Pretoria was used to prepare and cook traditional Basotho bread products. This therefore means the adjustments involved the use of equipment that was different from the traditional one used in Basotho households and the modern one used in the laboratory. The quantities prepared were reduced from the larger scale used by Basotho families to smaller scale quantities needed for descriptive sensory evaluation research purposes. The smaller quantities also led to reduced cooking time. A prepared form was used to record all the adjustments (Addendum 5A).

Large quantities of ingredients were bought and prepared before the start of the experiment in order to enable the researcher to use ingredients from the same batch from the beginning to the end of the experiment to ensure reliability and validity of the results. In this regard, at least 10 kg of flour was milled from each cereal type. The ingredients were selected and prepared such that they represented the authenticity of ingredients used for traditional Basotho bread. It is for this reason that all the three types of cereals were coarsely milled to resemble the flour produced by Basotho housewives on a grinding stone. Commercial wheat flour (Easy bake) was bought from a local supermarket in Lesotho and this is the type of flour used by 80 percent of Basotho for bread making, as indicated by phase 1 results. Commercial maize meal (Impala special) and commercial sorghum meal (*Monati Mabela*), instant yeast, sugar and cooking oil were all bought in bulk from a local supermarket in Pretoria.

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The quantities of ingredients were calculated and adjusted to produce the required yield. The Baker's percentage was used because it is considered the most precise and easy to follow step-by-step procedure for standardising bread formulas (Healea, 2007). In this regard, the weights of all ingredients were calculated as a percentage of the total flour in a recipe. According to the bakers' percentage formula, the flour is equal to 100%. The following formula was used to calculate the weight of all other ingredients:

$$\text{Ingredient } \% = \frac{\text{Weight of ingredient (IW)}}{\text{Total flour weight (TFW)}} \times \frac{100}{1}$$

4.15.3.1 Sourdough starter in bakers' percentage

The bread formula in this study included the use of sourdough starter. Sourdough consisted of a mixture of flour and water, therefore special consideration was given to calculations regarding the quantities of the main ingredients (flour and water) of the starter (Table 4.8).

- First of all the weight of flour and water in the starter were noted
- Starter flour weight was added to the weight of flour in the formula in order to get the total flour of the formula on which all the other ingredients proportions were based.
- Weight of water from the starter was also added to the water of the bread formula to get the sum weight of water in the formula.
- The total weight of water was calculated as a percentage of the total flour in the formula.
- Standardisation of bread recipes was repeated several times until the specified characteristics for authenticity of Basotho bread were reached. In the process, the consistency of quality and quantity were also of prime concern.

Table 4.8: An example of basic bread formula with sourdough adapted from Northwest Sourdough (2010).

Ingredients	**Actual quantities (g)**	**Percentages (%)**
Flour (339 g + 69g from sourdough)	408	100,0
Warm water (144 g + 115 g from sourdough)	259	63.5
Oil	5	1.2
Salt	8	2.0

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4.16 CONCEPTUALISATION AND OPERATIONALISATION FOR PHASE 3

Table 4.9 shows the most important concept addressed in phase 2; it indicates that phase 2 was meant to achieve primary objective 5.

Table 4.9: Conceptualisation and operationalisation for phase 2

<table>
<tr><td colspan="6">Primary objective
5.To standardise traditional Basotho bread recipes from regional culinary variations</td></tr>
<tr><td>Objective</td><td>Concept</td><td>Dimensions</td><td>Indicators</td><td>Measuring Instrument</td><td>Data Analysis</td></tr>
<tr><td>Primary objective above</td><td>Stan-dardisation of recipes</td><td>Selected recipes from phase 1</td><td>CWWheat
FWWheat
ComWheat
WRSorg
ComRSorg
WWhSorg
WWhMaize
ComWhMaize</td><td>Bakers' percentage</td><td>Evaluation panel</td></tr>
<tr><td colspan="6">6. To investigate total bread yield and the nutritional value of bread</td></tr>
<tr><td>6.1 Macronutrients

6.2 Fatty acids

6.3 Vitamins and minerals</td><td>% yield and nutritional value</td><td>Carbohydrates
Protein
Fat
Vitamins
Minerals</td><td>Quantity by portion unit

Quantity by weight</td><td>Bodybyte</td><td></td></tr>
</table>

* Abbreviations and acronyms appear in page xxviii

PHASE 3: METHODOLOGY- CHARACTERISATION OF THE STANDARDISED RECIPES OF TRADITIONAL BASOTHO BREAD

4.17 MATERIALS AND METHODS

4.17.1 Characterisation of breads

A prior qualitative investigation in rural and urban regions of Lesotho was conducted to obtain information on the culinary practices for Basotho steamed breads (phase 1 methodology). The regional variations were considered during standardization of bread recipes (phase 2). For each cereal, bread was prepared from both freshly milled whole

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grains and commercial flours. Variation of ingredients in the breads was meant to represent both the traditional and the modern ways of preparing bread in Lesotho (Table 4.10).

4.17.2 Flours

Wheat, white maize, white and red sorghum whole grains were obtained from local farmers in Lesotho. The grains were thoroughly cleaned by winnowing, sieving and sorting. The cleaned grains were milled at the Culinary Equipment Company–Lanseria, Gauteng using an “Original Osttiroler Getreidemuhlen” (A-9991 Dolsach/Stribach 55 Austria) Figure 4.3. The mill consists of a pine exterior and natural granite milling stones at the centre. The grain was poured into the hopper and it made its way down the valve to the stones. The grinding was performed by the friction between the moving top stone and the stable bottom stone. The mill is fitted with three cylindrical sieves (224, 450 and 750 µm) which separate the grain into different fractions (fine, coarse, semolinas and bran) in one operation. The collected fractions were mixed to obtain whole grain flour. Two types of flours (whole grain coarse and whole grain fine) were prepared from wheat by adjusting the mill to 3 mm for fine flour and 5 mm for coarse flour.

The flour particle sizes were chosen to represent the coarseness of flour manually ground using grinding stones in Lesotho for bread making. The mill was manually cleaned using appropriate cleaning devices before the milling of each grain sample. At the beginning of milling each grain type, the first 1kg of flour was discarded before collecting flour to be used for bread making. Flours were kept in sealed containers at 5^{o}C for a week before use.

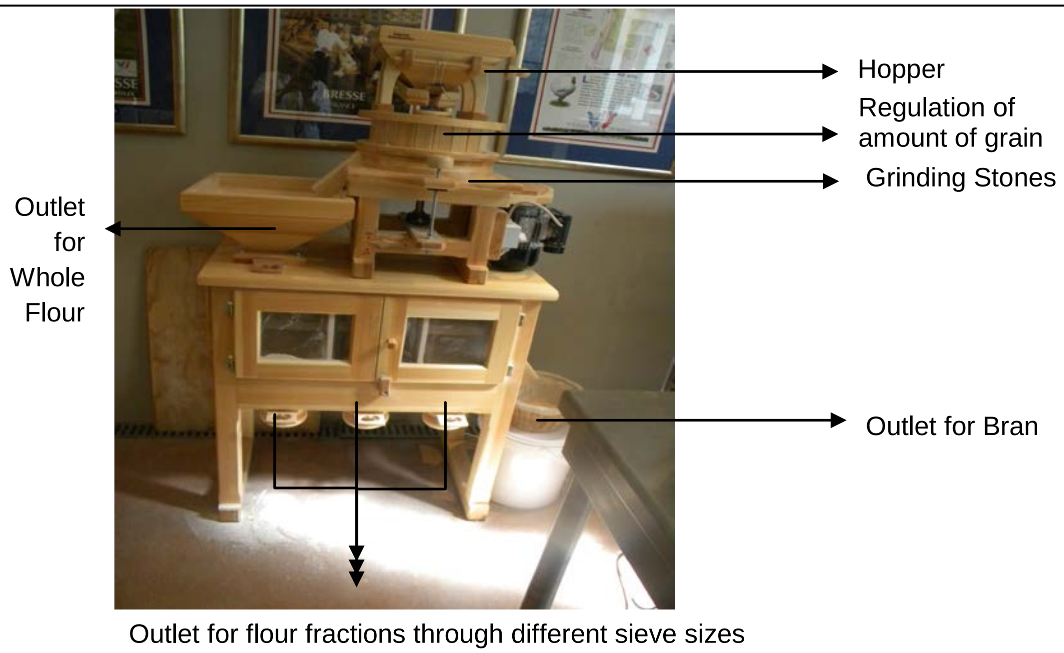

Figure 4.3: Original Osttiroler Getreidemuhlen used to mill maize, sorghum and wheat

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Table 4.10: Standardised recipe formulations used to prepare 8 steamed breads from whole grain flours and commercial flours

Ingredients	Wheat Breads			Sorghum Breads			Maize Breads	
	CWWheat	FWWheat	ComWheat	WRSorg	ComRSorg	WWhSorg	WWhMaize	ComWhMaize
Flour (g)								
Coarsely milled whole wheat (CWWheat)	170							
Finely milled whole wheat (FWWheat)		170						
Commercial wheat (ComWheat) *Letlotlo Easy Bake flour (Lesotho flour mills)*			170					
Whole grain red sorghum (WRSorg)				170				
Commercial red sorghum (ComRSorg) *Monati Super Mabela- pure grain sorghum fine meal [Nola Foods (Pty) Ltd South Africa],*					170			
Whole grain white sorghum (WWhSorg)						170		
Whole grain white maize (WWhMaize)							170	
Commercial special white maize (ComWhMaize) *Impala special maize meal (Premier Foods, Isando, South Africa)*								170
Water								
Luke warm water (g) (35^{o}C)	110	110	110					
Boiling water (g) (96^{o}C)				140	140	140	140	140
Sourdough (g) (1:1 w/w flour:tap water)	60	60	60	60	60	60	60	60
Instant yeast (g)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Salt (g)	3	3	3	2	2	2	2	2
Sugar (g)			10		15			15
Cooking oil (g)					10			10
Total weight (g)	343.5	343.5	353.5	372.5	397.5	372.5	372.5	397.5

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4.17.2.1 Commercial flour

Commercial maize and sorghum flours were bought at a supermarket in Pretoria, South Africa. Commercial wheat flour was bought at a supermarket in Maseru, Lesotho.

4.17.2.2 Flour particle size

Flour particle size fractions were determined according to the method used by Kebakile *et al.* (2008). The procedure included sifting 20 g of flour for 3 min through sieves of different mesh sizes (106, 250, 500, 1000 & 1400 µm) – Star screens test sieve-steel SABS 197–1971-Booysens 2016. The flour that passed through the different mesh sizes was weighed and the percentage to the total flour calculated. The procedure was repeated three times.

4.17.2.3 Proximate analysis of flours

The moisture content of the flours was determined by oven drying method AACC International (2000) Method 44–15A. Protein content was measured by the Dumas combustion method AACC International (2000), Method 46–30, using nitrogen conversion factors N × 5.83 for wheat and N × 6.25 for sorghum and maize flours. Crude fat was determined by a Soxhlet extraction method AACC International (2000), Method 30-25. Ash was determined using a muffle oven according to AACC International (2000), Method 08-01. The carbohydrate content was determined by the difference by summing up the determined values of moisture, ash, protein, crude fat and deducting from the total weight of the food (FAO, undated).

4.17.3 Preparation of sourdough

Sourdoughs (3000 g batches) were prepared from each type of flour. The ratio 1:1 w/w flour to tap water was used. The flour was thoroughly mixed with water by hand to form smooth ough. The dough was kept in a transparent plastic container with a lid and incubated at 25 °C to ferment for 24 h. The pH of sourdough was monitored on a daily basis. The varieties of sourdough were kept in the refrigerator (5°C) and fed with 1:1 (250 g:250 g) flour to tap water once a week to refresh it. Refreshed sourdough was left for 24 h before use.

The sourdough yield (DY) was calculated according to the formula proposed by Simpson *et al.* (2012:605) as follows:

$$DY = \frac{\text{(amount of flour + amount of water)}}{\text{Amount of flour}} \times 100$$

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$$DY = \frac{(1.5 + 1.5)}{1.5} \times 100$$

DY = 150

4.17.4 Preparation of breads

The dry ingredients were weighed and placed in a Kenwood Chef Excel Mixer – KM 210 model. For wheat breads, all other ingredients including the sourdough and luke warm water (35°C) were also weighed and added to the dry ingredients. The mixer with dough hook was run at speed 3 for 10 min. The dough was weighed before being transferred into a plastic bucket and incubated at 30°C for 3 h. The leavened dough was then pressed down with hands to release air and allowed to ferment again for a further 2 h.

To prepare **maize and sorghum breads**, the flour was weighed and placed into a transparent plastic container. Boiling water (96°C) was then added to the flour and the mixture was stirred with a wooden spoon and allowed to cool in a covered container. Sourdough and other ingredients were added to the cooled mixture and mixing was done with a Kenwood Chef Excel Mixer – KM 210 model at speed 3 for 5 min. The dough was weighed before being transferred back into the container to be incubated for 8 h at 30°C.

All the breads were steamed in an aluminium saucepan (8 L) with a tightly fitting lid as done by urban consumers in Lesotho. The fermented dough was weighed and shaped into a ball and placed in a round stainless steel bowl of 8 cm height and 12.5 cm diameter greased with sunflower oil. The bowl was then placed on a mesh of wires (steamer) that lifted the bread 6 cm above 2 L of boiling water. The bread was steamed for $1^1/_2$ h. Cooked bread was cooled for 30 min, packaged in zip lock plastic bags prior to weighing and freezing at -18°C before further analysis. The breads were prepared and cooked in triplicate.

4.17.5 Yield factor and nutritional value

The yield factor for each bread product was calculated in triplicate according to the formula suggested by Chettey, Wolmarans, Du Rand and Van Heerden (2011) as follows:

Yield factor (YF) = Cooked mass of food in grams ÷ raw mass of ingredient(s) in grams. *Multiplied by 100.*

$$YF = \frac{\text{Cooked mass of food in grams}}{\text{Raw mass of ingredients in grams}} \times 100$$

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Bodybyte software programme was used to calculate estimations of the nutritional composition of breads.

4.17.6 Standard breads

Two commercial breads, Plain Rye bread - Astoria bakery, South Africa and Sasko Premium whole wheat bread (Sasko bakeries, South Africa) were included as standards for the descriptive sensory testing. Table 4.11 lists the ingredients of these breads as indicated on the packaging material.

Table 4.11: Ingredients included in Sasko whole wheat bread and Astoria plain rye bread as listed on packaging

Ingredients		Breads	
		Sasko Premium Whole Wheat	Astoria Plain Rye
100% rye flour			√
Brown bread flour (White bread wheat flour, bran)		√	
Gluten		√	
Water		√	√
Yeast		√	√
Salt		√	√
Soybean flour		√	
Emulsifiers (vegetable origin)		√	
Preservative	- Calcium propionate	√	√
	- Calcium acetate		√
	- Sodium diacetate		√
Non-hydrogenated vegetable fat (palm fruit)		√	
Flour improver		√	
Enzymes (non-animal origin)		√	
Vitamins and mineral salts (electrolytic iron, zinc oxide)		√	

4.17.7 Total Titratable Acidity (TTA) and pH of sourdough and bread dough

The TTA and pH of sourdough and bread dough were determined according to the method used by Lonner, Welander, Molin and Dostalek (1986). A 5 g sample from each sourdough batch and from each bread dough batch was blended with 20ml distilled water. The pH was measured using a calibrated Hanna Instruments Microprocessor pH 211 meter fitted with a

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glass electrode. The pH value was recorded and the suspensions were then titrated with 0.1N NaOH to a final pH of 6.3. All tests were performed in triplicate from 0-2 days for sourdough. The TTA was expressed as % lactic acid (Henshaw & Ikpoh, 2010) as follows:

$$\frac{\mathrm{N\ x\ V1\ x\ Eqwt\ x\ 100}}{\mathrm{V2x\ 1000}} = \%\ \text{lactic acid}$$

N	= Normality of titrant (NaOH) = 0.1N
V1	= Volume of titrant (NaOH)
Eqwt	= Equivalent weight of lactic acid (constant) (mg/m Eq) = 90.08
V2	= Volume of sample (ml) = 5 ml

4.17.8 Physical properties of breads

The weights of the breads were recorded after 30 min of cooling. The bread volumes were measured by the rapeseed displacement method (Campbell, Penfield & Griswold, 1980:459) after weighing. Breads wrapped in zip locked plastic bags were placed in a graduated (5000ml) glass cylinder. The rapeseeds were then run into the same container until the container was full. The volume of seeds displaced by the loaf was recorded as the loaf volume. The specific volume of bread was then calculated according to the AACC method 10-05-01as follows:

$$\text{Specific Volume}\ \ (cm^3/\mathrm{g}) = \frac{\text{Loaf Volume}}{\text{Loaf Weight}}$$

4.17.8.1 Crumb texture

The crumb texture was determined on bread samples previously frozen and thawed overnight at room temperature (25°C), using the AACC method 74-09. Slices from the centre of each bread sample were used for the analysis. Steamed bread samples were sliced to a thickness of 2.5cm using an electric knife. For standards (Sasko Premium whole wheat bread and Astoria Plain Rye), 2 slices of 1.25 cm each, were stacked together. The texture was determined using an EZ – L Shimadzu texture analyser equipped with a 10mm diameter probe. The bread samples were positioned between the load cell and the plate of the machine. The load cell of 5000 N was used for traditional bread samples and a load cell of 50 N was used for commercial samples. The probe was then allowed to compress the crumb to a 40% compression limit (10-mm compression depth) at 10 mm/min speed. The analysis was performed at 3 positions (left, centre and right) of bread slices in triplicate.

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4.17.8.2 Bread appearance

Three slices from each bread type were thawed and photographed. The slices were cut to a 2.5 cm thickness from the centre using an electric knife. Photos were taken with a Nikon D700 digital camera equipped with a 105mm macro lens. The camera was attached to a copy stand at 0.5m distance from the bread slices. A neutral white paper background was used for all samples and the slices were illuminated with 2 Elinchrom flashes fitted with umbrellas. Pictures were processed in the Photoshop CS5 – University of Pretoria.

4.17.8.3 Colour measurements

Bread samples were removed from the freezer and thawed overnight at (25°C) for colour measurements determined with a Konica Minolta Chroma Meter CR – 400 (Konica Minolta Sensing, INC, NARICH cc). The colour meter was calibrated prior to the analysis with a standard white ceramic tile to the following values: L* = 97.40, a* = 0.10 and b* = 1.89. The colour measurements were recorded from the crumb of steamed bread slices in triplicate. The colour values were expressed as L* a* b* values. L* represent a measure of whiteness between a range of (0) black – (100) white, while a* represents positive values for reddish colours and negative values for greenish colours and b* reports positive values for yellowness and negative values for blueness. The L* a* b* values were used to calculate Chroma and hue angle using the following equations:

$$\text{Chroma} = \sqrt{a^2 + b^2}$$

Hue angle = tan-1(b/a)

4.18 DESCRIPTIVE SENSORY EVALUATION

Sensory characterisation of traditional Basotho bread was performed using the generic descriptive method (Einstein, 1991). A panel of 10 assessors carried out evaluation of breads. The descriptive sensory panel consisted of one male and nine females aged between 23 and 42 years. Prior to selection, assessors were subjected to a screening exercise that tested their ability to determine basic tastes, differences in colour, texture and aroma. Panellists also received orientation regarding the type of breads that they were going to evaluate and they signed a consent form, indicating their willingness to participate. Panellists participated in seven 2 h training sessions before the evaluation. It was during these training sessions that the panellists were familiarised with the actual bread products and they generated a detailed vocabulary of 36 sensory attributes describing texture, aroma and

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flavour differences among the breads (Table 4.12). They also reached a consensus on the reference standards and methodology to use.

The breads were thawed in sealed bags overnight at room temperature. Samples were sliced (1.5 cm) using an electric knife and three slices from the centre were used for sensory evaluation. The slices were cut into rectangular shapes (40 mm x 20 mm) of approximately 20g each. Each sample was placed in an individual transparent polyethylene zip-lock type bag (100 x 110 mm) labelled with a 3-digit random code. All ten bread samples were presented in a randomized order to the panellists.

Table 4.12 :Description lexicon used by the sensory panel to evaluate wheat, sorghum and maize breads.

Attributes	Definition	References	Scales
Aroma/smell			
Overall bread aroma	Intensity of the overall aroma of the bread		0 = Not intense 100= Very intense
Fermented aroma	Intensity of aroma associated with fermented bread	Wheat dough fermented for 8 h at 30°C = 100	0 = Not intense 100= Very intense
Yeasty	Intensity of aroma characteristic of yeast used as a leavening agent	Mixture of commercial instant yeast and water in a ratio of 1:1= 100	0 = Not intense 100= Very intense
Malty aroma	Intensity of aroma typical of African traditional beer with sour overtones	Sorghum beer (Chibuku) = 100	0 = Not intense 100= Very intense
Musty /earthy	Intensity of aroma typical of wet grains	Sorghum soaked in water for 24 h =100	0 = Not intense 100= Very intense
Cereals/ grain aroma	Intensity of aroma typical of cereal/grains (Sorghum, maize, wheat)	Whole grains (Wheat) =50	0 = Not intense 100= Very intense
Herbal aroma	Intensity of aroma characteristic of herbal tea	Black forest tea bag soaked in 250 ml boiling water =100	0 = Not intense 100 = Very intense
Cooked sorghum aroma	Intensity of aroma typical of cooked sorghum flour	Thick sorghum porridge (25% solids) =100	0 = Not intense 100= very intense
Freshly baked wheat bread aroma	Intensity of aroma characteristic of freshly baked wheat bread	Traditional white bread (Sasko) =100	0 = Not intense 100= Very intense

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Table 4.12 (continued) : Description lexicon used by the sensory panel to evaluate wheat, sorghum and maize breads

Dairy sour aroma	Intensity of aroma characteristic of fermented sour dairy products such as butter milk and cream cheese	Philadelphia Cream cheese = 100	0 =Not intense 100=Very intense
Texture attributes by touch			
Dryness of bread crumb	Degree of perceived dryness of bread by feeling with fingers	Traditional white bread (Sasko)=50	0 = Not dry/moist 100= Very dry
Crumbliness of bread crumb	Degree to which bread particles are loose when bread sample is rubbed between thumb and index fingers	Traditional white bread (Sasko)=100	0 = Not crumbly 100= Very crumbly
Springiness of bread crumb	Degree to which the sample returns to initial shape after moderate pressure by compressing the sample between thumb and index finger.	Traditional white bread (Sasko)=100	0 = Not springy 100= Very springy
Texture attributes by mouth feel			
Firmness of first bite	Analysis of first bite: force required by molars to bite bread.	Traditional white bread (Sasko)=50	0= Not firm 100= Very firm
Roughness of crumb	Degree of perceived abrasiveness on bread surface by lips. Presence of any particles, lumps, bumps, etc., in the product.	Taditional white bread (Sasko)=0	0= Not rough/smooth 100= Very rough
Dryness	Degree of perceived dryness in the mouth	Traditional white bread (Sasko)=50	0= Not dry/moist 100= Very dry
Cohesiveness	Degree to which the bread holds together or deforms while chewing in the mouth	Cooked coarsely ground thick maize porridge (35% solids) = 100	0= Not cohesive 100= Very cohesive
Graininess /grittiness	Degree to which bread contains small grainy particles.	Cooked coarsely ground thick sorghum porridge(35% solids) = 100	0= Not grainy 100= Very grainy
Heaviness	Weight of product perceived when first placed on tongue.	Traditional white bread (Sasko)=50	0= Not heavy 100= Very heavy
Firmness of crumb	Degree to which bread deforms during chewing in the mouth	Traditional white bread (Sasko)=50	0= Not firm 100= Very firm
Chewiness	Number of chews required before bread is ready for swallowing	Traditional white bread (Sasko)=50	0= Few 100= Many
Fibrousness / bran	The amount of fibers/bran present in the bread	Cooked coarsely ground thick maize porridge (35% solids = 100)	0= Not fibrous 100= Very fibrous

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Table 4.12 (continued) : Description lexicon used by the sensory panel to evaluate wheat, sorghum and maize breads.

Flavour (taste and aroma)			
Intensity of overall flavor of bread crumb	Intensity of overall flavour of bread crumb while chewing		0= Not intense 100= Very intense
Cooked whole wheat flavour	Intensity of taste typical of bread made with wheat flour	Cooked whole wheat =100	0= Not intense 100= Very intense
Cooked Sorghum flavour	Intensity of flavour characteristic of cooked sorghum	Cooked thick sorghum porridge (pap) =100	0= Not intense 100= Very intense
Cooked maize flavour	Intensity of flavour characteristic of cooked maize meal	Cooked thick maize porridge (pap)	0= Not intense 100= Very intense
Malty flavour	Intensity of flavour associated with dark beer with sour overtones.	Sorghum beer (Chibuku) =100	0= Not intense 100= very intense
Musty (stale)	The aromatics associated with wet grain and damp earth	Wet sorghum grain soaked for 24 h =100	0= Not intense 100= very intense
Sweet taste	Intensity of basic taste characteristic of sucrose	Sucrose solution 16 g/L = 100	0= Not intense 100= Very intense
Salty taste	Intensity of basic taste characteristic of table	Salt solution 5 g/L =100	0= Not intense 100= Very intense
Sour taste	Intensity of basic taste characteristic of lactic acid	Sorghum beer (Chibuku) = 100	0= Not intense 100= Very intense
Bitter taste	Intensity of basic bitter taste characteristic of caffeine or tannin.	Strong black tea =100	0= Not intense 100= Very intense
Astringent	Intensity of a lingering sensation that coats, dries and numbs the mouth, palate and tongue.	Sorghum beer (Chibuku) = 100	0= Not intense 100= Very intense
After taste			
Overall Intensity of aftertaste of bread	Intensity of taste of crumb staying in mouth after tasting		0= Not intense 100= Very intense
Residue			
Grainy/ Presence of grainy residue	The amount of grains left in the mouth after swallowing		0= No grains 100= Many grains left after swallowing
Fibrous/ presence of bran residue	The amount of bran left in the mouth after swallowing		0= No fibrous residue 100= Extensive fibrous residue

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Evaluation of the breads was performed in three sessions of 1 h each carried out on three consecutive days. During the evaluation each panellist was provided with filtered water and asked to cleanse their palates before and between tasting of samples. In addition assessors were also provided with reference samples and a list of attributes including their descriptions to help them with sample evaluation. Panellists were supervised throughout the testing period. Attribute intensities were rated on structured line scales with the left side of the scale representing the lowest intensity (0) and the right side representing the highest intensity (100) of the attribute. The test was carried out in the sensory laboratory of the University of Pretoria. Compusense ® five, release 4.6 (Compusense, Guelph, Canada) was used to collect responses. The individual booths in the laboratory enabled panellists to be positioned independently and free from distractions and panellists evaluated the breads under red light.

4.19 STATISTICAL ANALYSIS

Analysis of variance (ANOVA) was performed to determine the effect of independent variables (Bread types) on dependent variables (pH, TTA, texture, colour and sensory attributes). All means were compared using the least significant difference (LSD) test at $p \leq 0.05$. The mean scores of significant sensory attributes were subjected to principal component analysis (PCA), using the correlation matrix with bread types in columns and attributes in rows. The data processing was performed using SAS ® version 9.3 (SAS Institute INC, SAS campus Drive, Cary, NC 27513) under Microsoft Windows XP (SP3) on a desk top computer.

4.20 CONCEPTUALISATION AND OPERATIONALISATION FOR PHASE 3

Table 4.13 presents the operationalisation to achieve primary objective 6 and its sub-objectives. The methodology in this chapter clearly describes measurement of all indicators listed in Table 4.13.

4.21 SUMMARY

The chapter outlined three phases used to collect data. Phase 1 was basically mixed methodology convergent parallel design to collect information using focus groups and questionnaire on knowledge, recipes, frequency of consumption and acceptability of traditional Basotho bread as influenced by culture, age group and location. Phase 2 dealt with recipe standardisation while phase 3 was on the characteristics of breads including pH, TTA, instrumental texture analysis and sensory evaluation of breads. Appropriate procedures were

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applied to analyse data. The methodology employed helped to build one phase using the results obtained from the preceding phase. The next chapter provides the results for both the preliminary and the main study.

Table 4.13: Conceptualisation and operationalisation for phase 3

Primary objective 7. To profile and characterise traditional Basotho bread.					
Objective	Concept	Dimensions	Indicators	Measuring Instrument	Data Analysis
7.1 To determine the pH and TTA of sourdough and bread dough for Basotho breads prepared from wheat, maize and sorghum flour.	Characteristics of standardised recipes	Acidity of sourdough and bread dough	pH and TTA	pH meter	Statistical means, and PCA 5% level of significance
7.2 To determine the sensory attributes of bread prepared from wheat, maize and sorghum		Sensory characteristics	Appearance Texture Flavour Aroma	Descriptive sensory panel	
7.3. To determine the physical characteristics of Basotho breads prepared from wheat, maize and sorghum flour.		Physical characteristics	Texture Colour Volume Weight	Instrumental texture analyser Colour meter Rape seed method Measuring scale	

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Chapter 5:

RESULTS AND DISCUSSION OF PHASE 1

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SECTION C – INFLUENCE OF REGIONS AND GENERATIONS ON PREPARATION AND ACCEPTANCE OF BASOTHO BREAD

SECTION D – CULTURAL AND CONTEXT INFLUENCE ON BREAD ACCEPTANCE

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Chapter 5:

RESULTS AND DISCUSSION OF PHASE 1

This chapter presents the findings of data collected and analysed in phase 1 of the study. Data is presented in 4 sections covering 4 objectives of phase1

5.1 INTRODUCTION

The purpose of chapter 5 is to merge concurrent quantitative and qualitative data addressing the first 4 objectives of the study. The objectives addressed in phase 1 of this study were:

1. To identify and describe different types of traditional breads prepared in Lesotho.
2. To investigate past and current culinary practices related to Basotho traditional bread.
3. To investigate to what extent regions and generations affect preparation and consumption of traditional bread.
4. To investigate the impact of Basotho culture on traditional bread acceptance using a cultural hedonic framework.

The findings are presented according to the objectives in which qualitative data is presented chiefly in a table format showing categories, concepts and participants' statements following questions and themes as was done by Dicks (2007). Charts and graphs illustrating numbers of the quantitative data are merged in the discussion to clarify the same conceptual phenomena. Photographs are included in order to support interpretations. The discussion starts with a brief description of the demographic data of respondents. Figure 5.2 shows the order in which topics and sub-topics fllow in section A of chapter 5.

SECTION A

Following a brief description of demographic data, this section presents the findings of the research on names and description of traditional Basotho breads (Objective 1)

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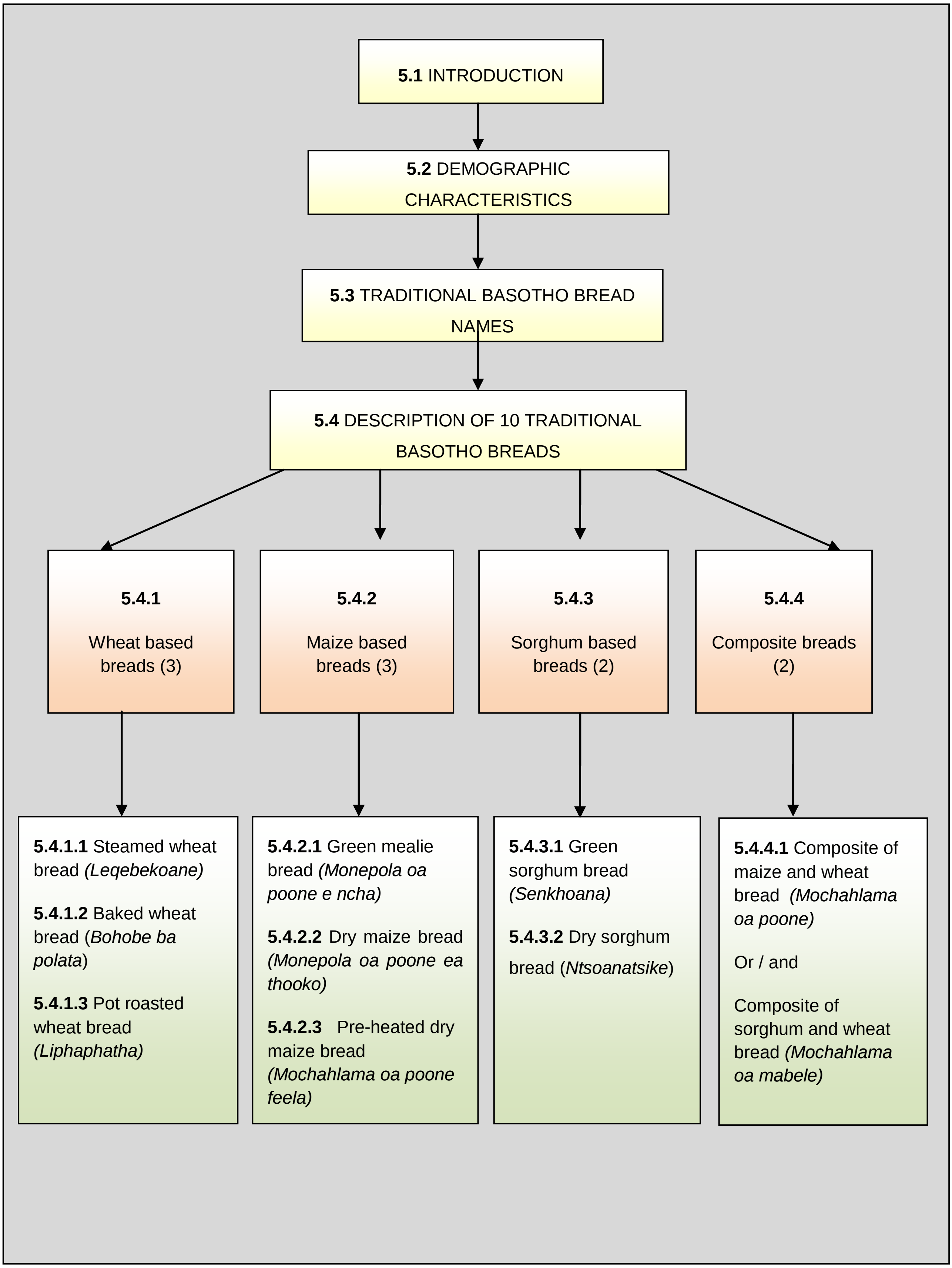

Figure 5.1: Flow chart for Section A of Chapter 5

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5.2 DEMOGRAPHIC CHARACTERISTICS OF PHASE 1 PARTICIPANTS

Table 5.1 present the findings on demographic characteristics of participants in phase 1. All (100%, n=253) respondents who filled in the questionnaire were females. These women came from the rural and urban areas as shown in Table 5.1. The age distribution of participants ranged from 28 to over 61y. The sample was not systematically drawn; the findings may be associated with the fact that women of this age are knowledgeable about different types of traditional Basotho bread and more actively engaged in bread preparation activities compared to older women who may not handle laborious activities, involved in bread making. The level of education varied from no formal education to tertiary education.

Table 5.1: Demographic information on 253 female respondents that completed the questionnaire

Variables	Category	Percentage % (n)
Location	Rural	39.5 (100)
	Urban	60.5 (153)
Age (years)	28	11.9 (30)
	29-41	20.6 (51)
	42-60	41.9 (106)
	> 61	25.7 (65)
Level of Education	No formal education	1.2 (3)
	Primary school	60.9 (154)
	Secondary school	31.2 (79)
	Tertiary school	6.7 (17)

BREAD NAMES

5.3 TRADITIONAL BASOTHO BREADS PREPARED FROM WHEAT, MAIZE AND SORGHUM AS WELL AS COMPOSITED FLOURS

Different types of traditional Basotho breads were identified during the preliminary study and are presented in Figure 5.2. The findings indicated that Basotho prepare bread from wheat, maize and sorghum as well as from a mixture of wheat and maize or a mixture of wheat and sorghum.

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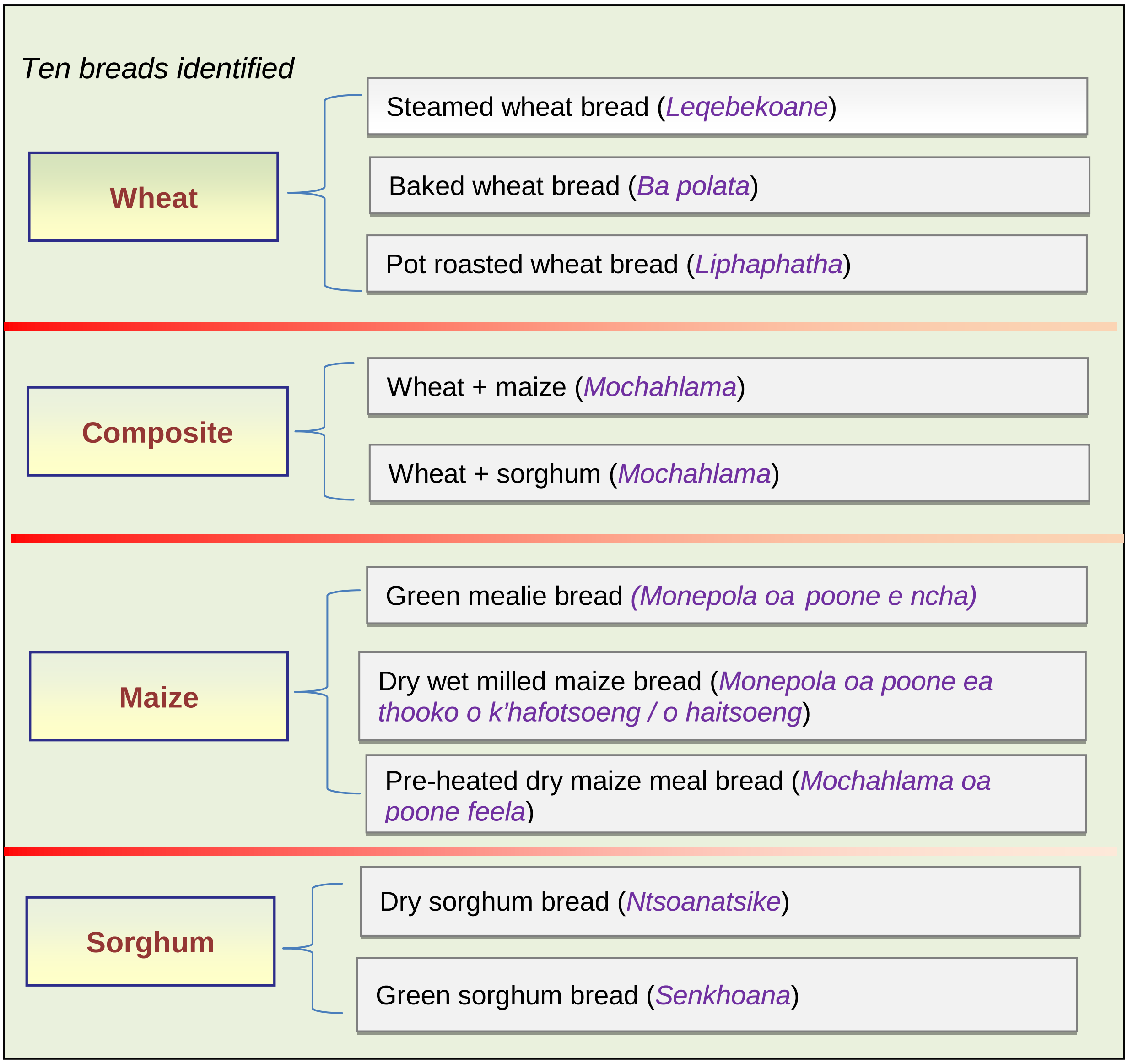

Figure 5.2: Traditional Basotho breads identified during the preliminary study

DESCRIPTION OF THE TEN BREADS

5.4 DESCRIPTION OF 10 TRADITIONAL BASOTHO BREADS AND PARTICIPANTS PERCEPTIONS OF THEIR SENSORY CHARACTERISTICS

Focus group participants gave an overall description of 10 traditional Basotho breads identified in the preliminary data collection. Participants' perceptions of sensory characteristics for breads are presented in this section.

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5.4.1 Wheat-based breads (*Leqebekoane, Bohobe ba polata & Liphaphatha*)

Steamed wheat bread (*Leqebekoane)*, baked wheat bread (*Bohobeba polata)* and pot roasted wheat bread (*Liphaphatha)* are traditional Basotho breads prepared from wheat flour, sourdough or commercial yeast, salt and warm water. The bread dough preparation method is the same for all the three breads, but the difference comes with the cooking methods as the names suggest. Flour is mixed with salt, raising agent and sometimes sugar. However, all participants only use sugar when making bread using commercial flour (Whole wheat flour, bread flour and Easy bake flour) and do not add sugar when they use flour from ground whole wheat grains. One of the respondents (83 y) commented:

> *Lesotho does not have sugar cane; we do not understand why Basotho nowadays like to add sugar in bread. Sugar is not part of Basotho ingredients.*

And another respondent said:

> *Sugar is optional in bread making. Basotho used to prepare bread without any sugar. We still do not like to add sugar in bread. This is because whole wheat flour can produce sweet tasting bread on its own.*

Warm water is added to all the ingredients and kneading continues until the housewife is satisfied with the signs of a well-developed dough (details of these signs are given in section B, table 5.29). The dough is then covered and left to ferment.

5.4.2 Perception of participants on dehulled wheat bread products

Participants indicated that dehulling wheat can improve the colour of wheat bread by making the colour lighter and therefore resulting in attractive products. They mentioned that dehulled wheat flour products would have relatively higher volume than undehulled wheat flour products. Dehulling wheat is said to produce bread with less dense and softer texture. These qualities of dehulled wheat flour suggest higher acceptance of products over undehulled wheat flour bread.

5.4.2.1 Steamed bread *(Leqebekoane*)

The ingredients used for steamed wheat bread in the five regions are presented in Table 5.2. According to the information in Table 5.2, steamed wheat bread is prepared from wheat, salt, sugar, yeast, warm water and sourdough. However, sugar and commercial yeast are not commonly used in the rural regions (Mokhotlong and Thaba-Tseka). Steamed wheat bread is cooked in a three legged iron pot in rural areas or in a big saucepan over a paraffin or a gas stove in urban areas. To cook the steamed wheat bread, the dough is shaped into round balls

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and placed over the prepared steamer (details of constructing the steamer are given in Section C of this chapter. The pot is then filled with water up to the level of the steamer and left to boil prior to adding the dough. Bread is allowed to steam in a pot covered throughout the process, but water may be replenished as needed.

Table 5.2: Original recipes for steamed wheat bread (*Leqebekoane*) prepared from 5 regions of Lesotho

	Regions									
	Leribe		Mafeteng		Mokhotlong		Thaba-Tseka		Maseru	
Ingredients	g	%	g	%	g	%	g	%	g	%
Wheat flour	2100	100	1400	100	2200	100	2000	100	1250	100
Salt	25	1.66	25	1.78	30	1.36	25	1.25	20	1.6
Sugar	60	4	25	1.78	-	-	-	-	80	6.4
Yeast	10	0.66	10	0.7	-	-	-	-	10	0.8
Warm water	1350	64	1000	70	1130	51.4	1200	60	800	64
Sourdough	-	-	50	3.57	250	11.4	500	20	125	10

- Participants' perceptions of sensory qualities of steamed wheat bread

Texture, colour and flavour were said to be the most important quality attributes for steamed wheat bread. Participants described traditional steamed wheat bread as round and/or oblong shape, with a soft thin skin that forms a smooth semi glossy finish without a crust (Figure 5.3). They said that the bread should have a high volume, with well distributed air cells. The texture varies from soft (when commercial wheat flour) is used and heavy (when flour from cultivated wheat is used). Moist, dense as well as open textures were all perceived as typical characteristics of steamed wheat bread. Other researchers reported similar properties of steamed wheat bread in other cultures (Wen, Lorenz, Martin, Stewart & Sampson 1996; Ang *et al.,* 1999:15; Rubenthaler *et al.,* 1990; Sun, 2007; Lombard *et al.,* 2000; Manley & Nel, 1999). The discussion with participants revealed that the colour of steamed wheat bread depends on the type of wheat flour used. The cultivated wheat produces dark brown bread and sometimes-golden brown bread especially from dehulled wheat. Commercial wheat produces a light brown bread with well distributed specks of bran around the bread (Figure 5.3).

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Figure 5.3: Steamed wheat bread prepared from commercial flour (Easy bake): showing the distribution of fibre on the skin of the bread. Photograph by Pulane Nkhabutlane, April 2011.

5.4.2.2 Baked Basotho wheat bread (Bohobe ba polata)

Baked wheat bread was prepared according to the ingredients listed in Table 5.3 for each region. Sourdough was not used in Leribe which is one of the urban areas and participants in Leribe used the highest proportion of sugar to flour than those in the other regions. Traditionally and currently baked Basotho wheat bread (*Bohobe ba polata*) is cooked in a flat cast iron pot (*Pitsa ea polata*) using coals from cow dung (*Lisu/Likhapane*) (Figure 5.4). This type of fuel is easily available from livestock and, with its slow heating capacity, it is considered the most suitable source of heat for baking wheat bread. The fire is prepared well in advance and bread can only be baked when all coals are ready. The flat iron pot is then greased traditionally using animal fat (*ts'otso*) and nowadays housewives greased with cooking oil. The hot coals are then placed on top of the lid and underneath the pot as seen in Figure 5.4. Poor people in urban areas collect wasted fabric from the clothing industries and use these to make fire for baking, using a cast iron flat pot. This practice was seen in Leribe-Maputsoe during focus group demonstrations. The modern ways of cooking traditional baked wheat bread is practiced in the urban areas and it includes the use of a large aluminium pot on a paraffin heater, paraffin or gas stove. The challenge with the modern method is that the heat comes only underneath the pot and the upper side of the bread cannot be cooked unless it is turned during the baking process in order to cook both the bottom and the top sides. In order to overcome this problem, participants in Mafeteng–Makaung demonstrated the cooking method that they called a combination method of cooking wheat bread. In this method, a small tin is filled with water and placed right at the centre of the pot just before putting round balls of dough around it in a greased saucepan. During the cooking process the

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water boils and provides steam to the top part of the bread, while baking occurs at the bottom so the bread is cooked by both baking and steaming at the same time.

Table 5.3: Original recipes of baked wheat bread (*Bohobe ba polata*) from 5 regions of Lesotho

	Regions									
	Leribe		Mafeteng		Mokhotlong		Thaba–Tseka		Maseru	
Ingredients	g	%	g	%	g	%	g	%	g	%
Wheat flour	1300	100	1400	100	3000	100	3100	100	2250	100
Salt	15	1.15	15	1.07	35	1.16	30	0.97	30	1.3
Sugar	80	6.15	40	2.85	-	-	-	-	100	4.4
Yeast	10	0.76	15	1.07	-	-	-	-	15	0.7
Warm water	800	61.5	1000	71.4	1600	53.3	1700	54.8	1520	67.5
Sourdough	-	-	50	3.57	350	11.7	500	16. 1	-	-

- Participant's perceptions of sensory qualities of baked wheat bread

Baked wheat bread possesses similar quality characteristics as steamed wheat bread in terms of volume, shape, and crumb colour as well as crumb texture. Well baked Basotho wheat bread must have a golden brown crust (Figure 5.4 B & D) and aroma of freshly baked wheat bread. According to participants, the baked brown crust can be too hard for children and old people unless it is dampened with plain or sweetened water and wrapped with a clean cloth while still hot. Undercooking, mostly due to inadequate heating or sometimes short cooking time, result in a sticky, rubbery crumb texture and doughy flavour.

5.4.2.3 Pot roasted wheat bread (*Liphaphatha*)

Pot roasted breads (*Liphaphatha*) are also made from fermented wheat dough like steamed and baked wheat bread. The ingredients for pot roasted bread in different regions are shown in Table 5.4. The preparation method is outlined in the flow chart Figure 5.5. The method differs from the other wheat breads in that it involves flattening the dough on a floured Basotho mat (*Sethebe*) and cutting it into round, square or rectangle shapes as desired by the housewife. Depending on the skill of the housewife or the practices in different regions,

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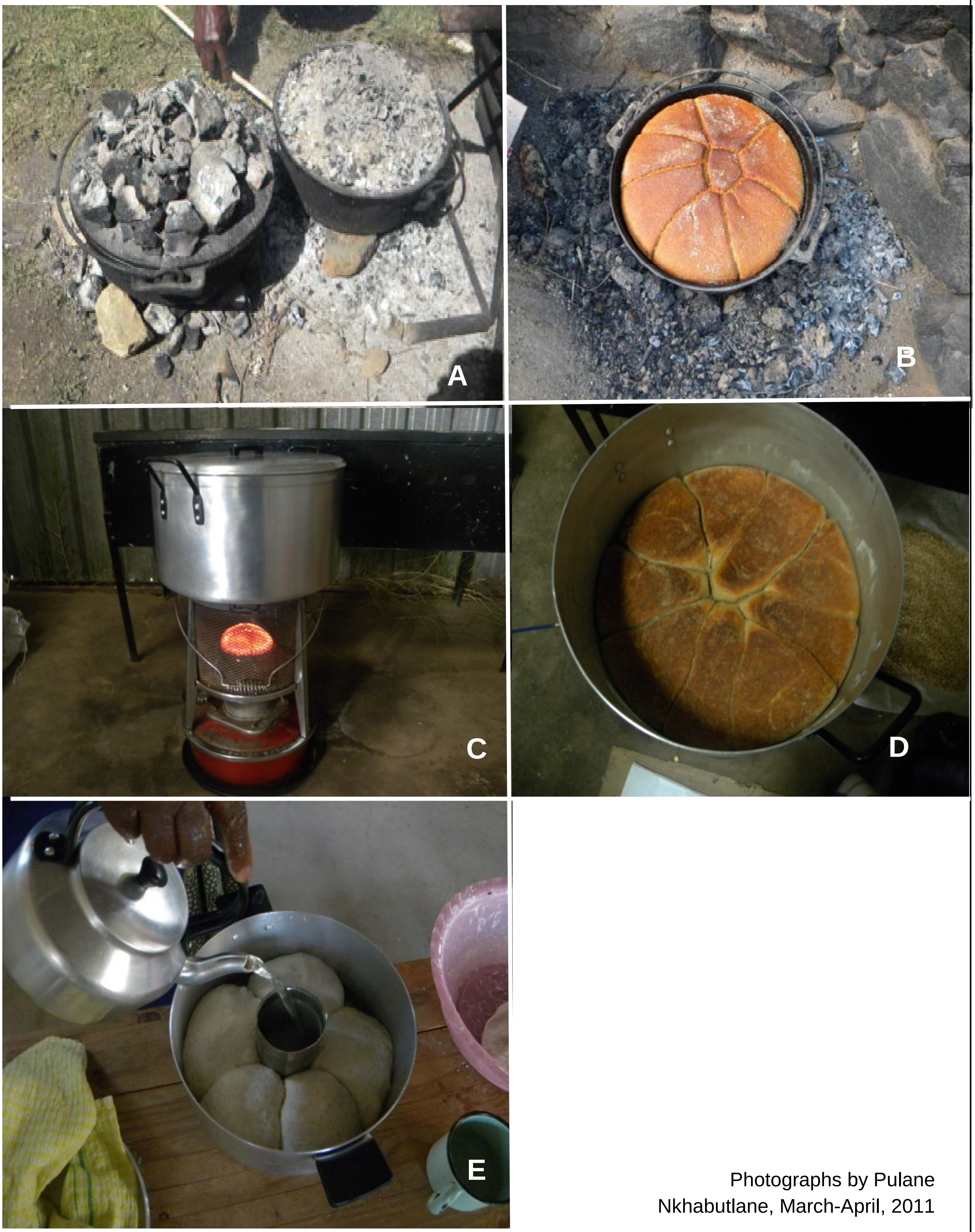

Photographs by Pulane Nkhabutlane, March-April, 2011

Figure 5.4: Baked wheat bread: A - live coals on a flat three legged iron pot, B - baked bread inside a flat iron pot, C - baking using a saucepan on a paraffin heater, D - baked bread turned to cook the other side, E - a combination method of baking and steaming

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the dough may also be flattened in the palms of the hands to about 2 cm thick. The flattened pieces of dough are allowed to rest for sometime so that the dough can rise to its maximum before it is roasted. The roasting is done on a hot surface of a three legged flat pot or normal round based three legged pot. Sometimes it is done over the iron pot lid. Urban participants use a saucepan over a paraffin heater. The hot surface used for roasting is sprinkled with a little flour and is not greased. Roasted breads are cooked on the bottom side first and have to be turned in order to brown both sides.

Table 5.4: Original recipes of pot roasted wheat bread (*Liphaphatha*) from the 5 regions of Lesotho

	Regions									
	Leribe		Mafeteng		Mokhotlong		Thaba--Tseka		Maseru	
Ingredients	g	%	g	%	g	%	g	%	g	%
Wheat flour	1500	100	1300	100	2350	100	3200	100	1250	100
Salt	15	1.66	15	1.15	25	1.06	25	0.78	15	1.2
Sugar	80	4	50	3.85	60	2.55	40	1.25	50	4
Yeast	10	0.66	15	1.15	-	-	50	0.15	10	0.8
Warm water	1100	73	1000	76.9	1400	59.6	1900	59.3	750	60
Sourdough	-	-	50	3.85	250	10.6	500	15.6	125	10

- Participants' perceptions of sensory qualities of pot roasted wheat bread

Pot roasted flat breads (*Liphaphatha*) have a floury golden brown hard crust and a soft crumb (Figure 5.6). Immediately after cooking, the crust is dampened with a little water and wrapped with a clean cloth to soften. This is perceived as a good quality of roasted bread by Basotho. The urban people add sugar to the water which is used for dampening the crust and this sugar adds a sweet taste and improves the taste of pot roasted bread.

5.4.3 Maize-based breads (*Monepola oa poone encha, Monepola oa poone ea thooko o kh'afotsoeng and o haitsoeng, Mochahlama oa poone feela)*

Three types of maize breads were identified: Green mealie bread (*Monepla oa poone e ncha*), dry wet milled maize (*Monepola oa poone ea thooko o kh'afotsoeng and o haitsoeng*) and dry pre-heated maize meal bread (*Mochahlama oa poone feela*).

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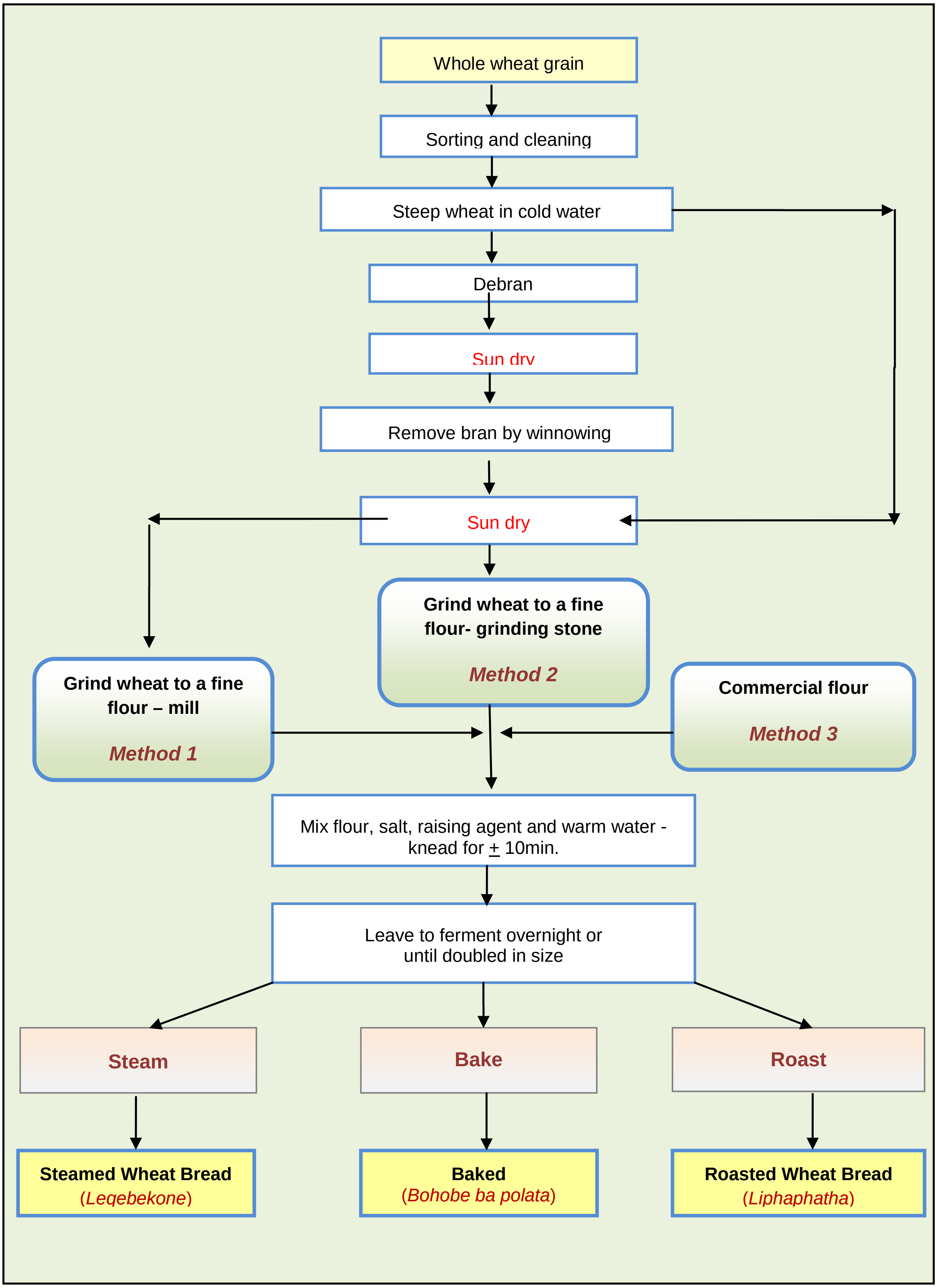

Figure 5.5: Flow chart indicating the preparation of steamed, baked and pot roasted wheat bread

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Photographs by Pulane Nkhabutlane, April 2011

Figure 5.6: Pot roasted wheat bread cooked on the inside surface of iron pot lid.

5.4.3.1 Green mealie bread (*Monepola oa poone e ncha*)

Table 5.5 shows the quantities of green mealies used to prepare green mealie bread in five regions. Green mealie bread is a traditional Basotho bread that is usually prepared in autumn due to limited availability of dry maize. The bread is prepared while housewives are waiting for their maize crops to dry up in the fields. The preparation method involves wet milling of green mealie kernels to a thick dough on a grinding stone and adding a little salt for taste (Figure 5.8). The dough is shaped into cob like shapes and covered with maize leaves or husks (Figure 5.7). The covered dough is then placed over the steamer and allowed to steam until completely cooked. Three names for this bread were noted in different regions as *'Malitsibana* which means feather like appearance, *Mohlefe* which means very fibrous and *Monepola oa poone e ncha* meaning wet milled green mealie bread. No starter is added to this bread. Green mealies are wet enough to easily form a paste/dough when wet milled. This is why water is not added to this bread.

Table 5.5: Ingredients for green mealie bread (*Monepola oa poone e ncha*) from 5 regions of Lesotho

	Regions				
	Leribe	Mafeteng	Mokhotlong	Thaba–Tseka	Maseru
Ingredients	g	g	g	g	g
Green mealies	1900	2000	1700	3200	2000

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Figure 5.7: The picture showing a Mosotho woman wrapping green mealie bread in green mealie leaves (A), the wrapped bread is steamed in a three legged pot (B) in regions Thaba-Tseka, Mohlakeng.

The step by step method to prepare green mealie bread is presented in a flow chart Figure 5.8.

- Participants' perceptions of sensory qualities of *Monepola oa poone e ncha*

Participants described the qualities of green mealie bread as whitish and yellowish depending on the variety of maize used. The texture qualities include heavy, compact and fibrous. With these qualities, the bread is preferred for its quick satiating value. Consumers like the bread because of the green maize aroma which is very intense. Participants who have not eaten this bread expressed the desire to prepare it in their households. One woman expressed her liking of the bread by saying:

> *I like this bread although I have not eaten it before. It tastes like green mealies, I am going to cook it in my household and I just hope my children will like it.*

5.4.3.2 Dry maize bread (*Monepola oa poone ea thooko o kh'afotsoeng and o haitsoeng)*

Dry maize bread (*Monepola oa poone ea thooko*) is a fermented traditional Basotho bread prepared from dry maize and other ingredients, as shown in Table 5.6. Salt was not

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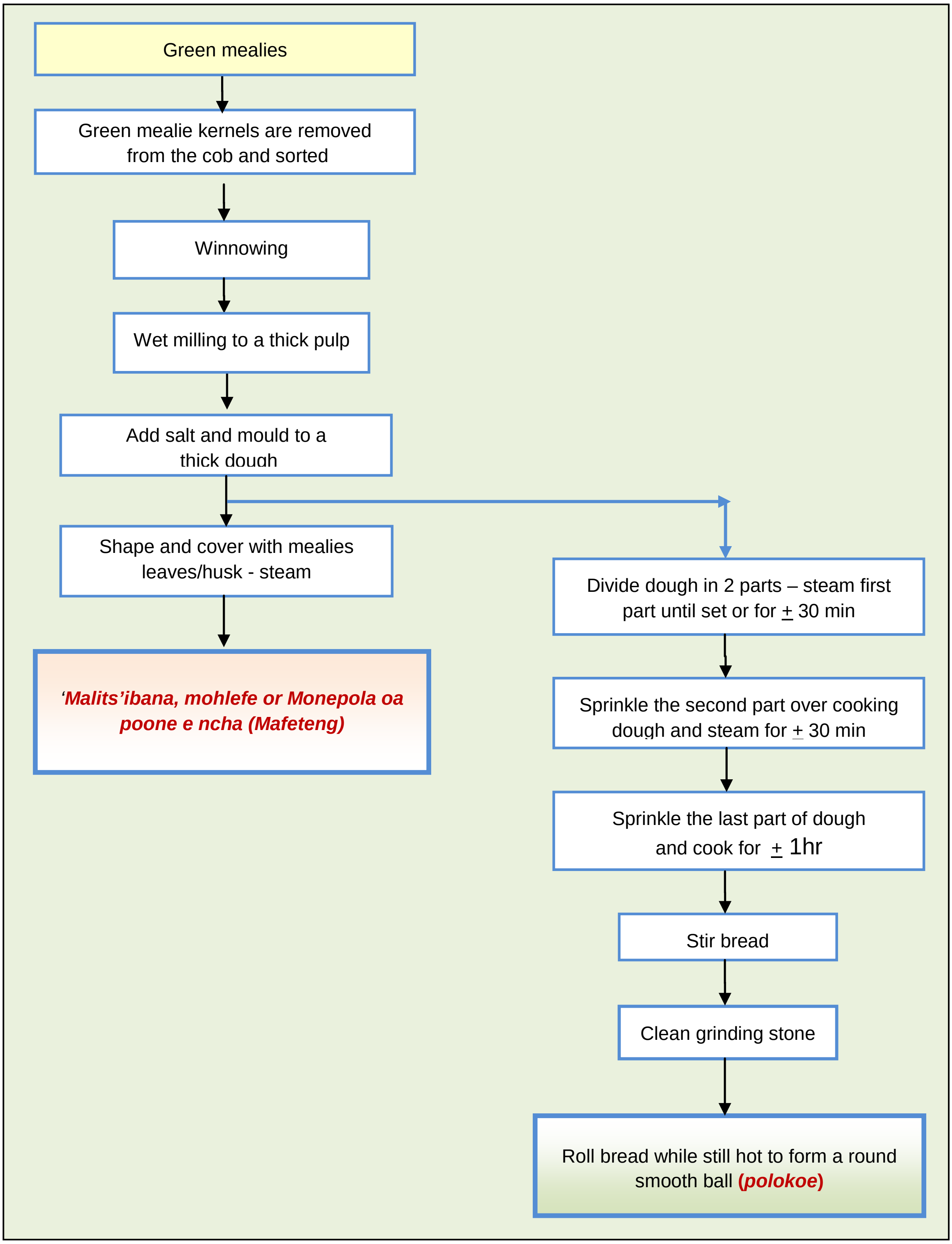

Figure 5.8: Flow chart for the preparation of green mealie bread (*Monepola oa poone e ncha*)

added to this bread in the three regions investigated. *Monepola oa poone ea thooko* has similar preparation techniques as a fermented maize product, *Kenkey* prepared in Ghana

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(Nout 2009; Nche *et al.,* 1996; Nout *et al.,* 1996). During its preparation cleaned dry maize kernels are soaked to soften the pericarp, so that it is easily removed when the maize is crushed. The process of crushing wet maize on a grinding stone is referred to as *Ho-kh'afola* by Basotho. The loose bran is further removed by hand when the crushed maize meal is shaken several times (*ho-hlokola*) in a bowl. The remaining gritty maize meal is mixed with warm water and allowed to soften for 2-3 h prior to wet milling. Alternatively to prepare *Monepola oa poone ea thooko o haitsoeng* the dry maize kernels are coarsely ground on a grinding stone and then mixed with water to soften in order to facilitate wet milling.

Table 5.6: Original recipes of dry maize bread (*Monepola oa poone ea thooko o haitsoeng*) from the 5 regions of Lesotho

	Regions									
	Leribe		Mafeteng		Mokhotlong		Thaba–Tseka		Maseru	
Ingredients	g	%	g	%	g	%	g	%	g	%
Maize meal	1800	100	1200	100	2100	100	1600	100	2200	100
Salt	-	-	-	-	15	0.7	-	-	15	0.68
Warm water	750	41.6	500	41.6	1000	47.6	1000	62.5	1000	45.5
Sourdough	200	11.1	250	20.8	500	23.8	400	25	600	27.3

The wet milled dough (Figure 5.9) is divided into 2 equal parts. The first half is moulded into small rectangular shapes that are steamed over the steamer for 10 min. to pre-cook the starch. The steamed mixture is then mixed with the remaining half and kneaded to form a sticky dough. In the present study in all the regions, participants agreed that in Lesotho there is no specific term given to either gelatinised maize meal or to the entire process. However, they described the purpose of the gelatinised mixture as a binding substance to enhance the moulding of maize dough into balls.

Literature revealed that in Ghana, a similar type of bread is prepared and the steamed mixture is referred to as *Aflata.* The process of mixing both the steamed dough and the raw dough (Figure 5.10) is referred to as *Aflatasation* (Nout, 2009; Nche *et al.,* 1996; Nout *et al.,* 1996; FAO, undated; Nche *et al.* (1996) also stated that the gelatinized mixture is used as a binding substance.

The starter (traditional beer (*joala*), sour porridge supernatant (*lekoele)* or sourdough (*tomoso*) is then added and the dough allowed to ferment overnight or for about 8-9 h depending on the level of sourness desired by a housewife. This therefore presents itself as

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Figure 5.9: Wet milling dry maize dough (*Ho nepola*), Maseru, Thaba-Bosiu

the major difference with the *kenkey* in Ghana, which is fermented for 3-4 days (Nout, 2009; Blandino, Al-Aseeri, Pandiella, Cantero & Webb, 2003; Nche *et al.,* 1996; Nout *et al.,* 1996 & FAO, undated). Apart from sourness, the fermented maize dough will have both large and small cracks depending on the consistency of the dough indicating that the dough is well fermented. Fermented dough is moulded into balls and steamed (Figure 5.10) using the traditional steamer.

A variation for the preparation of *Monepola oa poone ea thooko* was noted in Mafeteng and Leribe regions*.* In this method the initial steps including fermentation are similar to the first method, both soaked and dry maize kernels are used up to the stage when half of the mixture is shaped into small balls and steamed (Figure 5.9). In this variation, the remaining raw dough is sprinkled on top of the steaming dough and allowed to cook. The process of sprinkling is continued at intervals, until all the raw dough is finished. The pot is covered and bread is cooked until all the water has evaporated. Details on the variation method are given under sorghum breads in the next section.

When the bread is fully cooked, the steamer is removed and the bread allowed to drop in to the pot to be completely stirred using a wooden stick (*Lesokoana*). The stirred maize bread is then rolled on a grinding stone to a smooth round ball (*Polokoe*) (Figure 5.11) and it is ready to be served. A good quality *Polokoe* should be smooth without cracks. The preparation of *polokoe* is regarded as a skill on which a newly married woman is tested. In order to get an

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impression about her upbringing and an indication of whether she will be able to take care of the family. An alternative is to mould the dough into round balls as soon as it has fermented as done in steamed wheat bread and to cook on the steamer.

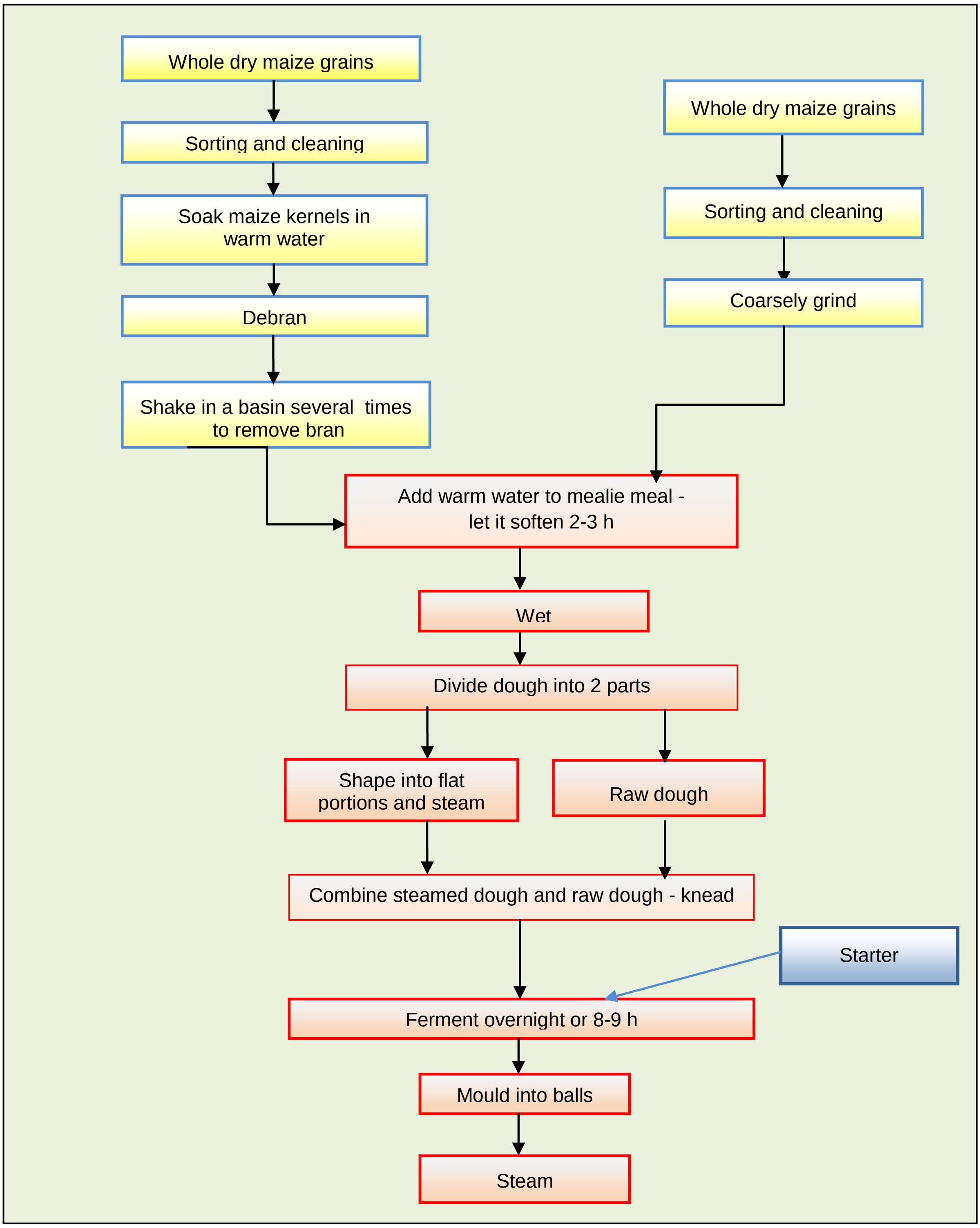

Figure 5.10: Flow chart of the preparation of dry maize bread (*Monepola oa poone ea thooko o k'hafotsoeng)* and (*Monepola oa poone ea thooko o haitsoeng*)

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Figure 5.11: Dry maize bread shaped into a smooth round ball (*Polokoe*)

- Participants' perceptions of sensory qualities of ***Monepola oa poone ea thooko***

The colour of *monepola oa poone ea thooko* was described as greyish white, and yellowish white depending on the maize variety used and handling during preparation. This bread is also preferred with both fresh and sour milk. In general, *monepola oa poone ea thooko* is heavy, and very dense, depending on the milling skill of the housewife. The bread texture also varies from fine to coarse, but it should not be crumbly or sticky. Participants also mentioned that the sour taste in *monepola oa poone ea thooko* is considered the most important sensory attribute.

5.4.3.3 Pre-heated dry maize bread (*Mochahlama oa poone feela*)

Mochahlama oa poone feela is a fermented bread prepared from dry maize meal. Boiling water is added to maize meal and the mixture is left covered until it cools. Then the starter [(traditional beer *(joala*), sour porridge supernatant (*tomoso ea motoho*) or sourdough (*tomoso)*] and salt are added to the cool mixture and mixed by hand to form a dough. When the dough is ready it is left to ferment until it is sour. Fermented dough is cooked using the steaming method as described for the steamed wheat bread. This type of bread is commonly prepared in the urban areas, probably because maize yields more in the urban areas than in

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rural areas. Urban participants also mentioned that they always prepare this bread using commercial maize meal.

5.4.4 Sorghum based breads (*Senkhoana*)

The two types of sorghum breads identified were made from green sorghum (*Senkhoana*) and from dry sorghum kernels **(*Ntsoanatsike*).** The description of breads follows:

5.4.4.1 Green sorghum bread (Senkhoana)

Green sorghum bread *(Senkhoana)* and green mealie bread are prepared in a similar manner. *Senkhoana* is also shaped into a *polokoe* as done in *Monepola oa poone ea thooko*. *Senkhoana* is a traditional Basotho bread prepared from green sorghum (at a state before grains harden) (Figure 5.12 & Figure 1.13). Green sorghum bread (*Senkhoana*) was not prepared in Thaba-Tseka (Table 5.7) because sorghum does not grow well in this region.

Table 5.7: Ingredients of green sorghum bread (*Senkhoana*) from 5 regions of Lesotho

	Regions				
	Leribe	Mafeteng	Mokhotlong	Thaba–Tseka	Maseru
Ingredients	g	g	g	g	g
Green sorghum	400	1100	1100	-	2000

The discussion with participants in the present study revealed that this bread is associated with poverty because it is consumed due to lack of food at the time when household dry grain stores have completely run out and housewives are waiting for the sorghum crop to get dry in the fields. Housewives emphasised the fact that consumption of *Senkhoana* is not a matter of food choice but to satisfy hunger.

One participant in Mokhotlong clearly narrated this fact:

> *Senkhoana has always been part of my diet and I still consume it even today. I have never worked before, and I have many children whose father (my husband) has abandoned.*

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Figure 5.12: Green sorghum for preparing green sorghum bread (*Senkhoana*)

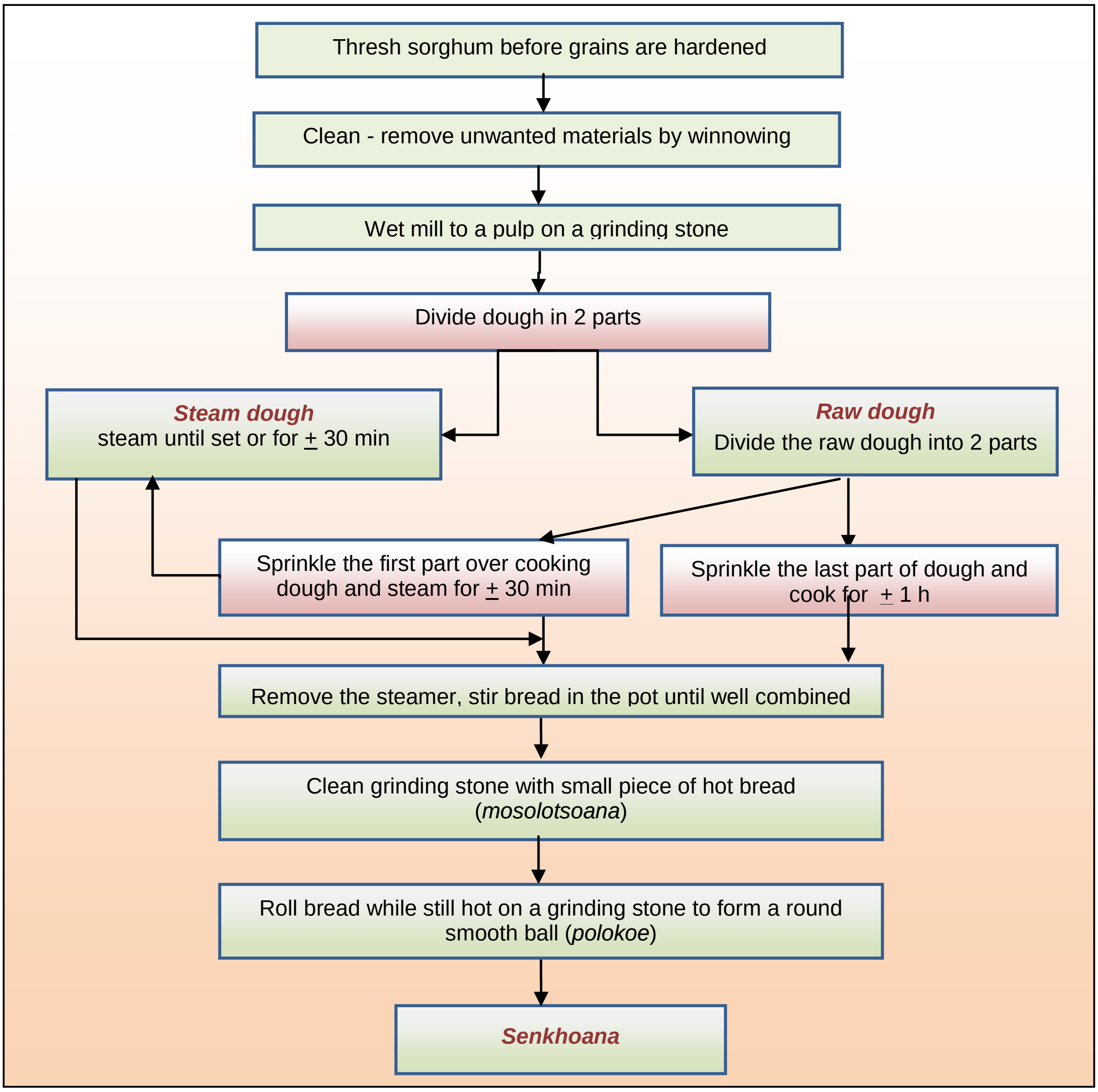

Figure 5.13: Flow chart for the preparation of green sorghum bread (*Senkhoana*)

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- Participant's perceptions of sensory qualities of ***Senkhoana***

Participants described the colour of *Senkhoana* as varying from greenish brown, greyish brown, reddish brown depending on the variety and stage of maturity of the sorghum. *Senkhoana* is slightly bitter but it is best eaten with milk and meat stew. The focus groups also revealed that the texture of *Senkhoana* is very cohesive and therefore heavy. Elderly participants who have eaten *Senkhoana* before seemed to like it and it reminded them of the good old days. The younger women who had not tasted *Senkhoana* before did not like its colour, texture and taste. One woman described the feeling she had with a piece of *Senkhoana* in her mouth by saying:

> *It is very sticky in the mouth and it takes long to chew, I am not able to swallow this bread. I have never eaten this bread before and I do not think I will cook it for my family.*

5.4.4.2 Dry sorghum bread (Ntsoanatsike)

Ntsoanatsike is a traditional Basotho bread made from dry sorghum as shown, using ingredients listed in Table 5.8. The preparation steps (Figure 5.14) for *Ntsoanatsike are* generally similar to the dry maize bread (*monepola oa poone ea thooko*) as described previously. Nout (2009) and Nche *et al.* (1996) said that the fermented maize and sorghum bread in Ghana is also prepared the same way. In Northen Ghana, *kenkey* is sometimes prepared using sorghum instead of maize.

Table 5.8: Original recipes of dry sorghum bread (*Ntsoanatsike*) from the 5 regions of Lesotho

	Regions									
	Leribe		Mafeteng		Mokhotlong		Thaba–Tseka		Thaba- Bosiu	
Ingredients	g	%	g	%	g	%	g	%	g	%
Sorghum meal	1700	100	1500	100	2100	100	3400	100	2200	100
Salt	20	1.18	15	1	15	0.9	25	0.7	15	0.68
Warm water	1000	58.8	600	40	1000	46.7	1000	29.4	1400	63.6
Sourdough	250	14.7	250	16.6	400	12.3	600	19.0	500	22.7

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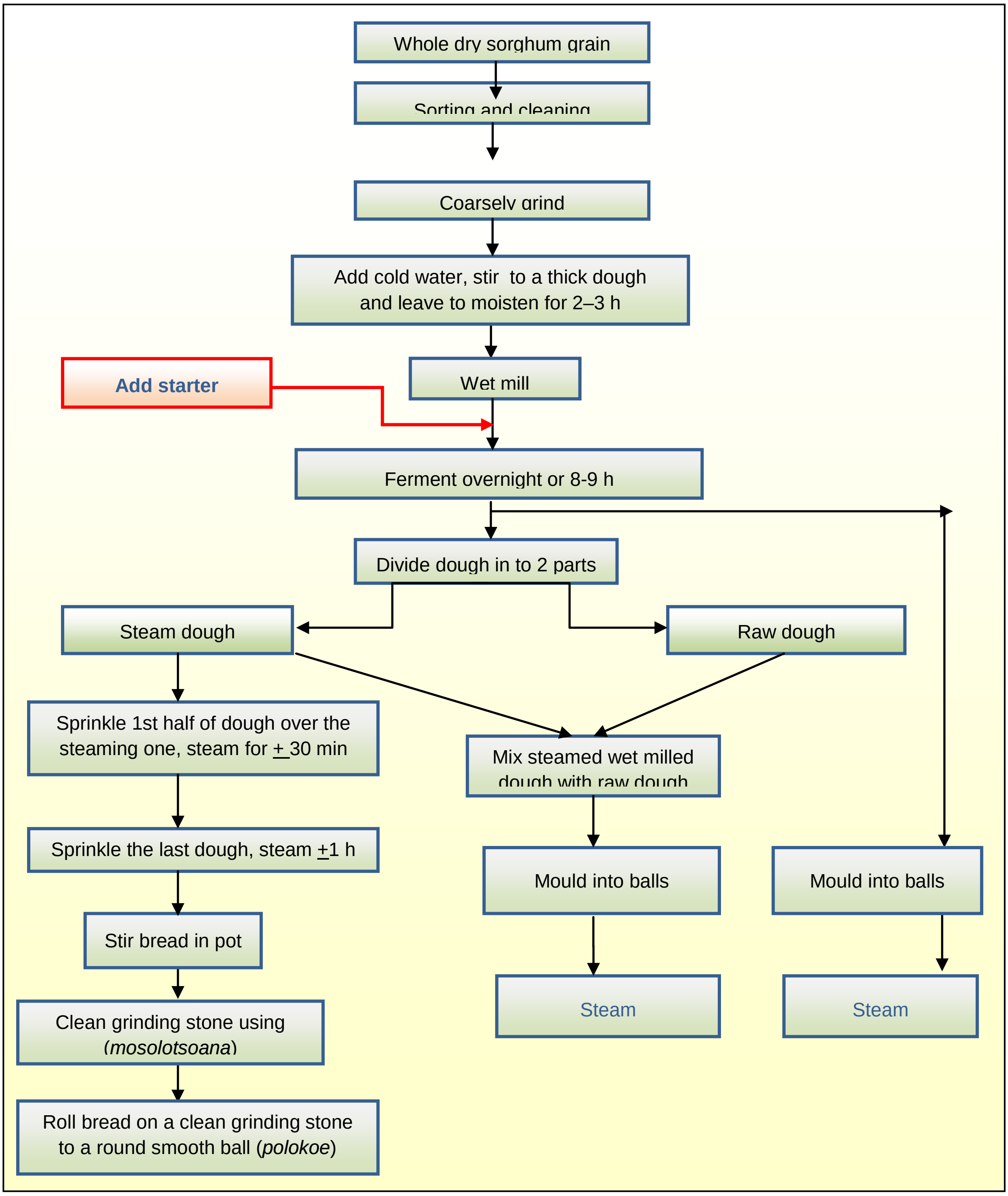

Figure 5.14: Flow chart of the preparation of dry sorghum bread (*Ntsoanatsike*)

- Participants' perceptions of sensory qualities of *Senkhoana*

Sour taste is the predominant characteristic that determines a good quality *Ntsoanatsike*. The bread is very dark, and colour ranges from reddish brown, brown, greyish brown also depending on whether red or white sorghum has been used. However, similar to the other

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breads the main criterion for Basotho food acceptance is based on the ability to satiate such that the consumer does not need to eat again after a short while. This bread also meets the Basotho requirements due to its compact and heavy texture. However, acceptability of sorghum in foods has shown serious resistance in Tanzania due to reasons like unpleasant colour, aroma, taste, aftertaste and stomach feel (Keregero & Mtebe, 1994). The sorghum meal dumplings are characterised by a reddish-brown colour and a pleasant nutty, sweet and sour taste. The Pedi in South Africa also prepare a similar type of dumpling with sorghum "Kaffir-corn meal" (Quin, 1959).

5.4.5 Composite breads *(Mochahlama)*

In many cases Basotho prepare composite breads from a mixture of wheat and maize or wheat and sorghum in order to overcome high costs of wheat flour. According to participants' discussion, these types of breads are also associated with poverty.

5.4.5.1 Composite maize/wheat and sorghum bread (Mochahlama)

Mochahlama is a steamed fermented bread prepared from either a composite of maize and wheat or sorghum and wheat flour using the ingredients shown in Tables 5.9 & 5.10. The findings indicate that the people in the rural areas (Mokhotlong and Thaba-Tseka) use higher proportions (60 and 77.8%) of maize meal to wheat flour respectively than people in the urban areas.

Table 5.9: Original recipes of the composite of wheat and maize bread (*Mochahlama oa Poone*) from 5 regions of Lesotho

	Regions									
	Leribe		Mafeteng		Mokhotlong		Thaba-Tseka		Maseru	
Ingredients	g	%	g	%	g	%	g	%	g	%
Wheat flour	2100	53.8	1000	43.5	1000	40	800	22.2	1800	42.9
Maize meal	**1800**	**46.2**	**1300**	**56.5**	**1500**	**60**	**2800**	**77.8**	**2400**	**57.1**
Salt	25	0.64	25	1.09	25	1	30	0.8	25	0.59
Sugar	50	1.28	-	-	-	-	-	-	-	-
Yeast	-	-	-	-	-	-	-	-	-	-
Boiling water	2000	51.3	3000	130	1500	60	3000	83.3	3500	83.3
Sourdough	75	1.9	500	21.7	250	10	500	13.8	-	-
Supernatant	-	-	-	-	-	-	-	-	500	11.9

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Table 5.10 also indicates the highest proportion (72%) of sorghum flour in Mokhotlong than in all other regions. It was indicated that composite breads are associated with poverty in Lesotho. The literature also pointed out that the largest proportion of poor people in Lesotho is found in the rural areas (Ministry of Agriculture and Food Security, 2008). This may therefore be the reason why more of the non-wheat flour is used in the rural areas than in urban areas. Poor people cannot afford to buy wheat. Variations regarding preparation methods of composite bread do exist in the regions. In the rural areas (*Mokhotlong and Thaba-Tseka*), flour is obtained from whole grains and the long procedures from wet cleaning, dry milling and sometimes wet-milling are involved. In urban areas, commercial flour is used for composite breads. The preparation methods involve adding boiling water to maize/sorghum and keeping it covered for about 10 min to gelatinize the starch and then cool (Figure 5.15). According to the respondents, the pre-heating process allows the development of the sweet taste in the mixture and therefore the reason why it is not necessary to add sugar in this bread. The pre-heated meal also helps to reduce crumbliness in the composite bread. The resulting dough is mixed with wheat flour, salt and a starter. A few participants (8%, n=21), in the urban areas, indicated that they also use a mixture of instant yeast and sourdough for this bread. In the rural areas, composite bread is never prepared from commercial instant yeast. The reasons given were related to taste and texture preferences as shown in the following statements:

> *Composite bread prepared from commercial yeast is tasteless; it lacks the sourness, which is the main characteristic of traditional Basotho composite bread. Commercial yeast also produces bread with a very loose texture.*

Table 5.10: Original recipes of the composite of wheat and sorghum bread (*Mochahlama oa mabele*) from the 5 regions of Lesotho

	Regions									
	Leribe		Mafeteng		Mokhotlong		Thaba–Tseka		Maseru	
Ingredients	g	%	g	%	g	%	g	%	g	%
Wheat flour	700	33.3	1450	42.0	600	28.0	-	-	800	30.8
Sorghum meal	1400	66.7	2000	58.0	1550	72.0	-	-	1800	69.2
Salt	20	0.95	30	0.87	20	0.9	-	-	15	0.57
Sugar	40	1.90	-	-	-	-	-	-	-	-
Boiling water	2000	95.2	3000	86.9	-	-	-	-	2200	84.6
Sourdough	-	11.9	500	14.5	265	12.3	-	-	-	-
Supernatant	-	-	-	-	-	-	-	-	400	11.9
Traditional Beer	-	-	-	-	-	-	-	-	-	-

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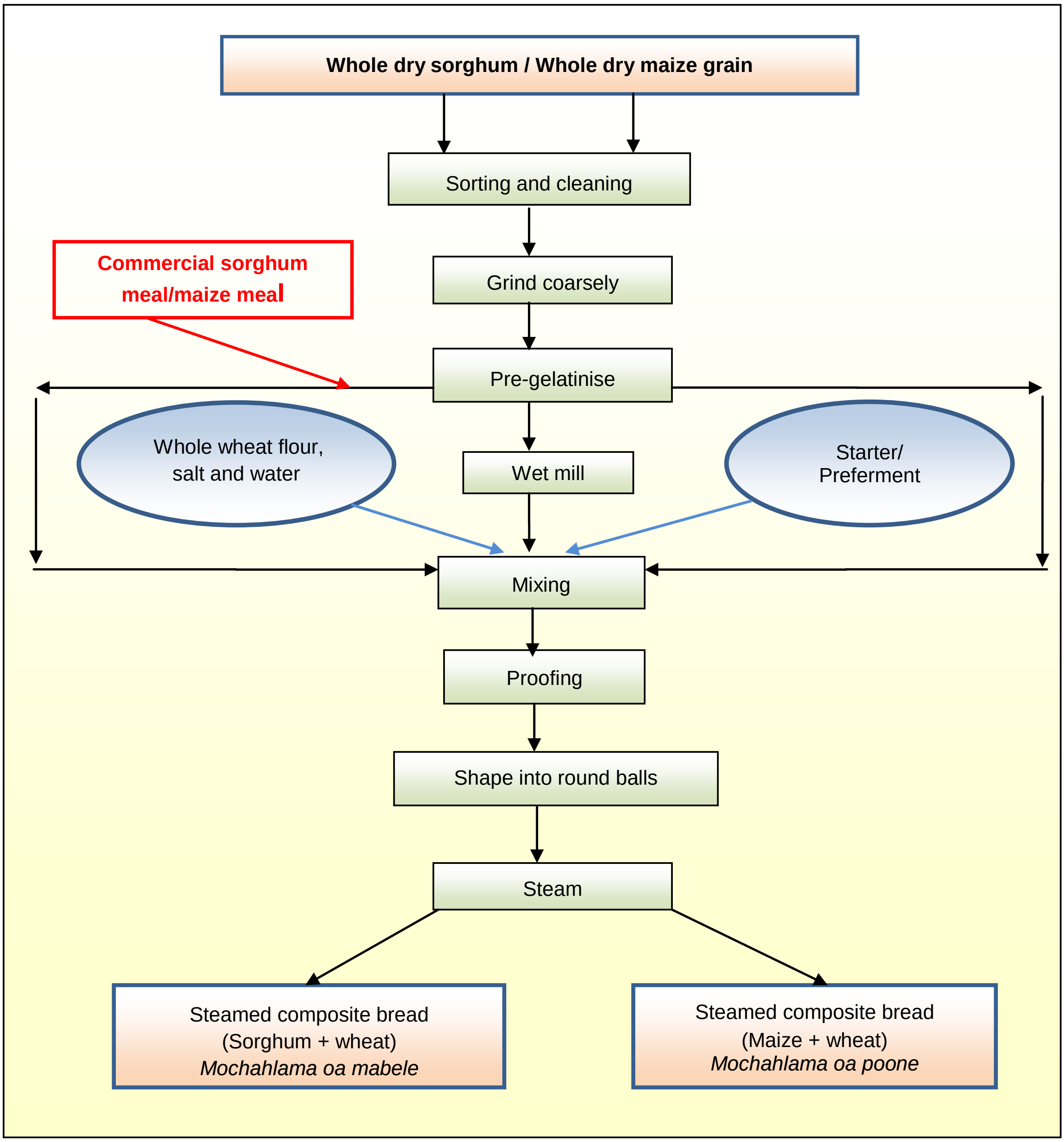

Figure 5.15: Flow chart for the preparation of sorghum + wheat and maize + wheat composite bread

When the dough has fermented it is cooked by the steaming method only. According to participants other methods of cooking are said to produce composite bread (*Mochahlama)* with a very dry and hard texture.

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- Participants' perceptions of sensory qualities of composite bread

The most important sensory qualities used by Basotho to assess the quality of a composite bread included taste/flavour, colour and texture. According to focus group participants *Mochahlama* should have a sharp sour taste and a blend of salt and sweet taste. Composite breads must have a relatively large volume and a round shape. Wheat and white maize composite bread must be whitish brown with visible brown fibrous material from wheat flour. On the other hand, wheat and sorghum composite bread must be brown with black and brown specks depending on the variety of sorghum flour used (Figure 5.16). Well-cooked *Mochahlama* must have a well distributed air cells (pores) structure and must not be too crumbly. According to participants if this bread is too crumbly it is a sign that the maize and sorghum flours used were not well heated. Compared to wheat bread, composite breads are always heavier with denser texture. Composite bread is preferred for its filling ability. Cracks always appear on the top surface (Figure 5.16) of *Mochahlama* and they are perceived as important quality attributes which indicate that bread dough was well developed and bread is well cooked.

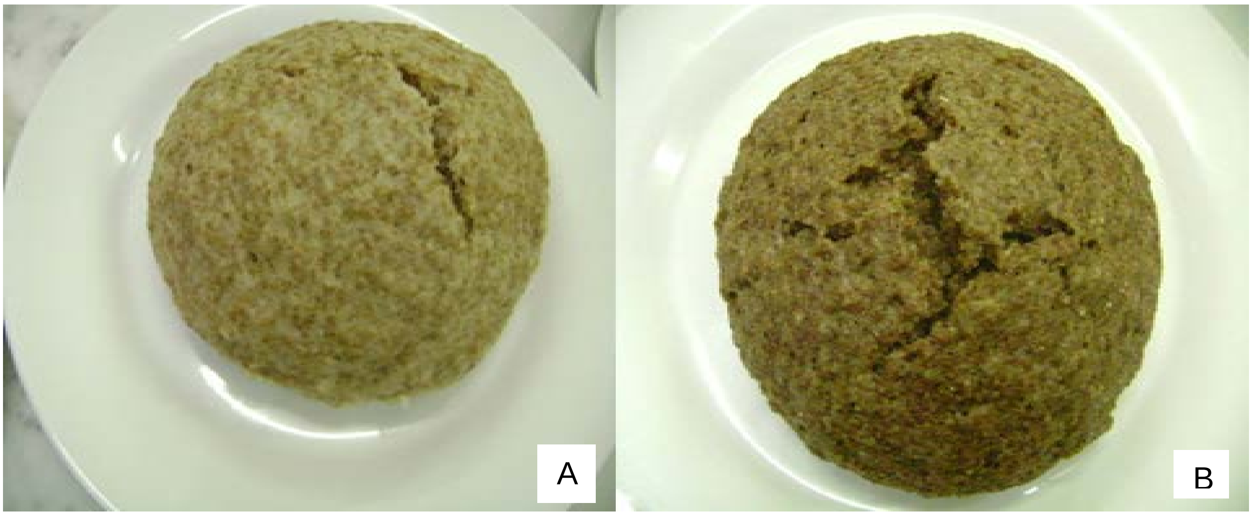

Figure 5.16: Steamed composite maize (A) and sorghum bread (B). Photographs by Pulane Nkhabutlane, April, 2011

5.5 SUMMARY

The study revealed 10 different types of traditional Basotho breads, prepared from maize, wheat and sorghum (Table 5.11). The breads differ in terms of culinary practices, physical and sensory properties. Cereal processing methods for traditional Basotho bread making include, washing, sorting, soaking, dehulling and dry milling. Wet milling is applied on dry

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Table 5.11: Summary of culinary practices regarding different types of traditional Basotho breads

Bread	Ingredients	Equipment/Utensils	Preparation methods	Description of sensory quality	Accompaniments
Wheat Based 1. Steamed wheat bread (*Leqebekoane}*	Wheat flour Starter (Sourdough) Traditional beer, sour Porridge supernatant and/or Commercial yeast Salt Sugar (optional)	Grinding stone Motor & pestle Mixing bowl Basotho mat (*Sethebe*) Clay pot/ 3 legged iron pot Saucepan Basotho basket (*Seroto*)	Cleaning of grains Sorting grains Steep grains in water Debranning Winnowing Mixing ingredients Kneading Fermentation Shaping Cooking	Round/symmetrical High volume Soft texture Thin skin, glossy finish Soft, moist, dense Open crumb Balance of sour, sweet and salty taste	Milk. Tea bean/pea soup meat stews green vegetables
2. Baked wheat bread (*Bohobe ba polata*)	Same ingredients as for steamed wheat bread			Golden brown crust Soft crumb Large air cells High volume Balance of sour, sweet and salty taste	Milk. Tea bean/pea soup meat stews green vegetables
3. Pot-roasted wheat bread (*Liphaphatha*)	Same ingredients as for steamed wheat bread			Floury golden brown crust Brown crust Soft crumb, flat shape Balance of sour, Sweet and salty taste	Water, Tea Milk
Maize Based 4. Green mealie bread (*Monepola oa poone e ncha, mohlefe, 'Malits'ibana)*	Green maize kernels	Grinding stone Basotho mat (*Sethebe*) Stirring stick (*Lesokoana)* Clay/3 legged iron pot	Sorting Wet milling Cooking	Whitish to yellowish Dense heavy texture Fibrous Green mealie aroma	Milk Meat stews Vegetable relish
5. Dry maize bread	Dry maize		Cleaning		

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Table 5.11: (*continued*) Summary of culinary practices regarding different types of traditional Basotho breads

(*Monepola oa thooko*) 6. Pre-heated dry maize bread	Starter Maize meal		Sorting, Steep in water Debranning, winnowing Coarse grinding *(haila)* Wet milling Mixing ingredients Kneading Fermentation Cooking Pre-heating	Greyish white & yellowish Dense heavy texture Fibrous Sour smell and taste	Milk Meat stews Vegetable relish Bean/pea soup
<u>Sorghum Based</u> 7. Green sorghum bread (*Senkhoana*) 8. Dry sorghum bread (*Ntsoanatsike*)	Green sorghum Dry sorghum Starter	Grinding stone Basotho mat (*Sethebe*) Stirring stick (*Lesokoana*) Grinding stone Basotho mat (*Sethebe*) Stirring stick (*Lesokoana*)	Wet milling Cleaning Sorting Coarse grinding *(haila)* Wet milling Mixing ingredients Kneading Fermentation Cooking	Greyish/ Greenish/ Reddish brown, sticky Dense heavy texture Slightly bitter Greyish brown Greenish brown Reddish brown Dense heavy texture Very sour taste and aroma	Milk , Meat stews Vegetable relish Bean/pea soup Milk , Meat stews Vegetable relish Bean/pea soup
<u>Composite Breads</u> 9. Maize + Wheat 10. Sorghum + wheat	Maize flour Wheat flour Starter Sorghum flour, wheat Flour& starter	Grinding stone Basotho mat (*Sethebe*) Mixing bowl Clay /3 legged iron pot	Grinding Gelatinizing Kneading	Whitish brown Compact & heavy Crumbly Sour smell and taste Reddish/off-white brown, sour taste, crumbly, compact & heavy	Milk, Meat stews Bean/pea soup Milk, Meat stews Bean/pea soup

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maize and sorghum cereals only. The most common method of cooking for all breads is steaming. Baking and pot-roasting are used to cook wheat breads only (Table 5.11).

The fermentation process is applied to all breads except for green mealie and green sorghum breads. These breads are associated with poverty because they are prepared at the time when households run short of dry grains and are waiting for their crops to dry up in the fields. Young participants have not prepared dry and green sorghum breads. The majority of respondents who had prepared these breads were older than sixty years.

Important quality characteristics for wheat breads were stated as high volume for both steamed and baked. The texture of wheat bread varies from soft when commercial flour is used to heavy when flour from cultivated wheat grains is used. The most desired characteristic for pot-roasted wheat bread is a golden brown colour. In general, maize and sorghum breads were characterised by heavy and dense texture.

Bread is normally consumed with milk, meat and chicken, peas and bean soup and sometimes, vegetable relish. Nowadays people consume bread with tea. Consumption of wheat bread is generally more than that of maize and sorghum breads. All participants said they would consume wheat bread everyday if they could afford it. The fact that Lesotho cannot produce enough wheat to meet the demands for bread consumption and because maize and sorghum yield higher than wheat in the urban areas, suggests that more research needs to be done in order to improve the quality characteristics of maize and sorghum breads to increase their consumption in Lesotho.

SECTION B – CULINARY PRACTICES

This section presents the results on past and current culinary practices regarding traditional Basotho bread (Objective 2)

5.6 INTRODUCTION

This section outlines an overview of Basotho culinary practices with regard to traditional bread-making. The ingredients such as leavening agents, flour, water, salt and sugar (Table 5.12) are outlined and described. The reasons for the choice of ingredients are also given. A description of the preparation of ingredients and the type of equipment used are given in this

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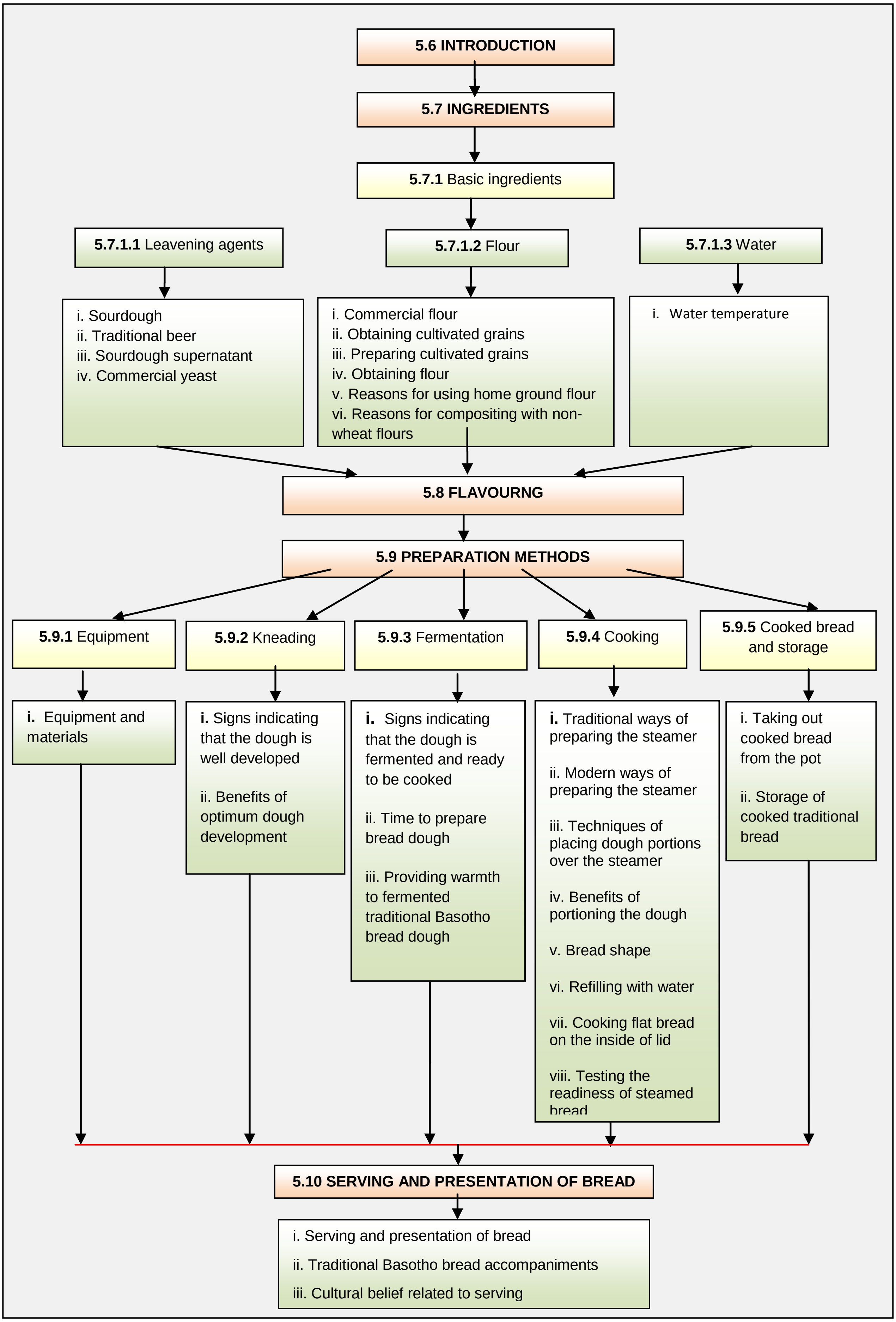

Figure 5.17: Flow chart for Section B (Culinary Practices) of Chapter 5

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section. Ways of flavouring traditional Basotho bread are described. The themes discussed in these sections follow logically according to the theories which formed the questions during data collection. Information related to the same concept from different questions was grouped together to form a common theme. Questions from the focus group guide formed the base for discussion in this chapter, as done by Dicks (2007). A summary presenting the findings in section B is outlined in Table 5.12.

Table 5.12: Presentation of the findings in section B

Culinary practices main topics	Sub-topics of culinary practices
Ingredients	Leavening agents Flour Water
Flavouring	Flavouring techniques
Preparation methods	Equipment Kneading the dough Fermentation Cooking Bread storage
Serving	Serving and presentation

5.7 INGREDIENTS

Participants were asked to mention all the basic ingredients used to make traditional Basotho bread.

The objective of this question was to determine all the basic ingredients used for traditional Basotho bread. In response to this question, only one theme emerged as basic ingredients for traditional Basotho bread as shown in Table 5.13.

5.7.1 Basic ingredients in traditional Basotho bread making

Focus group participants listed basic ingredients for bread making as shown in Table 5.13. It was stated that the choice of a leavening agent depends on the type of bread to be prepared (statement 5.13.2). Details of the suitability and preparation of leavening agents are provided later in this section. Different types of cereal grain (wheat, maize and sorghum) flours are used on their own or in combination to make bread (more details are provided later in this

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section). Water was mentioned as one of the basic ingredients and warm water is used for all wheat-based breads while boiling water is used for composites of both maize and sorghum breads. According to statement 5.13.8, salt is basic to all types of traditional Basotho breads but sugar is not common to Basotho. It is used by urban people and a few people in the rural areas who can afford to buy it.

Table 5.13 Theme 1: Basic ingredients for traditional Basotho bread

Respondents statements	Concept	Category
5.13.1 We use different types of raising agents (sourdough, traditional beer, and sour porridge supernatant and commercial yeast, depending on what is available to the housewife. **5.13.2** The choice of a raising agent also depends on the type of bread to prepare. For example, traditional beer and sour porridge supernatant are suitable for composite breads. **5.13.3** We also use commercial yeast, although it is not suitable for whole wheat breads and I have never used it for maize and sorghum breads.	Sourdough Traditional beer Sour porridge supernatant Commercial yeast	Leavening agents
5.13.4 We use wheat flour for bread making. Maize and sorghum flours are also used for other traditional Basotho breads. **5.13.5** We also combine both wheat and maize flour for composite bread. **5.13.6** Wheat flour is also used for composite bread with sorghum flour.	Wheat flour Maize flour Sorghum flour	Flour
5.13.7 We always use warm water and boiling water for composite breads.	Water	Water
5.13.8 Salt is always added in all bread types, but sugar is optional and it is used with commercial flour only.	Salt Sugar (optional)	Flavouring agents

5.7.1.1 Leavening agents

i. Sourdough

How do you prepare and use sourdough as a raising agent in traditional Basotho bread?

The purpose of this question was to determine preparation methods of sourdough by Basotho and how they use sourdough in bread-making.

The results from this question suggested 4 themes:

Theme 1: Preparation of sourdough
Theme 2: Sourdough storage
Theme 3: Reasons for keeping sourdough for a long time
Theme 4: Sourdough benefits

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Theme 1: Preparation of sourdough

The theme "preparation of sourdough", suggested two categories: previous dough and fermenting flour mixture (Table 5.14). In agreement with the definition given by Christian, (1978:23), sourdough, as the name implies, is "*the dough left until it has turned sour".*

Table 5.14 Theme 1: Preparation of sourdough

Respondents statements	Concept	Category
5.14.1 Sourdough is prepared by leaving aside a small piece of dough when cooking bread, then adding water to it. This dough is normally kept in a bottle with a tight fitting lid. 5.14.2 Sourdough is a piece of small dough that was left previously when cooking bread. 5.14.3 Leave aside a small piece of dough when cooking bread, put it in a container and add water and keep it covered until it is needed for use	Small piece of dough	Previous dough
5.14.4 If I have to prepare bread and I do not have sourdough, then I borrow it from my neighbour. Then when I cook bread, I will leave aside 2 small portions of dough, one for her and one for me. 5.14.5 It is also possible that a housewife can forget to leave aside a small piece of dough. In that case, when time comes for bread-making, you can simply borrow sourdough from your neighbour.	Borrow neighbour's sourdough	
5.14.6 Mix a little flour with water – leave for about 3 days covered. It can now be used as sourdough. You do not have to add anything to this mixture, after 3 days it is ready to be used and it has fermented. 5.14.7 If you do not have sourdough in your home, take a small quantity of wheat flour and add a little yeast. Let the mixture ferment and use it the next day.		Fermenting flour mixture

Previous dough comprised of two concepts (Table 5.14.6) that are described in statements 5.14.1 - 5.14.5. A small piece of dough is left from bread dough. This dough is kept in a small container and allowed to sour until the time when it is needed to make new bread. This practice is also followed in China (Ang *et al.,* 1999:15). This method of preparing sourdough was described as the most convenient method by participants, and it was commonly used in both rural and urban areas in Basotho households and by small traditional bread entrepreneurs (street vendors). The advantages of previous dough include the fact that it does not require detailed preparation and no other ingredient has to be bought in order to have a raising agent. It appears that Basotho also developed coping/survival strategies such as borrowing in times of shortage of sourdough. For example, previous dough could be obtained from a neighbour for bread making (statements 5.14.4-5.14.5, Table 5.14).

Participants indicated that if previous dough is not available, a mixture of flour and water is fermented naturally for 3 days as described in statement 5.14.6, Table 5.14. This method

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was defined by Sanni *et al.* (1998) as a mixture of flour and water which has been left to ferment for 2-7 days to develop the required characteristics: acidic-sharp taste and used for making bread from cereal flours. This is the method that is very ancient, it was used before commercial yeast was available, and the fermentation of this mixture is due to the action of wild yeasts and bacteria (Gisslen, 2009:134; Holm, 2002:31). Participants mentioned that they sometimes add commercial yeast to the mixture of flour and water to speed up fermentation (4.6.7). The method is similar to the one used in Poland, *polish, or the one used in* Italy, *biga* or *levain-levure* used in France (Gisslen, 2009:133).

Theme 2: Sourdough storage

Participants indicated that in order to keep their sourdough for a long time, they add fresh cold water to the dough and keep it covered in bottles (Figure 5.18) or plastic containers at room temperature (statements 5.15.1-5.15.2, Table 5.15). Holm (2002:32) reported that plastic containers, glass mason jar, butter crock or bean pot with loose fitting lids to allow continued fermentation by bacteria from the air are the most suitable containers for keeping sourdough. While DiMuzio (2009:67) and Holm (2002:39) suggested that sourdough should be kept in the refrigerator until it is needed for use. According to the current study, none of the participants mentioned the use of a refrigerator for storage of sourdough both in the rural and urban areas. As mentioned in Chapter 1, temperatures in Lesotho are sometimes very low. This may be the reason for not using refrigerators to store sourdough.

Figure 5.18: Sourdough stored in a bottle

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Another reason may be that many people in Lesotho do not own refrigerators. Many people in Africa still do not possess preservation facilities such as refrigerators (Taylor, undated). Surprisingly even urban participants who own refrigerators mentioned that they have never used them to store sourdough.

Table 5.15 Theme 2: Sourdough storage

Respondents statements	Concept	Category
5.15.1 Leave aside a small piece of dough in a bottle and add water to cover the dough, and then keep at room temperature. **5.15.2** Leave aside a small portion of dough while cooking bread. Put it in a bottle, or any plastic container with a lid, add water sufficient to cover the dough.	Add water	Keeping sourdough
5.15.3 It can be used within 2 days, a week or kept for even a month depending on the temperature conditions **5.15.4** In chorus – For a long time, up to a month. **5.15.5** Sourdough is kept for as long as it is usable. **5.15.6** It can be used within 2 days, a week or kept for even a month depending on the temperature conditions.	A day to a month	Length of storage
5.15.7 When sourdough has been kept for too long it develops mold which could be removed and water taken out. The old water is replaced by fresh water on the remaining dough. **5.15.8** Make sure that you remove greyish layer of mold on top of sourdough before use. It forms this layer when it is kept for a long time. **5.15.9** When sourdough is kept for a long time, it forms a greyish layer on top. This layer smells badly, so it should be removed before use.	Mold development	Keeping qualities of sourdough
5.15.10 Sourdough can be kept for a very long time, even up to a month, but as it stays the water in it turns the colour to greyish green. It also forms a greyish green mold on top. Therefore we remove that mold and discard it. We also discard the water and replace it with fresh water. **5.15.11** The water in the sourdough spoils quickly and can even have bad smell (*ponyonyo*).	Bad smell	
5.15.12 The best thing is to discard the water if sourdough has been kept for too long.	Thick water	
5.15.13 Sometimes it stays until it is no longer usable, and then it is discarded. That is when water smells badly and thickens. **5.15.14** The spoiled water in sourdough is discarded and replaced by fresh water. **5.15.15** We also discard the water and replace it with fresh water. **5.15.16** Check the remaining dough for smell and if it still has acceptable smell then fresh water can be added and used, but if it smells bad, throw it away. **5.15.17** If sourdough has stayed long, add fresh water and sugar to the dough immediately after discarding water.	Adding fresh water and sugar	Reviving old sourdough

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According to participants, sourdough can be stored for up to a month (statements 5.15.3 - 5.15.6, Table 5.15). Holm (2002:39) also suggested that sourdough can be kept in the freezer for a very long time, but the housewife has to remember to take it out so that it is at room temperature by the time it is used. Christian (1978:23) also reported that sourdough can be kept for a long time depending on the storage conditions. Sourdough stored for a long time may develop undesirable characteristics such as mould, a bad smell and excessive water. It may thicken or stretch (statements 5.15.7-5.15.13, Table 5.15). Once these bad characteristics have developed, the spoiled water is discarded and sourdough is refreshed with fresh water and sometimes with sugar. Holm, 2002:32 supports the use of water and flour but not of sugar. Holm (2002:37) states that sourdough may change colour and turn to orange and this is normally an indication that it is spoiled and it has to be discarded.

Gisslen (2009:135) and Holm (2002:37) recommended that during the fermentation of sourdough from beginning stages until it is used, it is imperative to refresh it with flour in order to provide nutrients for the micro-organisms so that they are able to grow and multiply and that the starter can be able to handle the fermentation of a large proportion of dough. Participants in this study did not mention reviving or feeding sourdough with flour. This may probably be associated with the reason that Basotho kept sourdough for a long time due to lack of flour and could not have flour kept for reviving sourdough.

What are the reasons for keeping sourdough for a very long time?

Participants had already mentioned in the previous question that they keep sourdough for a long time (3 days - month) until it spoils and then discard it. It was important to understand why the sourdough was kept for a long time and not used. The reasons are listed in Table 5.16.

Theme 3: Reasons for keeping sourdough for a long time

The main reason for keeping sourdough for a long time was lack of flour to prepare bread. The description of this concept appears in statements (statements 5.16.1–5.16.5, Table 5.16). Participants mentioned that they always keep sourdough for a certain period of time, but if they are not able to get flour by any means to prepare bread, then they discard the sourdough.

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Table 5.16 **Theme 3:** Reasons for keeping sourdough for a long time

Respondents statements	**Concept**	**Category**
5.16.1 In chorus - Sourdough is kept for a long time if ingredients (flour) for bread making are not availble. **5.16.2** Sourdough is kept for a long time because of lack of ingredients (flour) for preparing bread. **5.16.3** In most cases, it is when the ingredients are not available for bread making. **5.16.4** The main reason is shortage of ingredients – flour. As long as one does not have flour, then sourdough cannot be used. **5.16.5** We normally run out of sourdough during times when the harvested wheat is finished in our homes, and we are without bread for a very long time. The sourdough spoils and it is discarded.	Lack of flour	Shortage of ingredients

Theme 4: Sourdough benefits

Participant's perception of sourdough benefits is seen as improvement of bread quality. This is seen in two concepts that emerged from this category: taste improvement and long shelf life (statements 5.17.1–5.17.5, Table 5.17). During the focus group discussion, participants agreed that sourdough is the only leavening agent which produces bread with a desirable sour flavour. Traditional acidic sourdough has been used as a technique to improve flavour, texture and microbiological shelf life of bread in different parts of the world (Sadaghi, 2008, Bolourian *et al*., 2010). Moreover, 56% (n=142) of participants in this study use sourdough for the reason that it produces bread with good taste (Figure 5.17). Sourdough breads are characterised by more distinct unique flavour, compared to bread from other leavening agents (Dewettinck *et al*., 2008; Katina *et al.,* 2006; Katina *et al.,* 2005). Sourdough bread dough contains high levels of lactic acid bacteria, as a result of concentrated sour cultures found in them (DiMuzio, 2009:68). Sourdough produces unique flavours during fermentation. These flavours give desirable taste and aroma to the end bread product (Kim *et al.,* 2009).

Participants mentioned long shelf life (statements 5.17.3-5.17.4, Table 5.17) as an advantage for using sourdough. Katina (2005), Katina *et al.* (2006) and Katina *et al.* (2005) confirmed that sourdough can contribute to the keeping qualities of bread. This is because fermentation process by sourdough lowers the pH, which leads to uncomfortable conditions for growth, and multiplication of microorganisms and that would lead to reduced staling (Sadeghi, 2008).

Participants mentioned that sourdough is easily available (46%, n=118) as shown in Figure 5.17 and in statement 5.17.5, Table 5.17. Availability of sourdough was previously

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mentioned in Table 5.17, whereby participants agreed that leaving aside a small piece of dough from the previous fermented mixture makes the use of sourdough to be very convenient because one does not have to buy a leavening agent before preparing bread. Sourdough is a cheaper option for Basotho because they do not have to buy it.

Table 5.17 **Theme 4:** Sourdough benefits

Respondents statements	**Concept**	**Category**
5.17.1 Sourdough gives a sour taste to the bread, we like this sourness so much. **5.17.2** Sourdough improves the taste of bread; it gives bread a bit of sour taste.	Taste improvement	Improve bread quality
5.17.3 Bread made with sourdough lasts longer. **5.17.4** Bread made with sourdough has long storage stability.	Long shelf life	
5.17.5 Sourdough is easy to obtain and it produces bread with a good flavour.	Easily available	

Which other leavening agents are used for traditional Basotho bread?

Apart from sourdough, Basotho also use other types of leavening agents to prepare their traditional bread (Table 5.18). The purpose of this question was to enable participants to mention as many leavening agents as they could and also to describe how each raising agent is used.

Focus group discussions revealed different types of leavening agents used to prepare traditional breads as follows:

- Sourdough
- Traditional sorghum beer (*tomoso ea joala*)
- Traditional sorghum beer foam (fresh foam or dried, powdered, foam)
- Supernatant from a fermented mixture used to prepare sour thin porridge (*tomoso ea motoho*)
- Commercial yeast
- A mixture of sourdough and commercial yeast

The results formed three themes:

Theme 1: Traditional sorghum beer as a leavening agent

Theme 2: Use of supernatant for sour porridge

Theme 3: Commercial yeast

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Table 5.18 provides percentages of respondents using different types of leavening agents to make different breads. More than half of the participants (67%, n=169) used commercial yeast to make baked wheat bread and a lot of them (64%, n=162) also used it to make steamed wheat bread. Commercial instant yeast was not used for sorghum based breads. Less than half (44%, n=110) of the participants used sourdough for steamed wheat bread and 41%, n=104 of participants were using sourdough to make baked wheat bread. In order to obtain the benefits of both sourdough and commercial yeast, some women (21%, n=84) participants used a mixture of sourdough and instant yeast for steamed bread and some (20%, n=68) used this mixture to prepare baked bread.

Table 5.18: Type of leavening agents used by Basotho for different types of breads (% of respondents N=253) from 5 regions of Lesotho

	Leavening agent			
Type of breads	**Sourdough %**	**Traditional beer %**	**Commercial instant yeast %**	**Sourdough+ instant yeast %**
Steamed wheat	44	33	64	21
Baked wheat	41	27	67	20
Pot roasted wheat	34	20	42	16
Wheat + maize	33	22	19	8
Wheat + sorghum	2	2	0	0
Dry sorghum	3	4	0	0
Green sorghum	0	0	0	0
Green mealie	0	0	0	0
Dry maize	0	8	8	0
Gelatinized maize	7	5	3	2

Theme 1: Traditional sorghum beer as a leavening agent

Table 5.19 shows that Basotho used traditional sorghum beer in different forms as a leavening agent, from its foam (l*ekoeba*), beer as it is (*joala/leting*), and the traditional beer residue (*moroko*). Participants considered the age of traditional beer because the flavour of the beer changes from sweet to acid as it matures (statement 5.19.14, Table 5.19). However, other participants said that age of traditional beer when used as a raising agent is not an important factor to them. Participants also seemed to differ on the concept of diluting traditional beer with water in order to reduce sweetness (statements 5.19.11 & 5.19.12, Table 5.19). Some argued that traditional beer has to be diluted with water while others said it can be used as it is. This gives evidence that consumers' culinary practices and food preference differ from one region to the other and also from one individual to the other, as was also confirmed by Whyte, Hudson, Hasel, Gray and O'Reilly *(*2001) and Fuller (2005).

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Table 5.19 **Theme 1**: Traditional sorghum beer as a leavening agent

Respondents statements	Concept	Category
5.19.1 The traditional sorghum beer foam powder is mixed with water before it is used as a raising agent. This powder can be kept for as long as the housewife desires. **5.19.2** In a powdered form, this traditional foam can be stored for a long time and used when needed. **5.19.3** In chorus: Yes, it was used just like commercial yeast.	Traditional beer foam	Traditional beer foam
5.19.4 When traditional beer foam is used, it is sprinkled on the dry ingredients during bread making. **5.19.5** We have not used traditional sorghum beer foam and we do not have knowledge about it as a raising agent in bread making. **5.19.6** We do not know traditional beer foam and we do not know anything about it. We use traditional beer as it is.	Traditional sorghum beer foam	Traditional beer foam
5.19.7 Foam from hop beer (*hopose*) is used while fresh. **5.19.8** Remove foam on top of the traditional beer and dry it. When this foam is dry, grind it to a very fine powder and store it in a container with a tight fitting lid. **5.19.9** Traditional beer foam can be dried and finely ground. **5.19.10** Remove foam from traditional sorghum beer and dry it. When dry, lightly grind it and store it in a powdered form to use as a leavening agent, every time you need it.	Drying foam for storage	Preservation to prolong shelf life
5.19.11 Traditional beer is diluted with water before it is used as a raising agent for bread. **5.19.12** Both traditional beer and modernized beer- hops (*hopose*) do not need to be diluted in order to be used for leavening agent. They are used as they are. **5.19.13** Traditional beer can be diluted a little with water.	Reduce sweetness	Water dilution
5.19.14 We use traditional beer, and it should be 1 day old. This is because fresh traditional beer is still sweet so it can produce bread that is too sweet. **5.19.15** Traditional beer can be used either fresh or old.	Age of traditional beer	A day or 2-3 days old
5.19.16 Traditional beer residue (*moroko*) is mixed with water to produce sour liquid that is used as a raising agent. **5.19.17** Yes in this residue (*moroko*) – we add water to produce sour liquid referred to as *letsina- o oa thosoloa*.	Supernatant (*letsina*)	Add water to beer residue

Some participants used the foam of a traditional beer in its fresh form, while othes used it in a powdered form. This latter was a common practice in all regions except one (Thaba-Tseka) where participants indicated lack of knowledge regarding the use of traditional beer foam in bread making. The reason for this difference may be attributed to the fact that traditional beer is used as an alternative when sourdough is not available. People living in

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Thaba -Tseka, a region with a cold climate, normally have a lot of wheat and they are able to have sourdough for a longer period in the year such that there is no need to keep traditional beer foam for future use. Hop beer (*Hopose*) was not traditionally prepared in Lesotho, because all the ingredients for hops have to be bought. Participants believe it is the type of beer that was adopted from South Africa by Basotho who worked in the mines. This beer is also used as a leavening agent in bread making.

The benefits of using traditional sorghum beer in Basotho bread-making, are its good taste (36%, n=92), easy availability (34%, n=87), its high volume (23%, n=58) as well as quick fermentation (5%, n=61, Figure 4.15). In a study conducted by Prinsloo (1990:61) on qualities of bread prepared using sorghum beer, the sensory characteristics of sorghum beer bread were generally ranked as undesirable, but the colour, elasticity and softness of the crumb were appreciated by consumers.

Theme 2: Use of supernatant for sour porridge

The theme about sour porridge supernatant, as indicated in Table 5.20, has one category namely composite and non-wheat breads. Participants regard sour porridge supernatant as suitable for composite and also for breads made from maize and sorghum. Sour porridge supernatant is the liquid obtained from a fermented mixture of either maize and water or sorghum and water prior to cooking sour porridge.

Table 5.20: Theme 2: Use of supernatant for sour porridge

Respondents statements	Concept	Category
5.20.1 Supernatant from a fermented mixture ready to make thin sourporridge (*motoho*) is suitable for sorghum bread (*Ntsoanatsike*) **5.20.2** The supernatant (*hloeka*) from a fermented mixture for making sour porridge is also suitable for composite bread (*mocha-hlama*). This supernatant is good for composite breads and other traditional Basotho breads. **5.20.3** We use sour porridge supernatant (*hloeka*) from a mixture of porridge that has fermented, and is ready to be cooked.	Sour porridge supernatant	Composite and non-wheat breads

Theme 3: Commercial yeast

The theme about the use of commercial yeast in bread-making comprised two categories, namely benefits of commercial yeast and disadvantages of commercial yeast (Table 5.21). Participants indicated the benefits of commercial yeast as quick fermentation (69%, n=175), high volume bread (54%, n=136) and good taste (32%, n=79, Figure 5.15). Focus group

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participants, according to statements 5.21.1-5.21.3, Table 5.21), also described the benefits of commercial yeast. DiMuzio, (2009:68) confirmed the quick fermentation benefit. Commercial yeast requires about $1^1/_2$-2 h fermentation time to produce enough carbon dioxide sufficient to give high volume bread. DiMuzio (2009:68) reported that bread made from commercial yeast is normally not sour at all because the number of lactic acid bacteria produced within a short time is quite small.

Table 5.21 **Theme 3:** Commercial yeast

Respondents statements	**Concept**	**Category**
5.21.1 Commercial yeast is used as a raising agent because it is very quick, the dough takes a very short time to ferment. **5.21.2** I use yeast because of its quick fermentation effect and because it produces bread of a high volume.	Quick and high volume	Benefits of commercial yeast
5.21.3 I also like it because it does not produce bread with sour taste.	Taste Improvement	
5.21.4 The problem with yeast is the yeasty smell in the bread and a weak/loose texture.	Yeasty smell	Disadvantages of commercial yeast
5.21.5 When yeast is used alone in bread making, it produces bread that spoils easily.	Short shelf life	
5.21.6 Yeast on its own when used on our cultivated wheat flour, produces tasteless bread with loose texture.	Loose texture	
5.21.7 Commercial yeast is not good to be used on the cultivated wheat flour, because it produces dough with a very loose texture, which results in bread that is of low volume and that spread sideways.	Tasteless	
5.21.8 The taste of bread commercial yeast is used on cultivated wheat, also tends to be too sweet. In most cases, we mix commercial yeast and sourdough.	Too sweet	

Bread requires 3 - 4 h of fermentation time for the production of lactic acid enough to produce the desired sour taste in the dough if commercial yeast is used (DiMuzio, 2009:68). The present study revealed five concepts about the disadvantages of using commercial yeast as a raising agent for Basotho traditional bread. Some participants said yeast has undesirable effects on smell, texture, taste and shelf life of bread as indicated in statements 5.21.4 – 5.21.8, Table 5.21. The bland taste of bread prepared from yeast may be attributed to the short fermentation time.

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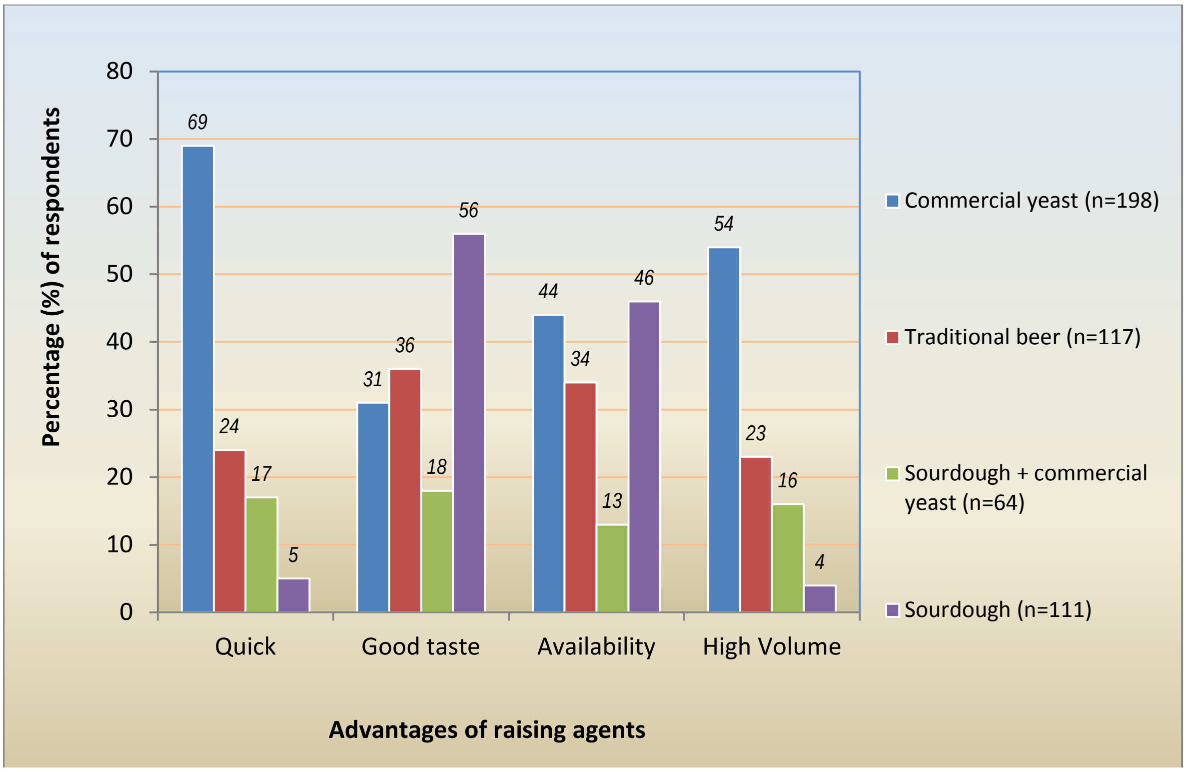

Figure 5.19: Participants' reasons for their choice of a leavening agent (N=253) where one participant responded to more than one type of raising agent

5.7.1.2 Flour

Which type of wheat flour do you use? What are the reasons for choosing this type of wheat flour?

The objective of this question was to demonstrate participants' perceptions regarding the type of flour that they use for bread making. This could offer explanations for why consumers choose whole grain flours and drift away from consuming bread prepared from traditionally whole grain flours to fine flours.

The results from this question produced 3 themes namely:

Theme 1: Commercial flour
Theme 2: Obtaining cultivated wheat grain for flour
Theme 3: Preparing cultivated wheat grain for flour

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Theme 1: Commercial flour

The majority (80%, n=201) of respondents use commercial wheat flour (Easy bake) (Figure 5.20). The use of commercial wheat flour was observed in the urban areas (*Leribe, Mafeteng and Maseru*) during focus group demonstrations. There were a few exceptions in the rural areas that said they used commercial wheat flour because they earn wages and can afford to buy it. Participants mentioned that the commercial wheat flour that was generally used in Lesotho was called *Easy bake.* Participants described Easy bake as a combination of whole wheat and bread flour. The reasons for their preference appear in statements 5.22.1-5.22.5, Table 5.22. Commercial wheat flour was liked for producing bread with a soft texture, appealing colour and a good taste. Participants also stated that commercial wheat flour was desired because of the visible fibre on the bread, which gives an impression that the bread satiates easily. They said bread prepared from this flour was neither too dark nor too light and it was good because Basotho do not like white bread while at the same time they do not want their wheat bread to be too dark. Surprisingly, participants in Lesotho expressed preference for flour with a lot of fibre pointing out to the fact that it was good for their health, as seen in statements 5.22.3, 5.22.4, 5.22.13 & 5.22.15, Table 5.22.

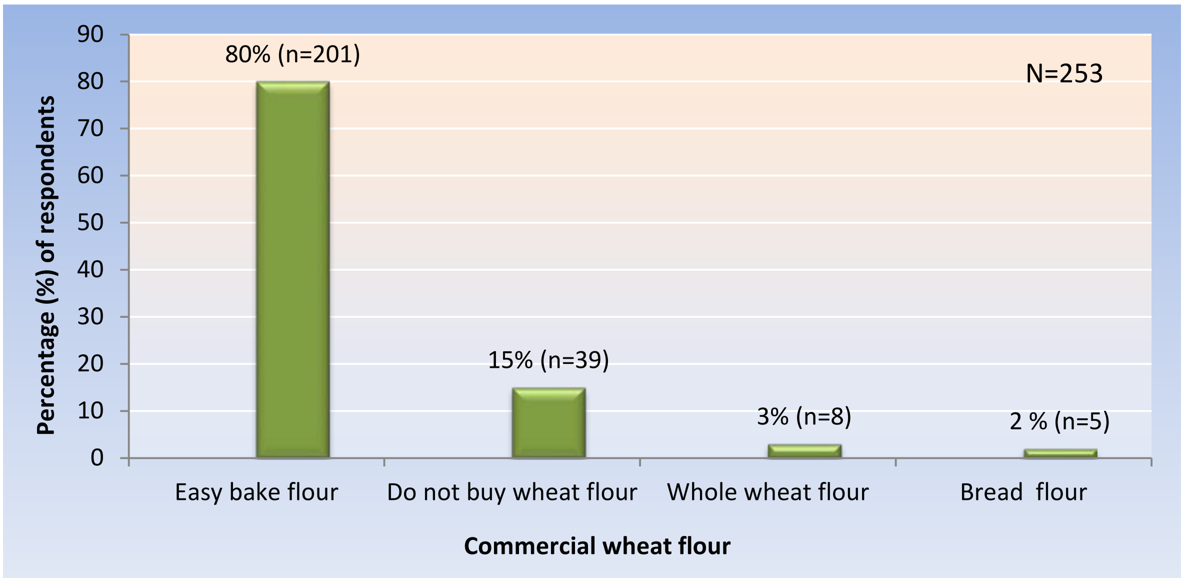

Figure 5.20: Types of commercial flour bought by respondents

Statements 5.22.7 & 5.22.8, Table 5.22 revealed the difference in preference of refined and whole wheat bread by older people and children. A portion of participants expressed that they prefer whole wheat bread but they have to go through a sacrifice of using this combined commercial flour (Easy bake) because their children prefer a lighter flour. One of the reasons

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for older people to prefer whole wheat bread appears in statement 5.22.2, Table 5.22. According to Figure 5.20 bread flour (white wheat flour) is the least preferred by Basotho. Ashton (1939) stated that Basotho disliked refined flour because it has less body and therefore it is not as filling as the whole flour food stuffs prepared from cereals ground at home. In the USA Bakke and Vickers (2007) reported that from a long time ago when white flour came into the market for bread making, it was liked by everybody and it immediately replaced coarse dark

Table 5.22 **Theme 1:** Commercial flour

Respondents statements	**Concept**	**Category**
5.22.1 I like wheat flour that is not too refined or too whole. Flour that combines both refined and whole wheat, because it produces tasty bread with good appearance. **5.22.2** Combined flour also is filling in the stomach, and that is why we like it so much when compared to purely white flour. **5.22.3** We use "*Easy Bake*" because it is a combination of white and brown flour so it is healthy because of roughage it contains. **5.22.4** *Easy Bake* is a combination of whole wheat and bread flour. It has enough fibre needed by the body, it is not too refined. **5.22.5** Yes, *Easy Bake* is a good combination of whole wheat and the white wheat flour so it is the type of flour I prefer. **5.22.6** So we like this combination, we do not like white bread; at the same time, we do not like bread that is too dark. **5.22.7** We buy "*Easy Bake*" flour – It is flour that combines both white and brown bread flour, in order to obtain bread that is neither too brown nor too white. We buy this flour because sometimes our children feel that wheat from the fields produces very dark bread, so we try to accommodate their needs in the diet.	Combination of white and brown wheat flour	Flour choice
5.22.8 I personally like whole wheat flour, but I sometimes have to buy "*Easy Bake*" because of my children. **5.22.9** *Easy Bake* also produces very tasty bread that is very soft.		
5.22.10 Bread prepared from commercial flour (*Easy Bake*) is lighter in weight and quite soft **5.22.11** Commercial flour (*Easy Bake*) result in bread that is very soft and cooks faster	Soft texture	Qualities of flour
5.22.12 Bread is lighter in colour with combined flour. **5.22.13** *Easy Bake* is lighter in colour but not too white, so it also has some roughage that is very visible.	Appealing colour	
5.22.14 *Easy Bake* also produces very tasty bread. **5.22.15** *Easy Bake* is combined flour, although it looks very light and it is tasty, it also has roughage.	Tasty	

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flours, although it is nutritionally poor. The dislike for coarse wheat flour bread was associated with the strong aroma found in whole wheat bread compared to the white one (Bakke & Vickers, 2007). The fact that production of white flour involves complex techniques, which make it more expensive than brown flour was linked to the level of civilization because it was bought by rich people then (Fieldhouse, 1995:80-81). Similarly, Ashton (1939) discovered that in Lesotho fine meal bread (bread made from finely ground flour) was used by a group of people considered well-off such as teachers, chiefs and other authorities. Although the literature by Ashton (1939) seems to be too old, it was the only source of information about Basotho eating habits, which could be accessed by the researcher. The other source of information was Coetzee (1982) for the Sothos in South Africa.

Figure 5.21 indicates that there were differences between the rural and urban areas, regarding the type of flour bought by participants. Easy bake flour was bought more (69%, n=139) in the urban areas than in the rural areas (31%, n=62). More participants in the rural areas (90%, n=35) than in the urban areas (10%, n=4) indicated that they did not buy wheat flour from shops. However, whole wheat flour was bought by very few participants in both urban (88%, n=7) and rural areas (13%, n=1). Similarly, only a few participants bought bread flour in urban (40%, n=2) and rural areas (60%, n=3).

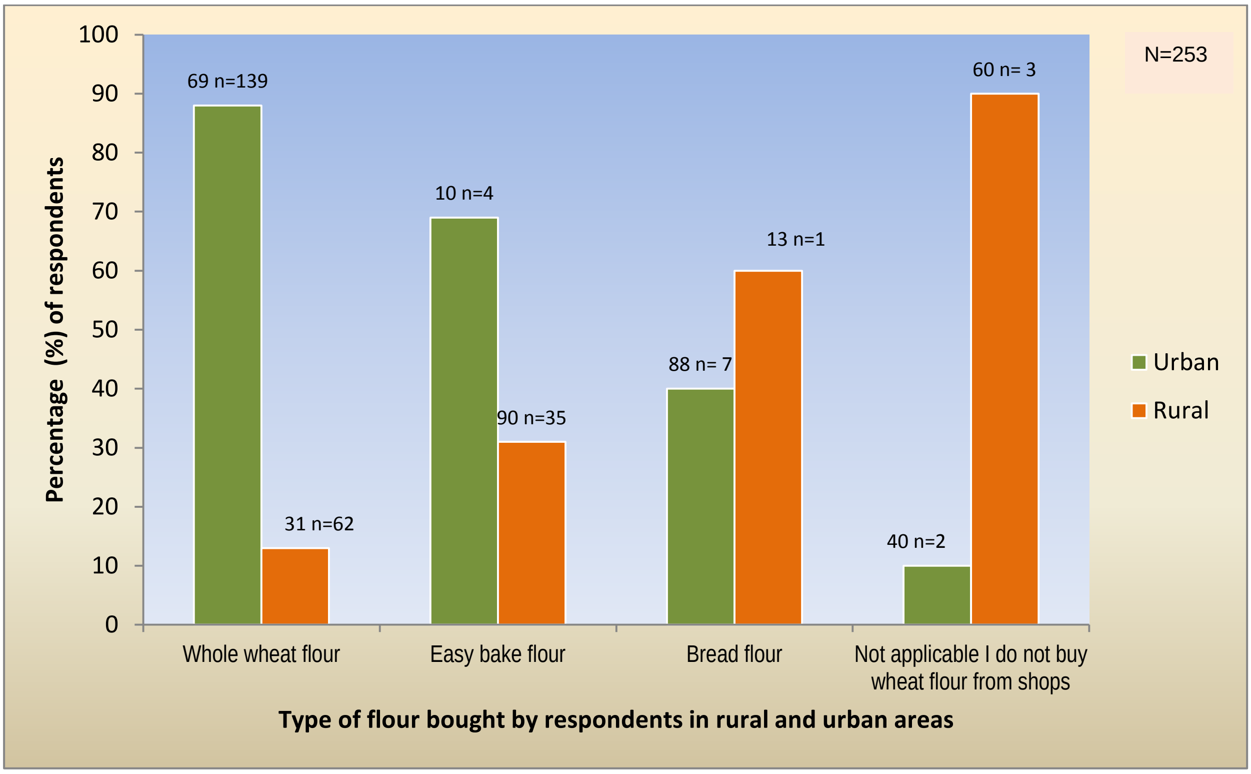

Figure 5.21: Types of commercial flour bought by respondents in the rural and urban areas

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Theme 2: Obtaining cultivated wheat grain for flour

Only one category was identified under the theme obtaining cultivated wheat in Table 5.23. This category consisted of five concepts that indicate different ways in which a housewife can have wheat flour for bread making. The five concepts were harvesting and gift portions (*mehari*), seed, barter system, borrowing and buying cultivated wheat. According to statements 5.23.1–5.23.4, Table 5.23, wheat grains were obtained directly from the fields during harvest time. In Lesotho, harvesting is a joint effort; the whole village was involved to help with harvesting, threshing and winnowing of wheat. All women that helped with winnowing were given small portions of wheat, from which they could prepare flour for bread or keep some as seed for the following year. The Barter system and borrowing were described as methods practised by people in developing countries in order to cope with poverty and high levels of malnutrition. This method involves exchange of cereals that are normally different in prices, as is the case with *ragi* and *jowar* in Ethiopia (Panth, 1997). In Lesotho, maize or sorghum was exchanged for wheat, and there were strategies to deal with the differences in price levels of different grains. Borrowing wheat flour and any other type of flour from a neighbour was a common practice in Lesotho (statement 5.23.6, Table 5.23). Participants said borrowing worked well as long as the same amount of flour taken was returned to the owner.

Table 5.23 Theme 2: Obtaining cultivated wheat grain for flour

Respondents statements	**Concept**	**Category**
5.23.1 Normally during harvest time, wheat flour is found in almost all households here in the rural areas. People that have not planted are invited to help with harvesting and they are then rewarded with small portions of wheat to use in their households.	Harvesting	Cultivated wheat flour sources
5.23.2 Wheat portions given to people that help with harvesting and winnowing are called *mehari and sometimes called meelela*.	Gift portions	
5.23.3 We grow wheat in the fields. People who could not grow their own wheat are given wheat as a reward for helping with harvesting and all the necessary activities such as winnowing needed to get wheat from the fields to the household.		
5.23.4 Each person leaves a small amount of grain to use as seed in the next season.	Seed	
5.23.5 One other option is the barter system-exchanging beans, sorghum or maize with somebody else who has wheat.	Barter system	
5.23.6 A housewife running short of wheat flour can get it from her neighbour by borrowing. The same quantity of wheat flour will be paid back as soon as it is available.	Borrowing	
5.23.7 People who did not grow wheat but have other crops, such as maize or beans, sell these crops and use the money to buy wheat for bread.	Buy cultivated wheat	

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Theme 3: Preparing cultivated wheat grain for flour

The information on how Basotho prepare cultivated wheat into flour for bread making produced three categories (Table 5.24). In general, the preparation begins with wet cleaning of whole wheat grains to remove dust and unwanted materials. Further cleaning of wheat grains is carried out by sorting to remove stones and other materials of high density. Grinding was traditionally done in the households, using a grinding stone. When mills were introduced, people with large quantities of wheat could take their wheat to the mills for grinding (statemens 5.24.1-5.24.3, Table 5.24). Stone grinding was found to be still common with old people both in the rural and urban areas. However in *Mokhotlong-Phahameng,* grinding of grains was done in households using hand mills (Figure 5.22) donated by the German government. In general, it was discovered that stone grinding was gradually being displaced by hammer mills in all the regions investigated. This is in line with the findings by Tsikoane (2007) that nowadays grinding of grain using stones at household level is less practised in Lesotho. Many Basotho take their grain to small-scale hammer mills and roller mills located in small towns in the regions (Tsikoane, 2007). The introduction of hammer mills in Africa was documented by Taylor (2003); Taylor and Dewar (2001) and Cornell and Hovering (1998). Mechanical milling of grain has become the norm in developing countries.

Table 5.24 Theme 3: Preparing cultivated wheat grain for flour

Respondents statements	Concept	Category
5.24.1 In most cases, those people that have been given wheat while helping others, they normally have little, so they do the grinding at home, while those with a lot of wheat, take it for grinding to the mills. **5.24.2** The grinding was done at home because there were no mills **5.24.3** In the past we used wheat from our fields and ground it at home.	Home grinding Mills	Grinding
5.24.4 Debranning of wheat was done in the past. We no longer do it because it is laborious. Bread prepared from debranned wheat is lighter in colour and not dark. **5.24.5** Debranned wheat is also easier to grind and produces soft bread. **5.24.6** Bread prepared from debranned wheat has high volume	Debranning enhance colour Debranning improves texture High volume	Debranning
5.24.7 The harvested wheat was stacked tightly in the fields to prevent it from germinating. The qualities of bread from germinated wheat are unattractive, they include bread that it too sweet, dark, loose texture with mouldy smell and taste.	Prevent germination	Ensure quality

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Figure 5.22: A picture showing a hand mill used to grind grain for bread flour at household level

Depending on the type of bread to be prepared, the clean dry grain was steeped in water for about five minutes and then partially sun-dried. After a few minutes of drying, de-branning was performed, traditionally using a stone pestle and a mortar (Figure 5.23). The de-branned grains were then sun dried on the floor to ensure easy removal of bran during winnowing. The use of a stone pestle and mortar has disappeared in urban regions because of urbanization, which has contributed to lack of resources such as grinding stones.

Enamel or metal containers were used instead of stone pestles. It seems that debranning of wheat was very common in Basotho culture to reduce the amount of fibre on whole wheat. This resulted in bread with enhanced qualities such as colour, texture and high volume (statements 5.24-5.26, Table 5.24). Coarse bran can be undesirable to structure and appearance of the bread (Cauvain & Catterall, 2007:356), because fibre depresses the loaf volume of the whole flour bread product (Sluimer, 2005:27).

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Figure 5.23: Stonemortar and pestle used for debranning grain. Picture of 'Me 'Mapulane Khati (my mother), Ha–Moshe, August 2011

Fibre also produces bread with darker colour. Webb and Owens (2003:200) stated that the darker colour might probably be due to the microbial contaminants found in the bran layer of the wheat kernel, which are normally reduced in debranned wheat flour.

Participants emphasised that it is important to protect wheat from rain during harvesting in order to prevent it from germinating. They said germinated wheat results in undesirable characteristics in bread. They indicated that bread prepared from germinated wheat becomes too sweet and has a malt aroma. Similar concerns regarding the effects of rain-damaged wheat on bread was reported by Quail (1996:31) and Singh, Singh, Kaur and Saxena (2001) in that the starch in germinated wheat is converted to maltose by active enzymes and this negatively affects the qualities of wheat bread.

Other options for obtaining different types of flour for bread making

Figure 5.24 shows that different types of bread were prepared from different sources of dry grains, flour and green grains. Flours were ground using hammer mills, grinding stone or sometimes flour was bought. The majority (83%, n=209) of participants bought wheat flour for preparing steamed wheat bread and also baked (82%, n=207) wheat bread.

For all the wheat based breads, hammer milled flour was ranked second after buying wheat and followed by stone grinding. These findings give an impression that traditional ways of

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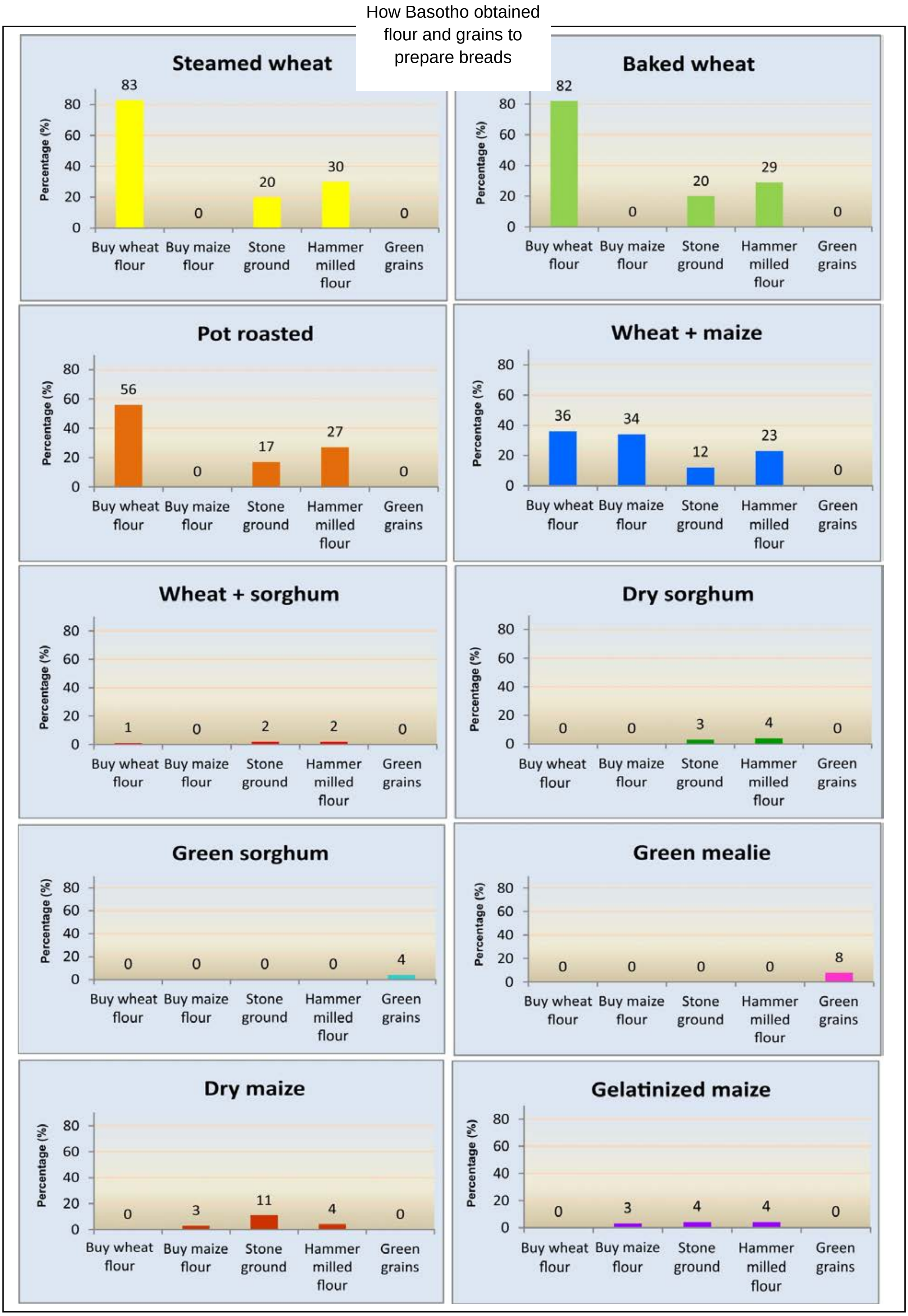

Figure 5.24: Types of flour and grain used to prepare different Basotho breads (N=253) where respondents picked more than one answer

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preparing grain are disappearing, probably due to the hard labour involved and because of lack of grain as one person mentioned during the focus group discussions. Green grains are only used for green sorghum and green mealie breads. Maize flour is bought basically for composite bread (34%, n=87). Participants that prepare dry maize bread use a higher percentage (11%, n=28) of grain ground with a stone than hammer milling and buying.

Reasons for using home ground flour

The majority of respondents (78%, n=142) in the urban areas did not use a grinding stone in their households to produce flour (Figure 5.25). The reasons supporting the use of a grinding stone at home to produce flour were ranked high in the rural areas.

These reasons included the fact that respondents (85%, n=50 in the rural areas and respondents (15%, n=9) in the urban areas did not have enough money to buy flour from shops. Respondents in the rural areas (84%, n=47) and in urban areas (16%, n=9) said, they were able to produce fine flour as needed for the recipe. Respondents in the rural areas (83%, n=29) and in urban areas (17%, n=3) claimed that home ground flour produces bread with a good taste. Some

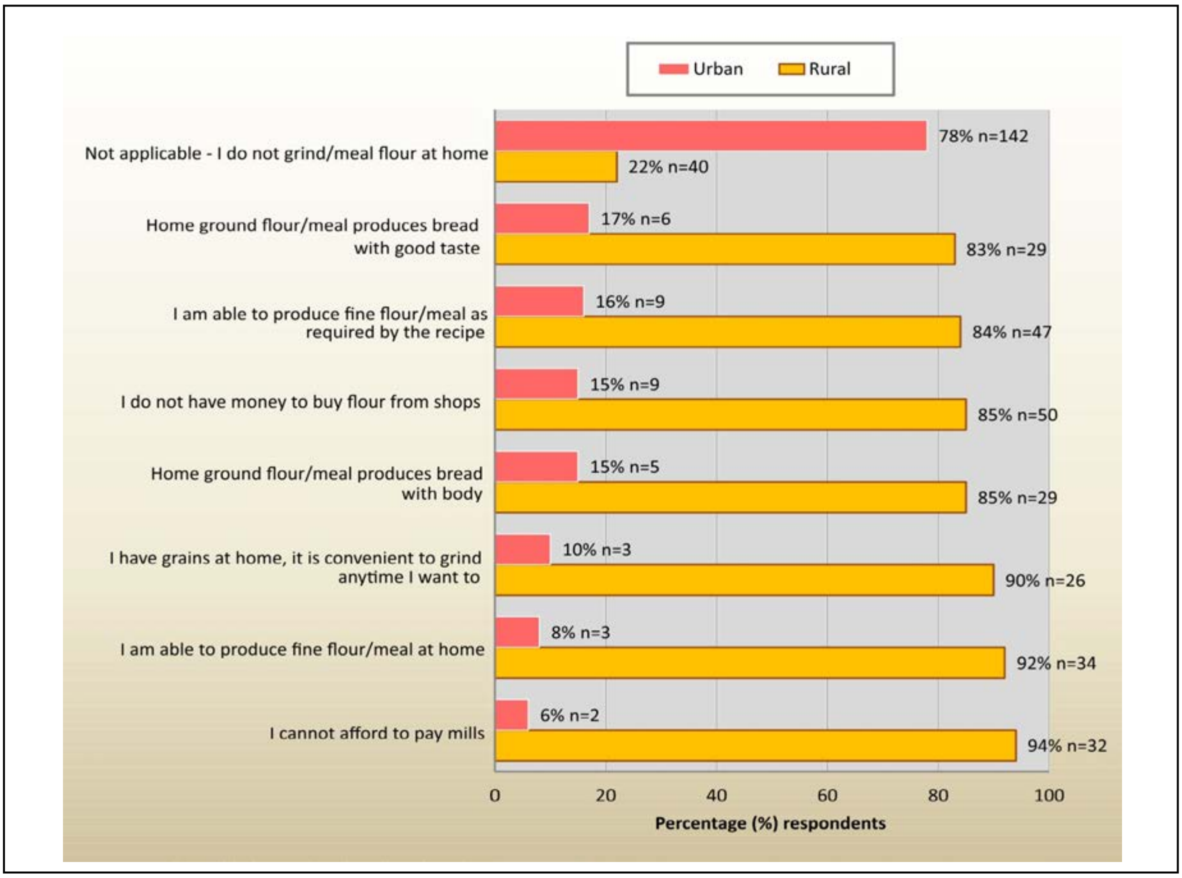

Figure 5.25: The reasons for respondents in the rural and urban areas for using flour ground at home. (N=253) where respondents picked more than one answer

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participants from rural areas (85%, n=29) and from urban areas (15%, n=5) further added that home ground flour produces bread with body. Grinding flour was also associated with affordability. In the rural areas respondents (94%, n=32) and in urban areas (6%, n=2) indicated that they used home grinding because they could not afford to pay millers.

What are the reasons for preparing bread from other types of cereals (maize & sorghum)?

Reasons for compositing bread

Only one theme emerged here as reasons for using non-wheat (maize and sorghum) flour for bread making. Participants prepare breads from a composite of wheat and non-wheat flour because wheat is expensive. There were other reasons listed to support why housewives composite wheat with non-wheat flours for bread making in Figure 5.26. In addition, statements 5.25.2–5.25.5, Table 5.25 emphasise that bread was prepared from other cereals due to the cost of wheat. This also explains why some respondents did not respond to this question. People who can afford wheat flour do not prepare composite breads.

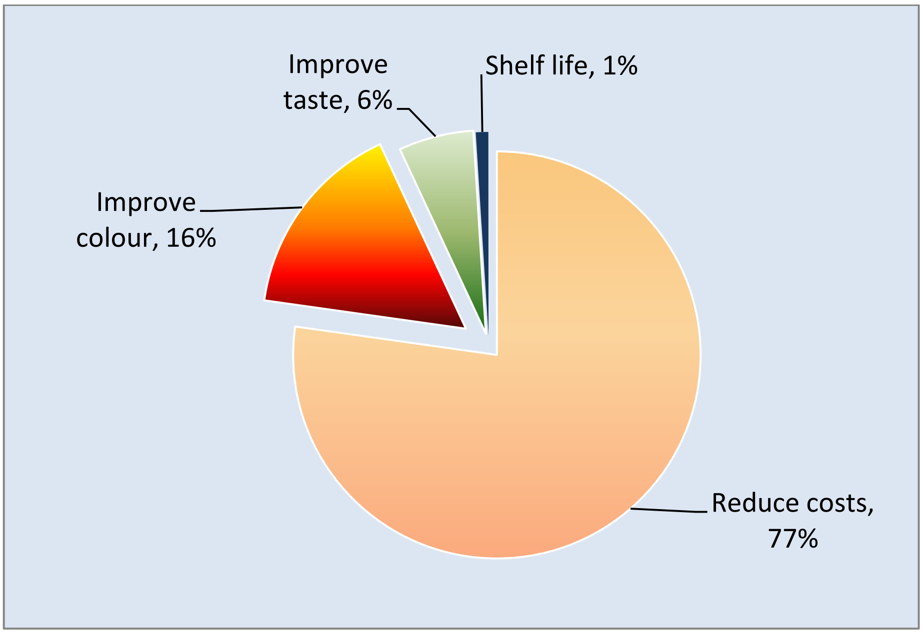

Figure 5.26: Percentage of respondents' reasons for compositing bread n=198

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Table 5.25 **Theme 1:** Reasons for using non-wheat (maize and sorghum) flours for bread making

Respondents statements	Concept	Category
5.25.1 Wheat bread is always found in privileged families who can afford to buy wheat. **5.25.2** Poor families have composite bread in most cases because wheat flour is expensive for them.	Wheat is expensive	Reduce expenses
5.25.3 Yes, green sorghum bread is associated with poverty. **5.25.4** Green mealie bread is also associated with poverty. **5.25.5** These breads are prepared in autumn when there are no dry grains anymore. **5.25.6** Certain breads such as bread from fresh maize and bread from fresh sorghum were cooked for the reasons of starvation. **5.25.7** One participant in Mokhotlong region said bread from fresh sorghum is not commonly prepared in this area so our children dislike it very much. **5.25.8** Fresh sorghum bread (*senkhoana*) is only prepared in periods of desperation when the family is really starving and there is nothing else they can do. This is normally in autumn when grains are still green and the last year's harvest is finished. **5.25.9** Also bread from fresh maize, although we still prepare and consume it, the reason for preparing it is still starvation, when we do not have an option.	Starvation	No option

5.7.1.3 Water

Why do you use warm water and not cold or hot water for bread making?

The researcher's intention to ask this question was to determine the participants' opinions and experiences about the water temperature used for preparing bread. Only one theme emerged in this section. It is water temperature, as shown in Table 5.26.

Theme 1: Water temperature

Participants indicated that warm water is suitable for use in bread making, as explained in Table 5.26. In line with this argument Gisslen, 2009:122 recommended 25.5^{o}C–26.7^{o}C water temperature as ideal for fermentation. However, some participants also mentioned that they sometimes use cold water (statement 5.26.8 & 5.26.9, Table, 5.26) because of a number of factors that include season of the year and regional differences regarding the weather. Participants mentioned that in summer water is already warm so they use it straight from the tap in the urban areas or from the bucket in the rural areas.

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In general, these findings prove that there is a need to control water temperature in bread making (Gisslen, 2009:122). Table 5.26 shows that the temperature of water has an effect on the quality of bread, which is the main category for this theme. These qualities are bread volume, colour, texture and taste. According to participants, cold water delays fermentation (statement 5.26.2-5.26.5, Table 5.26). Because of this delay, the bread volume is low, and the colour becomes dark. If the water is too hot, the dough will not rise and again the bread becomes very dark. The reason for this is that yeast is inactivated by high temperature.

Table 5.26: **Theme 1:** Water temperature

Respondents statements	**Concept**	**Category**
5.26.1 Bread prepared from hot water does not rise.	Bread volume	Product quality
5.26.2 Cold water results in dough that takes a long time to rise.		
5.26.3 The dough rises quickly with warm water.	Fermentation period	
5.26.4 Hot water is not good, it stops the action of a raising agent, so dough does not rise.		
5.26.5 Cold water delays the fermentation process, so the dough takes long to rise.		
5.26.6 Cold water results in very dark bread, which does not rise evenly.	Bread colour	
5.26.7 Bread prepared from hot water becomes very dark		
5.26.8 In summer, I do use cold water because the water is not very cold and the temperature of the environment is warm enough. In winter I use warm water only.		
5.26.9 Yes, in summer, tap water comes out already warm, so it can be used successfully to produce good tasting bread.	Taste	
5.26.10 The longer time it takes for the dough to raise, the more sour it becomes.		
5.26.11 Hot water produces sticky bread.	Texture	
5.26.12 Bread prepared from hot water becomes hard and heavy. Chorus: One can even suffer from stomach-ache from eating bread made with hot water.		
5.26.13 Hot water also results in bread with a very loose texture.		
5.26.14 It is also important to remember that if we experience rainy season during harvesting, wheat sometimes germinates while still in the fields. If wheat flour from germinated wheat has to be used, cold water should be used, because warm water will produce dough with very loose texture that will spread and not rise in the pot.		

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5.8 FLAVOURING TRADITIONAL BASOTHO BREAD

How do you add/improve the flavour of traditional Basotho bread?

The purpose of this question was to determine ingredients used for improving flavour and to find out whether techniques and processes involved in traditional Basotho bread-making add to its flavour. The results of this question (Table 5.27) led to one category - enhancing flavour and the discussion is based on one theme that emerged as flavouring bread.

A number of concepts emerged from this category to explain the type of flavours enhanced and also the techniques employed to enhance flavours of traditional Basotho bread.

- Addition of sugar
- Addition of salt
- Pre-gelatinization of starch
- Length of fermentation
- Type of raising agent (sour flavour)
- Mixing method
- Method of cooking and fuel used

5.8.1 Theme 1: Flavouring bread

According to statements 5.27.1-5.27.11, Table 5.27), participants differed in their opinions about adding sugar. Some of the participants, especially in the urban areas, add sugar. Participants from the rural areas claimed that the cultivated wheat that they use for bread making (statement 5.27.9, Table 5.27) is naturally sweet so they do not have to add any sugar to this bread. Other participants clearly showed that the sweet taste of bread is also enhanced by addition of boiling water to the maize or sorghum (pre-gelatinization of starch) meal during preparation of composite breads. As a result, they do not need to add sugar. All the participants mentioned that they added salt in order to enhance flavour. This is in line with literature which shows that salt is added primarily to improve the flavour of bread (Sluimer, 2005:46).

The length of fermentation is a concept that affects bread flavour (Table 5.27) (*Flavouring bread* statements 5.27.16-5.27.18, Table 5.27). These results correspond well with Table 5.32 *(time to prepare bread dough).* For the concept to appear twice it is an indication that fermentation time is important in determining the flavour of bread. Apart from the length of fermentation, bread flavour is the result of the type of leavening agent used (statement 5.27.9, Table 5.27).

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Table 5.27 **Theme 1:** Flavouring bread

Respondents statements	**Concept**	**Category**
5.27.1 Sugar is added for flavour and good taste. **5.27.2** Yes, that sweet taste is good. **5.27.3** I do not like bread with sugar, even now in my household; I do not add sugar when I prepare bread. **5.27.4** Lesotho does not have sugar cane; we do not understand why Basotho nowadays like to add sugar in bread. Sugar is not one of Basotho's ingredients.	Addition of sugar	Enhancing flavour
5.27.5 Basotho used germinated wheat or sorghum flour for its sweet taste. You add just a little bit- about a handful or 2, depending on the amount of bread you are preparing. **5.27.6** Yes, we used germinated flour and it is called *motsoako* (additional mix). **5.27.7** Sugar is optional in bread making. Basotho used to prepare bread without any sugar. We still do not like to add sugar in bread. This is because wheat flour is sweet on its own. That is why we always use a little bit of wheat flour even for breads that are made using other cereals (m*otsoako*). **5.27.8** Mixing with a little wheat flour gives a sweet taste. **5.27.9** Our cultivated wheat is very sweet, so we do not add sugar.		
5.27.10 We do not have to add sugar while preparing bread, we only add salt. **5.27.11** If sugar is added to our traditional wheat, it produces a loose textured bread.		
5.27.12 When making composite bread (*mochahlama*), sweet taste is enhanced through the addition of boiling water (pre-gelatinisation) to the maize meal or sorghum meal. **5.27.13** Pre-gelatinization of maize or sorghum starch when preparing composite bread improves flavour. Bread becomes too sweet.	Pre-gelatinization	
5.27.14 Salt is used for flavouring. **5.27.15** We add salt for saltiness.	Addition of salt	
5.27.16 The length of time for the dough to rise also affects bread flavour. **5.27.17** Dough that has been left to ferment for a long time has low sugar content and it becomes sour. Long fermentation also produces a sour smell.	Length of fermentation	
5.27.18 If dough is cooked before it is well fermented, Bread becomes too sweet The taste is very bland and not sour at all Salt is more pronounced. This type of bread does not taste like bread.		
5.27.19 Different types of leavening agents also result in differences in the flavour of bread.	Type of raising agent used	
5.27.20 Basotho bread is cooked in different methods, sometimes we steam or sometimes we bake it. The taste is different depending on the method of cooking used. The sticks used for preparing the steamer also add flavour to the bread.	Method of cooking	
5.27.21 Bread that is cooked outside with wood using a traditional iron pot has a different flavour from the bread that is cooked using paraffin, or a gas stove. We prefer the one cooked outside in a three legged pot.	Pot material and type of fuel used	

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The same concept surfaced previously (Table 5.17) for benefits of sourdough and Table 5.21 on the use of commercial yeast. The concept of method of cooking regarding bread flavour is described in statement 5.27.20. Participants mentioned that bread cooked by steaming method has a different flavour from bread cooked using the baking method. They also agreed that materials for preparing the steamer improve flavour of bread. Some participants agreed that bread cooked using wood and a three legged iron pot has a different flavour from the one cooked on top of a stove (statement 5.27.21, Table, 5.27).

5.9 PREPARATION METHODS

An overview of the type, choice and preparation of ingredients for bread-making were described. This section deals with the main preparation techniques in bread-making. They include kneading, fermentation and cooking, starting with equipment used in the preparation of bread.

Which equipment and material do you use for Basotho bread?

Bread cannot be prepared without the use of proper equipment. It was important to ask this question in order to document the traditional and modern types of equipment used in both the rural and urban areas of Lesotho for bread making. The discussion of results is based on one theme that emerged as equipment and materials for bread making.

5.9.1 Equipment and materials for bread making

Traditionally, Basotho used grinding stones, clay pots, cast iron pots, Basotho baskets, Basotho mats and mixing bowls made from enamel and aluminium (Figure 5.27). Pots were basically used for cooking; A Basotho hand-woven grass mat (*Sethebe*) was used for collecting flour during stone grinding. Hand woven grass basket (*Seroto*) was used for carrying grain and flour and for serving bread. Flour was collected on the Basotho mat during the grinding of grains on a grinding stone. Mixing bowls were basically used for winnowing, to carry grains, to carry flour, for mixing and kneading and also for serving bread. With all the changes experienced in culinary practices (Table 5.28), participants adopted the modern style of using plastic containers instead of enamel and aluminium bowls for bread-making. The reasons stated for preferring the use of plastic containers were associated with provision of warmth for quick dough fermentation when compared to other materials such as enamel (statements 5.28.4, 5.28.6 & 5.28.8, Table 5.28). Availability was stated as the prime reason for the use of plastic containers because the market was flooded with plastic containers and enamel. Aluminium containers were few or not available at all. Convenience

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was mentioned as the other reason for the choice of plastic containers because they come with lids, so a housewife does not need to look for additional materials to cover the dough during fermentation.

Figure 5.27: Picture of equipment used in the preparation of Basotho bread in Leribe. A (enamel mixing bowl (*sekotlolo)*), B (flat cast iron pot for baking bread (*Pitsa tsa sesotho*)), C (three legged cast iron pots for steaming bread), D (Basotho mat (*sethebe*)), E (Basotho basket (*Seroto*)), F (Grinding stone (*leloala)*), G (top grinding stone (*Ts'ilo/ts'iloana*))

The use of plastic mixing bowl has a limitation because they cannot handle enough dough for the large sizes of Basotho families according to statements 5.28.11, 5.28.12 & 5.28.14, Table 5.28. A promising aspect was the fact that as much as plastics were saturating the market, enamel and aluminium bowls were also being introduced again in the market for those who desired to use them. Statement 5.28.16, Table 5.28 outlines a list of other Basotho equipment that could be used to cover the dough during fermentation process.

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Table 5.28 **Theme 1:** Equipment and materials for bread making

Respondents statements	**Concept**	**Category**
5.28.1 I do not like plastic mixing bowls, and I have seen the type of mixing bowls made from aluminium that we used in the past (*Sekotlolo sa sheleng*/*sa romane*). They are back now. **5.28.2** Nowadays we use plastic basins more, because traditional types of mixing bowls are no longer available anywhere. **5.28.3** Plastic basins come with lids, they are therefore convenient because we do not need to look for materials to cover the dough. **5.28.4** Plastic bowls become warm easily, so the dough takes a short time to rise. **5.28.5** Plastic bowls are used when kneading the dough. **5.28.6** We also use 10L plastic buckets nowadays because they warm up quicker and they come with lids to cover, unlike enamel basins. They are therefore convenient because we do not have to look for materials to cover the dough. **5.28.7** Mixing bowls – Plastic basins. **5.28.8** Nowadays we prefer plastic basins because the dough takes a shorter time to rise in a plastic basin. **5.28.9** Plastic basins are more preferred also because they already have lids to cover them. In addition, plastic buckets are also used for the same reason. **5.28.10** I sometimes use a plastic bucket. I place dough in it for some time to rise. **5.28.11** As much as I agree with people that say plastic mixing bowls have advantages, they do not come in big sizes. Basotho have very large families, so they need to use big mixing bowls.	Plastic mixing bowls	Mixing bowls
5.28.12 Enamel mixing bowls make kneading of dough very easy because they are large enough and the dough does not stick to the surface like with plastic containers.	Enamel mixing bowls	
5.28.13 We use enamel bowls. **5.28.14** Mixing and kneading of dough can be successfully done in an enamel bowl, because enamel bowls are wide enough to allow mixing. The dough does not stick to the basin while kneading. However, nowadays we also have plastic mixing bowls and we use them rather than enamels bowl to keep the dough because plastic mixing bowls warm up easily and keep the warmth inside for the dough to rise. **5.28.15** I have seen both basins (*sa sheleng & sa romane*) at Metro Cash and Carry Wholesale. In fact, most of the old equipment that we used in the past is continually coming back to the market nowadays. **5.28.16** We also use - Traditional basket (*seroto*) to cover the dough in the bowl. - Traditional mat (*sethebe*) to cover the dough during fermentation. - Another enamel basin can be used to cover the dough during fermentation.		Traditional mats and baskets
5.28.17 Sack bags are also used to make a warm layer underneath the basin. We also use clean pieces of cloth such as table cloths to cover the dough.		Sack bags

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5.9.2 Kneading

For how long do you knead the dough? How do you know that the dough is ready to be left for fermentation?

The objective of this question was to determine the participants' reasons for the length of time they take to knead the dough and how they determine that the dough is well developed. The findings revealed that kneading was considered most important in wheat and composite breads. The information was grouped in two themes:

Theme 1: Signs indicating that the dough is well developed
Theme 2: Benefits of optimum dough development

Theme 1: Signs indicating that dough is well developed

Participants perceived the texture of the dough as an important indicator (Table 5.29). They said the dough should not be sticky, it should leave hands, fingers and the mixing bowl clean when touched or when lifted up (statements 5.29.1-5.29.5, Table 5.29). When the dough no longer sticks to the mixing bowl, apart from the fact that the dough is well developed, this, according to participants, was an indication that a housewife is very tidy. Development of dough involves different stages from mixing ingredients into a fluid, then to a sticky mixture and finally to a plastic and elastic mass (Cauvain, 2007:23; Quail, 1996:51; Sluimer, 2005). The elasticity of the dough also came up in the discussion (statement 5.29.6, Table 5.29). Gisslen (2009:103) reported that a sticky texture appears before the dough reaches the ideal state of development, and that once the dough is well developed, it becomes less sticky and it can be easily handled.

Table 5.29 Theme 1: Signs indicating that dough is well developed

Respondents statements	Concept	Category
5.29.1 You knead the dough until it does not stick to your hands or to the basin, and until the dough forms a thick non-sticky consistency. **5.29.2** When the dough does not stick to the hands/fingers anymore and also when it does not stick to the hands or basin anymore. **5.29.3** During kneading when your hands come out clean. **5.29.4** Lift up the dough from the basin; if the basin is clean, and the dough no longer sticks to the basin, then it is well done. **5.29.5** We leave the basin in which the dough is kept very clean for neatness.	Clean hands Clean mixing bowl	Non sticky dough
5.29.6 We test the dough by pressing it with the first finger, if it springs back quickly that is an indication that it is ready. You can also press it with a finger and if it springs back it is ready.	Leaves no dent	Elasticity
5.29.7 This is referring to kneading the dough for the 2nd time. It is done to release the air out of the dough. It also helps to distribute the raising agent. It is done for a few minutes.	Elasticity	Knocking back

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According to the respondents in all the regions, **kneading** was perceived as the most important step in wheat bread making, and it was taught to Basotho girls from a very young age to help them become good housewives. Elwert–Kretschmer (2001) mentioned that in Benin young girls from as early as 7-8 y learned the cooking skills from their mothers or a close female relative, aunt or female cousin, because a woman who masters the important culinary skills was treated with respect, honour, pride and love. According to respondents, the importance of kneading the dough thoroughly was always emphasised because the texture and colour of wheat bread were also the result of a well-developed dough as a consequence of the kneading employed. In agreement with these findings, Callejo (2011) noted that intensive kneading lightens the bread in terms of colour and texture and helps the bread to increase in volume (Callejo, 2011). On the other hand, insufficient kneading produces dough with low volume (Participants in all the regions agreed that kneading of dough was done at two intervals and that the first interval followed by knocking back (statement 5.29.7) before starting the second kneading phase.

Theme 2: Benefits of optimum dough development

Participants indicated the benefits of optimum dough development as two categories (Table 5.30). The first is bread qualities. This category covers soft texture, taste improvement, enhancement of colour, high volume and short cooking time (statements 5.30.1-5.30.8). The texture of bread and the high volume are the results of the method used during mixing, because during mixing air is blended into the dough causing the gluten to become more elastic.

Table 5.30 **Theme 2:** Benefits of optimum dough development

Respondents statements	**Concept**	**Category**
5.30.1 We were taught from a young age, that bread dough has to be thoroughly mixed in order to produce a good quality product. **5.30.2** Well mixed dough results in soft bread. **5.30.3** Bread cooks faster and it becomes very soft and tasty.	Soft texture	Bread qualities
5.30.4 Well mixed dough cooks faster.	Short cooking time	
5.30.5 Bread becomes very tasty, thorough kneading encourages good flavour because all flavourings used such as salt, sugar and sourdough mix well and balance. **5.30.6** It is important to knead the dough thoroughly because this will result in very tasty bread which does not stick to the mouth.	Taste improvement Prevent sticky texture	
5.30.7 It is important to knead the dough thoroughly because the bread also becomes light in colour.	Enhance colour	
5.30.8 If kneading has been done properly, dough rises to a higher level and results in bread that is well risen.	High volume bread	
5.30.9 If kneading has been done properly, bread becomes soft, and dough takes a short time to rise.	Speed fermentation	Fermentation

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Mixing further develops the gluten by causing its strands to form an elastic network (Gisslen, 2009:103; Cauvain, 2007:23; Sluimer, 2005:7). The soft texture is also associated with tenderisation of bread that occurs during leavening, when the air cell walls become thinner (Gisslen, 2009:103). The benefit of proper mixing described in statement 5.30.5 showed that participants believe that mixing helps to improve bread flavour because during mixing flavouring agents are well distributed in to the mixture.

Gisslen (2009:103) reported that mixing facilitates the blending of water, flour and all the other ingredients. Participants reported that bread from a well-developed dough looks lighter in colour (statement 5.30.7, Table 5.30). Quail (1998:53) indicated that optimum dough development causes the dough to change from dull and rough to a smooth and silky shiny surface. Optimum dough development also has an advantage for fermentation time. Participants, according to statement 5.30.9, Table 5.30 noted that the more force applied by their hands to knead the dough contributes to a shorter time taken for the dough to rise. During the kneading of dough, force is applied. It introduces energy to the dough which in turn, and the dough becomes warm and rises (Cauvain, 2007:23). If the dough itself is already warm, fermentation is quicker.

5.9.3 Fermentation

What are the important techniques related to fermentation of traditional Basotho bread dough?

This question was important in this study to allow the participants opportunity to describe all the techniques that are essential during dough fermentation. Four themes came out of the discussion:

Theme 1: The signs indicating that the dough is fermented and ready to be cooked
Theme 2: Time of the day to prepare traditional Basotho bread dough
Theme 3: Basotho cultural belief on the fermentation process
Theme 4: Providing warmth to ferment traditional Basotho bread dough

Theme 1: The signs indicating that the dough is fermented and ready to be cooked

Participants indicated in theme 1 (Table 5.31) that before they make the decision to cook the bread, there are signs which indicates that the dough is ready to be cooked. Two categories resulted from this theme: dough appearance and sourness. Gisslen (2009:122) reported that

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dough fermentation times vary so much depending on different conditions, so the clock time may not be a good indicator of the readiness of the dough. Appearance and feel of the dough, as used by Basotho, were suggested as good indicators of readiness. Participants agreed that cracks were an indication of a well fermented dough of maize and sorghum mixtures as well as of composites, of wheat and maize or sorghum (statement 5.31.2 & 5.31.3, Table 5.31) and (Figure 5.28 B & C) Sometimes cracks are found in whole wheat dough.

Table 5.31 **Theme 1:** The signs indicating that the dough is fermented and ready to be cooked

Respondents statements	Concept	Category
5.31.1 Chorus: The dough cracks (*e ea peperana, e ea sena, boa petsoha*). **5.31.2** Dough from composite mixture (*mochahlama*) shows cracks. **5.31.3** The dough from whole wheat and composite mixtures shows cracks.	Cracks	Dough appearance
5.31.4 Commercial wheat bread dough shows bubbles all over.	Bubbles	
5.31.5 The dough doubles in size. **5.31.6** Wheat dough doubles in size, maize and sorghum dough also increases in size although they may not double. **5.31.7** The dough is ready to be cooked when it has doubled in size. **5.31.8** When it has doubled its size. **5.31.9** The size of the dough, meaning if it has doubled in size or more than the original dough volume especially with wheat bread.	Double the original size	
5.31.10 Presence of sour smell or fermented smell. **5.31.11** The sour smell is also an indication of readiness. If the sour smell is too strong/heavy, it means the dough overstayed and if cooked it will result in bread that is too sour.	Sour smell	Sourness
5.31.12 One method of testing is to taste a small piece of dough and if it tastes sour, then the dough is ready to be cooked. All respondents agreed – yes we do take a piece of dough to taste. **5.31.13** The sour taste indicates readiness for cooking. If the dough is so sour that it cannot be tolerated in the mouth, then it means it was allowed to ferment for a long time and it passed the readiness state. This type of dough will produce bread that is too sour. **5.31.14** When the dough has sour a smell. **5.31.15** A sour smell when opening the container in which the dough is kept. **5.31.16** If the dough is too sour, add a little flour to it and knead again. Leave for a few minutes then cook the dough. **5.31.17** We should not also forget that maize breads and sorghum breads become sour faster than wheat breads.	Sour taste	
5.31.18 The dough becomes lighter in weight.	Lighter weight	

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Bubbles were also said to be good indicators of a well fermented dough, especially if commercial wheat flour was used (statement 5.31.4) and (Figure 5.28 A). The other indication mentioned was doubling of the size of the dough (statements 5.31.5-5.31.9). Some participants made it very clear that doubled size of dough becomes obvious in wheat mixtures (statements 5.31.5-5.31.9, Table 5.31). Fermentation helps gluten to become smoother; it stretches further and holds more air (Gisslen, 2009:122).

Figure 5.28: Wheat (A), maize (B) and sorghum (C) dough showing signs of fermentation

Participants' statements 5.31.5–5.31.17, Table 5.31 explained the concept of the sour smell and sour taste as an indication that the dough was ready to be cooked. They said that the sour smell of fermented dough was detected by a housewife the moment she entered the room in which fermented dough was kept. It was also a normal practice for a Mosotho woman to verify that the dough had fermented by taking a small piece of dough into her mouth to taste, and if the dough tasted sour then it meant that it was fermented. At this point, housewives agreed that maize dough ferments faster than both sorghum and wheat dough. This was also mentioned as the reason why composited dough always ferments faster than

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wheat dough and has a more intense sour smell than wheat dough. The sourness according to (Hansen & Hansen, 1996) is due to the lactic acid, acetic acid and volatile flavour compounds such as alcohol, esters and carbonyls produced during fermentation.

Participants also argued that an experienced housewife would easily detect the weight differences between a fermented dough and unfermented dough. They claimed that fermented dough would be lighter in weight than the unfermented dough (statement 5.31.18, Table 5.31). This claim complemented, Bouthyette's (2008) observation that around 7,000 BC the Egyptians were preparing unleavened bread from stone ground cereals. Later on, around 3,500 BC, the Egyptians discovered that if dough were left unattended for several hours before baking, it became airy and lighter than the freshly made dough. The Egyptians associated this phenomenon to their belief on benevolent Gods, while in actual fact science proved that the dough becomes airy and lighter because of the CO_2 produced by natural yeasts during fermentation (Bouthyette, 2008). Phase 2 results of this study (Addendum 11) recorded lower mass values for fermented dough compared to fresh dough.

Theme 2: Time of the day to prepare traditional Basotho bread dough

Table 5.32 shows that traditional Basotho bread could be prepared at any time of the day. It could be in the morning or overnight, depending on weather conditions and other circumstances as judged by the housewife (statement 5.32.1–5.32.2, Table 5.32). However morning was justified as the best time because fermentation time can be monitored well during the day while the housewife is awake, in order to obtain the desired level of flavour. In contrast, some participants argued that overnight fermentation could still be the best option, as long as the housewife is able to wake up very early in the morning and manage to cook the bread at the desired level of sourness. Participants suggested that sourness in the dough could also be controlled by techniques employed to cover the dough, depending on the length of hours available for the dough to ferment as described in statement 5.32.4, Table 5.32. The dough could be lightly covered if a longer time is given for fermentation, and heavier materials (warmer) should be used if the dough is expected to ferment in a very short period of time. Gisslen (2009:123) suggested that during the times when it is necessary to ferment dough for long hours, it is advisable to reduce the dough temperature in order to avoid over-fermentation. Statements 5.32.3 & 5.32.4, Table 5.32 imply that if dough is allowed to ferment for a long time it will be too sour, thus confirming Gisslen's (2009:103) findings.

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Table 5.32 **Theme 2:** Time of the day to prepare traditional Basotho bread dough

Respondents statements	**Concept**	**Category**
5.32.1 Morning is the best time to prepare bread dough because a housewife is able to monitor and see when it is ready to be cooked before it gets too sour.	Morning	Controlling flavour through fermentation process
5.32.2 Bread dough can still be made overnight as long as a housewife is able to wake up early and cook it before it over ferments. **5.32.3** If the dough was prepared overnight and it over fermented and has become too sour, a housewife should simply add a little flour and knead for few minutes to reduce the sourness in the dough. Then leave it to ferment further for a short time. **5.32.4** Also if dough has to be made overnight, then use less material to cover, so that the temperature is reduced, this will delay fermentation and avoid sharp sour taste. **5.32.5**: It is wise to prepare the dough overnight so that it has enough time to rise, and cover it with clean cloths and blankets. In particular the dough that should ferment for a longer time includes maize & sorghum dough because Basotho prefer maize and sorghum breads with a sharp sour taste.	Overnight	

Theme 3: Providing warmth to ferment traditional Basotho bread dough

The theme on providing warmth for the dough to ferment (Table 5.33) resulted in only one category with four concepts: bath of boiling water, warm surface, the sun and use of warm materials (statements 5.33.1– 5.33.5, Table 5.33). The dough was fermented in a mixing bowl that was wrapped completely with clean cloths and blankets. Warm temperature of around 21°C to 27°C was noted as the ideal temperature for gluten development (Gisslen, 2009:103). DiMuzio (2009:53) emphasised that it is important to keep the dough temperature moderate because if it is cold, the dough might take too long to rise and if it is higher than optimum the dough might rise faster than normal. Participants from Leribe (an urban area) used the warmth from the sun to speed up fermentation. The explanation in statement 5.33.3, Table 5.33 was provided by participants from Mafeteng (another urban area) who said that the heat from the sun was not good and could produce bread with very loose texture. This may be explained by the fact that fluctuating fermentation temperature affects the proportions of lactic and acetic acid in the dough, resulting in an certain undesirable flavour and physical characteristics (Gisslen, 2009:135). This may be true regarding the temperature from the sun because it is not controlled.

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Table 5.33 Theme3: Providing warmth to ferment traditional Basotho bread dough

Respondents statements	Concept	Category
5.33.1 Sometimes we put the dough over the bowl containing a bath of boiling water in order to speed up rising.	Bath of boiling water	Warm environment for fermentation
5.33.2 We also use our traditional fire place (*leifo*). We remove all the live coals and the ash and clean it up. We cover this fire place with any type of material that cannot burn easily and put animal skin or sack on top. A bowl of dough is then placed on this warm layer.	Warm surface	
5.33.3 We do not use the sun for quick fermentation because the heat from the sun causes the dough to lose its strength and result in a loose texture. The taste and flavour of bread are also negatively affected.		
5.33.4 We do take the dough outside where the sun shines, so it gets warm and rises.	The sun	
5.33.5 We cover the dough with a clean cloth and sometimes with clean blankets. Have a layer of warm material at the bottom of the basin containing the dough and then cover the top.	Warm materials	

Theme 4: Cultural belief associated with the fermentation process of traditional Basotho bread

Participants across all the five regions indicated a strong cultural belief associated with factors affecting the length of the fermentation process (Table 5.34). It is believed that housewives differ in their skill and method of dough handling. This affects fermentation and dough development. Dough handling is regarded as an important skill in which women take pride (statement 5.34.1–5.34.5).

Table 5.34: Theme 4: Cultural belief on the fermentation process of traditional Basotho bread

Respondents statements	Concept	Category
5.34.1 Yes, in Lesotho we believe that people have a different effect on the length of time taken by the dough to rise. We believe that some housewives mix and knead the dough in such a way that it takes a very short time to ferment, while otherds make dough that takes a long time to ferment or sometimes does not rise at all.	Determines speed of fermentation	Housewives differ
5.34.2 We refer to the person that makes the dough to take a short time to rise as having light weight hands (*tsoho le bobebe*). The one whose dough takes a very long time to rise we say her hand is heavy (*letsoho le boima*).		
5.34.3 Yes, we believe that the speed of fermentation depends on the lightness and heaviness of the hand of the individual preparing the dough. If bread takes a very short time to rise, we know that the person who prepared the dough has a lighter hand (*le bobebe*), but it is believed that if the dough takes a long time to rise, it means that it has been prepared by someone with a heavy hand (*le boima*).		
5.34.4 Yes, some women have lighter hands and therefore the dough they have prepared takes a very short time to rise.		
5.34.5 The dough of those with heavy hands takes longer to rise.		

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5.9.4 Cooking traditional steamed Basotho bread

How is the steamer prepared and used?

In this question the researcher attempted to investigate how women in different regions of Lesotho use the local resources to prepare the steamer for steamed Basotho bread. The responses to this question resulted in two themes:

Theme 1: Traditional ways of preparing the steamer

Theme 2: Modern ways of preparing the steamer

Theme 1: Traditional ways of preparing the steamer

Basotho used available resources such as sticks, maize or sorghum stalks, wheat straws and grass to prepare the bread steamer (Figure 5.29). The availability of these resources differed from region to region. Some participants indicated that they used grain stalks instead of sticks. The use of grain stalks appeared to be common in the rural areas due to very cold climatic conditions that inhibit trees from growing; as a result women experienced a shortage of wooden sticks (Statements 5.35.1–5.35.11, Table 5.35). Participants in the rural areas, mainly Mokhotlong and Thaba-Tseka, also used wheat straws more than any other type of material to prepare the steamer because wheat is grown there. The techniques for using wheat straws are well discussed in statement 5.35.19, Table 5.35. Grass and wheat straw were used in a similar manner; they were made into a thick layer inside the pot (statements 5.35.12 & 5.35.19, Table 5.35) or sometimes used to form a thin layer on top of sticks, as described in statements 5.35.13 & 5.35.24, Table 5.35. Coetzee (1982) reported the construction of a traditional steamer in a similar manner using sticks, maize cobs or grain stalks in inter-lacing style to form a mesh-like structure in a clay cooking pot.

Table 5.35 **Theme 1:** Traditional ways of preparing the steamer

Respondents statements	Concept	Category
5.35.1 For steaming all types of bread mixtures (wheat bread, maize and sorghum based bread) - We use sticks that are cleaned and cut according to the size of the pot and arranged in a crisscross fashion, in the middle of the pot. - These pieces of wood can be used on several occasions. You can keep them in a safe place after use, normally up on a tree). Wash them before the next use. **5.35.2** Sticks – we first clean them and peel them so they are clean. While all the other sticks are crossing each other in the pot, one stick is placed standing in the middle of the pot to create space for refilling. **5.35.3** The sticks are used more than once in order to save time and labour when we need to cook bread. It means a housewife does not have to look for sticks time and again, and also does not need to do the cutting of sticks, which is a laborious task.	Sticks	Natural resources to prepare the steamer

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Steamer for Steamed Bread

A. Grain stalks

B. Grain stalks cut to fit the pot

C. Sticks

D. Wheat straw

E. Maize husks

Photographs captured by Pulane Nkhabutlane, April, 2011

Figure 5.29: Traditional ways used by Basotho to prepare the steamer for cooking bread

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Table 5.35 *(continued)* **Theme 1:** Traditional ways of preparing the steamer

5.35.4 We also use sticks from different types of trees. **5.35.5** We use green sticks or dry sticks; it only depends on what is available.		
5.35.6 If pieces of sticks are not there, one can use maize or sorghum stalks both when dry or while still green. Any type of material can be used to make a steamer, what is important is that it should be clean. **5.35.7** If green maize or sorghum stalks have been used, their leaves can be used to form a layer that prevents the dough from falling below the steamer. **5.35.8** Place sorghum stalks or maize stalks inside the pot in a crisscross fashion according to the size of the pot. **5.35.9** We also use maize or sorghum stalks, which are normally available after harvesting.	Grain stalks	
5.35.10 Maize stalks were commonly used in the past because we were growing a lot of maize. **5.35.11** We also use maize stalks both while green and when dry.		
5.35.12 Roll grass in circles inside the pot starting from the bottom of the pot up to the level that will allow dough to rise fully without touching the lid of the pot.		
5.35.13 On top of the sticks, you put a thin layer of long grass (*Joang ba mohlomo*). **5.35.14** In the past, the dough was placed on top of this grass and the house-wife was supposed to remove grass sticking to bread immediately when taking bread out of the pot. **5.35.15** Different types of long stalked grass are also used e.g *mohlomo, roothoane e kang leloli & mosea*. **5.35.16** The good thing about (*roothoane*) is that bread does not stick to the steamer.		
5.35.17 Grass leaves are attractive prints on the bread.	Grass	
5.35.18 This strong grass is used when it is still green and also when it is dry.		
5.35.19 First of all, make sure that a 3 legged pot is very clean. Use wheat straw. Twist the wheat straw according to the size of the pot and fit midway of the pot to cover the circumference. Place some straw lengthwise (*sehlohlolo*) protruding to the top of the twisted straw in the middle of the pot. This is to allow space for the steam to pass, also to allow space for refilling with water. It also helps to create some space between dough portions so that they remain separated. As a result, the bread will also cook faster. **5.35.20** Yes – wheat straw is easily available in our area (*Mokhotlong*) because we grow wheat, so every time after harvest we have plenty of wheat straw. The wheat straws can be used more than once to prepare the steamer. In order to use it more than once, take it out of the pot immediately and remove bread pieces and dry it. Then tie it into a bundle and keep it in a safe place such as on the tree. **5.35.21** We still place dough on the wheat straw, but if this has been done, we remove bread from the steamer immediately while still hot, because the straw sticks to the bread more when it becomes cold.	Wheat straw	

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Table 5.35 *(continued)* **Theme 1:** Traditional ways of preparing the steamer

5.35.22 Wheat straw is first cleaned; heads are removed from the straw. In the past the dough was placed on top of the wheat straw as it is.		
5.35.23 We use wheat straw; we keep it from harvesting time, so we can use it several times. **5.35.24** We sometimes place a thin layer of straw on top of sticks to prevent the dough from falling in to the water.It is important to make sure that the steamer is very tight and well-fitting so that dough does not fall into the water.		

Theme 2: Modern ways of preparing the steamer practised in urban areas

Participants mentioned that they have developed modern techniques of preparing the steamer (Table 5.36), especially in the urban areas where the natural resources were no longer found (statement 5.36.1, Table 5.36). The use of plastic bags on top of grass was common in all the regions. Participants (statements 5.36.4–5.36.6, Table 5.36) said that the best plastic bags to use were those without printed ink or colours because of the fear that colours other than white might easily leach and affect bread appearance. Moreover, participants also suspected that colours might be poisonous. Other participants mentioned that they also used different types of sacks instead of plastic bags on top of the steamer. Participants in the urban areas also used the steamer wire bought at local markets (Figure 5.30).

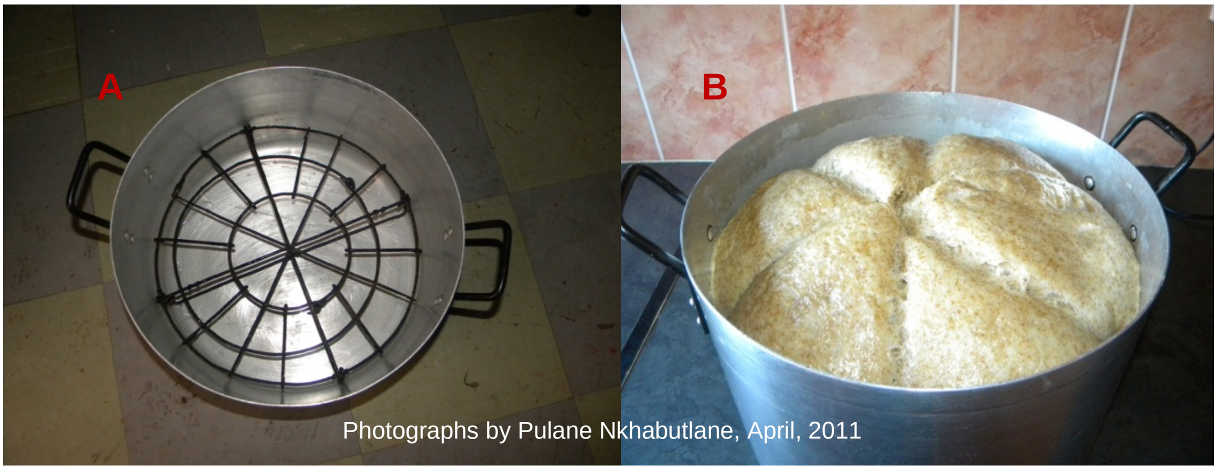

Figure 5.30: A modernised bread steamer (A) and steamed wheat bread in a saucepan (B)

Participants also mentioned that steamer material could be used more than once (statement 5.36.7, Table 5.36). Manley & Nel (1999) reported that in the western and southern Cape (South Africa) lower-income families cooked steamed bread by wrapping the dough in a plastic bag and then steaming bread by boiling in a saucepan, using a gas cooker or an

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open fire. Instead of using a steamer, Lombard *et al*. (2000) also reported that consumers in South Africa boiled the dough in a plastic bag.

Table 5.36 Theme 2: Modern ways of preparing the steamer

Respondents statements	**Concept**	**Category**
5.36.1 Nowadays we buy the steamer made from wire at the market because we no longer have sticks and grass around us. **5.36.2** We no longer use a three legged pot for cooking bread so the sticks and grass were suitable for the traditional way of cooking. **5.36.3** The use of wire steamer saves a lot of time because it is ready for use.		Wire
5.36.4 We use plastic bags that do not have ink prints. **5.36.5** Ink prints on plastic bags can discolour bread. **5.36.6** We prefer to use plastic bags without coloured ink prints. **5.36.7** We cut plastic to fit the size of a pot and wash with clean water.	Caution of using plastics	Plastic bags
5.36.8 Make small holes around this plastic to allow the steam to pass through from water to the dough/bread. **5.36.9** You can still cook bread with plastic bags as they are, without any holes; bread still cooks without a problem. **5.36.10** It is also possible to cook without plastic bag. This is good because it allows grass to make attractive prints on the bread. **5.36.11** We also use plastic bags, which we place on top of sticks and grass. The best plastic to use is the one without colours or writing. We do not know what substances are in these colours, so we do not want any colours going to the bread. **5.36.12** Since the introductions of plastic bags, the housewives place plastics on top of the wheat straws. They are very careful on the choice of plastic; we make sure that we use plastic without any writings. **5.36.13** We place plastic, orange bags or clean sacks on top of sticks or on top of grain stalks. **5.36.14** We use plastics to prevent the dough from falling through the sticks and also so that the straw does not stick to the bread. **5.36.15** We place plastic or sacks on top of sticks or on top of wires. If you have to use plastic with writings, it is advisable to turn inside out so that writings are at the bottom. **5.36.16** Make small holes all over the plastic so that steam can move easily.		
5.36.17 Steamer from any type of material can be recycled for future use. Or if the material is old it can be used to make fire.	Recycling steamer	
5.36.18 Nowadays small tins are used to place in the middle of the pot. These tins have small holes to allow the refilling of water and steam to pass through. **5.36.19** It is important though to remember to have wheat straw or tin at the middle of the steamer to use for refilling.	Provision for refilling on the steamer	

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What special precautions should be observed for steaming bread once the water boils?

The purpose of this question was to determine the main procedures employed after the water has boiled during the steaming of traditional Basotho bread. Four themes emerged from participants' responses:

Theme 1: Techniques for placing dough portions over the steamer
Theme 2: Benefits of portioning the dough
Theme 3: Refilling with water
Theme 4: Flat bread on the inside of the pot lid

Theme 1: Techniques for placing dough portions over the steamer

Two categories (Table 5.37.2) for placing dough portions in the pot while the water starts boiling came up; bread shape and maintaining the boiling temperature. Participants agreed that the dough was portioned into small round or pillow shapes (statement 5.37.1, Table 5.37).

Table 5.37 Theme1: Techniques for placing dough portions over the steamer

Respondents statements	Concept	Category
5.37.1 When water boils, well risen dough is divided into small balls these balls are placed on top of the steamer and the pot covered immediately.	Round or pillow shaped portions	Bread shape
5.37.2 The dough is placed in the pot when water starts to boil.		
5.37.3 Yes, you have to work as fast as you can, and cover the pot immediately.		
5.37.4 Place round portions of dough as quickly as you can in the pot. This is done to maintain the boiling temperature in the pot so that bread will just rise without any delay.		Maintain the boiling temperature
5.37.5 When a housewife takes her time to cover the pot or to place dough in the pot, the water in the pot will cool and the bread will not rise to the maximum.		
5.37.6 If you take long to place the dough on the steamer, the pot will be opened for a long time and the temperature will be low. If the temperature is low the dough will not rise to optimum or may not rise at all. This will result in hard, heavy and very compact bread.		
5.37.7 A good technique would be to put a portion of dough and cover the pot alternately.		
5.37.8 Make sure that there is enough fire under the pot in order to keep the water boiling while placing the dough on the steamer.		
5.37.9 There should be enough wood to maintain the heat underneath the pot, so that boiling continues.		
5.37.10 The fire should be enough to cook bread. This is why it is important that every time the fire goes off, it is replaced.		

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According to participants, it was important for the housewife to be as quick as possible while placing the dough portions on the steamer in order to maintain the boiling water temperature in the pot (statements 5.37.3-5.37.10, Table 5.37). Participants also suggested that a housewife had to maintain the fire burning underneath the pot to make sure that the water does not stop boiling. According to participants, the importance of maintaining the boiling temperature is that the steam from the boiling water helps the bread to rise to its maximum for improved texture.

Theme 2: Benefits of portioning the dough

The dough was shaped into round balls (Figure 5.31) and placed such that one ball was next to each other to form a circle in the pot. Portioning the dough is described as the step whereby a mass of dough is divided into pieces according to the sizes determined by a housewife or the baker (Quail, 1996:57). This was also the normal practice for Arabic housewives (Quail, 1996:59). There are benefits associated with portioning the dough (statements 5.38.2–5.38.7, Table 5.38). Small bread portions allow space for refilling the pot with water during cooking, portioned bread also cooks faster and looks very appetising in the pot. Portioned bread is already in manageable sizes and shapes during serving and presentation of bread.

Table 5.38 **Theme 2:** Benefits of portioning the dough

Respondents statements	Concept	Category
5.38.2 Portioning helps to leave space for refilling with water. **5.38.3** Portioning creates space for the passage of air and steam when water boils. **5.38.4** Portioning the dough is also the way our Basotho bread is prepared. That is why it is called *leqebekoane*. Shaping into small balls also helps to produce a neat product that does not easily break and fall into pieces. **5.38.5** Bread also cooks faster if portioned. **5.38.6** Portioning bread also helps bread to remain soft but not wet, because it leaves spaces for the water to boil freely. **5.38.7** Portioning the dough helps during serving. Portions are given to different family members. **5.38.8** The bread placed in the middle can stop the passage of air and steam and therefore delay cooking. **5.38.9** Portions are determined, depending on the size of the pot, but the smaller portions cook faster.	Space to refill Presentation/Neatness	

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Figure 5.31: Shaping bread dough into balls and placing them over the steamer in boiling water, Mokhotlong – Phahameng

What are the reasons for shaping sorghum and maize bread into a round ball (*polokoe*)?

Cooked maize and sorghum bread were shaped into a round ball (section A, Figure 5.11) called *polokoe.* This question was important to further explore the reasons for shape in maize and sorghum breads as well.

Bread shape *(polokoe)* for maize and sorghum breads

Table 5.39 shows that when Basotho prepared bread, they considered the appearance and also how the bread would be used and stored. It is very clear from statement 5.39.2 that maize and sorghum bread were used for feeding men and boys working in the fields during ploughing or harvesting seasons. Bread had to be prepared in a manner that would allow Basotho girls to carry it with a hand-woven basket (*seroto*) or a mixing bowl on their heads for long distances without being damaged. The smoothness of *Polokoe* was considered an important quality because it was believed that *polokoe* with cracks would allow a passage for insects and other unwanted materials. *Polokoe* is believed to provide strength needed for boys' fights (*ho kalla*) and that the boy who has eaten it cannot be beaten by others (*Ha a batoe*) Statement 5.39.4, Table 5.39. shows that Basotho boys were prepared to be strong

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and have fighting skills so that they could protect their village and their families during attacks. This is done through games in which they are competing among themselves (*Ba kalla*).

Table 5.39 Maize and sorghum bread shape *(polokoe)*

Respondents statements	Concept	Category
5.39.1 This round ball (*polokoe*) looks neat and it is easy to store and take to the fields using a Basotho basket.	Round shape	Neatness
5.39.2 One advantage is that Basotho fields are very far. Therefore, during ploughing times when a Mosotho girl, takes food to the fields bread balls could easily fall. This was very common when a girl tripped and fell down due to bad roads. The ball would just roll and not break apart. Then the fell girl would just remove dust from the ball and continue with the journey.		
5.39.3 Round ball (*polokoe)* satiates for a very long time. Basotho like to stay full and not to get hungry easily.	Daily activities	Satiety
5.39.4 There was also a belief that other boys cannot beat a Mosotho boy who eats this round ball (polokoe).	Fighting	Enough energy

Theme 3: Refilling with water

Table 5.40 describes the procedure for adding water from the beginning (statements 5.40.10-5.40.23, Table 5.40) to the end of the cooking process (statements 5.40.4-5.40.21, Table 5.40). The pot was filled with water up to the level of the steamer. The water was brought to a boil and replenished as needed throughout the cooking process (Figure 5.32). Although addition of water was common to all participants during the demonstrations, there were some discrepancies regarding the temperature of the water that was replenished during the process of steaming (statements 5.40.6-5.40.21, Table 5.40). Some participants did not mind whether the water was cold, hot or boiling, while others preferred to use hot water to avoid lowering the temperature of the water already in the pot. Water was added on the side (Figure 5.32) or at the centre of the pot where provision of space was made, without wetting the bread.

Table 5.40: Theme 3: Refilling with water

Respondents statements	Concept	Category
5.40.1 Depending on the amount of fire, refilling with water should be done regularly. However, adding water only once helps to prevent opening the pot often while cooking.	Amount of water at the beginning	Steaming water
5.40.2 A house wife should keep checking the steam as it goes out of the pot. If it slows down, it is an indication that the water is getting finished.		

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Table 5.40 *(continued)* **Theme 3**: Refilling with water

5.40.3 Get some water and replenish in the pot. **5.40.4** We use just cold water. Replenishment of water can be done several times until bread is well cooked. **5.40.5** Refill with hot water in the space left in the middle of bread portions. If portions are close to one another and there is no space in the middle for refilling, then refill, on the side. Make sure that water does not reach bread. **5.40.6** It is important to add replenishing water on the side of the pot through some space between the bread and the wall of the pot. This to avoid making bread too wet. **5.40.7** Add quite a lot of water that should be below the steamer. This water should be enough to boil until bread has risen to the maximum and set before you need to refill. **5.40.8** We add cold water at the beginning of cooking. **5.40.9** We add cold water just enough to be quite below the steamer, but enough to boil until bread has set very well. **5.40.10** For refilling, I use warm/hot water.	Refilling during the cooking process	Water temperature for refilling
5.40.11 We refill with either cold water/warm water, It does not matter whether cold or hot water is used. **5.40.12** Yes, hot water for refilling in order to maintain boiling temperature and speed up the cooking process. **5.40.13** Yes, I agree with them, that although you can use cold water at the beginning, hot water is used for refilling. I refill with hot water to prevent cracking of the pot. **5.40.14** I use hot water also because; cold water lowers the temperature in the pot and can delay the cooking process. Hot water helps to continue the boiling process.	Reasons for refilling with either cold or hot water	Importance of water temperature
5.40.15 Any type of water especially in summer. **5.40.16** In winter we refill with hot water, to maintain the temperature in the pot. Hot water also helps to prevent breakage of the pot. **5.40.17** Quite a number of times, it is important to refill the pot. **5.40.18** Refill little by little with boiling water it helps the pot to continue boiling with enough water (*O oa e nyenyeletsa*). **5.40.19** If the water is completely finished in the pot, take off the pot from the fire and let it cool a little before adding water. This is to prevent the pot from cracking. **5.40.20** When there is still enough water in the pot, the boiling is rapid and steam goes our fast. As soon as the steam stops to go out, then the water level is too low. **5.40.21** Refilling is done by pouring water through a small tin with holes at the bottom or wheat straw placed in the middle of the pot between bread portions (*linkhoa*). This is done to prevent water from getting to the bread, so that bread does not become wet.		

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Figure 5.32: A picture showing a Mosotho woman refilling a pot of steamed bread with water, Thaba–Bosiu

Theme 4: Flat bread on the inside of the pot lid (*Bohobe ba sekoaelo*)

It is a normal practice for Basotho to cook flattened bread on the inside part of the lid (Figure 5.33) of a steaming pot Table 5.41. The reasons for cooking this type of bread were described by participants (statements 5.41.1–5.41.2, Table 5.41). The flattened bread cooks faster than the bigger portions of bread inside the pot and for this reason this bread was used for emergencies such as ensuring that children have eaten before sleeping. The lid bread (*bohobe ba sekoaelo*) was also served as breakfast for children going to school and sometimes for shepherds (herd boys) going to look after the animals, while the bigger portions inside the pot were still cooking.

Table 5.41 Theme 4: Flat bread on the inside of the pot lid

Respondents statements	**Concept**	**Category**
5.41.1 If there is still some dough left, it is cooked by placing it on the inside of the lid, and flatted to stick on the lid and also to cook faster (*bohobe ba tekesele kapa ba sekoaelo*). **5.41.2** Bread cooked on the lid helps to feed the children when they come from the school, a woman from the field, children going to school and shepherds who go early in the morning to look after the animals or when they come back in the evening. It serves the emergency hunger while bread in the large pot is still cooking.	Cooks faster	Flattened bread on the lid

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Figure 5.33: Flat bread steamed on the inside surface of a cast iron pot lid, Thaba –Bosiu

How do you test the readiness of bread?

Most Basotho (the respondents) did not have watches to estimate the time in which bread would be ready while cooking. This question was meant to gain understanding on how housewives determined that bread was ready. Only one theme emerged as testing the readiness of steamed bread.

Theme 1: Testing the readiness of steamed bread

The question about testing steamed bread readiness was asked as an attempt to investigate the techniques used by housewives to determine whether bread is well cooked by exploring the equipment used and the sensory properties that are good indicators of a well cooked bread. Three important categories of testing the readiness of bread came up from this question (Table 5.42). Participants indicated that they used clean sharp sticks (statement 5.42.1, Table 5.42 and Figure 5.34), a sharp knife (statements 5.42.2–5.42.4, Table 5.42), strong grass or the back of a spoon.

Apart from the use of various instruments to test bread readiness, participants indicated that they visually checked to see if bread has cracked or not and also to see the colour change of bread (statements 5.42.13–5.42.19). Cracks were perceived as an indication of good quality bread that was well cooked. Participants indicated that smell was also important because

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they were able to differentiate between the smell of bread that was still uncooked and the smell of cooked bread (statement 5.42.20). In addition, sound was also used to detect if bread was ready as described in statements 5.42.21–5.42.25, Table 5.42. Participants indicated that they were experienced in using their hands or fingers to tap or touch the top of the bread and if bread springs back when touched and does not leave a dent, that was an indication of its readiness (statement 5.42.10–5.42.12, Table 5.42).

Figure 5.34: Testing the readiness of steamed composite (wheat + maize) bread with a cleaned stick, Mokhotlong

Table 5.42 **Theme 1:** Testing the readiness of steamed bread

Respondents statements	**Concept**	**Category**
5.42.1 Test steamed bread readiness by using firm grass (*joang ba mohlomo*) to stick it deep, in the middle of the bread. If this firm grass comes out clean, it means that the bread is cooked, but it is coated with traces of dough, then it means that it is still not ready.	Sharp stick	Sharp instrument
5.42.2 The knife comes out clean.		
5.42.3 Insert a clean sharp knife into the bread, if it comes out clean, then the bread is cooked.		
5.42.4 We use a knife or a wheat straw to insert in the middle of a bread portion. If it comes out clean, then the bread is cooked.	Sharp knife	
5.42.5 I use the back of a spoon, to see if it comes out clean, if it is clean, then the bread is well cooked.		
5.42.6 You can insert a clean thin stick into the bread. If it comes out clean, it is an indication that bread is well cooked.		

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Table 5.42 *(continued)* **Theme 1:** Testing the readiness of steamed bread

5.42.7 Use a reed straw to insert in a bread portion, if it comes out clean, then the bread is ready.		
5.42.8 I use strong grass straw to insert in to the middle of the bread and if it comes out clean, then the bread is cooked. **5.42.9** The back of a spoon can also be used. If it comes out clean, the bread is cooked.	Strong grass Back of spoon	
5.42.10 Tap or place fingers on top of the bread. If your fingers do not leave a dent on the bread or if the bread springs back immediately, then it means it is well cooked. **5.42.11** Press bread the bread with a finger or fingers and if it springs back, it is well cooked. **5.42.12** When you pat this steamed wheat bread portion a little, it shakes, and then you know that it is cooked.		Elasticity
5.42.13 Steamed bread is ready if it has cracked **5.42.14** Chorus: Yes cracks are important; they indicate that bread is cooked. **5.42.15** The cracks also indicate that the bread is well cooked.	Cracks	Sensory properties
5.42.16 Baked or roasted bread has a golden brown colour **5.42.17** When bread portions have slightly separated in the pot **5.42.18** Cooked bread is lighter in appearance. **5.42.19** Maize & Sorghum bread will normally have a wide crack formed on top as an indication that it is well cooked. **5.42.20** Bread also has a certain odour that comes out immediately when opening the pot and it indicates that bread is cooked. **5.42.21** The other test is to slightly tap the bread with an open hand - a heavy sound indicates that it is not well cooked, but lighter sound shows that it is cooked. **5.42.22** Tap the top of the baked bread a little with fingers, if bread does not have a sound and it is soft, then it is cooked.	Colour Odour Sound	
5.42.23 Baked bread that is uncooked has a very silent sound, but bread that is cooked has a loud sound. **5.42.24** Slightly patting bread with fingers, a lighter sound indicates that bread is cooked.		

How do you lift cooked steamed bread out of the pot? Moreover, how is Basotho bread stored?

This question was important to find out from participants how they removed hot bread from the pot and how bread is stored (Table 5.43). The two themes that emerged included:

Theme 1: Taking steamed bread out of the pot

Theme 2: Storage of Basotho bread

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Theme 1: Taking bread out of the pot

The category to ensure safety included the concepts of prevention of scalding and removing steamer materials such as grass from the bread to make sure that it was safe for consumption. The second category was to cool the bread and the procedures for cooling are described in statements 5.43.3–5.43.7, Table 5.43.

Table 5.43 **Theme 1:** Taking steamed bread out of the pot

Respondents statements	Concept	Category
5.43.1 Dip hands into a basin of cold water in order to prevent scalding. **5.43.2** Remove bread from the steamer and carefully remove wheat straws or grass sticking on the bread.	Prevent scalding Remove steamer material from the bread	Ensure safety
5.43.3 Remove the pot from the fire and let it cool, just a little. Take out the bread while still hot and prevent scalding by dipping hands into water and then taking out the bread. **5.43.4** Remove the pot from the fire to cool a little **5.43.5** Slide the pot lid a little to cool the bread **5.43.6** The next step is to remove the pot from the fire and remove the lid to cool the bread. Cooling is done by slightly opening the lid to allow cold air to go into the pot while still keeping the bread soft. When bread is cool, cover the pot or remove bread with hands and keep in a mixing bowl. Sometimes the water is removed from the pot and the bread kept inside the pot. **5.43.7** The next step is to lift the pot and remove it from fire and put it aside to cool. Remove or open the lid slightly to cool the bread.	Cool the bread	Cooling the bread

Theme 2: Storage of Basotho bread

Bread could be stored in a big bowl or Basotho basket or in the same pot used for cooking (Table 5.44). The pot used for cooking was only used if it was not needed to cook any other type of food (statements 5.44.1–5.44.3, Table 5.44). Seventy nine percent (79%, n=197) of the participants kept baked bread in the pot used for baking. This was probably because a flat cast iron pot was used for baking purposes only and therefore could not be needed to cook any other type of food, as practised by Basotho. Figure 5.35 shows that Basotho baskets were rarely used to store wheat breads but they were commonly used to store sorghum and maize breads. A mixing bowl was used by many participants to store steamed bread (52%, n=127) and pot roasted bread (85%, n=147).

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Table 5.44 **Theme 2:** Storage of Basotho bread

5.44.1 Put bread in a big bowl and cover. However, if the pot used for cooking bread is not going to be used for anything else, bread can be taken back to the pot once it is cool. **5.44.2** Place the bread in a mixing bowl to cool. If the pot is not going to be used for something else take bread back into the pot for storage. If the pot is going to be used to cook something else, keep the bread covered in a mixing bowl, or in a Basotho basket (*seroto*). **5.44.3** The advantage of taking the bread out of the pot is to delay spoilage.	Pot used for cooking Mixing bowl Basotho basket	Storing bread

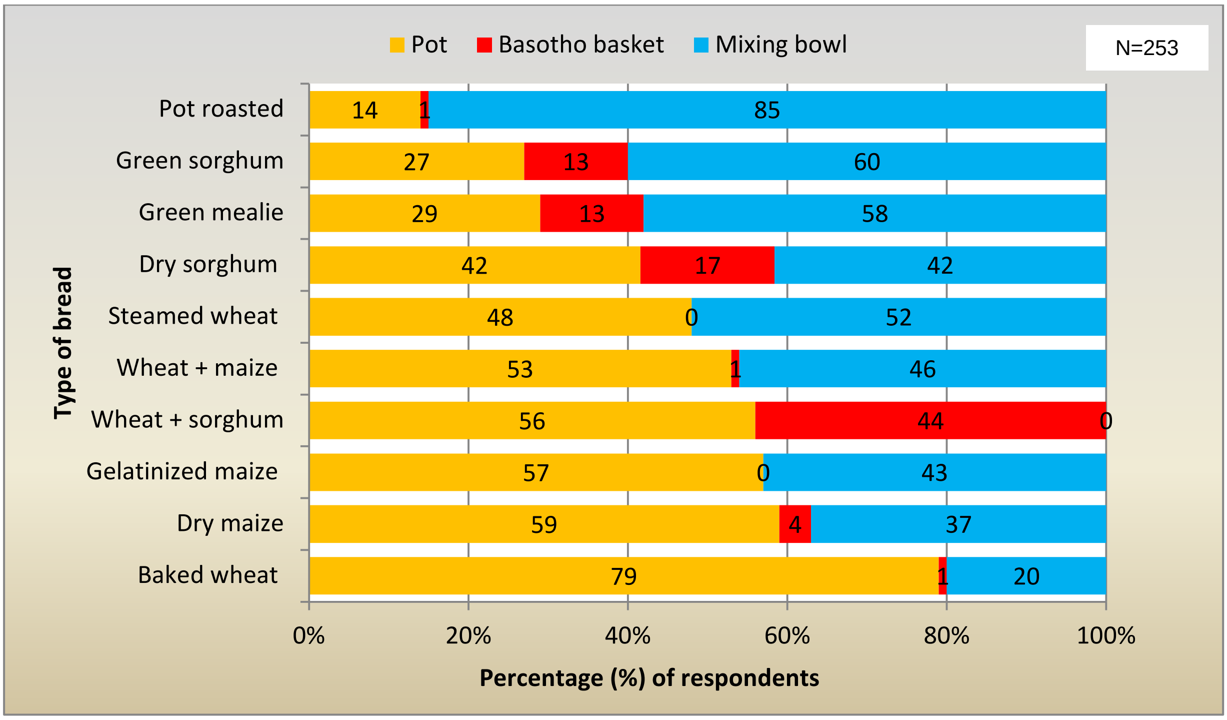

Figure 5.35: Percentage of respondents using the pot, Basotho basket or mixing bowl for storing bread. N=253 where respondents picked more than one answer

Traditional Basotho breads were normally consumed within a short space of time immediately after cooking. One participant said:

> *"Basotho families are quite big; there is no need to bother about the shelf life of bread because we finish the whole pot at once".*

Figure 5.36 presents consumer perceptions on the shelf life of different Basotho breads. Most participants (81%, n=201) indicated that steamed wheat bread cannot be kept longer than 1-2 days. According to focus group participants', storage time of steamed bread

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depends on the season of the year, whether it is winter or summer. This may be the reason why some participants (19%, n=46) indicated that steamed bread can last for 3 days. In winter, the shelf life of bread is normally longer but in summer, bread spoils easily. Participants described the signs of deteriorated steamed bread texture changes; bread becomes sticky and gummy and loses its firmness. Bread also develops a bad smell and a bad taste. It develops mould on the skin (top layer of bread) and changes colour.

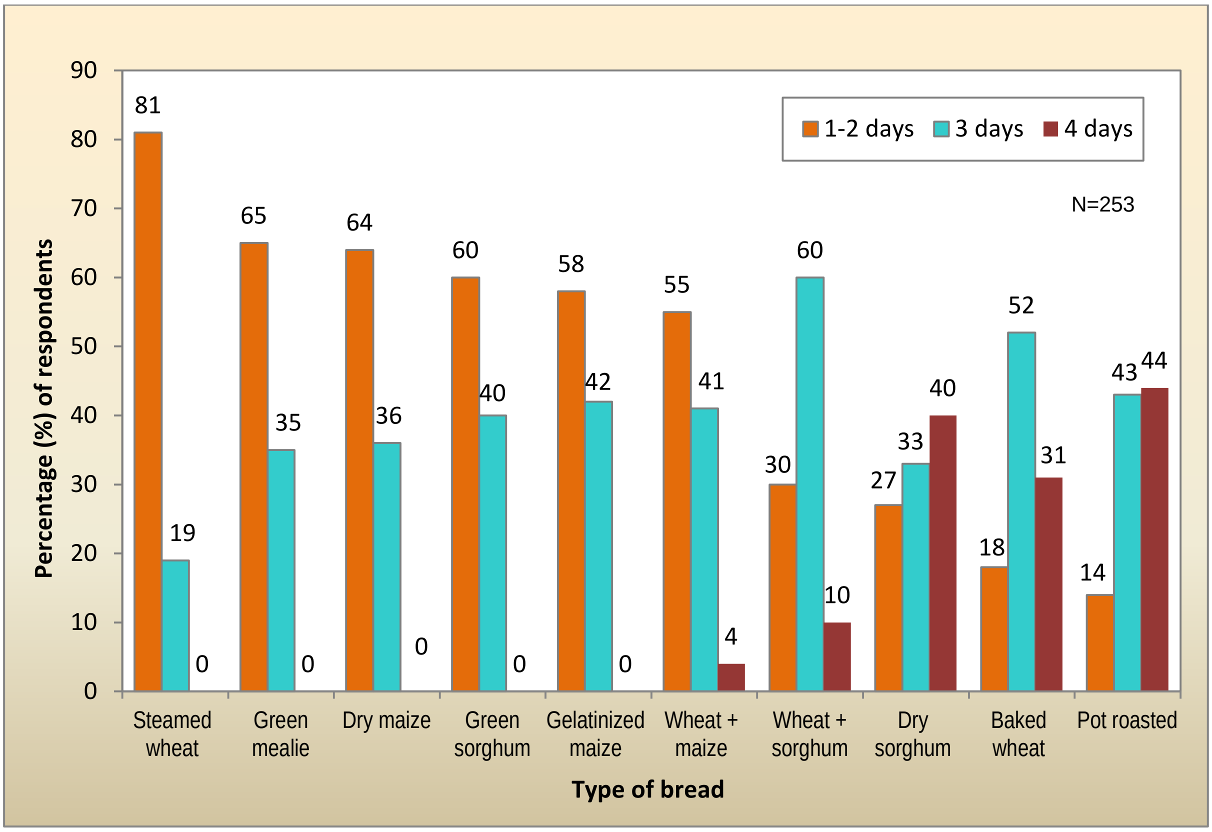

Figure 5.36: Percentage of respondents storing bread for 1 – 2, 3 or 4 days

Baked wheat bread can last for 3 days (52%, n=128) to 4 days (31%, n=76) (Figure 5.34). Participants who prepare pot-roasted bread indicated that it can last for 3 (43%, n=73) to 4 days (44%, n=74). The fact that all other breads from maize and sorghum are steamed reduces their shelf life such that they can safely last for 1-2 days only. The participants have not considered methods to preserve and extend the shelf life of traditional Basotho bread because they prefer to eat it while still fresh and also because they finish the bread before it spoils.

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5.10 SERVING AND PRESENTATION

How do you serve traditional Basotho bread?

The objective of this question was to describe ways in which Basotho serve their traditional bread. The question brought out three important themes as follows:

Theme 1: Serving and presentation of bread
Theme 2: Traditional Basotho bread accompaniments
Theme 3: Cultural belief with regard to serving bread

Theme 1: Serving and presentation of bread

Focus group participants described Basotho meal times as important moments, and that meals are particularly consumed in households and a social gatherings. Male adults were served first and the food was taken outside to them while they were sitting close to their animals (*Khotla*). The males sit outside mainly to protect their families so that they could see the strangers from afar, to guard against theft of their animals and also to have discussions with neighbours regarding issues affecting the village. For this reason, males were not supposed to sit in relaxing positions when eating, they used to squat on their haunches or kneel down on the floor (Ashton, 1939). In contrast, in the urban areas male adults sit on chairs to eat their meals together with family members. In the rural areas male adults make chairs out of aloe stalk (*Lekhala*) and tree stumps in order to sit inside the house (Ashton, 1939). The rural participants said males are not supposed to be surrounded by women so that they remain highly respected. In the past, a man who was always close to women was said to be very weak. He was mocked and his manhood doubted. In agreement with Ashton (1939), women were served inside the house while sitting flat on the ground or on a mat (*Moseme*) prepared from grass (*Leloli*), with their legs folded sideways under the body or their legs straightened (*ba namme*). On the other hand, in urban areas women sat on chairs and shared the meals with the rest of the family members. Children ate together from the same bowl while seated on the floor. In urban areas, women and children also sat on chairs.

Traditionally in Lesotho, it was a normal practice for family members of the same sex (males or females) to eat together from the same dish using their hands. For adults, bread was served in a conical-shaped Basotho basket (*Seroto*) (Figure 5.37) and an accompaniment served in a large enamel or steel bowl. Children were served bread and accompaniment (vegetables or meat stew) in the same dish. However, if bread was to be eaten with milk,

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both bread and milk were mixed together (*ho futsoela*) for both children and adults in a bowl. Bread with milk is still consumed by urban participants mixed together in one bowl.

Serving different Basotho breads

- **A.** A round ball (*Polokoe*) for maize and sorghum bread
- **B.** Green mealie bread
- **C.** Steamed bread cut with a knife

Photographs by Pulane Nkhabutlane, March 2011

Figure 5.37: Different ways of serving traditional Basotho bread, Leribe, 2011

Portioning as a category produced two concepts which showed that in the past Basotho portioned bread by breaking (*hlephola)* it with hands (statements 5.45.7–5.45.10, Table 5.45) while nowadays many families use knives to cut bread into slices (statements 5.45.11–5.45.14, Table 5.45). Ashton (1939) wrote that in Lesotho the housewife cuts the dumplings into thick slices and presents the bread normally with beans, peas, milk or boiled chicken to the rest of the family members, starting with the man.

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Participants agreed that bread is normally served cold because it is easy to portion and can last longer than when it is served hot. Changes in culinary practices have occurred over a long period and many Basotho, especially in the urban areas, use cutlery for bread accompaniments. Families in the urban areas have also shifted from eating together in the same dish to eating from separate plates. Osseo-Asare (2005) noted similar practices in West Africa where meals were served in bowls and eaten with hands in the past. Spoons and forks were never used. Urban participants in Lesotho stated that they eat accompaniments for bread with spoons.

Table 5.45 Theme 1: Serving and presentation of bread

Respondents statements	**Concept**	**Category**
5.45.1 Men ate outside. Their bread portion was given to them while sitting close to their kraals (*khotla*). This was because men were supposed to be always alert to make sure that their animals were not stolen. **5.45.2** Men had their meals outside, next to their animals. **5.45.3** One reason for men to sit outside was for protection of their family members, so that they could easily see a stranger from afar. **5.45.4** Children were given their portion in one bowl; Men in another big bowl; Women also in their bowl. **5.45.5** Three portions of bread were served one for men, one for women and the other for children.	Men, women and children	According to family status
5.45.6 Traditionally Basotho shared food. Family members of the same age and same sex ate from one big bowl. **5.45.7** Break bread and give to family members (*hlephola*). This is what was traditionally done. **5.45.8** Traditionally, bread was just broken with hands because knives were not common. **5.45.9** In the past Basotho did not have knives, they just broke bread (*hlephola*) with their hands. **5.45.10** Sometimes in the past bread portions were served as they were in a basin and people would break them as they eat.	Breaking by hand	Portioning
5.45.11 Slice bread with a knife for family members. **5.45.12** Nowadays we have knives so we use them to slice bread. **5.45.13** Slice with a knife for family members. **5.45.14** A strong reed straw was also used to cut bread and portion it for different family members.	Slice with a knife or with a reed straw	

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Theme 2: Traditional Basotho bread accompaniments

Participants mentioned that one of the reasons they prefer bread more than any other cereal products such as thick porridge (*papa*) is because it can be eaten on its own, without any accompaniment. Nevertheless, many participants (Table 5.46) agreed that traditional Basotho breads tasted even better when accompanied with milk, mutton or beef stew, chicken stew or pork. In addition, nowadays the popular accompaniment for bread is tea. Ashton (1939) stated that animal products, legumes and beverages were used as accompaniments for traditional Basotho bread. As much as urbanisation has taken place, accompaniments for bread have not changed much. The reason may probably be because Lesotho does not have a variety of food, and because the poor economic situation, that does not allow people to try new foods. Basotho mentioned that spreading butter on bread is considered ay luxury and it occurs in a few families in the urban areas. They said butter is expensive and they still enjoy bread without it. Participants also mentioned that they make peach jam use as an accompaniment for bread.

Table 5.46 **Theme 2:** Traditional Basotho bread accompaniments

Respondents statements	**Concept**	**Category**
5.46.1 Milk (both fresh and sour) Chicken (boiled) Pork (boiled) Beef (boiled) Mutton (boiled) Eggs	Animal Products	Bread accompaniments
5.46.2 Bean soup Pea soup Lentil soup	Legumes	
5.46.3 Sour Porridge Water + sugar mixture Tea	Beverages	
5.46.4 Green vegetable or tomato and onion relish	Vegetables	
5.46.5 Butter or jam		

Theme 3: Cultural belief with regard to serving bread

There are some cultural beliefs associated with the serving of bread. Participants generally believe that housewives can be categorised into what they called heavy and light hands (*Letsoho le boima le letsoho le bobebe*). The differences are said to have an effect in the length of time for people to reach satiety (Table 5.47). This means that there are certain housewives that, when they serve food, people get satisfied quickly after eating a small

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amount of food. On the other hand, people enjoy food served by the other housewives and feel that they want more and more food to eat.

Table 5.47 **Theme 3:** Cultural belief with regard to serving bread

Respondents statements	**Concept**	**Category**
5.47.1 Yes, we believe that there are differences in the hands of people dishing out bread. A light handed housewife finishes food in the pot because her food is tasty and does not satisfy people quickly. People always feel that they need more, while another housewife. People get easily satisfied and we refer to her as having heavy hands. **5.47.2** Yes, we agree with her, people differ a lot regarding the dishing of bread. With some, the food becomes so tasty that you just want to eat without stopping. With others the food fills you up quickly. **5.47.3** We prefer the heavy handed one. **5.47.4** A lot of food is not wasted with a heavy hand one because people get satisfied within a very short space of time. **5.47.5** Yes, one with the lighter hands encourages more eating without people reaching satiety.	Differences in dishing out food	Reaching satiety
5.47.6 I prefer the one with lighter hands because we enjoy her food, and we feel like eating all the time. **5.47.7** I prefer the one with heavy hands because children get satisfied quickly. **5.47.8** The one with heavy hands does not promote appetite. You eat very little and you are satisfied within a very short time. **5.47.9** These belief goes further because we also believe that this person with heavy hands makes people reach satiety quickly if she is the one dishing out food, while the one with lighter hands makes people to want to eat more food. As a result in the case of serving food, light hands are a disadvantage because food will finish faster in the pot.	Effects of housewives hands on reaching satiety	

SECTION C:
INFLUENCE OF REGIONS AND GENERATIONS ON PREPARATION AND ACCEPTANCE OF BASOTHO BREAD

This section presents the results on the factors that influence perceptions of Basotho consumers (younger, older, rural, and urban) regarding preparation, choice and consumption of traditional Basotho bread (Objective 3)

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5.11 PERCENTAGE OF RESPONDENTS THAT HAVE PREPARED TRADITIONAL BASOTHO BREADS BEFORE

In response to the question about which traditional Basotho bread they have prepared (HP) and which breads they still prepare (SP) in their households? The responses regarding the types of bread that have been prepared and are still prepared are summarised according to different age groups of respondents in Figure 5.38A and Figure 5.38B. The majority of participants have prepared wheat based breads (steamed, baked wheat and pot roasted bread) (100%, n=253), (100%, n=253) and (83%, n=210) respectively (Figure 5.38A). Regardless of the impact of changes in culinary practices in the regions, the number of respondents who still prepare wheat breads for household consumption remains high (98%, n=247; 98%, n=248 & 68%, n=173) for steamed, baked and pot roasted bread respectively. The results generally indicated that a minority (16%, n=40; 24%, n=60 and 29%, n=73) of participants have prepared breads with a composite of wheat and sorghum, dry sorghum and green sorghum in the past, respectively. Only 4%, n=9 of participants still prepare a composite of wheat and sorghum bread and only 4% - 5% still prepare sorghum breads. The reasons for not preparing sorghum breads could be attributed to the fact that sorghum does not grow well in some regions of Lesotho such as the mountains because of the cold weather.

Maize-based breads have been prepared by less than half (41%, n=103) to (44%, n=112) of participants. Some participants (44%, n=112) have prepared green mealie bread before but only a small number (4%, n=10) continue to prepare this bread. The wheat and maize composite bread was well known to 82%, n=208) respondents who have prepared it before, but only 53%, n=133 still prepare this composite bread today.

The number of respondents within each age group varies because recruitment of participants considered that there were supposed to be younger and older generations. Young respondents (20-28 y) have not prepared dry sorghum and green sorghum breads. These breads were well known to the elderly (older than 60 y.) participants. Percentages of respondents preparing steamed and baked wheat bread did not differ at all between age groups (Figure 5.38B). Composite of wheat and sorghum was prepared by only a small percentage (3%) of the younger generation.

Participants were asked to indicate the type of bread that they still prepare in their households. Young generation (20-28 y) participants did not prepare sorghum breads, while participants in age group (29-41 y) have also stopped preparing dry sorghum bread (Figure 5.38C). The higher percentage (67%) of participants preparing wheat + sorghum bread and

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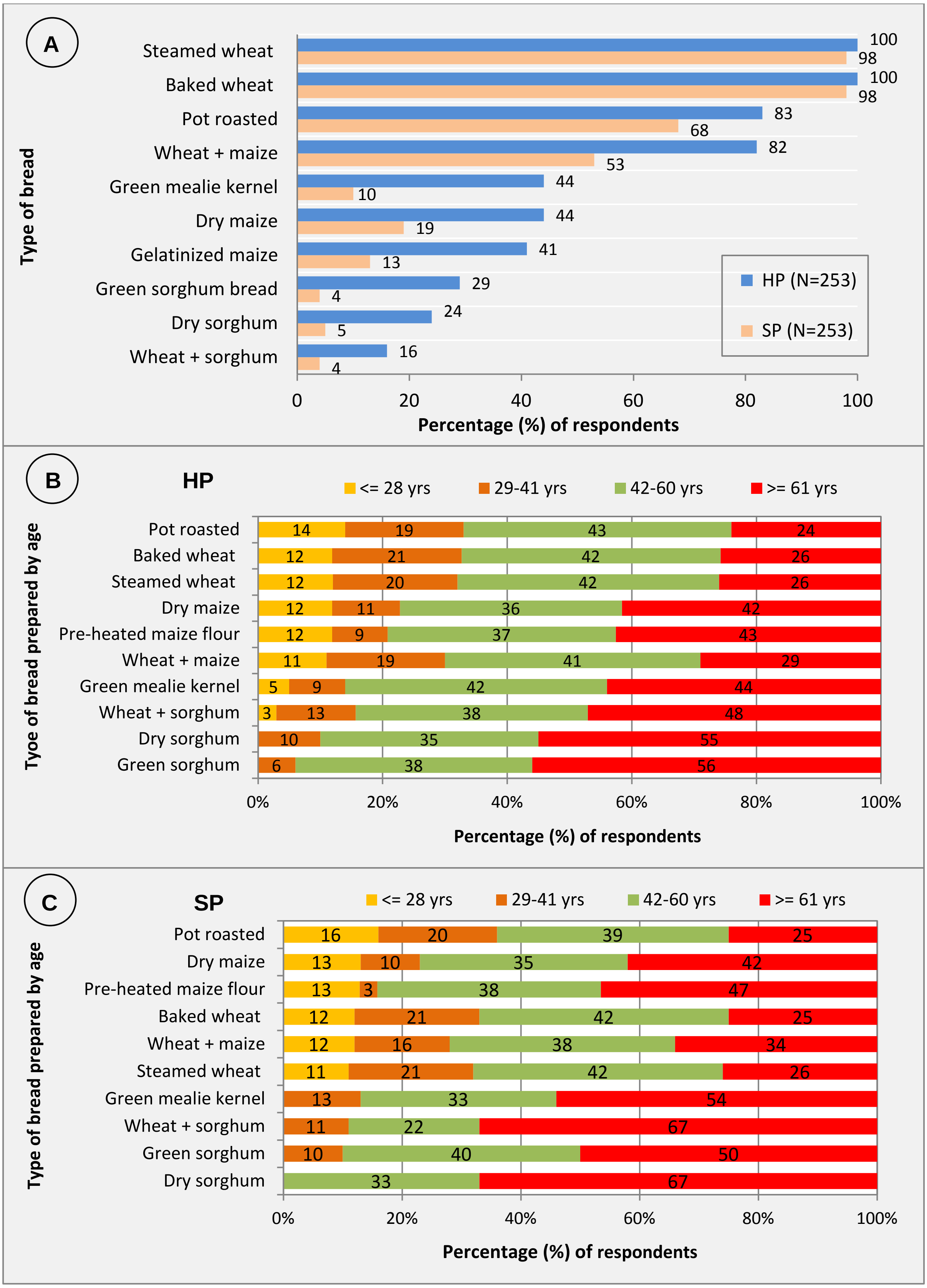

Figure 5.38A: Percentage distribution of respondents that have prepared (HP) the bread before and those that still prepare (SP) the bread; **B:** Percentage distribution of respondents by age groups that have prepared (HP) the bread before; **C**: Percentage distribution of respondents by age groups that still prepare (SP) the bread

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dry sorghum bread was recorded in the age group over 60 y. Green sorghum bread and the Green maize kernel bread were also prepared by many (50% and 54%) of the elderly participants. Participants (42%) in the age group 42-60 y still prepare both steamed and baked wheat breads but only small numbers in 60+ groups.

5.12 REASONS FOR NOT PREPARING TRADITIONAL BASOTHO BREAD IN RURAL AND URBAN AREAS

The reasons for not preparing breads are presented in Figure 5.39. Unavailable ingredients (UI), labour intensive (LI), not tasty (NT) and bread being out-dated (BO) were ranked higher for all composite and sorghum breads in the urban areas than in the rural areas. In the rural areas unavailable ingredients for gelatinised maize bread were rated very high. Steamed and baked wheat bread were not included in Figure 5.39 because they were prepared by all the respondents. Pot roasted wheat bread was not prepared by urban consumers because it was considered outdated, labour intensive and ingredients were not available.

5.13 THE INFLUENCE OF REGIONS AND GENERATIONS ON ACCEPTABILITY OF DIFFERENT TRADITIONAL BASOTHO BREADS

The focus group discussions revealed that Basotho prefer bread that is neither too white nor too dark. This is probably the reason why many (80%, n=201) consumers in both the rural and urban regions prepare bread from commercial wheat flour *(Easy Bake)*. The dark bread prepared from cultivated wheat was better accepted in the rural areas than in urban areas. In general, Basotho associate the dark colour of bread with heaviness and satiety to supply the energy required to carry out hard, physical daily duties. Basotho associated white bread with less energy and therefore too much of it needs to be consumed in order to get the required energy. It was found that participants in the urban areas prefer wheat bread with a soft texture, a lighter colour and slightly sweet taste. Participants in one urban region (Mafeteng) insisted that whole wheat bread flour needed to be sieved first in order to remove fibre before preparing the bread. The preference for soft textured bread became more evident when participants indicated that they would prefer to eat different types of wheat breads on the day of cooking steamed bread (55%, n=134), baked bread (55%, n=135) and that they eat pot-roasted bread (65%, n=113) while still soft.

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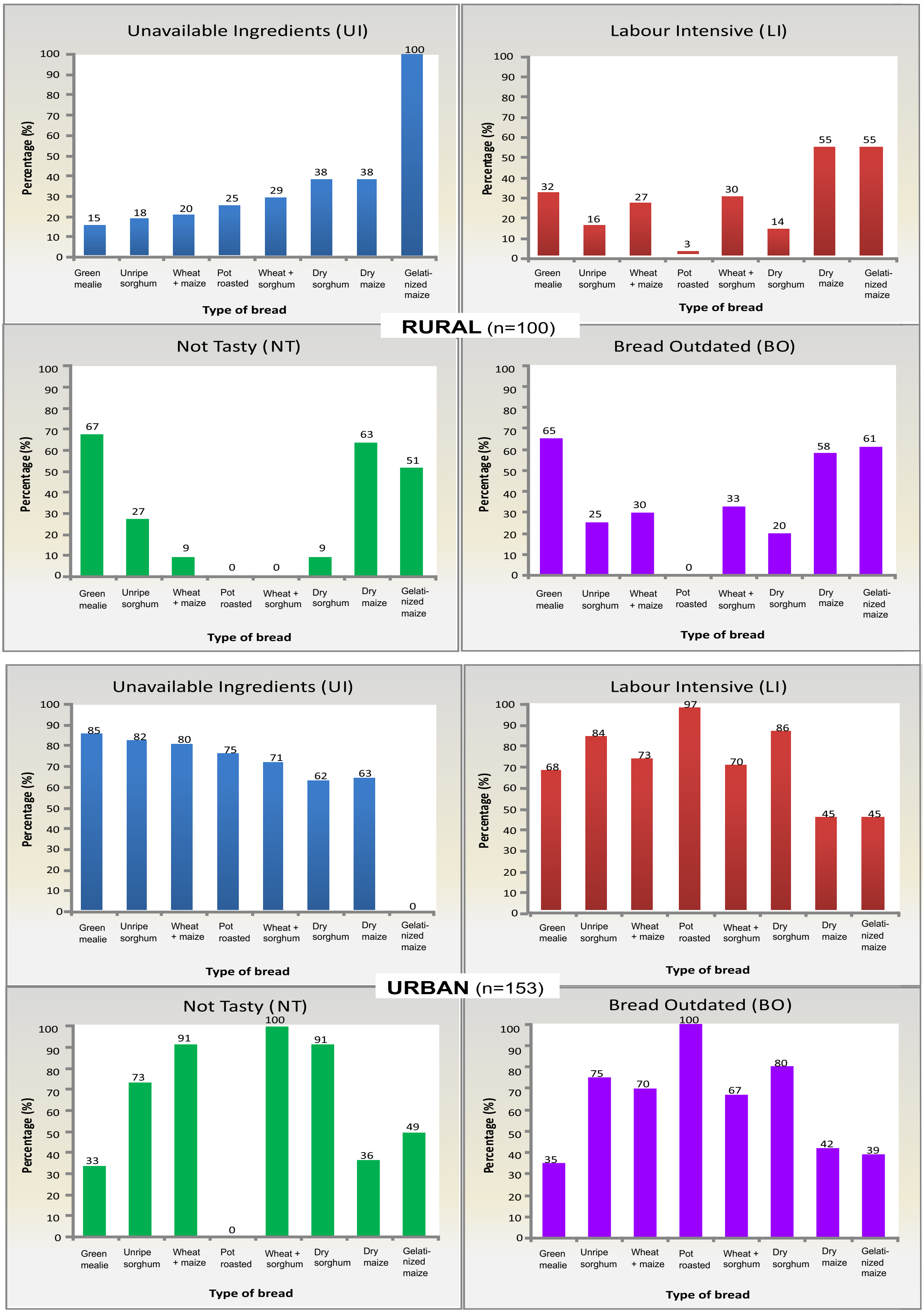

Figure 5.39: Percentage distribution of rural (n=100) and urban (n=153) respondents according to reasons that made them stop to prepare certain traditional Basotho breads (N=253)

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In general, the elderly people in both the rural and urban areas of Lesotho who still remembered the taste and occasions of the old days when these breads formed the major constituents of Basotho diet accepted traditional breads from sorghum and maize. The older people associated the traditional bread prepared from whole grain flours with good nutrition and health. One participant (aged 82) said:

> *These young people do not like traditional foods and we really feel sorry for them because they do not want to learn from us. We are very healthy and we live longer because of eating traditional whole grain foods. Our children have all kinds of illnesses and die at a very young age because they do not eat healthy traditional foods.*

However the younger participants in the focus groups did not accept the taste of green sorghum bread and dry sorghum bread. One participant said:

> *I have never eaten this bread before, maybe if I had had a chance to eat it, I would be used to the taste and like it. I do not like this compact, sticky texture.*

The findings from this study are consistent with the findings by Matenge, van der Merwe, De beer, Bosman and Kruger (2012) who reported that younger consumers did not accept traditional foods due to lack of knowledge about them. Participants in that study suggested that traditional foods should be introduced early in childrens' diet to familiarise the children with their sensory qualities. Familiarity increases food acceptance (Bech-Larsen, Grunet, Poulsen, 2001). Younger participants also mentioned that their mothers never cooked some of the traditional breads for them, and this could have contributed to the way they perceive the sensory characteristics of the bread. In line with these comments Moroni, Bello and Arendt (2009) said that as much as sourdough bread is still an important product consumed in Eastern Europe, its acceptability might be posing challenges to consumers that are unfamiliar with the product. They suggested that in order to increase the acceptability of sourdough breads with sensory qualities desired by consumers, changes in relation to starter cultures and processing techniques must be employed to meet their needs.

Surprisingly, the sensory qualities of both composite breads - wheat and maize bread and wheat and sorghum bread were liked and accepted by all focus group participants (elderly and younger generation as well as rural and urban consumers). Even though some participants had never consumed composite breads before, they liked the sour taste. Focus

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group participants likened it to the sourness of sour porridge. The appearance of composite breads was also generally liked.

5.14 CONSUMPTION OF TRADITIONAL BASOTHO BREADS

Table 5.48 shows that wheat-based breads were consumed more often than sorghum and maize-based breads. Higher consumption of wheat bread confirms the statement made by one participant who said:

> *We like wheat bread so much, even more than meat. If it was possible I would not mind to eat wheat bread every day.*
>
> *Wheat bread is very special in our diet, it is not consumed as frequently as other food. It is prepared on Sundays and preparation of wheat bread requires a proper plan from the housewife*.

The main reason associated with the liking of bread is that it tastes good on its own and can even be consumed without any accompaniment, as one of the respondents commented:

> *Some of us are very poor, we always struggle to get a relish for starchy food, and we like bread so much because it can even go well with water*.

During the focus group discussion, participants made it very clear that consumption of wheat bread was limited by affordability of ingredients. They said the consumption of wheat bread in Lesotho draws a distinct line between the rich and the poor, in that bread consumption increases as the income increases. According to Table 5.48, baked wheat bread was consumed more frequently (37%, n=92) compared to steamed bread (23%, n=57) and pot-roasted bread (21%, n=37) for everyday consumption. Focus group participants in all regions mentioned that consumption of bread in Lesotho traditionally occurred anytime of the day, however, the changing culinary practices have transformed some of the urban participants so that they prefer to consume bread in the morning for breakfast.

Table 5.48 reflects that many respondents rarely consumed sorghum and maize breads as well as the composite of wheat and maize and wheat and sorghum.

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Table 5.48: Percentage of consumption of traditional Basotho breads (N=253)

Bread	**Frequently (Everyday) %**	**Regularly (2-3 days a week) %**	**Occasionally (Once a week) %**	**Rarely (≤ Once a month) %**
Steamed wheat bread (*Leqebekoane*)	23	27	30	19
Baked bread (*Bohobe ba polata*)	37	29	24	10
Pot roasted bread (*Liphaphatha*)	21	24	30	24
Wheat + maize bread (*Mochahlama*)	5	15	14	66
Wheat + sorghum bread (*Mochahlama*)	0	11	11	78
Dry sorghum bread (*Ntsoanatsike)*	0	27	18	54
Green sorghum bread (*Senkhoana*)	0	0	8	92
Dry Maize bread (*Monepola oa Thooko*)	2	2	13	82
Green mealie bread (*Monepola oa poone e ncha)*	8	0	4	88
Gelatinized maize bread (*Mochahlama oa poone feela*)	8	0	4	88

5.15 CONSUMPTION OF COMMERCIAL BREAD

Do you sometimes buy commercial bread? If so why and which bread do you prefer, commercial or homemade bread?

It was important to find out whether apart from the traditional bread, Basotho also eat commercial bread. Table 5.49 shows that participants consume commercial bread although they complain about the fact that it is too soft and too small and cannot satisfy the whole family.

Participants in rural and urban areas do buy commercial bread from shops (Table 5.49), but they indicated that they prefer the homemade bread more than the commercial bread. According to participants, they are forced to buy bread during times when wheat flour is very

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scarce and they find it cheaper to pay for one loaf of bread to be eaten by children rather than to buy wheat flour.

Table 5.49 **Theme 1:** Home-made bread versus commercial bread

Respondents statements	Concept	Category
5.49.1 Yes, we like the bread that we prepare and cook for ourselves more than the bread that we buy. **5.49.2** Yes, we sometimes buy a loaf of bread from shops. We only buy bread if flour for preparing bread is not there, because a loaf of bread will be cheaper than to buy flour for bread making. A loaf of bread however, is too small and it cannot satisfy the whole family. We buy this loaf to be eaten by children.	Home -made bread versus bought loaf.	Preference of bread.

SECTION D:
CULTURE AND CONTEXT INFLUENCE ON BREAD ACCEPTANCE

This section presents the findings about the role of culture and context in bread acceptance (Objective 4).

5.16 CULTURAL RELATED ASPECTS TO TRADITIONAL BASOTHO BREAD

According to focus group discussions, culture came out as the contributing factor for accepting traditional breads in Lesotho. Elderly people eagerly mentioned that traditional Basotho bread forms part of Basotho tradition and culture. They all agreed that their mothers and grandmothers taught them the bread making skills at a very young age, because it was believed that a Mosotho woman should master the skills of producing bread with good sensory qualities as specified by the culture. The fact that these elderly participants were culturally moulded to prepare and consume traditional Basotho bread, made it easier for them to accept the breads. Elderly people related the stories of their past on how traditional bread symbolises their culture. They had this to say:

> *When I grew up I thought that my mother was very cruel when she taught me how to make different kinds of breads and insisted that I cannot make it in marriage if I do not master the bread making skills. I enjoyed every moment of preparing and serving bread to my in-laws. My mother-in-law used to sit very close to me to watch while I was grinding*

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grain, and wet milling on a grinding stone. I never had a problem with any of these processes of bread making.

I remember as a young girl, I would carry the traditional Basotho bread in a big bowl and walk for a long distance to give food to the boys and men ploughing in the fields.

One elderly participant in Mafeteng said:

I love the taste of traditional breads from sorghum and maize and I still prepare them in my house especially because I am staying with my husband only, and do not have a problem of children who would not like the traditional breads.

Elderly participants suggested that Basotho children should be taught the meaning and value of traditional food culture as this could help them accept traditional bread. They said modernization and urbanization have changed the traditional ways of preparing food in Lesotho and if efforts are not made to teach the young generation how to prepare traditional breads then acceptance of these breads would continue to be a problem. In line with these opinions, Matenge *et al.* (2012) reported similar observations from elderly people in South Africa on knowledge and acceptance of traditional foods.

Participants said that unlike any other type of cereal product in Lesotho, bread was culturally used for special occasions such as Sunday meal times, Christmas, weddings, ceremonies, traditional feasts of all kinds and gatherings to help with heavy duties. Moreover, bread was also served as a provision for long walking trips and school trips, to celebrate the first Basotho king's memorial (*Moshoeshoes' day*). Moshoeshoes' day is celebrated in March every year. This is the Basotho's long lived heritage to honour the former King Moshoeshoe I who is the founder of the Basotho nation and who died on 11 March 1870. He is honoured for fighting against many nations in order to protect the land and Basotho and also for preserving the country's language, art and culture. This day is marked with celebrations across the country which includes schools' athletics and traditional dance competitions. Bread has always played a major role on this occasion as provision for students when they travel to visit other schools for sports and cultural dances. Bread was in most cases accompanied with chicken in the urban areas and with mutton in the rural areas for Moshoeshoes' day.

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The survey showed that baked bread was used for all occasions. Almost all (98%, n=248) used baked bread for trips and many (96%, n=242) served baked bread on Christmas day. The same number (94%, n=238) of participants used baked bread for Moshoeshoes' day, feasts and for help teams. Steamed wheat bread was used more (81%, n=205) for trips than for other occasions (Moshoeshoes' day, feasts and help teams. Participants indicated that Christmas was very special for Basotho, and its importance was marked by the preparation of wheat bread in each family. It was a normal practice for Basotho children to wear new clothes and then move from one house to the other on Christmas day to be served bread, which was normally accompanied with ginger drink. Wealthier families served bread with chicken or mutton on Christmas day. This is still the normal practice in the rural areas which, according to participants, encourages all Basotho to be generous from a very young age. One participant said:

> *Any woman that could not give children food, in particular bread, on Christmas day was mocked and the whole village knew she was not a giver.*

Focus group discussions also revealed that bread formed an important dish for traditional feasts such as weddings and thanks giving and funerals. All women in the village participated to prepare and bake wheat bread using mud ovens (*onto*) and sometimes flat three legged iron pots for these occasions. One woman said:

> *When bread was prepared for traditional feasts women would gather together to help with preparations and cooking of bread and that was where a woman who did not know how to prepare bread would be exposed.*

Another indicator that bread served important roles in Basotho culture was the fact that it was used as a test for newly married women. If a newly married woman (*ngoetsi*) masters the skills of preparing bread, it was an indication that she comes from a good family and that her upbringing was proper and she would handle the challenges of marriage. One participant said:

> *Basotho girls used to prepare the bread dough at night in order to wake up very early to cook bread so that by the time the rest of the family members wake up, bread would be ready. Waking up very early was an indication of a strong girl who can make a good wife. So girls around the village were competing about waking up early to cook bread. This is how we got marriage partners because a girl who woke up early was well*

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> *known in the village and would be recommended to a man by his mother or his relatives.*

Similarly, Elwert – Kretschmer (2001) and Sharf, Sukovic, Sharkey and St. John (2011) reported that culinary practices are a responsibility of women. A woman with good cooking skills is said to come from a respectable family and in particular a well-mannered mother. While, on the other hand, a woman with poor cooking skills destroys the family reputation and encounters serious marriage problems in relation to both the husband and the in-laws.

Basotho culturally performed heavy demanding duties (hoeing, harvesting, threshing and winnowing) as a team – 'help team' (*letsema)*, in order for neighbours to join hands and help one another. The family that needed help would invite men and women from the village to come and help on a specified day of the week. For this activity, bread formed the major part of the meal to be eaten while people were working. Participants further indicated that for help teams, bread was served with bean or pea soup. One participant said:

> *Culturally Basotho shared and enjoyed bread during help team (letsema) activities such as: hoeing, harvesting or any other type of activity as requested by the neighbour.*

Sunday is regarded as a very special day in Lesotho. As much as it was not always easy to obtain wheat flour for bread making, all housewives made an effort to serve bread on Sundays. One housewife commented:

> *Preparation of a Sunday meal was started in the evening of the previous day (Saturday) by kneading the bread dough to be cooked early on Sunday morning. A lot of times, this bread would go along with boiled chicken. The free-range chicken was traditionally slaughtered on Saturday and cooked for Sunday. I always remember the taste of hot steamed wheat bread served with well-cooked boiled chicken. I am telling you, food was good during our times.*

To what extent do you support the statement that bread is one of the important food stuffs in Basotho diet?

The purpose of this question was to determine the participants' perceptions about the importance of bread in Basotho diet. The discussions resulted in only one theme namely factors indicating that bread is very important in Basotho diet.

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5.17 FACTORS INDICATING THAT TRADITIONAL BREAD IS VERY IMPORTANT IN BASOTHO DIET

Four categories describing the importance of bread in Basotho diet (Table 5.50): importance of bread in the diet, special occasions, variety in the diet and special skills. Statement 5.50.1, Table 5.50 clearly indicates that bread could be prepared as often as the housewife wishes, but they were limited by lack of wheat flour. The importance of bread was also made clear by choosing to serve it on special occasions such as on Sundays and for special Basotho feasts, as shown in statement 5.50.5, Table 5.50 and in Figure 5.40. Participants further indicated (statements 5.50.6–5.50.10, Table 5.50) that bread gives variety in the diet. This is why it is important that a housewife applies all efforts to make bread available.

Table 5.50 **Theme 1:** Factors indicating that bread is very important in Basotho diet

Respondents statements	Concept	Category
5.50.1 Bread is the most important food in Basotho diet. If I had enough wheat, I could prepare it on a daily basis. **5.50.2** Yes, bread is very important in our diet? **5.50.3** Unlike the rest of Basotho foods, when you want to prepare bread, you make a plan and this shows that bread is very important. **5.50.4** You need to make a plan because there are many cooking processes involved.		Importance of bread in the diet
5.50.5 Bread is also cooked on Sundays, because Sunday is also an important day. We also serve bread during Basotho feasts and important ceremonies.	Sunday Basotho feasts	Special Occasions
5.50.6 Our children like bread so much, that when bread is cooked, they cannot eat thick porridge (*papa*). As a result, bread lasts for only one day in large families and for only two days in smaller families.		Variety in the diet
5.50.7 First of all is variety, Basotho like variety in the diet so that children are not stuck with pap only in the diet. **5.50.8** With all the processes involved, as much as we like bread, it cannot be prepared daily. **5.50.9** It is very necessary to prepare bread for the family to have variety in the diet and stop the monotonous routine of papa. **5.50.10** If there is a shortage of wheat flour, we make a composite with other cereals so we can add variety in the diet.		
5.50.11 Other breads like poy-roasted bread (*Liphaphatha*) cook faster so they are normally prepared when time is limited in order to give it to the shepherds so that they are not late for their animals. They are also given to children so they can eat before they sleep or when they go to school in the morning. **5.50.12** Roasted bread is also prepared for trips provision because it has a long storage stability/long shelf life.		
5.50.13 A newly married woman is tested on the skills of preparing bread to confirm that she is a real woman.	Test newly married women	Special skills

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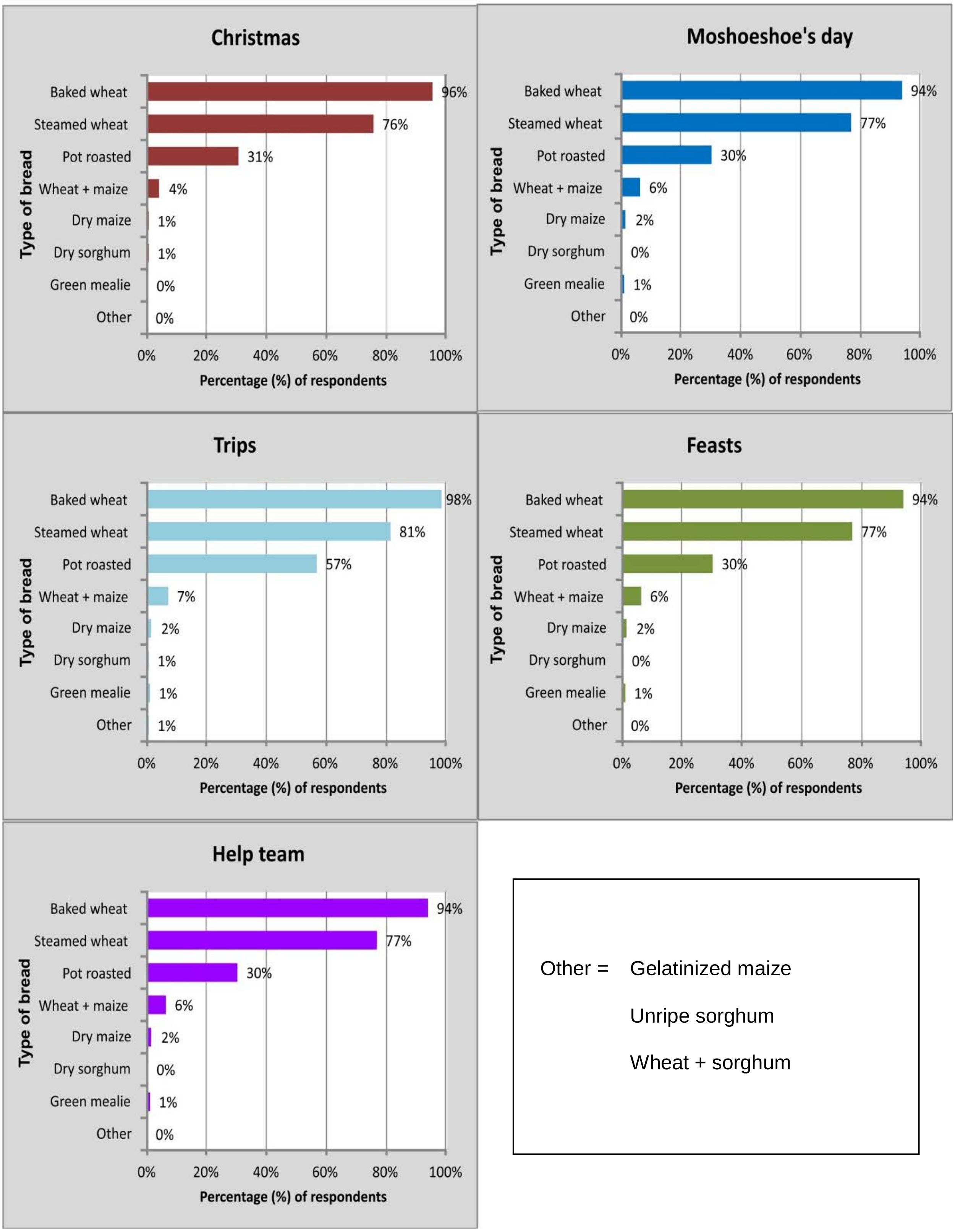

Figure 5.40: Percentage of respondents using different traditional breads on special occasions

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5.18 SUMMARY OF RESULTS

This chapter described the main ingredients, culinary practices, aspects related to culture and food acceptance. Sourdough emerged as the first theme. It is prepared by mixing flour and water and left to ferment at room temperature until it has developed the acidic – sharp taste. Sourdough can also be prepared by leaving aside a small piece of dough from previous bread dough and kept in a bottle until it is needed for use. There are many advantages associated with sourdough in bread-making. For example, sourdough is easily available. Depending on the type of bread and availability of ingredients, Basotho also use traditional beer in different forms, supernatant of sour porridge and commercial yeast for bread making.

It was found that many Basotho prepare wheat bread from commercial flour rather than cultivated grains. The reasons for using commercial wheat flour were soft texture, appealing colour and good taste of bread. However, lack of grain due to poor agricultural practices was also mentioned as the reason for having no option but to use commercial flour.

Kneading and fermentation of bread dough were described as the most important preparation steps in bread making. Fermentation is affected by the type of leavening agent, type of flour used, fermentation temperature, length of fermentation and dough development. Participants described indicators of well fermented Basotho bread dough in terms of appearance and smell of the dough. Maize, sorghum and composites of wheat and maize and wheat and sorghum crack and have a sour smell that fills the room. The dough for wheat breads bubbles, and doubles in size.

In terms of flavouring Basotho bread, respondents indicated that salt and sugar add flavour to the bread. However, it was found that sugar was commonly used in the urban areas and sparingly used in the rural areas by a few participants who can afford to buy it. Participants indicated that sugar is not used with flour prepared from cultivated grain; it can only be used with commercial flour. Length of fermentation and the type of raising agent used also improve the flavour of bread. Basotho generally use a three legged iron pot for cooking different types of bread in the rural areas. The steamer is prepared with sticks, grain stalks, wheat straw and grass as a grid to elevate bread depending on what is available in the region. The urban people use a steamer with a wire grid in an aluminium pot on a paraffin or gas stove.

Traditional Basotho breads were less accepted by younger generation. Elderly participants suggested that younger generation should be taught the meaning and value of traditional food culture as this could help them accept traditional bread.

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Chapter 6

STANDARDISATION, NUTRITIONAL VALUE AND YIELD PERCENTAGE

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Chapter 6

STANDARDISATION, NUTRITIONAL COMPOSITION AND YIELD PERCENTAGE

This chapter presents the results pertaining to standardisation process, and provides the nutritional composition and percentage yields of breads (Objective 5 &6).

6.1 INTRODUCTION

This chapter presents the results for the standardisation of steamed bread types. The standardisation process was performed in phase 2 of the study following the procedure described in Chapter 3. Preliminary trials led to adjustments in recipe quantities of ingredients and the decision to add other ingredients (sugar, cooking oil and instant yeast) that were not part of the original recipes in order to improve taste and texture. The type of equipment used were noted, the water temperature and fermentation temperature were recorded, mixing time, fermentation and cooking time were standardised and recorded throughout the process.

6.2 DISCUSSION OF THE STANDARDISATION RESULTS

The standardisation process according to Figure 6.1 produced small scale recipes and improved the recipes such that the temperature, preparation, fermentation and cooking time were specified. The fact that the standardised recipe used Kenwood mixer reduced the preparation time by 2 hrs. Fermentation time was also reduced by 1.5 hrs and this may be due to the fact that two types of raising agents (sourdough and yeast) were used for standardised bread samples as compared to the original recipes which used only one type of starter per bread. Controlled temperature may have also contributed to the improved fermentation time since the original recipes were prepared in varying climatic conditions of different regions.

Figure 6.1 shows the most important elements covered by the standardisation process. This helps to achieve the the important basic rule about the recipe, that it should be reproducible in order to produce the same results when prepared repeatedly under the same conditions consistently (Hullah, 1984:54). The nutritional value of steamed wheat, maize and sorghum bread is also presented.

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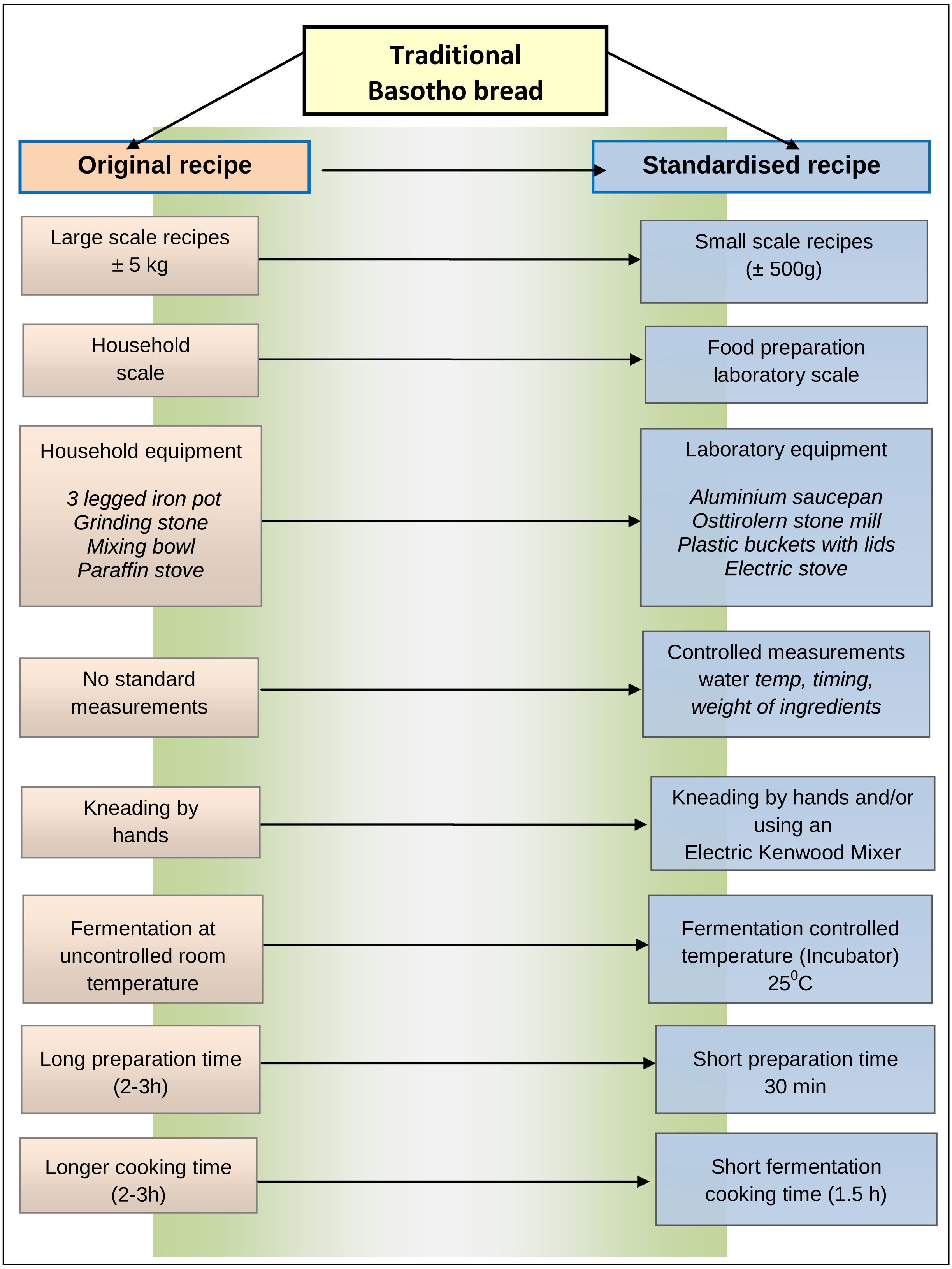

Figure 6.1: The standardisation process of Basotho steamed breads

6.3 NUTRITIONAL COMPOSITION OF STEAMED BASOTHO BREADS

The information about the nutritional composition of breads, according to bodybyte calculations, is presented in this section. The main differences in the nutritional composition

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are due to the differences in ingredients used in recipes. For example, bread in which commercial flour was used generally has higher energy values than their whole grain flour counterparts (Table 6.1) because of addition of sugar and cooking oil in the recipes.

As was expected, the protein levels of whole wheat breads are much higher than in all other breads with non-wheat flour. According to the Lesotho Food Composition table compiled by Lephole, Khaketla and Monoto (2006), where the nutritional composition of steamed wheat bread was calculated using metabolisable energy conversion factors as stated in Greenfield and Southgate (2003), the lower energy values (818 kJ) were recorded for steamed white bread, compared to 825 kJ for steamed brown bread per 100g edible portion.

Table 6.1: Nutritional value of steamed wheat, maize and sorghum Basotho bread

Bodybyte

RECIPE

For: PULANE NKHABUTLANE

Energy and Nutrition Information:

Recipe: COARSELY MILLED WHOLE WHEAT BREAD (CWWheat)

Recipe Ingredients:

Leavening agents, yeasts, baker's active dry

Quantity by Portion Unit:	0.04 x 1 tbsp
Quantity by Weight:	1g/0.02 oz

Salt, table

Quantity by Portion Unit:	0.01 x 1 cup
Quantity by Weight:	3g/0.11 oz

Water, municipal

Quantity by Portion Unit:	0.59 x 1 cup
Quantity by Weight:	140g/4.94 oz

Wheat flour, whole-grain

Quantity by Portion Unit:	1.67 x 1 cup
Quantity by Weight:	200g/7.05 oz

TOTAL ENERGY AND NUTRIENTS FOR RECIPE:

Total Recipe Quantity by Weight: 344 g/12.12 oz

Energy and Macro-Nutrients:

Energy:	2854 kJ
Carbohydrates:	145.3 g
Protein:	27.6 g
Total Fat:	3.8 g

Fatty Acids:

Saturated:	0.6 g
Mono-Unsaturated:	0.5 g
Poly-Unsaturated:	1.6 g
Cholesterol:	0 mg

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Dietary Fiber:	24.5 g (94% AI)
Total Sugars:	0.8 g
Water:	160.4 g
Glycemic Load:	78.5

Eicosapentaenoic (EPA):	0.00 g
Docohexaenoic (DHA):	0.00 g
Arachidonic (AA):	0.00 g
Linoleic (LA):	1.48 g (12% AI)
Linolenic (ALA):	0.08 g (7% AI)

Vitamins:

Vitamin A (IU):	18 IU (1% RDA)
Vitamin A:	5 mcg (1% RDA)
Vitamin C:	0.0 mg (0% RDA)
Vitamin E:	1.64 mcg (11% RDA)
Thiamin:	0.91 mg (82% RDA)
Riboflavin:	0.46 mg (42% RDA)
Niacin:	12.93 mg (92% RDA)
Vitamin B6:	0.69 mg (53% RDA)
Vitamin K:	3.8 mcg (4% AI)
Vitamin D:	0.0 mcg (0% AI)
Folate:	100 mcg (25 % RDA)
Vitamin B12:	0.00 mcg (0% RDA)
Pantothenic Acid:	2.07 mg (41% AI)
Alpha-Carotene:	0 mcg
Beta-Carotene:	10 mcg
Beta-Cryptoxanthin:	0 mcg
Lycopene:	0 mcg
Lutein + Zeaxanthin:	440 mcg

Macro-Nutrient Energy Ratio:

77% Net Carb (2198 kJ)
18% Protein (502 kJ)
5% Fat (154 kJ)

Minerals

Sodium:	1176 mg (78% AI)
Calcium:	72 mg (6% AI)
Phosphorus:	698 mg (100% RDA)
Magnesium:	278 mg (90% RDA)
Potassium:	820 mg (17% AI)
Iron:	7.85 mg (44% RDA)
Zinc:	5.90 mg (74% RDA)
Copper:	0.78 mg (86% RDA)
Selenium:	141.5 mcg (257% RDA)
Manganese:	7.60 mg (422% AI)

Recipe: FINELY MILLED WHOLE WHEAT BREAD (FWWheat)

Recipe Ingredients:

Leavening agents, yeasts, baker's active dry
Quantity by Portion Unit: 0.04 x 1 tbsp
Quantity by Weight: 1g/0.02 oz

Salt, table
Quantity by Portion Unit: 0.01 x 1 cup
Quantity by Weight: 3g/0.11 oz

Water, municipal
Quantity by Portion Unit: 0.59 x 1 cup
Quantity by Weight: 140g/4.94 oz

Wheat flour, whole-grain
Quantity by Portion Unit: 1.67 x 1 cup
Quantity by Weight: 200g/7.05 oz

TOTAL ENERGY AND NUTRIENTS FOR RECIPE:

Total Recipe Quantity by Weight: 344 g/12.12 oz

Energy and Macro-Nutrients:

Energy:	2854 kJ
Carbohydrates:	145.3 g

Fatty Acids:

Saturated:	0.6 g
Mono-Unsaturated:	0.5 g

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Protein:	27.6 g	Poly-Unsaturated:	1.6 g
Total Fat:	3.8 g	Cholesterol:	0 mg
Dietary Fiber:	24.5 g (94% AI)	Eicosapentaenoic (EPA):	0.00 g
Total Sugars:	0.8 g	Docohexaenoic (DHA):	0.00 g
Water:	160.4 g	Arachidonic (AA):	0.00 g
Glycemic Load:	78.5	Linoleic (LA):	1.48 g (12% AI)
		Linolenic (ALA):	0.08 g (7% AI)

Vitamins:

Vitamin A (IU):	18 IU (1% RDA)
Vitamin A:	5 mcg (1% RDA)
Vitamin C:	0.0 mg (0% RDA)
Vitamin E:	1.64 mcg (11% RDA)
Thiamin:	0.91 mg (82% RDA)
Riboflavin:	0.46 mg (42% RDA)
Niacin:	12.93 mg (92% RDA)
Vitamin B6:	0.69 mg (53% RDA)

Macro-Nutrient Energy Ratio:

77% Net Carb (2198 kJ)
18% Protein (502 kJ)
5% Fat (154 kJ)

Minerals

Vitamin K:	3.8 mcg (4% AI)	Sodium:	1176 mg (78% AI)
Vitamin D:	0.0 mcg (0% AI)	Calcium:	72 mg (6% AI)
Folate:	100 mcg (25 % RDA)	Phosphorus:	698 mg (100% RDA)
Vitamin B12:	0.00 mcg (0% RDA)	Magnesium:	278 mg (90% RDA)
Pantothenic Acid:	2.07 mg (41% AI)	Potassium:	820 mg (17% AI)
Alpha-Carotene:	0 mcg	Iron:	7.85 mg (44% RDA)
Beta-Carotene:	10 mcg	Zinc:	5.90 mg (74% RDA)
Beta-Cryptoxanthin:	0 mcg	Copper:	0.78 mg (86% RDA)
Lycopene:	0 mcg	Selenium:	141.5 mcg (257% RDA)
Lutein + Zeaxanthin:	440 mcg	Manganese:	7.60 mg (422% AI)

Recipe: COMMERCIAL WHEAT (EASY BAKE) BREAD

Recipe Ingredients:

Leavening agents, yeasts, baker's active dry
Quantity by Portion Unit: 0.04 x 1 tbsp
Quantity by Weight: 1g/0.02 oz

Salt, table
Quantity by Portion Unit: 0.01 x 1 cup
Quantity by Weight: 3g/0.11 oz

Sugars, granulated
Quantity by Portion Unit: 3.52 x 1 serving, packet
Quantity by Weight: 10g/0.35 oz

Water, municipal
Quantity by Portion Unit: 0.59 x 1 cup
Quantity by Weight: 140g/4.94 oz

Wheat bran, crude
Quantity by Portion Unit: 1.17 x 1 cup
Quantity by Weight: 10g/4.94 oz

Wheat flour, white, all-purpose, unenriched
Quantity by Portion Unit: 1.52 x 1 cup
Quantity by Weight: 190g/6.70 oz

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Recipe: COMMERCIAL WHEAT (EASY BAKE) BREAD (ComWheat)

TOTAL ENERGY AND NUTRIENTS FOR RECIPE:

Total Recipe Quantity by Weight: 354 g/12.47 oz

Energy and Macro-Nutrients:

Energy:	3164 kJ
Carbohydrates:	161.6 g
Protein:	21.4 g
Total Fat:	2.3 g
Dietary Fiber:	9.5 g (37% AI)
Total Sugars:	10.5 g
Water:	163.5 g
Glycemic Load:	98.6

Fatty Acids:

Saturated:	0.4 g
Mono-Unsaturated:	0.2 g
Poly-Unsaturated:	1.0 g
Cholesterol:	0 mg
Eicosapentaenoic (EPA):	0.00 g
Docohexaenoic (DHA):	0.00 g
Arachidonic (AA):	0.00 g
Linoleic (LA):	1.95 g (8% AI)
Linolenic (ALA):	0.06 g (5% AI)

Vitamins:

Vitamin A (IU):	1 IU (1% RDA)
Vitamin A:	0 mcg (0% RDA)
Vitamin C:	0.0 mg (0% RDA)
Vitamin E:	1.26 mcg (2% RDA)
Thiamin:	0.29 mg (27% RDA)
Riboflavin:	0.16 mg (15% RDA)
Niacin:	3.93 mg (28% RDA)
Vitamin B6:	0.22 mg (17% RDA)
Vitamin K:	0.8 mcg (1% AI)
Vitamin D:	0.0 mcg (0% AI)
Folate:	69 mcg (17 % RDA)
Vitamin B12:	0.00 mcg (0% RDA)
Pantothenic Acid:	1.11 mg (22% AI)
Alpha-Carotene:	0 mcg
Beta-Carotene:	1 mcg
Beta-Cryptoxanthin:	0 mcg
Lycopene:	0 mcg
Lutein + Zeaxanthin:	58 mcg

Macro-Nutrient Energy Ratio:

85% Net Carb (2694 kJ)
12% Protein (378 kJ)
3% Fat (92 kJ)

Minerals

Sodium:	1170 mg (78% AI)
Calcium:	40 mg (6% AI)
Phosphorus:	313 mg (45% RDA)
Magnesium:	105 mg (34% RDA)
Potassium:	332 mg (7% AI)
Iron:	3.37 mg (19% RDA)
Zinc:	2.09 mg (26% RDA)
Copper:	0.39 mg (43% RDA)
Selenium:	72.4 mcg (132% RDA)
Manganese:	2.45 mg (136% AI)

Recipe: WHOLE RED SORGHUM BREAD (WRsorg) and WHOLE GRAIN WHITE SORGHUM (WWhSorg)

Recipe Ingredients:

Leavening agents, yeasts, baker's active dry
Quantity by Portion Unit: 0.04 x 1 tbsp
Quantity by Weight: 1g/0.02 oz

Salt, table
Quantity by Portion Unit: 0.01 x 1 cup
Quantity by Weight: 2g/0.07 oz

Water, municipal
Quantity by Portion Unit: 0.72 x 1 cup
Quantity by Weight: 170g/6.00 oz

Sorghum

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Quantity by Portion Unit: 1.04 x 1 cup
Quantity by Weight: 200g/7.05 oz

TOTAL ENERGY AND NUTRIENTS FOR RECIPE:

Total Recipe Quantity by Weight: 373 g/13.14 oz

Energy and Macro-Nutrients:

Energy:	2854 kJ
Carbohydrates:	149.5 g
Protein:	22.8 g
Total Fat:	6.6 g
Dietary Fiber:	0.1 g (0% AI)
Total Sugars:	0.0 g
Water:	188.3 g
Glycemic Load:	97.1

Fatty Acids:

Saturated:	0.9 g
Mono-Unsaturated:	2.0 g
Poly-Unsaturated:	2.7 g
Cholesterol:	0 mg
Eicosapentaenoic (EPA):	0.00 g
Docohexaenoic (DHA):	0.00 g
Arachidonic (AA):	0.00 g
Linoleic (LA):	0.00 g (0% AI)
Linolenic (ALA):	0.00 g (0% AI)

Vitamins:

Vitamin A (IU):	0 IU (0% RDA)
Vitamin A:	0 mcg (0% RDA)
Vitamin C:	0.0 mg (0% RDA)
Vitamin E:	0.00 mcg (0% RDA)
Thiamin:	0.49 mg (44% RDA)
Riboflavin:	0.31 mg (28% RDA)
Niacin:	6.05 mg (43% RDA)
Vitamin B6:	0.01 mg (1% RDA)
Vitamin K:	0.0 mcg (0% AI)
Vitamin D:	0.0 mcg (0% AI)
Folate:	12 mcg (3 % RDA)
Vitamin B12:	0.00 mcg (0% RDA)
Pantothenic Acid:	0.06 mg (1% AI)
Alpha-Carotene:	0 mcg
Beta-Carotene:	0 mcg
Beta-Cryptoxanthin:	0 mcg
Lycopene:	0 mcg
Lutein + Zeaxanthin:	0 mcg

Macro-Nutrient Energy Ratio:

80% Net Carb (2198 kJ)
12% Protein (502 kJ)
8% Fat (154 kJ)

Minerals

Sodium:	791 mg (53% AI)
Calcium:	60 mg (5% AI)
Phosphorus:	580 mg (83% RDA)
Magnesium:	2 mg (1% RDA)
Potassium:	710 mg (15% AI)
Iron:	8.89 mg (49% RDA)
Zinc:	0.03 mg (0% RDA)
Copper:	0.02 mg (2% RDA)
Selenium:	0.1 mcg (0% RDA)
Manganese:	0.00 mg (0% AI)

Recipe: COMMERCIAL RED SORGHUM BREAD (ComRSorg)

Recipe Ingredients:

Leavening agents, yeasts, baker's active dry
Quantity by Portion Unit: 0.04 x 1 tbsp
Quantity by Weight: 1g/0.02 oz

Oil, vegetable, sunflower, linoleic, (hydrogenated)
Quantity by Portion Unit: 0.05 x 1 cup
Quantity by Weight: 10g/0.35 oz

Salt, table
Quantity by Portion Unit: 0.01 x 1 cup
Quantity by Weight: 2g/0.07 oz

Sorghum
Quantity by Portion Unit: 1.04 x 1 cup
Quantity by Weight: 200g/7.05 oz

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Sugars, granulated

Quantity by Portion Unit:	5.28 x 1 serving, packet
Quantity by Weight:	15g/0.53 oz

Water, municipal

Quantity by Portion Unit:	0.72 x 1 cup
Quantity by Weight:	170g/6.00 oz

TOTAL ENERGY AND NUTRIENTS FOR RECIPE:

Total Recipe Quantity by Weight: 398g/14.02 oz

Energy and Macro-Nutrients:

Energy:	3469 kJ
Carbohydrates:	164.4 g
Protein:	22.8 g
Total Fat:	16.6 g
Dietary Fiber:	0.1 g (0% AI)
Total Sugars:	15.0 g
Water:	188.3 g
Glycemic Load:	106.8

Fatty Acids:

Saturated:	2.2 g
Mono-Unsaturated:	6.6 g
Poly-Unsaturated:	6.4 g
Cholesterol:	0 mg
Eicosapentaenoic (EPA):	0.00 g
Docohexaenoic (DHA):	0.00 g
Arachidonic (AA):	0.00 g
Linoleic (LA):	3.53 g (29% AI)
Linolenic (ALA):	0.09 g (8% AI)

Vitamins:

Vitamin A (IU):	0 IU (0% RDA)
Vitamin A:	0 mcg (0% RDA)
Vitamin C:	0.0 mg (0% RDA)
Vitamin E:	4.11 mcg (27% RDA)
Thiamin:	0.49 mg (44% RDA)
Riboflavin:	0.31 mg (29% RDA)
Niacin:	6.05 mg (43% RDA)
Vitamin B6:	0.01 mg (1% RDA)
Vitamin K:	0.5mcg (1% AI)
Vitamin D:	0.0 mcg (0% AI)
Folate:	12 mcg (3 % RDA)
Vitamin B12:	0.00 mcg (0% RDA)
Pantothenic Acid:	0.06 mg (1% AI)
Alpha-Carotene:	0 mcg
Beta-Carotene:	0 mcg
Beta-Cryptoxanthin:	0 mcg
Lycopene:	0 mcg
Lutein + Zeaxanthin:	0 mcg

Macro-Nutrient Energy Ratio:

73% Net Carb (2539 kJ)
10% Protein (352 kJ)
17% Fat (578 kJ)

Minerals

Sodium:	791 mg (53% AI)
Calcium:	60 mg (5% AI)
Phosphorus:	580 mg (83% RDA)
Magnesium:	2 mg (1% RDA)
Potassium:	710 mg (15% AI)
Iron:	8.89 mg (49% RDA)
Zinc:	0.03 mg (0% RDA)
Copper:	0.02 mg (2% RDA)
Selenium:	0.2 mcg (0% RDA)
Manganese:	0.00 mg (0% AI)

Recipe: WHOLE WHITE MAIZE BREAD (WWhMaize)

Recipe Ingredients:

Corn meal, whole-grain, white

Quantity by Portion Unit:	1.64 x 1 cup
Quantity by Weight:	200g/7.05 oz

Leavening agents, yeasts, baker's active dry

Quantity by Portion Unit:	0.04 x 1 tbsp
Quantity by Weight:	1g/0.02 oz

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Salt, table

Quantity by Portion Unit: 0.01 x 1 cup
Quantity by Weight: 2g/0.07 oz

Water, municipal

Quantity by Portion Unit: 0.72 x 1 cup
Quantity by Weight: 170g/6.00 oz

TOTAL ENERGY AND NUTRIENTS FOR RECIPE:

Total Recipe Quantity by Weight: 373 g/13.14 oz

Energy and Macro-Nutrients:

Energy:	3047 kJ
Carbohydrates:	154.0 g
Protein:	16.4 g
Total Fat:	7.2 g
Dietary Fiber:	14.7 g (57% AI)
Total Sugars:	1.3 g
Water:	190.4 g
Glycemic Load:	90.5

Fatty Acids:

Saturated:	1.0 g
Mono-Unsaturated:	1.9 g
Poly-Unsaturated:	3.3 g
Cholesterol:	0 mg
Eicosapentaenoic (EPA):	0.00 g
Docohexaenoic (DHA):	0.00 g
Arachidonic (AA):	0.00 g
Linoleic (LA):	3.18 g (26% AI)
Linolenic (ALA):	0.10 g (9% AI)

Vitamins:

Vitamin A (IU):	6 IU (0% RDA)
Vitamin A:	2 mcg (0% RDA)
Vitamin C:	0.0 mg (0% RDA)
Vitamin E:	0.84 mcg (6% RDA)
Thiamin:	0.78 mg (71% RDA)
Riboflavin:	0.43 mg (39% RDA)
Niacin:	7.46 mg (53% RDA)
Vitamin B6:	0.62 mg (47% RDA)
Vitamin K:	0.6 mcg (1% AI)
Vitamin D:	0.0 mcg (0% AI)
Folate:	62 mcg (15 % RDA)
Vitamin B12:	0.00 mcg (0% RDA)
Pantothenic Acid:	0.91 mg (18% AI)
Alpha-Carotene:	0 mcg
Beta-Carotene:	2 mcg
Beta-Cryptoxanthin:	2 mcg
Lycopene:	0 mcg
Lutein + Zeaxanthin:	10 mcg

Macro-Nutrient Energy Ratio:

81% Net Carb (2468 kJ)
10% Protein (291kJ)
9% Fat (287 kJ)

Minerals

Sodium:	849 mg (57% AI)
Calcium:	16 mg (1% AI)
Phosphorus:	488 mg (70% RDA)
Magnesium:	256 mg (83% RDA)
Potassium:	584 mg (12% AI)
Iron:	6.99 mg (39% RDA)
Zinc:	3.67 mg (46% RDA)
Copper:	0.40 mg (45% RDA)
Selenium:	31.1 mcg (57% RDA)
Manganese:	1.00 mg (56% AI)

Recipe: COMMERCIAL WHITE MAIZE BREAD (ComWhMaize)

Recipe Ingredients:

Corn meal, degermed, enriched, white

Quantity by Portion Unit: 1.45 x 1 cup
Quantity by Weight: 200g/7.05 oz

Leavening agents, yeasts, baker's active dry

Quantity by Portion Unit: 0.04 x 1 tbsp

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Quantity by Weight: 1g/0.02 oz

Oil, vegetable, sunflower, linoleic, (hydrogenated)
Quantity by Portion Unit: 0.05 x 1 cup
Quantity by Weight: 10g/0.35 oz

Salt, table
Quantity by Portion Unit: 0.01 x 1 cup
Quantity by Weight: 2g/0.07 oz

Sugars, granulated
Quantity by Portion Unit: 5.28 x 1 serving, packet
Quantity by Weight: 15g/0.53 oz

Water, municipal
Quantity by Portion Unit: 0.72 x 1 cup
Quantity by Weight: 170g/6.00 oz

TOTAL ENERGY AND NUTRIENTS FOR RECIPE:

Total Recipe Quantity by Weight: 398g/14.02 oz

Energy and Macro-Nutrients:

Energy:	3696 kJ
Carbohydrates:	170.5 g
Protein:	17.2 g
Total Fat:	13.3 g
Dietary Fiber:	14.9 g (57% AI)
Total Sugars:	16.3 g
Water:	193.1 g
Glycemic Load:	101.2

Fatty Acids:

Saturated:	1.8 g
Mono-Unsaturated:	5.5 g
Poly-Unsaturated:	5.1 g
Cholesterol:	0 mg
Eicosapentaenoic (EPA):	0.00 g
Docohexaenoic (DHA):	0.00 g
Arachidonic (AA):	0.00 g
Linoleic (LA):	4.96 g (41% AI)
Linolenic (ALA):	0.13 g (12% AI)

Vitamins:

Vitamin A (IU):	6 IU (0% RDA)
Vitamin A:	2 mcg (0% RDA)
Vitamin C:	0.0 mg (0% RDA)
Vitamin E:	4.41 mcg (29% RDA)
Thiamin:	1.44 mg (131% RDA)
Riboflavin:	0.84 mg (77% RDA)
Niacin:	10.27 mg (73% RDA)
Vitamin B6:	0.52 mg (40% RDA)
Vitamin K:	1.1 mcg (1% AI)
Vitamin D:	0.0 mcg (0% AI)
Folate:	478 mcg (119 % RDA)
Vitamin B12:	0.00 mcg (0% RDA)
Pantothenic Acid:	0.68 mg (14% AI)
Alpha-Carotene:	0 mcg
Beta-Carotene:	2 mcg
Beta-Cryptoxanthin:	2 mcg
Lycopene:	0 mcg
Lutein + Zeaxanthin:	10 mcg

Macro-Nutrient Energy Ratio:

77% Net Carb (2837 kJ)
8% Protein (313kJ)
15% Fat (546 kJ)

Minerals

Sodium:	785mg (52% AI)
Calcium:	14 mg (1% AI)
Phosphorus:	174 mg (25% RDA)
Magnesium:	82 mg (27% RDA)
Potassium:	334 mg (7% AI)
Iron:	8.35 mg (46% RDA)
Zinc:	1.47 mg (18% RDA)
Copper:	0.17 mg (19% RDA)
Selenium:	15.8 mcg (29% RDA)
Manganese:	0.21 mg (12% AI)

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6.4 YIELD FACTOR

All steamed breads gave a yield of more than 80% and all wheat breads yielded 94 to 96%, Table 6.2. The highest yield percentage was recorded in whole grain white maize bread. According to Movahed, Rooshenas and Ahmadichenarbon (2011) the use of different methods of dough preparation could be the cause of different levels of bread yield.

Table 6.2: Bread percentage (%) yield

Types of bread	**Raw mass in gram (g)**	**Cooked mass in gram (g)**	**Yield Factor (YF) %**
Coarsely milled whole wheat (CWWheat)	344	324	94
Finely milled whole wheat (FWWheat)	344	329	96
Commercial wheat (ComWheat) *Letlotlo Easy Bake flour (Lesotho flour mills)*	354	338	95
Whole grain red sorghum (WRsorg)	373	330	89
Commercial red sorghum (ComRSorg) *Monati Super Mabela- pure grain sorghum fine meal [Nola Foods (Pty) Ltd South Africa]*	398	341	86
Whole grain white sorghum (WWhSorg)	373	332	89
Whole grain white maize (WWhMaize)	373	360	97
Commercial special white maize (ComWhMaize) *Impala special maize meal (Premier Foods, Isando, South Africa)*	398	350	88

6.5 SUMMARY

This chapter presented the standardisation process and results for traditional Basotho bread. The nutritional composition and yield of steamed Basotho bread were also outlined and discussed. The results revealed that the standardised recipes were improved in terms of shortened preparation, fermentation and cooking time. The chapter also reflected that the type of flour used had an effect on the energy levels of each steamed bread. In general commercial flours produced higher energy levels than whole grain flours. The yield factor for breads varied due to additional ingredients added during the standardisation process.

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Chapter 7

PHYSICO-CHEMICAL AND SENSORY CHARACTERISATION OF TRADITIONAL STEAMED BASOTHO BREADS

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Chapter 7

PHYSICO-CHEMICAL AND SENSORY CHARACTERISATION OF TRADITIONAL STEAMED BASOTHO BREADS

This chapter presents the results about the physico-chemical characteristics of standardised steamed breads.

7.1 INTRODUCTION

The results pertaining to primary objective 7 of the main study are addressed in this chapter. The information in this chapter forms phase 3 of the study. Following the standardisation phase, the results here focuses on the sensory characterisation of wheat, maize and sorghum steamed breads from Lesotho.

7.1.1 Flour particle size distribution

- **Flour particle size distribution**

The flour particle size distribution of milled grains and commercial flours is presented in Figure 7.1. ComWheat flour was the most fine with 57% of the flour passing through the smallest (106) µm sieve. ComMaize meal had the lowest percentage of small particles (< 106 µm) but the largest proportion of particles 250 - 500 µm. CWWheat and whole grain white maize flours were the most coarse with about 10% of particles 1000 -1400 µm. No particles >1000 µm were recorded for all sorghum flours. ComRSorg had the smaller percentage (10%) of fine particles compared to WRSorg (18%) and WWhSorg (17%), but WWhSorg comprised of more (85%) particles at 500 µm than WRSorg (77%) and ComRSorg (79%).

- **Proximate composition of flours**

The proximate composition of the flours used for the steam breads is presented in Table 7.1. The results for wheat and sorghum flours and for maize were comparable to values recorded previously (Kundi, 2002; Phattanakulkaewmorie, Paseephol & Moongngarm, 2011) .

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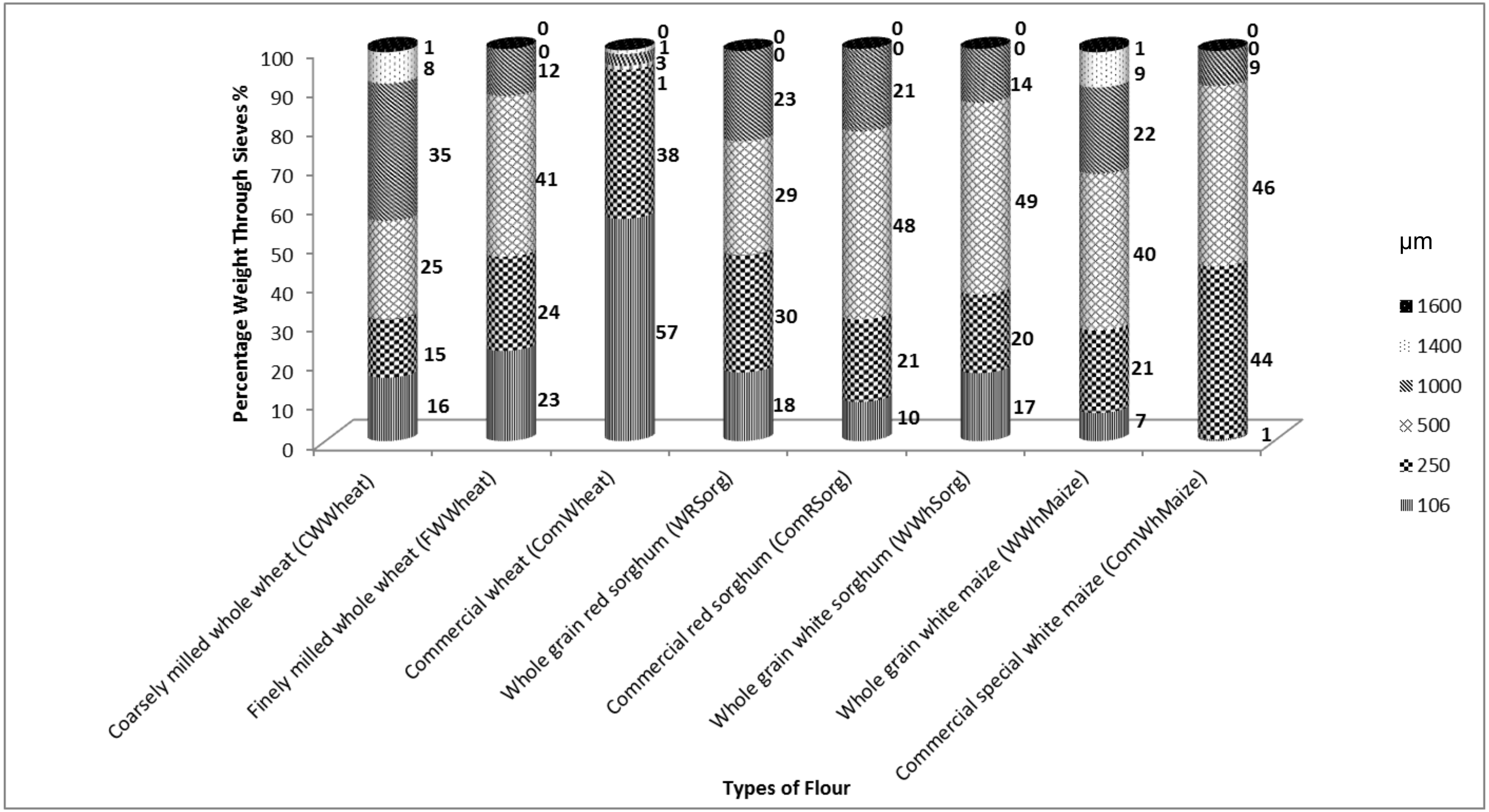

Figure 7.1: Particle size distribution (% particles that pass through various size sieves) of whole grain and commercial wheat, maize and sorghum flours

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Table 7.1 Proximate composition (%) of whole grain and commercial flours

Flours	Moisture (%)	Protein (% dwb)	Crude Fat (% dwb)	Ash (% dwb)	Carbohydrates (by difference) (% dwb)
Coarsely milled whole wheat (CWWheat)	11.20 ^{b}± 0.06	10.48^{e} ± 0.08	1.60^{a} ± 0.06	1.71^{e} ± 0.02	86.21^{d} ± 0.04
Finely milled whole wheat (FWWheat)	11.80 ^{d} ± 0.02	13.05^{f} ± 0.07	1.33^{a} ±0.05	1.69^{e} ± 0.04	83.93^{a} ± 0.09
Commercial wheat (ComWheat)	11.63 ^{c}± 0.09	13.34^{g} ± 0.06	1.61^{a} ± 0.08	1.01^{b} ± 0.00	84.03^{a} ± 0.14
Whole grain red sorghum (WRSorg)	12.72 ^{f} ± 0.11	8.20^{b} ± 0.01	2.77^{b} ± 0.14	1.55^{d} ± 0.04	87.48^{e} ±0.19
Commercial red sorghum (ComRSorg)	11.95 ^{e} ± 0.03	9.69^{d} ± 0.09	2.51^{b} ± 0.06	1.30^{c} ± 0.04	86.50^{d} ±0.11
Whole grain white sorghum (WWhSorg)	11.09^{b} ± 0.09	9.69^{d} ± 0.01	3.75^{c} ± 0.10	1.91^{f} ± 0.00	84.64^{b} ± 0.10
Whole grain white maize (WWhMaize)	11.86^{de}± 0.01	9.43^{c} ± 0.02	3.76^{c} ± 0.39	1.73^{e} ± 0.03	85.07^{c} ± 0.40
Commercial special white maize (ComWhMaize)	10.87 ^{a} ± 0.01	7.86^{a} ± 0.02	3.75^{c} ± 0.05	0.94^{a} ± 0.04	87.45^{e} ± 0.07

Values are means ± standard deviations. ^{abcdef} Values in the same column with different letters are significantly different at p ≤ 0.05. dwb-Percentage dry weight basis.

7.1.2 Sourdough and bread dough pH and TTA

The pH of wheat bread sourdoughs varied from 3.9 for ComWheat to 5.3 and 5.8 for CWWheat and FWWheat respectively on day 1 (Table 7.2). The final sourdough pH was 3.8 for ComWheat and 4.2 for both CWWheat and FWWheat. The highest TTA (1.0) for wheat sourdough was recorded in ComWheat on day 2. There was no significant difference between bread dough pH and TTA from different wheat flour types.

ComRSorg sourdough had a significantly higher pH (6.6) than WRSorgh and WWhSorg sourdoughs before fermentation (Table 7.2), but showed the lowest pH (3.7) compared to 4.0 and 4.3 of WRSorg and WWhSorg respectively on day 2. WWhSorg and ComRSorg had the same TTA level (0.5). This was lower, compared to WRSorg on day 2. WWhSorg had a higher pH (5.0) than WRSorg and ComRSorg dough, but TTA did not differ significantly across all sorghum bread doughs.

The pH of ComWhMaize from day 0 to day 2 was significantly higher than pH values recorded for WWhMaize sourdough. WWhMaize showed higher TTA (0.8) than ComWhMaize (0.4), but did not differ significantly in terms of bread dough pH and TTA.

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Table 7.2: Mean Titratable Acidity[1] (TTA) and pH values of sourdough from wheat, sorghum and maize flours and corresponding bread dough samples

Breads	Sourdough					Bread dough (Prior to steaming)	
	pH (Day 0)	pH (Day 1)	pH (Day 2)	TTA (Day 1)	TTA (Day 2)	pH	TTA
Coarse milled whole wheat (CWWheat)	6.28^{e}	5.27^{c}	4.23^{ab}	0.13^{e}	0.81^{b}	5.24^{a}	0.26^{bc}
Fine milled whole wheat (FWWheat)	6.43^{bc}	5.75^{b}	4.17^{b}	0.20^{d}	0.73^{c}	5.10^{a}	0.26^{bc}
Commercial wheat (ComWheat)	6.35^{de}	3.91^{f}	3.78^{e}	0.56^{a}	0.99^{a}	5.01^{a}	0.22^{c}
Whole grain red sorghum (WRSorg)	6.38^{cd}	5.87^{a}	4.04^{c}	0.22^{d}	0.79^{b}	4.56^{b}	0.37^{ab}
Commercial red sorghum (ComRSorg)	6.62^{a}	3.72^{g}	3.65^{f}	0.59^{a}	0.50^{d}	4.64^{b}	0.33^{abc}
Whole grain white sorghum (WWhSorg)	6.43^{cd}	5.13^{d}	4.26^{a}	0.28^{c}	0.47^{de}	5.04^{a}	0.41^{a}
Whole grain white maize (WWhMaize)	6.36^{cde}	3.92^{f}	3.88^{d}	0.11^{e}	0.81^{b}	4.67^{b}	0.29^{bc}
Commercial white maize (ComWhMaize)	6.51^{b}	4.09^{e}	4.08^{c}	0.40^{b}	0.41^{e}	4.59^{b}	0.34^{abc}

[1]TTA values are expressed % lactic acid (sourdough starter containing 1:1 ratio of flour: water) titrated to pH 6.3.

Values are means. [abcdef] Values in the same column with different letters are significantly different at P≤ 0.05.

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7.1.3 Texture profile analyses and bread appearance

Figures 7.2 to 7.5 provide photos of the breads as well as the results of texture analysis and specific volume measurements. The differences in bread shape, volume, crumb structure and colour are obvious. All wheat breads have round tops showing a gap or crack on the sides (Figure 7.2). Non-wheat breads on the other hand are completely flat, with the exception of WWhMaize, which is slightly round (Figure 7.3 & 7.4). Wheat breads had a higher volume compared to sorghum and maize breads ($p < 0.05$). For wheat bread, the finer the flour, the higher the volume (Figure 7.2). The non-wheat breads had more compact structures with smaller volumes.

The means for colour parameters (L*, a*, b*, chroma and hue angle) of bread types are shown in Table 7.4. As expected (red sorghum breads) were more red (a*) for both skin and crumb, compared to the other breads. The skin and crumb of steamed maize breads were whitest with the highest L* values and hue angles. The lowest L* value indicating darkest colour was recorded for WRSorg bread. WWhMaize bread and ComWheat bread were more yellow on the skin with the highest b* values. In general, the finer crumb of breads prepared using commercial flours were lighter in colour than crumbs of breads prepared from whole grain flours. Whole grain breads showed fibrous substances, causing speckled appearance. The chroma and hue angle values for both skin and crumb differed significantly ($p<0.05$) between breads. Maize breads had significantly higher hue angles. Maize breads also had lowest skin and crumb a- values. The crumb colour for CWWheat bread and WWhSorg did not differ significantly ($p > 0.05$) for all colour parameters. In general, the chroma values of bread crumb for ComWhMaize, WRSorg, ComWheat and CWWheat bread were similar but significantly higher ($p < 0.05$) than the other breads.

The wheat and non-wheat breads displayed differences in crumb structure and texture parameters. The non-wheat breads required higher maximum force do deform than wheat and standard breads. The texture graphs shown in Figures 7.2-7.5 reflects three types of texture properties: plastic deformation for wheat breads (Figure 7.2), brittle deformation for the non - gluten breads (Figure 7.3-7.4) and elastic deformation for standard breads (Figure 7.5). Rye bread was more dense and hard, compared to standard whole wheat bread. The fine crumb structure of ComWhMaize bread was more dense in structure (40 N) than CWhmaize (31 N) (Figure 7.4).

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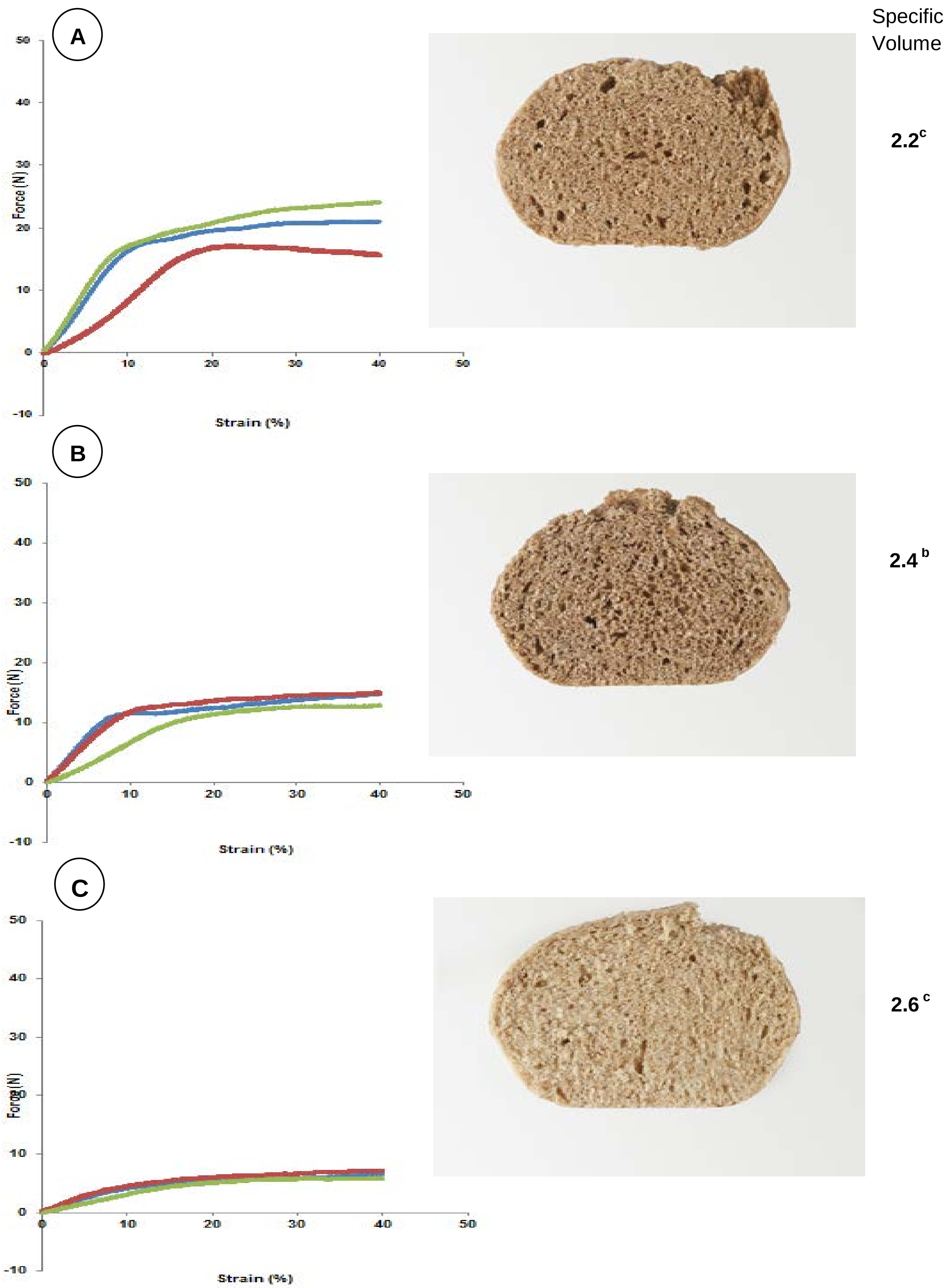

Figure 7.2: Characteristics of wheat breads: visual properties, specific volume and texture profiles (force to deform) left (blue) centre (green) right (red) of wheat breads. A. Coarse whole wheat bread (CWWheat) B. Fine whole wheat flour bread (FWWheat) and C. Commercial flour wheat bread (ComWheat). Blue – left. Red- centre. Green – right positions.

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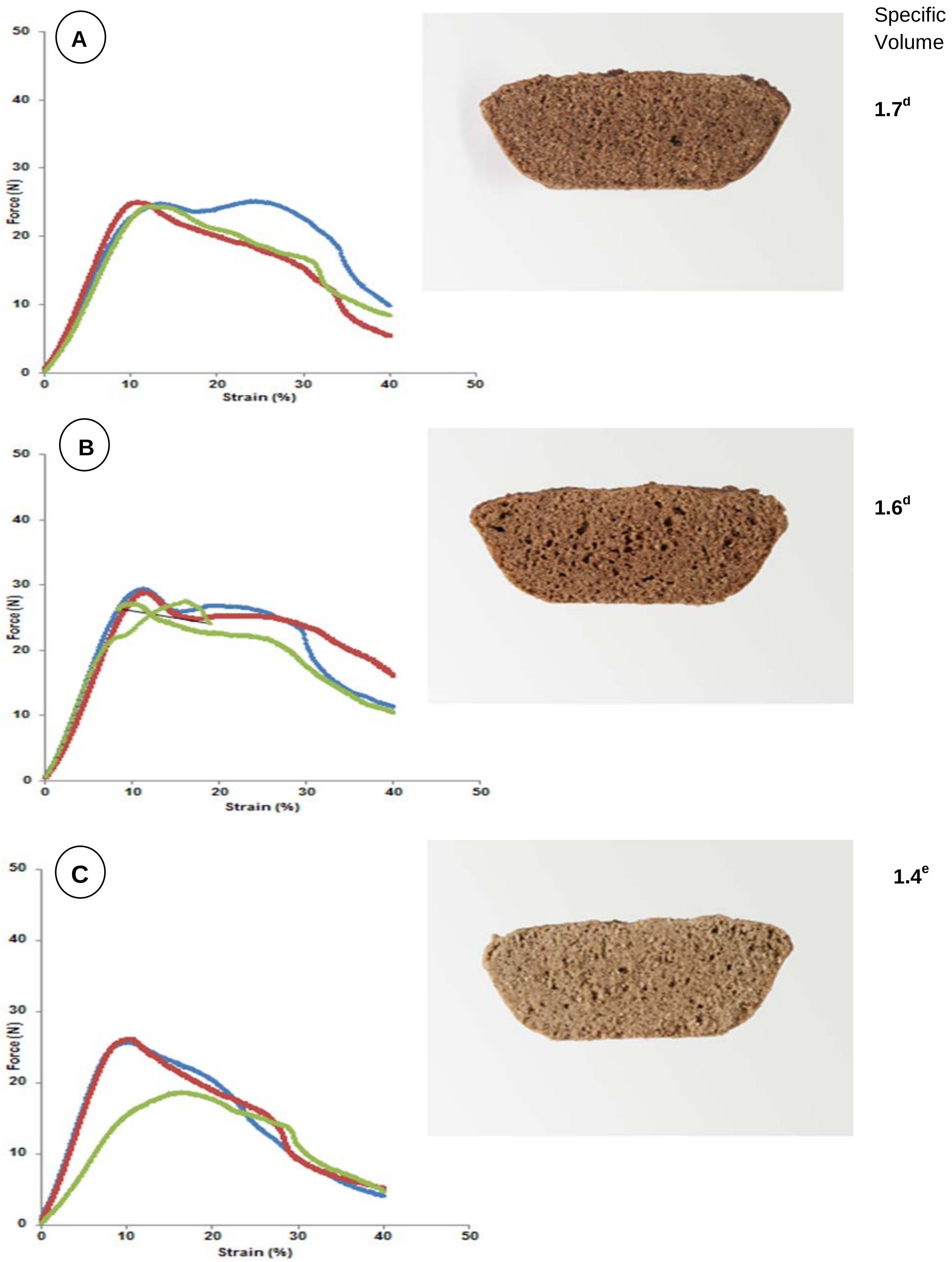

Figure 7.3: Characteristics of sorghum breads: visual properties, specific volume and texture profiles (force to deform) left (blue) centre (green) right (red) of sorghum breads. A. Whole red sorghum bread (WRSorg) B. Commercial red sorghum bread (ComRSorg) and C. Whole white sorghum bread (WWhSorg). Blue – left, Red- centre, Green – right positions.

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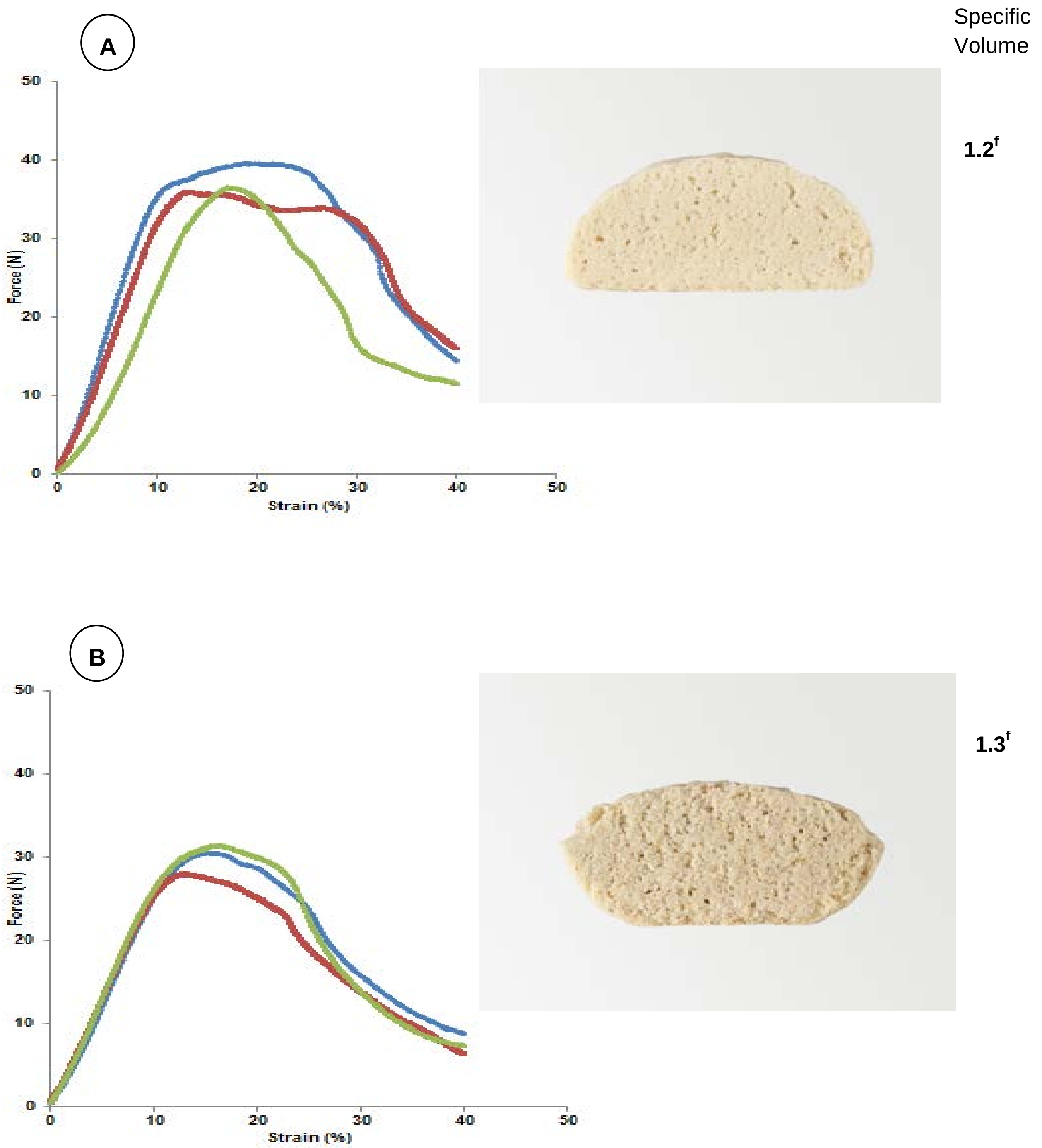

Figure 7.4: Characteristics of maize breads: visual properties, specific volume and texture profiles (force to deform) left (blue) centre (green) right (red) of maize breads. A. Whole white maize bread (WWhMaize) and B. Commercial white maize bread (ComWhMaize). Blue – left, Red- centre, Green – right positions.

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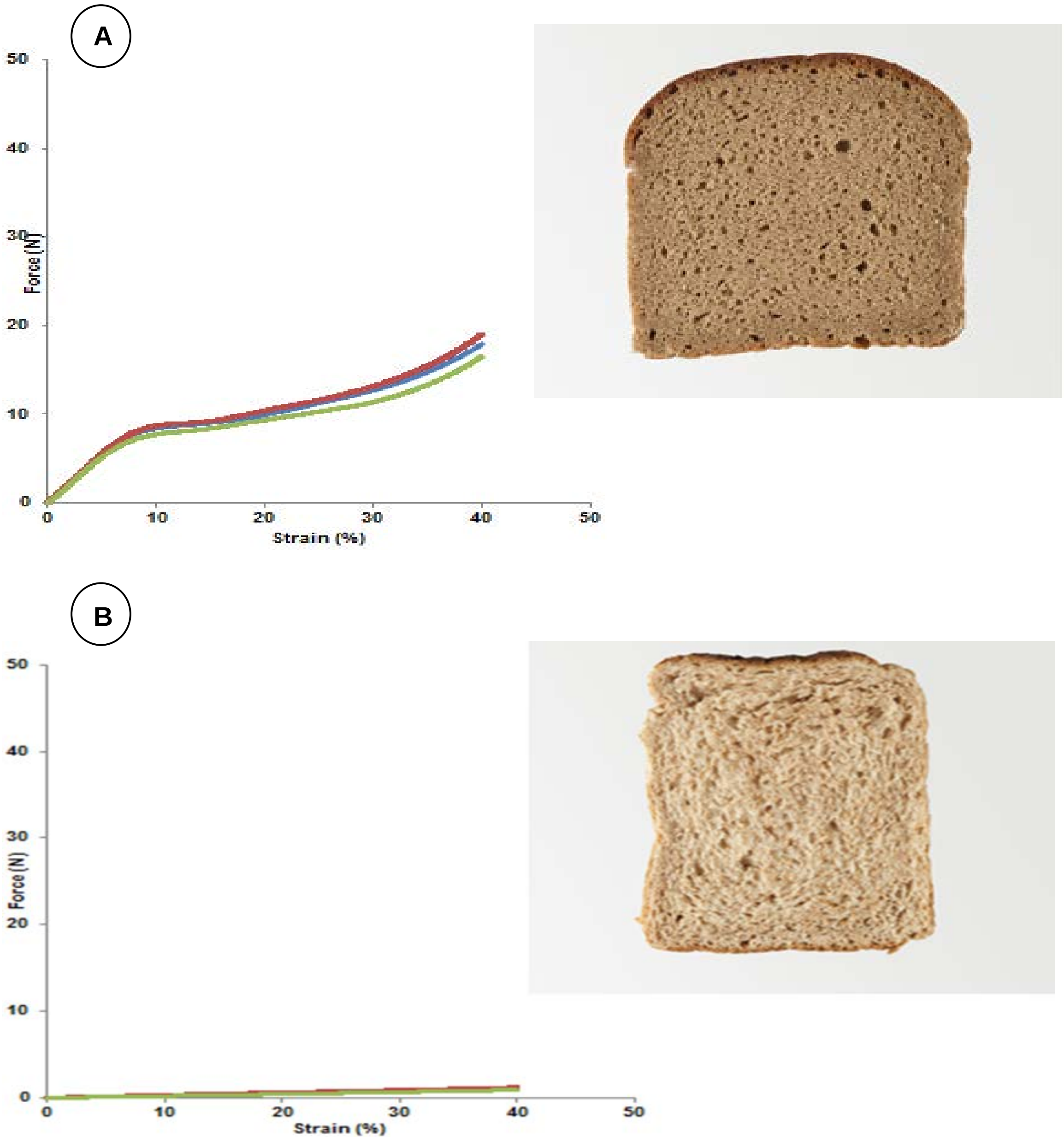

Figure 7.5: Characteristics of standard breads: visual properties, specific volume and texture profiles (force to deform) left (blue) centre (green) right (red) of standard breads. A. Std rye bread (100% plain). B. Std whole wheat bread. Blue – left, Red- centre, Green – right positions.

The fineness of flour in wheat breads also had an effect on the hardness of wheat bread. Figure 7.2 shows that ComWheat bread required less compression force (10N) compared to FWWheat bread (20N) and CWWheat bread (25N). The force required to deform the different breads at 3 positions (left, centre and right) is presented (Figure 7.2 -7.5). Bread position did not have an influence on the force required to deform non-wheat breads. However, CWWheat was softer at centre position than left and right positions.

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Table 7.3: Colour of wheat, sorghum and maize bread samples for both skin (outer part of steamed bread) and crumb

Type of Bread	L*	a*	b*	Chroma	Hue
Skin					
Coarse milled whole wheat (CWWheat)	64.83^{c}	8.70^{b}	15.05^{b}	17.39^{ab}	59.94^{c}
Fine milled whole wheat (FWWheat)	60.09^{d}	8.71^{b}	12.24^{c}	15.03^{bcd}	54.29^{d}
Commercial wheat (ComWheat)	77.83^{b}	5.13^{c}	16.26^{ab}	17.07^{abc}	72.45^{b}
Whole grain red sorghum (WRSorg)	48.18^{f}	11.35^{a}	5.89^{e}	12.80^{d}	27.33^{f}
Commercial red sorghum (ComRSorg)	55.57^{e}	11.72^{a}	9.60^{d}	15.16^{bcd}	39.32^{e}
Whole grain white sorghum (WWhSorg)	64.47^{c}	7.50^{b}	12.32^{c}	14.43^{d}	58.52^{c}
Whole grain white maize (WWhMaize)	89.25^{a}	-0.74^{d}	18.42^{a}	18.44^{a}	92.27^{a}
Commercial white maize (ComWhMaize)	91.85^{a}	-1.24^{d}	14.52^{bc}	14.57^{cd}	94.94^{a}
Rye (standard)	nd	nd	nd	nd	nd
Whole wheat (standard)	nd	nd	nd	nd	nd
Crumb					
Coarse milled whole wheat (CWWheat)	46.36^{c}	4.21^{b}	8.11^{c}	9.14^{de}	62.51^{f}
Fine milled whole wheat (FWWheat)	43.79^{d}	4.00^{b}	6.64^{d}	7.76^{f}	58.91^{f}
Commercial wheat (ComWheat)	58.56^{b}	1.98^{c}	9.37^{b}	9.58^{cd}	78.08^{c}
Whole grain red sorghum (WRSorg)	38.40^{f}	7.47^{a}	5.78^{e}	9.45^{cd}	37.75^{g}
Commercial red sorghum (ComRSorg)	41.01^{e}	7.03^{a}	5.74^{e}	9.08^{de}	39.23^{g}
Whole grain white sorghum (WWhSorg)	47.99^{c}	4.09^{b}	7.67^{c}	8.69^{e}	61.96^{f}
Whole grain white maize (WWhMaize)	65.88^{a}	-0.71^{d}	10.92^{a}	10.94^{b}	93.73^{b}
Commercial white maize (ComWhMaize)	66.79^{a}	-1.29^{d}	9.20^{b}	9.30^{de}	97.94^{a}
Rye (standard)	46.09^{cd}	4.02^{b}	9.26^{b}	10.11^{c}	66.48^{e}
Whole wheat (standard)	59.24^{b}	3.98^{b}	11.58^{a}	12.25^{a}	71.12^{d}

Values are means ± standard error for skin and crumb. Values in the same column with different letters are significantly different at $p \leq 0.05$.

L-value	Whiteness	(100) white
		(0) black
a-value	Positive values	(+) red colour
	Negative values	(-) green colour
b-value	Positive values	(+) yellow colour
	Negative values	(-) blue colour

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7.1.4 Descriptive sensory analysis

All the sensory descriptive attributes, except firmness of crumb and astringency, differed significantly ($p \leq 0.05$) among the breads (Table 7.4). PCA, including 34 attributes that were found to be significantly different among breads, gave an insight on the aroma, texture and flavour properties of the breads (Figure 7.6). The grouping and separation of breads on the PCA plot is generally explained by the influence of the type of grain used. The first three PC's explained a total variance of 88 %. PC1, explaining 57 % of the variation, separated the breads such that wheat breads and the rye standard are on the right and sorghum and maize breads on the left of the loading plot. PC2 explained 18 % of the variation and separated the rye bread from the rest of the bread samples, placing it on the lower right quadrant. Red sorghum breads are grouped together and located at the bottom left of the loading plot. They are separated from a group of maize breads. White sorghum breads, located at the top of PC2 and PC3, explained an additional 13% of the variation and further differentiated breads on the basis of the type of the grain used. Sorghum breads lie along the positive axis while maize breads lie along the negative axis of PC3.

The breads on the right (PC1) were more cohesive with a springy crumb. They had more intense cooked whole wheat flavour and fresh baked wheat aroma than the ones on the left. The limited number of attribute scores on the right indicates the more bland flavour. In contrast the non-wheat breads displayed on the left side of the PCA loading plot had more complex flavour profiles showing significantly more intense fermented aroma, malty aroma and flavour, musty aroma and flavour and sour taste than wheat breads. The aroma of WRSorg and ComRSorg breads did not differ significantly ($p>0.05$). As expected, the cooked sorghum aroma was perceived more intensely in all sorghum breads (Table 7.4 & Figure 7.6). Cooked maize flavour was perceived more intensely in maize breads and cooked whole wheat flavour was more clearly associated with the wheat breads. These characteristics mark a clear distinction between bread samples as a result of the type of grain flour used. A sweet taste was noted ($p<0.05$) in all the breads utilising commercial flours where sugar was added as an ingredient in the formulations. Although texture attributes varied significantly among the breads, the three sorghum breads (WRSorg, ComRSorg and WWhSorg) did not differ ($p>0.05$) for all texture attributes (Table 7.4). The non-wheat breads displayed on the left side of PC1 were characterised by more crumbly and rough bread crumbs, dryness, graininess and chewiness. Non-wheat breads were more heavy and rough. WWhMaize bread was significantly more fibrous compared to all the other breads (Table 7.4). The presence of bran and grainy residues were more evident in non-wheat breads (PC1 Figure 7.6).

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Table 7.4: Mean descriptive sensory ratings for standardised steamed traditional Basotho wheat, sorghum and maize breads

Attribute	Type of bread												
	CW Wheat	FW Wheat	Com Wheat	WR Sorg	ComR Sorg	WWh Sorg	WWh Maize	ComWh Maize	Rye	Whole wheat standard	SE	F-value	P-value
Aroma													***
Overall aroma	49^{cd}	61^{abc}	46^{de}	69^{a}	70^{a}	55^{bcd}	63^{ab}	61^{abc}	61^{abc}	35^{e}	4.4	4.96	***
Fermented aroma	31^{d}	37^{cd}	26^{d}	63^{a}	66^{a}	49^{b}	44^{bc}	46^{bc}	31^{d}	9^{e}	4.4	12.52	***
Yeasty aroma	22^{b}	22^{b}	29^{ab}	29^{ab}	35^{a}	30^{ab}	29^{ab}	26^{ab}	9^{c}	18^{bc}	4.5	2.79	***
Malty aroma	18^{bc}	20^{bc}	9^{cd}	37^{a}	35^{a}	26^{ab}	15^{bc}	13^{cd}	11^{cd}	2^{d}	4.2	5.75	***
Musty/earthy aroma	22^{ab}	15^{bcd}	15^{bcd}	28^{a}	30^{a}	20^{abc}	19^{abc}	15^{bcd}	9^{cd}	5^{d}	4.5	2.5	**
Cereals/grain aroma	18^{a}	19^{a}	18^{a}	14^{ab}	13^{ab}	18^{a}	14^{ab}	8^{b}	6^{b}	18^{a}	3.2	1.89	*
Herbal aroma	12^{b}	11^{b}	3^{b}	9^{b}	7^{b}	7^{b}	4^{b}	3^{b}	48^{a}	3^{b}	3.6	9.91	***
Cooked sorghum aroma	24^{b}	24^{b}	7^{c}	46^{a}	47^{a}	39^{a}	2^{c}	2^{c}	9^{c}	1^{c}	3.8	19.8	***
Fresh baked wheat bread aroma	21^{cd}	26^{c}	48^{b}	6^{f}	11^{ef}	12^{def}	11^{def}	18^{cde}	15^{def}	62^{a}	3.5	22.59	***
Dairy sour aroma	8^{c}	14^{bc}	15^{bc}	13^{bc}	12^{bc}	10^{c}	23^{ab}	28^{a}	12^{bc}	9^{c}	4	1.96	*
Texture													
Dryness of bread crumb	42^{a}	38^{ab}	27^{bc}	45^{a}	46^{a}	45^{a}	37^{ab}	43^{a}	18^{cd}	14^{d}	4.1	7.24	***
Crumbliness of bread crumb	31^{d}	33^{d}	17^{e}	71^{ab}	63^{bc}	77^{a}	77^{a}	59^{c}	4^{f}	4^{f}	3.6	54.3	***
Springiness of bread crumb	46^{c}	52^{bc}	65^{a}	10^{d}	12^{d}	5^{d}	9^{d}	7^{d}	63^{ab}	48^{c}	4.8	22.08	***
Firmness of first bite	40^{ab}	37^{b}	32^{bcd}	19^{de}	23^{cdeb}	17^{e}	21^{de}	35^{bc}	53^{a}	28^{bcde}	4.7	5.23	***
Roughness of crumb	36^{b}	32^{b}	14^{c}	63^{a}	59^{a}	60^{a}	59^{a}	56^{a}	6^{c}	7^{c}	3.9	29.77	***
Dryness	43^{bc}	33^{c}	21^{d}	60^{a}	58^{a}	55^{a}	50^{ab}	52^{ab}	13^{d}	15^{d}	4	17.21	***
Cohesiveness	42^{b}	46^{b}	65^{a}	24^{c}	21^{c}	25^{c}	26^{c}	27^{c}	71^{a}	72^{a}	5	14.29	***
Graininess	28^{b}	23^{b}	8^{c}	75^{a}	73^{a}	74^{a}	73^{a}	69^{a}	7^{c}	9^{c}	4.1	46.12	***
Heaviness	41^{abc}	39^{bc}	29^{c}	50^{ab}	52^{a}	49^{ab}	48^{ab}	52^{a}	44^{ab}	14^{d}	4.6	5.73	***
Firmness of crumb	34^{ab}	32^{ab}	36^{ab}	28^{b}	32^{ab}	32^{ab}	32^{ab}	36^{ab}	43^{a}	28^{b}	4.8	0.85	ns
Chewiness	51^{bc}	42^{cd}	42^{cd}	63^{ab}	69^{a}	72^{a}	68^{a}	61^{ab}	38^{d}	40^{cd}	4.5	7.53	***
Fibrousness	33^{bc}	34^{bc}	18^{d}	38^{b}	33^{bc}	38^{b}	73^{a}	30^{bcd}	2^{e}	22^{cd}	5	10.8	***

Values are means ± standard error. Values in the same row with different letters are significantly different at P≤ 0.05. Significance indicated as * p<0.05, *** p<0.01, *** p<0.001. CWWheat= Coarse whole wheat, FWW= Fine whole wheat, ComWheat= Commercial wheat, WRSorg= Whole red sorghum, ComRSorg= Commercial red sorghum, WWhSorg= Whole white sorghum, WWhMaize= Whole white maize, ComWhMaize= Commercial white maize bread.

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Table 7.4 *(continued)***:** Mean descriptive sensory ratings for standardised steamed traditional Basotho wheat, sorghum and maize breads

Attribute	Type of bread												
	CW Wheat	FW Wheat	Com Wheat	WR Sorg	ComR Sorg	WWh Sorg	WWh Maize	ComWh Maize	Rye	Whole wheat standard	SE	F-value	P-value
Flavour													
Overall flavour	44^{cd}	52^{bc}	46^{bcd}	65^{a}	65^{a}	53^{bc}	55^{abc}	57^{ab}	66^{a}	40^{d}	4.1	4.33	***
Cooked whole wheat flavour	27^{b}	28^{b}	47^{a}	8^{c}	13^{c}	8^{c}	11^{c}	11^{c}	10^{c}	47^{a}	4.1	11.91	***
Cooked sorghum flavour	17^{bc}	21^{b}	8^{cd}	46^{a}	$47\ ^{a}$	43^{a}	$4\ ^{d}$	4^{d}	7^{cd}	2^{d}	4.1	17.68	***
Cooked maize flavour	7^{b}	6^{b}	6^{b}	8^{b}	8^{b}	9^{b}	63^{a}	56^{a}	4^{b}	0^{b}	3.3	38.49	***
Malty flavour	12^{c}	15^{bc}	7^{cd}	28^{a}	26^{a}	23^{ab}	12^{c}	9^{cd}	9^{cd}	1^{d}	3.4	5.45	***
Musty flavour	18^{bcd}	18^{abcd}	11^{de}	31^{a}	29^{ab}	24^{abc}	18^{bcd}	15^{cd}	13^{cde}	1e	4.5	3.15	***
Sweet taste	4^{cd}	4^{bcd}	10^{ab}	3^{d}	10^{abc}	3^{d}	5^{bcd}	14^{a}	7^{bcd}	5^{bcd}	2.2	2.34	**
Salty taste	20^{b}	22^{b}	21^{b}	18^{b}	17^{b}	20^{b}	23^{b}	19^{b}	36^{a}	19^{b}	3.9	1.81	*
Bitter taste	3^{bcd}	3^{bc}	$1\ ^{cd}$	7^{a}	4^{ab}	$2b^{cd}$	4^{ab}	0^{cd}	4^{ab}	0^{d}	1.1	2.9	***
Sour taste	17^{cd}	24^{bcd}	18^{cd}	36^{a}	37^{a}	30^{ab}	28^{abc}	$21\ ^{bcd}$	15^{de}	4^{e}	4	5.67	***
Astringent	17^{abc}	17^{abc}	11^{bc}	20^{ab}	24^{a}	23^{ab}	24^{a}	15^{abc}	12^{abc}	5^{c}	4.5	1.6	ns
After taste													
Overall aftertaste	38^{bc}	45^{ab}	32^{bc}	53^{a}	53^{a}	43^{abc}	45^{ab}	37^{bc}	55^{a}	30^{c}	4.9	2.72	**
Presence of grainy residue	19^{b}	16^{bc}	6^{bcd}	59^{a}	62^{a}	56^{a}	52^{a}	55^{a}	4^{cd}	2^{d}	4.7	24.36	***
Presence of bran residue	21^{b}	23^{b}	15^{b}	21^{b}	17^{b}	20^{b}	5^{a}	13^{b}	1^{c}	14^{b}	4.2	8.6	***

Values are means ± standard error. Values in the same row with different letters are significantly different at P≤ 0.05. Significance indicated as * p<0.05, *** p<0.01, *** p<0.001

CWWheat= Coarse whole wheat, FWW= Fine whole wheat, ComWheat= Commercial wheat, WRSorg= Whole red sorghum, ComRSorg= Commercial red sorghum, WWhSorg= Whole white sorghum, WWhMaize= Whole white maize, ComWhMaize= Commercial white maize Bread.

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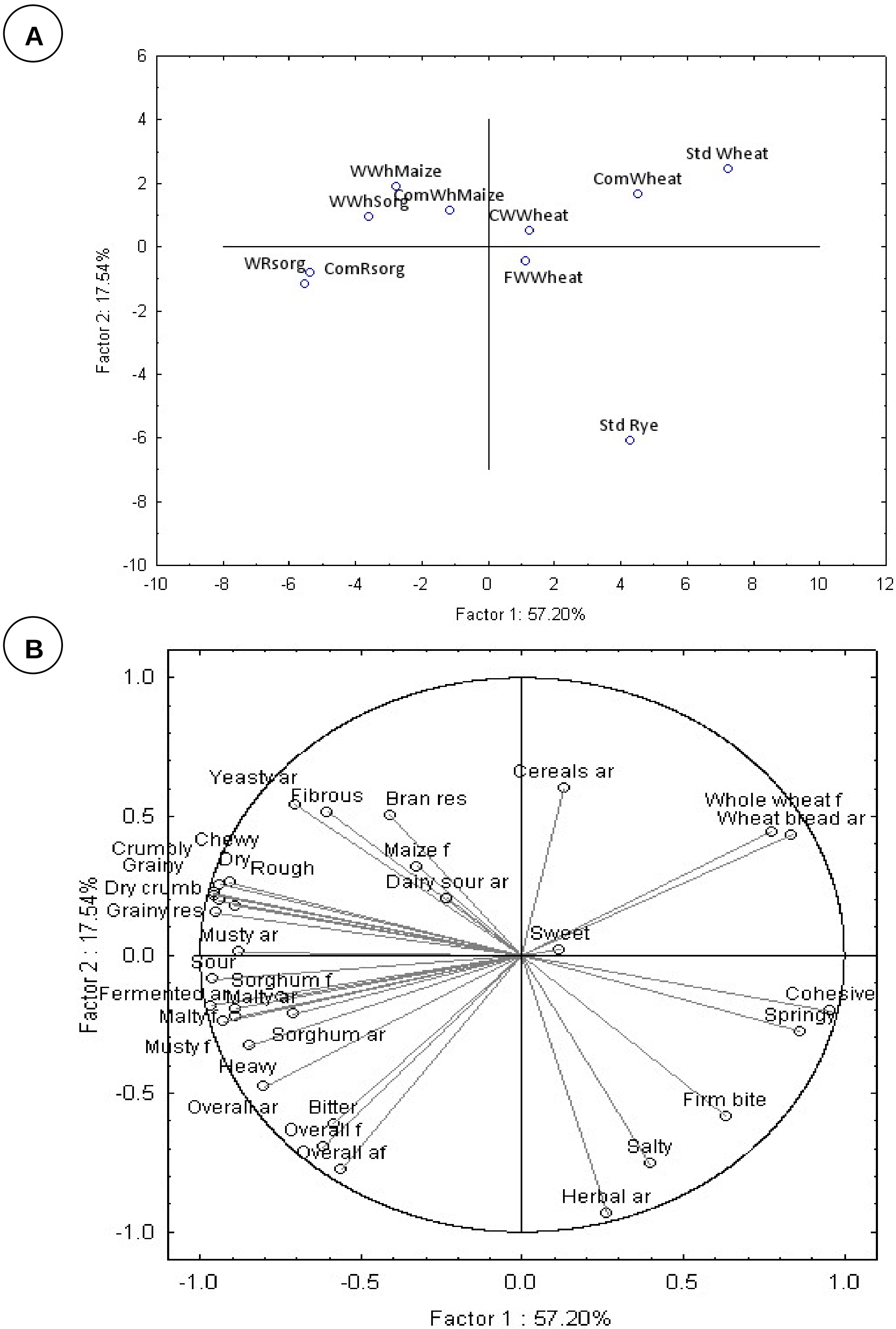

Figure 7.6: Principal component analysis of sensory properties of eight types of steamed bread samples prepared from three types of cereal flours. A. Plot of the first two principal component scores of bread samples and B. Plot of the first two principal component Loading projections of sensory attributes of breads. Abbreviations: on PC1 and PC2. ar-aroma, f-falvour, af- after taste, res– residue, CWWheat-Coarse milled whole wheat, FWWheat- Fine milled whole wheat, ComWheat-Commercial wheat, WRSorg-Whole red sorghum, ComRSorg-Commercial red sorghum, WWhSorg- Whole grain white sorghum, WWhMaize-Whole grain white maize, ComWhMaize- Commercial white maize.

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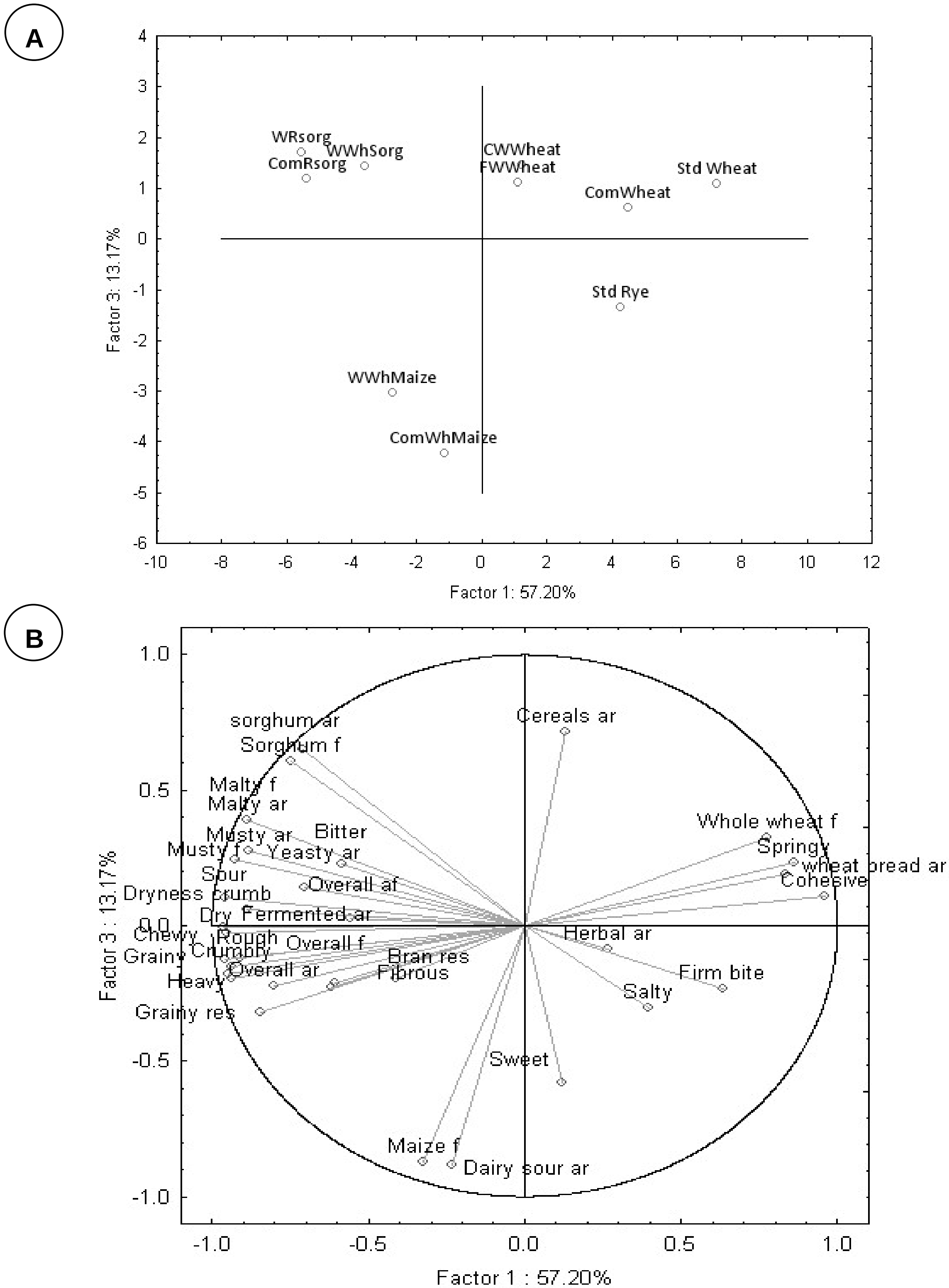

Figure 7.7: Principal component analysis of sensory properties of eight types of steamed bread samples prepared from three types of cereal flours. A. Plot of the first two principal component scores of bread samples and B. Plot of the first two principal component Loading projections of sensory attributes of breads. Abbreviations: on PC1 and PC3. ar-aroma, f-falvour, af- after taste, res– residue, CWWheat-Coarse milled whole wheat, FWWheat- Fine milled whole wheat, ComWheat-Commercial wheat, WRSorg-Whole red sorghum, ComRSorg-Commercial red sorghum, WWhSorg- Whole grain white sorghum, WWhMaize-Whole grain white maize, ComWhMaize- Commercial white maize.

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PC2 associated the rye bread used as standard with high ($p<0.05$) saltiness and a high intensity of herbal aroma (Table 7.4 & Figure 7.6). A more intense bitterness, overall flavour and overall aftertaste were noticed in red sorghum breads.

PC3 shows that sorghum breads were more similar to wheat breads than maize breads. Aroma attributes did not differentiate WWhMaize from ComWhmaize breads (Figure7.7) and they were associated with cooked maize flavour and intense dairy sour aroma.

7.1.5 Discussion

In order to characterise different types of Basotho breads, recipes collected from different regions of Lesotho were standardised and breads were prepared according to procedures documented in phase 1 of this study.

7.1.5.1 Bread volume

Wheat breads had higher volume than maize and sorghum breads. The high volume of wheat breads is due to gluten. Gluten forms the framework and is responsible for elasticity and extensibility in the dough due to its ability to retain carbon dioxide gas produced by fermentation (Hamelman, 2004; Sluimer, 2005; Mondal & Datta, 2008). On the other hand, the protein of non-wheat breads is hydrophobic in nature, insoluble and cannot form a framework that holds air during dough development. As a result, non-wheat breads are characterised by low volume (Duodu & Taylor, 2012). In order to counteract this problem, boiling water was added to pre-gelatinize the starch in maize and sorghum breads. Taylor *et al*. (2006) reported that pre-gelatinized starch results in hydrocolloid-like properties that might hold air bubbles in sorghum bread. The lower volume of CWWheat bread compared to ComWheat bread could be explained by the fact that the large particles in the whole grain wheat flour interfere with the gluten matrix such that the ability for gluten to stretch is reduced (Heinio, 2006:288; Stojceska, 2011). WWhMaize bread had a lower volume than ComWhMaize bread. The WWhMaize flour contained larger particles than the ComWhMaize flour. The larger particles in whole grain maize flours might interfere with the starch gel and the liquid films around the air cells (Taylor *et al.,* 2006), causing whole grain gluten free breads to have a lower volume than the breads with finer, smaller particles. In general, the overall quality of steamed bread depends on the quality characteristics of flour (Huang, Quail, Moss & Best, 1995).

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7.1.5.2 Bread colour

Besides the differences in volume and texture properties, colour differences in both the skin and crumb of steamed breads were found. The results reflected the different grain colours used to produce flour. The darker colour of WRSorg bread may be attributed to staining caused by phenolic pigments (anthocyanins) present in the pericarp (Kebakile *et al.,* 2008). The reason why commercial wheat and maize flour produced products which reflected a lighter colour than whole grain coarse milled flours may be associated with pigmentation colours found on the bran since fibrousness detected by the sensory panel (Table 7.3) may be an indication of the presence of fibre (Oladunmoye, Akinoso & Olapade, 2010). The high degree of yellowness in maize breads may be due to pigments e.g. carotenoids present in the pericarp and the endosperm (De la Hera *et al.,* 2012). Appearance is an important factor in the acceptance of bread. The similarity in colour of the CWWheat and WWhSorg bread could be an important factor to consider in encouraging consumers to substitute white sorghum for wheat during bread making.

7.1.5.3 Bread aroma and flavour

Non-wheat breads were characterised by more complex flavours dominated by high intensity of fermented aroma, sour taste and dairy sour aroma compared to bland wheat breads. The sourness is a typical characteristic of breads prepared from ground cereals using sourdough (Hammes & Gänzle,1998). This effect may be attributed to the fact that TTA and pH of non-wheat fermented bread dough showed higher levels of acidity than wheat breads. An intense acidic flavour on sorghum and maize bread were also reported by Carson, Setser and Sun (2000) and Sanni *et al.* (1998). The pH and TTA's of the sourdoughs prepared from different grain flours varied because they probably contained varying amounts of fermentable carbohydrates (Katina, 2005). Wheat is generally reported to have lower total fermentable sugar (3-4g l^{-1}) than maize and sorghum (Salim-ur-Rehman, Paterson, Piggott, 2006). Apart from the chemical composition of the substrate, the fermented aroma and sour taste could possibly be the effect of the longer fermentation time (Charalampopoulos, Wang, Pandiella & Webb, 2002) applied to non-wheat breads. Sorghum breads and wheat breads were relatively closer in flavour than maize breads which had distinctively dairy sour aroma and cooked maize flavour. This is an important point to consider when sorghum breads are destined to substitute wheat bread.

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The standard breads and wheat breads had more intense salt and sweet tastes compared to non-wheat breads. The high intensity of sourness in non-wheat breads probably masked salt and sweet tastes. The differences in the salt taste could also be due to the formulations which had more salt in wheat breads than in non-wheat breads, as practiced in Lesotho. The sweeter taste of breads prepared from commercial flours could be explained by the fact that sugar was included in the formula of these products. However, although the same amount of sugar was added in ComRsorg and ComWhMaize breads, the sweet taste was more intense in ComWhMaize than in ComRSorg. This may probably be because the bitter taste of red sorghum masked the sweet taste. One of the general flavour attributes of fermented sourdough whole cereal bread is bitterness due to whole grains being a rich source of phenolic compounds that could cause bitter taste. The sensations of bitterness in sorghum products are due to catechin and procyanidin B1, the common monomer and dimer, respectively, in sorghum (Kebakile *et al.,* 2008).

Red sorghum breads had stronger musty/earthy aroma and malty flavours. Germination encourages the bioactivity of the grain that give rise to new flavour components such as malty (Heinio, 2006). However, the fact that both whole grain sorghum and commercial sorghum breads had a malty aroma and flavour in this study, indicates that germination of grains may not be the only reason to explain the presence of these flavours. The cause of a malty aroma and flavour in sorghum breads therefore needs further investigation.

Maize and sorghum breads had more intense overall aroma and flavour compared to wheat breads. In general, it appears that flavour and aroma attributes were consequences of the type of grain flour used. Wholegrain flours are known to produce high amounts of volatile compounds which contribute to the flavour of bread (Czerny & Schieberle, 2002). The present study found that breads with close, heavy crumb texture, such as maize and sorghum had more intense aroma and flavour than soft breads with a porous crumb texture. Close textures have a stronger taste than soft airy breads. The intensity of aroma and flavour of breads with large air cells may be decreased by exposure to oxygen while in heavy crumbs they remain concentrated. This is why they are sensed immediately when bread is tasted (Cauvain & Catterall, 2007).

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This study showed the difference between using self-milled whole grain flours and commercial flours on TTA and pH of sourdough used for Basotho bread-making. The self-milled whole flours consisted of the starch endosperm, germ and bran in similar proportions as represented in the original grain. The composition for commercial flours was not known. However, whole grain flours tended to increase production of lactic acid in sourdough. Similar findings were previously reported by Katina (2005). The acidity of sourdough is the result of the growth and lactic acid production (Katina, 2005). The whole process depends on the microbial flora present in the fermentation matrix together with the buffering ability of the flour used and the ratio of lactic and acetic acid present in the mixture (Hansen & Hansen, 1996; Jekle *et al.,* 2010). Flour with a high proportion of bran has higher buffering capacity because of the highest alfa-amylase activity present on the outer parts of the grain (Katina, 2005). Likewise, if the outer parts have been removed, the flour tends to have a low buffering capacity; therefore commercial flours normally have lower buffering capacity than whole grain flours (Sahlin, 1999).

7.1.5.4 Bread texture

Wheat breads with a high volume were softer. The hardness of bread crumb as measured by instrumental analysis, increased with decrease in bread volume. Similarly, Komlenic, Ugarciic-Hardi, Jukic, Planinic, Bucic-Kojic and Sterelec (2010) reported lower values for hardness with increasing bread volumes. The wheat breads indicated plastic deformation, which is associated with a rubbery and soggy texture (Jeromidis, 1991). For wheat breads, the coarser the flour, the higher the compression force that was needed. These results could still be explained by the particle size of the flour used. The larger particles interfered with the protein network, limiting expansion during dough rising. This limited expansion causes the bread to be harder. The non-wheat breads (maize and sorghum) showed brittle deformation. This is due to small strains in a rather solid product that cause the product to break easily (Jeromidis, 1991). Although oil was added to bread made with commercial flours for the purpose of softening texture, the crumbs were still hard and brittle. Lipids also assist to incorporate air during dough mixing, lubricate and plasticise the mixture to produce softer crumb texture and increase bread volume (Pareyt, Finne, Putseys, Delcour, 2011). The non-wheat breads with oil added had negative texture characteristics such as crumbly and dry crumb to the same extend as whole grain non-wheat breads in which oil was not added. Pre-gelatinization

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was also applied for the reason that when starch is gelatinized it swells and forms a thick gel, the characteristic needed to improve texture of non-wheat breads (Satin, 1988). Despite the pre-gelatinization process applied, both whole grain and fine grain sorghum breads were crumbly and dry. It is possible that the frozen storage of the bread before evaluation may have contributed to the poor texture of the breads due to retrogradation and staling. The long cooking time (90 min), as typically practised by Basotho, could also be a contributing factor to the hardness of breads. Similar to these results, maize bread in which eggs were not added, crumbled when sliced in the study conducted by Sanni *et al.* (1998). The dry texture, presence of bran particles and grainy residue in whole maize and sorghum breads could possibly be due to the higher proportions of larger size particles in these flours, which further resulted in a chewy crumb. Larger particles have a lower water binding capacity in the batter, compared to small particles (Schober, Messerschmidt, Bean, Park & Arendt, 2005). Katina (2003) established that water absorption of dough is dependent on the particle size of flour and that large particles absorb water more slowly than smaller ones. When utilizing non-wheat flours with large particles for bread-making, Carson *et al*. (2000) also reported more rough and coarse products. Hugo, Rooney and Taylor (2000) established that sorghum flour in bread-making resulted in drier, grittier and firmer crumb. The fibrousness and grainy residues experienced in the whole meal breads in this study was attributed to the high proportion of large particles (1000 µm to 1400 µm) in flours. Some of the large particles of flour might have been resistant to gelatinisation process, causing the hardness and unevenness of the crumb. In contrast, it was found that pre-gelatinisation of maize flour increased the viscoelasticity of dough and caused higher dough consistency, so that the springiness and stickiness of maize breads were related to the pre-gelatinisation and retrogradation phenomena ($r > 0.71$) (Brites *et al.,* 2010).

The use of finer ComWhMaize flour also resulted in denser, harder and firmer bread crumb, compared to WWhMaize bread with coarse particles. This could be explained by the fact that smaller flour particles, absorbed more water and adhered closer to each other than larger fibrous particles. In agreement with these results, Schober *et al*. (2005) observed that the fine crumb structure is positively related to higher crumb firmness in non-wheat breads. Katina (2003) found the same particle size phenomena for sourdough wheat breads. The drier the bread crumb the more force was needed to compress the bread crumb. The hardness of bread increased with increased denseness

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of the bread crumb. The denser crumb structures of non-wheat breads are associated with desirable qualities in the diet of Basotho. Dense breads are heavier and are perceived by Basotho to provide satiety for a longer period than soft breads.

7.2 SUMMARY

The type of grain flour used to prepare steamed traditional Basotho bread has a great effect on the physical and sensory properties. There were clear differences in sensory properties between steamed wheat and steamed non-wheat breads. Steamed wheat breads have larger volume, a softer crumb and a more bland flavour compared to sorghum and maize breads. Both sorghum and maize breads are characterised by more complex and strong flavours and aroma notably sourness, musty, malty, dairy sour and fermented aroma. The texture of both non-wheat bread types is heavy, chewy, dry, fibrous and more brittle. Apart from the presence of gluten, coarseness and fineness of flour also seemed to be the major contributing factors to differences. The non-wheat breads showed low specific volume and therefore denser, tighter crumb texture than wheat breads and more force was needed for their deformation. The use of whole grain flours with large particles produced darker bread. More research is needed to investigate how to improve the sensory properties of non-wheat steamed breads. Possibilities include: compostiting non–wheat flours with wheat, addition of protein sources, altering the amount of water use, improving on the pre-gelatinization process and optimising steaming conditions. These improvements are needed to increase acceptance of non-wheat breads among the younger generation and modernised Basotho.

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Chapter 8

CONCLUSIONS, LIMITATIONS TO THE STUDY, CONTRIBUTIONS TO THEORY AND RECOMMENDATIONS FOR FURTHER RESEARCH

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CONCLUSIONS, LIMITATIONS TO THE STUDY, CONTRIBUTIONS TO THEORY AND RECOMMENDATIONS FOR FURTHER RESEARCH

This chapter presents conclusions according to objectives addressed in the study.

8.1 INTRODUCTION

This chapter presents the conclusion of the study objectively in order to reflect on the achievement of the set objectives and the effectiveness of the three phases mixed methodology approach to the study. Implications of the findings are unfolded and the methods used to achieve the objectives of the study are also critiqued in order to bring attention to the limitation of the study, for future researchers.

Traditional Basotho bread was defined as a general term that covers different types of cereal meal-dumplings (*linkhoa*) prepared with cereal flour, water, salt and a starter. In Lesotho bread is liked more than any other cereal product. However, the culinary practices of Basotho in general are changing because of urbanisation and westernisation. The younger generation generally have not prepared or consumed the breads before. If efforts are not made to preserve the knowledge of traditional ways of preparing breads and to pass it on to the younger generation, these culinary practices will gradually disappear and utilisation of available resources may be limited.

The study aimed to investigate the culinary practices of Basotho pertaining to traditional Basotho breads in order to document and facilitate the standardisation and description of the products and to make recommendations with regard to Basotho bread acceptance. Following this aim, the first objective was formulated to help carry out the investigation of culinary practices of Basotho pertaining to traditional Basotho bread. This objective was

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important because recipes of traditional Basotho breads which could not be sourced anywhere in the literature had to be collected in order to form the base of this study. Traditional Basotho breads are prepared with variations from one region to the other, and no proper measures of ingredients are taken by individual housewives when preparing breads. It was therefore necessary to carry out the second phase of this study to standardise traditional Basotho bread recipes from regional culinary variations. The standardised recipes helped to carry out further analysis on the breads, based on profiling and characterising traditional Basotho breads. The cultural perspective of a nation plays a major role in food acceptance. The fourth objective helped to determine how Basotho culture contributes to the acceptance of traditional Basotho breads.

8.2 METHODOLOGICAL REFLECTIONS

The study employed a mixed methodology technique in order to solicit data from a multitude of sources. The mixed methodology design ensured maximum variability in terms of the richness of data, analytical skills and the interpretation of data.

8.2.1 Research strategy and design

In order to achieve the objectives set for this study the research was conducted in three phases employing both quantitative and qualitative measuring instruments. The first phase included a descriptive survey, using a face to face structured questionnaire (Addendum 6) which was meant to identify breads prepared in the past and those that were still prepared by participants, the consumption patterns of traditional Basotho bread, the general information on ingredients, the type of fuel and shelf life of traditional bread. Focus groups employing qualitative methods of collecting data (Addendum 7) were used concurrently with the survey questionnaire to measure information on culinary practices (ingredients, flavouring, preparation steps and serving) as well as qualities of breads that influence liking or disliking of taste/flavour, appearance and texture of breads. The researcher led focus group discussions; notes were taken by the assistant moderator with the help of a nutrition officer during the discussion.

Purposive sampling was used to identify respondents for both survey questionnaire and focus groups based on the region under investigation, accessibility of respondents and

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the information they could provide. Phase 2 of this study involved standardisation of traditional breads recipes using bakers' percentage method. A trained panel for sensory properties, texture profile analysis and colour measurements. Phase 3 evaluated the breads prepared from standardised recipes.

8.2.2 Preliminary study

A preliminary study was conducted prior to data collection of the main study. The purpose of the preliminary study was to identify all types of traditional Basotho breads, in order to obtain the information needed to finalise the methodology of the main study.

8.2.3 Face to face questionnaire

Administering the questionnaire face to face to participants was considered the most effective means of collecting data from Basotho women in order to overcome the barriers due to illiteracy and concentration level. The questionnaire involved questions on 10 different types of breads which made it long and complicated. The questionnaire might have presented difficulties and frustrations to participants if they were to complete it on their own. The sampling included Basotho women only because of their responsibilities in culinary practices. This could present itself as a limitation to the study because inclusion of men might have generated more and complete data in relation to consumption patterns and quality characteristics for traditional Basotho bread acceptance. The results of phase 1 of this study were based on the representation of the 5 regions of Lesotho. Time and fund limitations did not enable the researcher to cover all the 10 regions.

8.2.4 Focus group discussions

Focus group discussions were used to generate traditional Basotho bread recipes. Fully enculturated women regarding bread-making were included in the focus groups and this allowed distinctions of data from different areas. Participants had the opportunity to discuss all the main areas of culinary practices in a non-threatening environment. The application of focus groups in a mixed methodology to substantiate the results from the survey questionnaire allowed an informal interaction among the participants and helped to generate data that could not be covered in a questionnaire. This method proved to be

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an effective technique to use with people who value their food culture. They demonstrated that it was an opportunity for them to share their knowledge on the importance of their culinary practices. The focus group consisted of varying age groups and this contributed to the collection of quality data, which included the knowledge of the older generation and the younger generation. Having ten people of different background in terms of age, education level and experiences in bread making allowed the researcher to generate large quantities of data with varying ideas within a relatively short period of time. The variation in age and experiences created an opportunity for participants to learn from one another, because each participant was an expert in at least one type of bread which she demonstrated. Demonstrations in focus groups also created opportunities for participants to help one another with laborious activities performed. The activities included grinding maize and wet milling on a grinding stone. On the other hand, it is important to note that the focus group discussion did not include working women (women with formal employment) in Lesotho. This is a limitation to the study because it is assumed that working women might have provided valuable data, which might possibly differ from the data provided by housewives. The differences would be because working women have limited time which could affect availability of time to prepare traditional Basotho breads in their households. Working Basotho women also have disposable income, which may also affect the type of ingredients used by a housewife to prepare bread. The frequency of consumption of traditional Basotho bread and the uses of bread in a household were also associated with affordability. The data from working women might have added more value to this study. The open ended questions of the focus group guide allowed participants to provide as much information as possible into the topic. This gave more insights on the phenomenon and strengthened the quality of data.

The quality characteristics of cooked products were presented to the focus group members and evaluated for acceptance based on texture, taste/flavour and appearance. The activity allowed participants to describe the sensory qualities of breads and to give their perceptions about the sensory characteristics. Although this method of evaluation worked effectively, the researcher still believes that providing each participant with a simple rating scale for acceptance of the sensory properties could have provided a more valid data than an open discussion in which some participants were indecisive with the acceptance of certain breads. This could also be regarded as a limitation to the study.

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The discussion of the focus groups provided recipes of ten different breads and the requirements for bread preparations were highlighted. This established clear guidelines to carry out the demonstration technique, which followed. The researcher was able to follow the demonstration steps with ease and to identify emergent themes that needed unravelling.

8.2.5 Observation and demonstrations

Collection of data on the preparation steps of breads could not be possible without the observation and demonstration in order to collect data. Demonstration occurred in the natural settings when experts demonstrated one step after the other. As experts demonstrated, observation, video taking and photographing were also employed to add more strength to data collection. During the demonstrations, participants further clarified the reasons for each step taken in bread-making. Observations also helped during the evaluation of bread products from which facial expressions and other body movements such as nodding or turning the head were observed. As participants continued with the demonstrations, the knowledge about traditional breads dealt with in the questionnaire were further clarified.

The collection of recipes through focus groups demonstrations and observations served a major role in establishing a foundation for the next phase of standardising traditional Basotho breads.

8.2.6 Standardisation and sensory evaluation

The standardised bread recipes were prepared in triplicate and bread samples stored in the freezer until the time when they were needed for sensory analysis. This was done because of the long processes involved to complete each bread and also because of a large number (8) of samples to prepare. Frozen storage of samples reduced the workload on the researcher on the evaluation day. It also reduced preparation time of samples before presentation to the sensory evaluation panel. Ideally, fresh bread should have been presented to the panel on same day after steaming, considering the fact that Basotho eat bread immediately after cooking. If the sensory panel were presented with

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fresh samples, the characteristics (as described by the sensory panel) might have given a more precise description of quality characteristics of traditional Basotho breads. It is suspected that, the effect of storage might have increased some of the negative characteristics of traditional Basotho bread.

8.2.7 Quantitative data analysis

The SAS statistical analysis (version 9.3) software was used to analyse data from the quantitative survey by means of descriptive statistics (percentage, frequencies, means and summary of tables). The same statistical package (version 9.3) software was used to analyse sensory, texture, pH and colour measurements. The statistical software helped to unravel the data according to the set objectives. Applying other statistical measurements howeve, such as correlation coefficients to measure the degree or extent of relationships between variables could have also contributed more depth to the unravelling of the data.

8.2.8 Qualitative data analysis

Data from focus groups was analysed manually, using the grounded theory approach. Themes, categories and concepts were identified from respondents' answers. Data analysis was performed manually, following the guidelines suggested by Krueger (2009:119). The manual transcription of data allowed the researcher the opportunity to read and re-read the information in order to be completely immersed in data, not only to become familiar with data but also to gain a deeper understanding of certain concepts needed for analysis and interpretation (Hayes, 2000:174). The researcher cannot deny the fact that as much as manual data analysis has advantages associated with giving the researcher 100 percent involvement and feel of data as stated by Krueger (2009:119), it can be very tedious and time consuming. This was specifically the case in this study when data from the 5 focus groups, consisting of 10 participants in each group, was analysed. The researcher believes that the use of a computer soft ware (Atlas.ti) would retrieve data faster and more accurately compared to doing the data analysis tasks manually.

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8.3 THE FINDINGS OF THE STUDY

The study was carried out in 3 phases. The conclusion regarding the findings of this study will be presented with regard to the objectives previously stated, because the research was carried out to meet the set objectives.

8.3.1 Conclusions related to phase one data

Phase 1 of the study investigated the different types of traditional breads prepared in Lesotho and the preparation methods used currently and traditionally in the Basotho households.

8.3.1.1 Conclusions related to the types and preparation of traditional Basotho breads (Objective 1).

The study identified 10 types of traditional Basotho breads, during the preliminary study, that are prepared from locally grown cereals (wheat, maize and sorghum). Milling of cereals was traditionally done on grinding stone by housewives. Nowadays, milling is done mechanically using roller and hammer mills. The use of commercial flour has become common in all the regions. The other ingredients used for bread-making include salt, water and starters of different kinds. Sugar is commonly used by participants living in the urban areas and a few in the rural areas who can afford to buy it.

Mixing of all the ingredients and kneading are done in a mixing bowl and bread is allowed to ferment until the dough smells sour, the dough has doubled in size and until a small piece of dough tastes sour in the mouth of a housewife. In some instances the wheat dough forms bubbles while maize and sorghum dough forms cracks. Kneading and fermentation are important parameters that must be controlled during bread production in order to produce a good quality product. When the dough is well fermented it is cooked using different methods of cooking which include steaming, baking and pot roasting. The steaming method was regarded as the most suitable and desirable method for all grain bread types.

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The steaming method is done over the steamer, in a three legged iron pot in rural areas and in a big saucepan in the urban areas. The traditional steamer is prepared using sticks, grass, wheat straws or grain stalks. Green maize husks or maize leaves are sometimes placed on top of sticks, depending on their availability in the season. The urban people place plastics on top of grass. Steamers used in the urban areas are made from wire and are obtained at the local market. When the water boils for steaming, fermented dough is shaped into round balls and placed over the steamer for cooking. Experienced housewives could tell when bread was well cooked by the smell and appearance of the bread. If a white small stick or firm straw comes out clean when inserted into the cooked bread, then it means bread is well cooked.

The flavour of traditional Basotho bread was the result of many factors including the type of ingredients used, such as type of flour and type of a raising agent. Flavouring agents such as salt and sugar and the length of fermentation process, also contribute to the flavour of traditional Basotho bread. According to focus group participants, mixing ingredients in bread-making helps flavours to be well distributed in the dough and therefore improve bread flavour.

8.3.1.2 Conclusions regarding comparisons of culinary practices in rural and urban areas of Lesotho (Objective 2)

Another focus of this study was on the differences between the rural and urban areas of Lesotho. The Basotho population is distributed across these main geographical locations. According to Table 8.1, it is concluded that there are differences between rural and urban areas regarding culinary practice of participants on traditional Basotho bread. Ingredients differed mainly due to availability and affordability. Participants in the rural areas could not afford to use bought ingredients such as sugar and commercial starter because they were not employed and markets are limited or not accessible. On the other hand, participants in the urban areas could not handle the long processes for preparing traditional Basotho breads as done by people in rural areas. The traditional ways of cooking, serving and consumption of bread were still followed in the rural areas and modern ways practised in the urban areas. The type of fuel (Table 8.1) used in rural areas does not need to be bought while in the urban areas participants have to buy fuel except for wasted fabrics that are used by poor people living in the urban areas, closer to the factories.

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Table 8.1: Comparison of culinary practices regarding traditional Basotho bread in rural and urban areas

Rural	Urban
Ingredients Whole grain flour Starter - Sourdough - Traditional sorghum beer - Sour porridge supernatant - A mixture of sourdough and commercial yeast Salt No sugar	Commercial flour Starter - Commercial yeast - A mixture of sourdough and commercial yeast Salt Add sugar
Preparation Cleaning of grain Winnowing Debranning Dry milling Wet milling Kneading Fermentation	Kneading Fermentation
Cooking Pot – Three legged cast iron pot Fuel - Wood - Cow dung - Grain stalks	Pot – Large saucepan or three legged cast iron pot Fuel - Paraffin - Gas - Electricity - Wasted fabric from clothing factories
Serving Bread is broken with hands (*hlephola*) Eating together in a common bowl Eating with hands	Bread slices cut with a knife Eating from separate plates Using cutlery for eating bread accompaniment
Consumption Bread consumed immediately after cooking and gets finished same day because of large families and lack of variety of foods No specific time of the day to eat bread. Any time of the day and also on trips	Bread lasts for 2-3 days and is served to smaller families Bread is consumed for breakfast and on trips

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8.3.1.3 Conclusions regarding the reasons/factors that influence perceptions of Basotho consumers on consumption of traditional Basotho bread (Objective 3)

Bread is very important in the Basotho diet; people living in the rural and urban areas used Bread for household consumption. Traditional Basotho bread acceptance was determined: Firstly, it was determined by how many times respondents consumed traditional Basotho bread (frequency of consumption) in the quantitative survey. Secondly, it was determined by perceptions of the sensory attributes of traditional Basotho breads when participants tasted the breads that they prepared. Participants further described the reasons for liking or disliking the sensory attributes of the breads. Consumption of traditional Basotho bread varied from frequently (everyday), regularly (3 times a week), occasionally (once a week) and rarely depending on affordability. In conclusion, participants preferred bread more than any other cereal product in Lesotho because of its taste, texture and the fact that it does not always need accompaniment.

The bread prepared from wheat is generally preferred to the bread prepared from maize and sorghum. The cost of wheat flour was identified as a limiting factor towards bread consumption. Some of the reasons contributing to the dislike of maize and sorghum breads were unfamiliarity with this type of bread. This was particularly the case for young participants. The elderly liked all the breads and associated them with certain events that occurred when they were growing up.

8.3.1.4 Conclusions regarding the perceptions of Basotho consumers about traditional bread acceptance using a cultural hedonic framework (Objective 4)

In order to gain a better understanding of the process by which culture influences Basotho traditional bread acceptance in Lesotho, a cultural hedonic framework was applied to explain the impact of traditions and cultural attitudes towards bread choice. The general perception of bread consumption within the Basotho culture was also solicited through the use of the cultural hedonic framework. Focus group participants were asked about factors considered in choosing traditional bread and to compare their traditional bread choices in the past with the current ones. These questions allowed participants free expression on their choice and cultural meanings and understanding attached to their perceptions in order to accept a traditional bread product. This approach also allowed the researcher to determine whether Basotho eat bread for the purpose of providing energy and health only (Utilitarian perspective) or whether bread

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was appreciated for the complexities involved in the preparation and savouring of food (Hedonic perspective) as outlined by Wansink *et al.* (2002).

Through focus group discussions, it is concluded that bread acceptance in Lesotho was influenced by culture. Family structure is the most important part of culture. It determines the context in which food is consumed. It was mentioned by participants that the type and amount of bread to be prepared in the household was determined by the composition of their household. If there were more men and boys in a household, the amount prepared would be higher. Culturally, Basotho men eat large quantities of food in order to have energy for tasks such as ploughing, cutting trees for wood or building animal kraals. The size of the family also determines bread acceptance. It was therefore established that the large families of Basotho created an environment that caused people in a group to consume more bread than individuals eating in situations where they were by themselves. On the other hand the size of the family also determines the cost of the bread. A family means frequent bread preparation in large quantities. This may not be possible in many Basotho households due to limited budgets. The type of bread consumed in a household depends on the availability of resources.

It is also concluded that one of the cultural issues surrounding bread acceptance is the number of meals served in Basotho households. Only two meals were traditionally served and the same practice was still followed in the rural areas. This meant that large quantities of bread served in the morning were meant to provide energy for a longer period of the day until the next last meal of the day that was served in the evening. To this effect, hunger determined bread acceptance for Basotho because by the time they eat in the evening, they are very hungry.

Perceived acceptance of traditional Basotho bread by the society was considered important and it was determined by the type of occasion in which bread was served, apart from a household. The significance of bread in Basotho culture was displayed in its use on special occasions such as Sundays, Christmas day celebrations, weddings, ceremonies, traditional feasts, as provision for travelling and to celebrate the first kings' memorial day (Moshoeshoes' day). Moreover, bread-making skills were culturally regarded as bench marks to test the qualities of a newly married woman.

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In conclusion, It is important to note that different generations incorporated in this study showed that different cultural groups coexist. In Lesotho, The cultural hedonic framework therefore should indicate differences in bread acceptance of the older and the younger generations. The results revealed that the younger generation lacked exposure to some of the traditional Basotho breads and this contributed to not accepting some of the traditional Basotho breads. The older participants, on the other hand, were familiar with all traditional bread types and their acceptance focused more on the benefits of eating breads, which include provision of energy. As much as the older participants had knowledge and skills about the traditional Basotho breads, the changes (as a result of physical and socio-cultural environment) contributed to lack of resources, accessibility and affordability. As a result, they were not able to prepare the breads for their children. In this way the younger generation was deprived of the knowledge about traditional Basotho breads. Consequently their acceptability becomes impossible.

Two cultural groups in Lesotho were also identified when comparing the rural and urban participants. The rural participants liked breads prepared according to the traditional ways of Basotho such as using whole grain flour. The urban participants preferred the breads prepared using commercial ingredients. The application of the framework established the understanding that traditional bread acceptance varies from generation to generation and from location to location.

8.3.2 Conclusions related to phase 2 data

Phase 2 of the study addressed the standardisation process of traditional Basotho bread recipes, the yield percentage and nutrient composition calculations for breads.

8.3.2.1 Conclusions regarding the standardisation process employed in phase 2 of the study (Objective 5)

It was concluded that traditional Basotho bread recipes from regional culinary variations use very large quantities in order to feed the large families of Basotho. According to the study plan, the findings of phase 1 were needed to develop phase 2. The large scale recipes, normally prepared in Basotho households, were standardised for small scale quantities to use for evaluation of physical and sensory qualities of breads. The standardisation process began with the preparation and cooking of bread using original

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recipes in order to establish the authentic characteristics for the final standardised products. The bakers' percentage method was used on the original recipes and all measurements including water were presented in weight, such as kilograms, in order to ensure consistency of measurements and proportions every time the formula is used.

The criterion for evaluating the authenticity of sensory attributes of the original and standardised recipes was based on descriptions provided by focus groups in phase 1 of the study. The researchers experience in preparing and eating traditional Basotho bread, together with a panel made up of 5 Basotho women who were familiar with the breads as well as two Nigerian post-doctorate students who worked on sourdough and sensory evaluation helped to ensure the authenticity of traditional Basotho bread products during the trials of the standardisation process.

The standardisation process employed all the three main steps suggested by Spears and Gregoire (2010:211) as 1. Recipe verification, 2. Product evaluation and 3. Quantity adjustments. During this cyclic process changes with regard to the type of equipment used, measures taken to control temperatures and to control fermentation time were noted. Measurements of ingredients were also noted at each trial.

The bakers' percentage was used to adjust large scale formulas to small scale bread formulas. Small scale recipes were prepared and evaluated for authentic sensory qualities based on appearance, texture and taste/flavour. Measurements and procedures were recorded. The procedure was repeated 3 times to ensure standard quality and quantity consistently (Spears & Gregoire, 2007:225). It can be concluded that proper measurements, coupled with clear preparation steps, can produce authentic recipes that can be repeated in all situations.

8.3.2.2 Conclusions regarding the yield percentage and nutrient composition of steamed Basotho breads (Objective 6)

It is concluded that the type of ingredients used for bread making affect the nutritional levels of bread.

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8.3.3 Conclusions related to phase 3 data

Profiling and characterisation of steamed Basotho bread was dealt with in phase 3.

8.3.3.1 Conclusions regarding the characteristics of steamed traditional Basotho bread (Objective 7)

It can be concluded that the types of grain (wheat, maize and sorghum) flour used or coarseness and fineness of flour are the main factors determining the differences of sensory and physical characteristics of breads. As observed in this study, the colours of breads were determined by whole grain colour, where ComWhMaize and WWhMaize exhibited whiter colour than all other breads. WRSorg and ComRsorg produced bread with a high intensity of red colour. Surprisingly the crumb colour for CWWheat bread and WWhSorg did not differ significantly ($p > 0.05$) for all colour parameters. The type of flour further proved its effects where the finer crumb structures from breads prepared using fine flours were lighter in colour than coarse crumb structures of breads prepared from whole grain flours. WWhMaize bread showed a more fibrous crumb than all other breads.

As discussed earlier in Chapter 6 it can be concluded that bread texture also differed according to differences in flour. Wheat breads had more open and larger gas cells of the crumb than maize and sorghum breads. The results indicated that the non-wheat breads had more compact and denser crumbs than wheat breads. The denser crumbs were associated with the high intensity of aroma and flavour. It was explained in chapter 6 that this effect was due to the fact that flavours and aroma are concentrated inside the compact crumb and therefore can easily be sensed, while in porous crumbs they are exposed to the air. The bread samples showed different levels of hardness as indicated in Figure 7.2, 7.3, 7.4 and 7.5 in chapter 7. The softer breads were the standard samples (rye and whole wheat sasko bread) which showed elastic slope. Wheat breads were softer than maize and sorghum breads and their slope indicated plastic deformation. In comparison to sorghum, maize breads were harder. However sorghum breads crumbled easily (Figure 7.3). The slopes for maize and sorghum breads indicated brittle deformation. Whole grain flours contained all the components, as represented in the original grain. Knowing the ratio distribution of components of commercial flours could

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have added more value to the study. However, the manufacturer could not provide information on the ration distribution of components as they considered it to be the secrets of the company. This was a **limitation to the study.**

8.4 FINAL CONCEPTUAL FRAMEWORK

This final conceptual framework is based on the findings of this study as a result of the application of the cultural hedonic framework to investigate how participants in Lesotho accepted or rejected the traditional Basotho breads. This conceptual framework is the first to be developed regarding the reasons that cause acceptance of bread by different age groups in Lesotho and also by people living in either rural or urban areas. This type of conceptual framework could provide a better understanding of food acceptance differences among the various cultural groups in Lesotho. It could also be useful in campaigns for good nutrition and in programs meant to alleviate food insecurity.

The conceptual framework (Figure 8.1) is divided into two parts, indicating the two major cultural groups (Higher context cultures and lower context cultures) found in Lesotho. Rural and old generation participants represent higher context cultures while urban and younger generation participants represent lower context cultures. According to the framework (Figure 8.1), Lesotho consists of rural and urban as well as old and young generational groups cultural contexts. It can be concluded that different cultural contexts and their perceptions about traditional Basotho bread affect the acceptance of traditional Basotho bread. Previous experience, socio-economic status, physiological status and liking of sour taste are common factors across the cultural groups.

8.5 LIMITATIONS OF THE STUDY AND RECOMMENDATIONS FOR FURTHER RESEARCH

The following recommendations were made for further research:

8.5.1 Geographical area

1. Lesotho is a small country with 10 districts. Collecting data from all 10 districts is still possible, although it could not be done in this study due to time and financial

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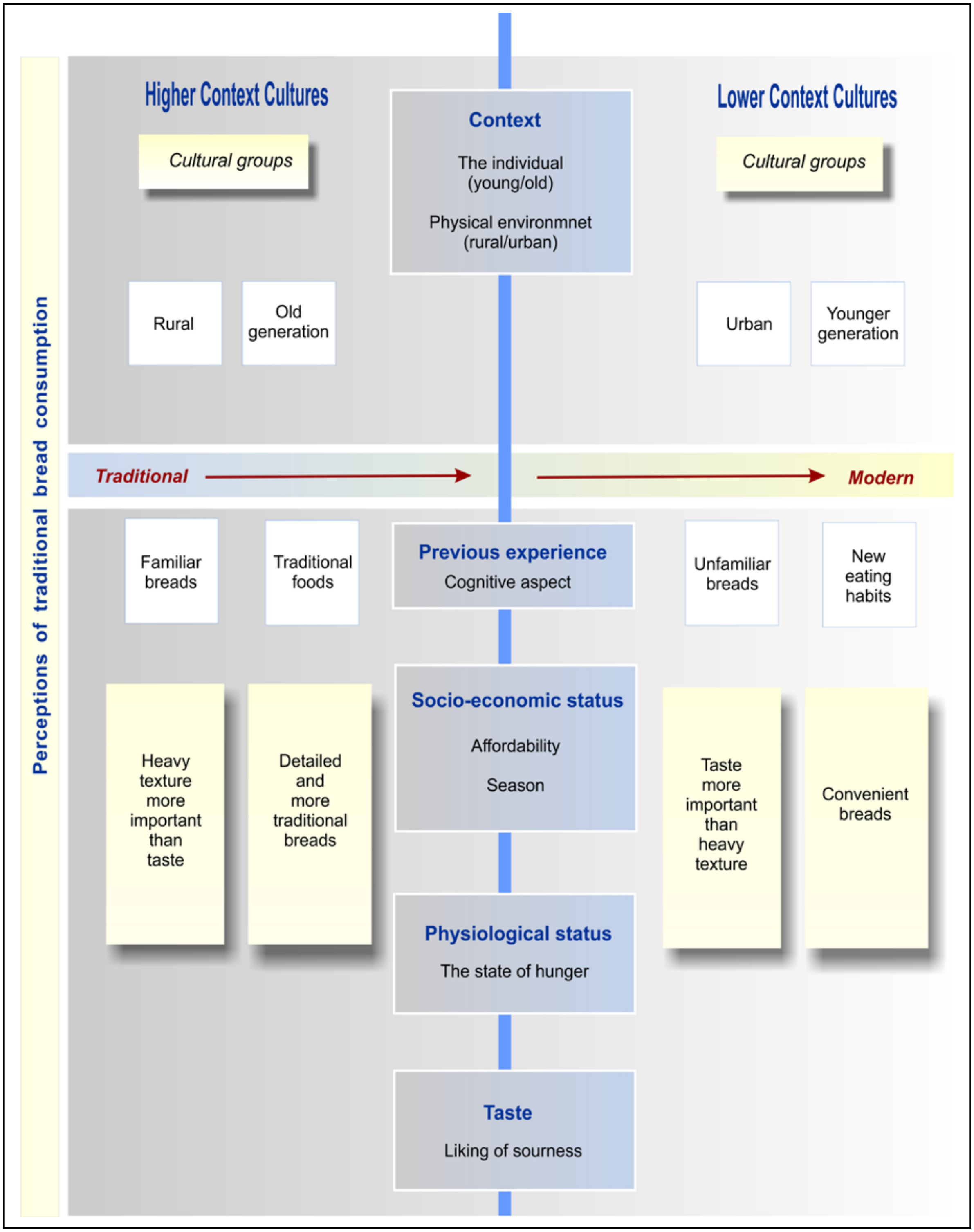

Figure 8.1: Final conceptual framework – A cultural hedonic framework for traditional Basotho bread acceptance

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limitations. Further studies on Basotho culinary practices should cover all regions of Lesotho in order to provide a more comprehensive report on Basotho culinary practices.

2. The findings revealed differences between rural and urban areas in ways of preparing traditional breads and acceptability. Further research is needed to study the influence of urbanization on food habits of Basotho. This research should focus on the main factors causing changes as people move from the rural areas to the urban areas.

8.5.2 Methodological aspects

1. The multiphase mixed methodology design used in this study provided variation of data collection and analysis. The method enabled data to be quantified. Qualitative focus groups provided in depth insights into the topic. In particular, the method provided an insight into investigating the culinary practices of Basotho regarding traditional Basotho bread and in applying the cultural hedonic framework to understand how culture influences traditional Basotho bread acceptance. However, it is recommended that further studies should include standard consumer sensory evaluation. It was not possible to do consumer sensory evaluation in this study because of time and financial limitations.

2. Research on consumer perceptions, attitudes and traditional food trends in Lesotho would highlight the reasons for accepting and rejecting traditional foods.

8.5.3 Gender

1. As much as women are responsible for culinary practices in the households, it could have been interesting to include males in the focus groups to seek the information on acceptability and the impact of culture on bread consumption because males are major consumers of bread as well. It is therefore recommended that studies of this nature should include both men and women in issues related to consumption and acceptability of bread.

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8.5.4 Generations and culinary heritage

1. The findings of this study showed discrepancies between older and younger participants regarding the knowledge and acceptability of traditional Basotho breads. Younger participants were unfamiliar with some of the traditional Basotho breads and had negative perceptions regarding their sensory attributes. These factors contributed to their lower liking of the products. On the other hand, the older participants liked the breads and associated them with experiences of the past. Owing to these differences, it is recommended that future studies should focus on how to transmit the culinary practices of Basotho from one generation to the other. This could encourage the use of traditional bread by the younger generation. Traditional bread is thought to be more nutritious and healthy because of its wholeness and high content of fibre. Transmission of Basotho culinary practices could also help Basotho to preserve their cultural identity.

2. The differences in generation groups also suggest that further studies are required to show the pattern of culinary loss over time.

3. This study is the first of its kind to document traditional Basotho breads, culinary practices and influence of culture towards acceptability of bread in Lesotho. As a follow up to this work, studies investigating culinary heritage of Basotho with regard to other types of foods should be undertaken in order to source more information from the older generation. If efforts are not made to preserve the knowledge and skills of Basotho cuisine, the Basotho culinary heritage will be lost. In the process the younger generation will be deprived of the opportunity to know where they come from. The information about Basotho cuisine would also encourage the use of healthy traditional foods which may not need to be bought, and thus benefit Basotho households with limited finances.

8.5.5 Traditional Basotho bread quality

1. The study revealed that Basotho like wheat bread more than maize and sorghum breads and more than any other cereal product. However, consumption of wheat bread is limited by the high cost of wheat. Therefore, research geared toward the

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improvement of the quality characteristics of maize and sorghum breads in Lesotho should be given the highest priority. The advantage of such a priority is that as already stated production of maize is relatively higher than wheat and sorghum in Lesotho.

2. The study has demonstrated that the type and qualities of flour used to prepare traditional Basotho bread influence the sensory characteristics of the bread. It becomes important therefore to determine the qualities of the grain and to control the size of flour particles during the milling process in order to produce the traditional Basotho bread desired by consumers. It is believed that other factors such as the method of cooking affect texture, appearance, flavour and aroma of traditional Basotho breads. However, their influence could not be determined as part of this study. It is recommended that research on effects of other cooking methods on traditional Basotho breads be conducted.

3. In this study only a few recipes were selected from the 10 recipes of traditional Basotho bread-making collected in phase 1 due to time constraints. It might be interesting to also conduct the study on the sensory and physico-chemical properties of composite breads prepared in Lesotho.

4. In general, the studies on determining the qualities of non-wheat breads need to be carried out. It is recommended that improvement of non-wheat breads in Lesotho include addition of proteins to improve elasticity of bread and to adjust the amount of water for the improved texture of bread. It is also believed that complete gelatinization of maize and sorghum starch might help improve the texture of non-wheat breads.

8.5.6 Bread preparation

1. The longer and tedious processes involved in the preparation of traditional Basotho breads calls for investigations on how the people in Lesotho could use labour-saving affordable equipment and technologies to perform activities such as de-branning, milling, wet milling and kneading. This could encourage the use of whole grain flours rather than refined commercial flours for making bread. Working mothers and older people who cannot handle labour intensive

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processes would have the opportunity to prepare traditional breads within a short space of time. The investigation on labour and time-saving technologies may be important because it might help those individuals willing to venture into business to produce traditional Basotho bread for sale in the urban areas and contribute to the improvement of their income while conveniently providing authentic bread to working consumers.

8.5.7 Recommendations to the Lesotho government

The findings from this study pose challenges to the Lesotho government to:

1. Consider transmission of indigenous knowledge in their school curriculum frameworks and establish educational programs that emphasise the relationship between food habits culture and food choice. This will help preserve knowledge about the culinary practices of Basotho. The findings suggested that younger generation lacked knowledge and could not accept traditional Basotho bread because the culinary practices of Basotho are not preserved.

2. Promote ways to increase production of wheat, maize and sorghum in the country. Respondents indicated that one of the reasons for not preparing breads was associated with lack of ingredients. Increased yield of these local cereals would encourage Basotho to prepare their bread from whole grain flours rather than to rely on bought flour which has gone through processing and loss of important components like fibre.

8.5.8 Recommendation regarding improvement of eating habits of Basotho

The information from this study should be communicated to both to professionals and non-professionals with the hope to convince Basotho about the health benefits of traditional Basotho breads and maybe reverse the trend of eating habits of Basotho. If information is communicated well, the study could benefit health conscious people who are aware of the celiac disease and other intolerances associated with wheat.

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8.5.9 Recommendation regarding the value of the study to consumer scientists

The results of the study could be incorporated in the Consumer Science teaching materials in order to facilitate the teaching of some traditional food components which already exists in the school syllabus.

8.6 CONCLUDING NOTE

The present study aimed to investigate the culinary practices of Basotho with regard to traditional bread and standardise the recipes collected from 5 regions of Lesotho in order to use them for the sensory and physico-chemical attributes of steamd Basotho breads. The study also aimed to use a cultural hedonic framework to describe consumers' perceptions of traditional Basotho bread and how these perceptions influence the ultimate acceptance of traditional Basotho bread. The aim of this study was addressed through 3 phases of collecting and analysing data, in order to establish a sequential mixed methodology design. The information obtained in this study was needed to fill the literature gap regarding Basotho culinary practices. Apart from the fact that the researcher experienced a number of limitations discussed in this chapter, the study forms a valuable contribution with regard to Basotho traditional food knowledge and acceptance. The study could be used as a foundation to improve the eating habits of Basotho.

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ADDENDUM 1

LETTER REQUESTING PERMISSION TO WORK WITH CHIEFS OF THE VILLAGES CONCERNED

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

AN INVESTIGATION OF CULINARY PRACTICES AND CONSUMER ACCEPTANCE OF TRADITIONAL BASOTHO BREAD

The chief

Leribe – Maputsoe
Mafeteng - Makaung
Mokhotlong - Phameng
Thaba-Tseka - Mohlakeng
Maseru - Thaba Bosiu (Lihaseng)

RE: PERMISSION TO CONDUCT RESEARCH

Dear Sir/Madam

This letter serves to request your permission for the researcher (Pulane Nkhabutlane) who is a PhD student in the department of Consumer Science – University of Pretoria, to conduct a survey in your area. The survey will begin with recruitment of participants for focus group discussions and subjects for face to face survey questionnaire during the preliminary research in January 2011 prior to data collection which is intended to start in March – April 2011.

The survey is conducted to investigate the culinary practices of Basotho with regard to traditional Basotho bread and to explore the consumers' perceptions of traditional bread and how these perceptions influence the ultimate acceptance of traditional bread. Secondly the study intends to apply the cultural hedonic framework to consumer perceptions of traditional Basotho bread in order to facilitate understanding and provide insights that will help explain the concept of consumer food acceptance in terms of cultural context. The results of the research will provide valuable information that will enable understanding of food values, food cultures, eating habits of Basotho and acceptance of traditional bread which will ultimately encourage the utilization of various cereals in bread making and therefore increase variety in the Basotho diet.

The survey will mainly focus on the following areas:

1. Culinary practices of traditional Basotho bread
2. Sensory characteristics of traditional Basotho bread
3. Perceptions of sensory characteristics of traditional Basotho bread
4. Consumer acceptance of traditional Basotho bread.

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I hope my request will reach your favourable consideration. Should you require any further information regarding this survey, you are more than welcome to contact Dr. G du Rand at Tel: (012) 420 3547.

……………………………………………..

Pulane Nkhabutlane

RESEARCHER

Department of Consumer Science

University of Pretoria, Pretoria 0002, Republic of South Africa. Tel. 012 420 3111

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ADDENDUM 2

AUTHORISATION LETTER FROM THE MINISTRY OF LOCAL GOVERNMENT-CHIEFTAINSHIP LESOTHO

LESOTHO

Nutrition Headquarters Office
P.O.Box 24
Maseru 100
Lesotho

15-12-2009

The Nutrition Extension Officer
Leribe – Maputsoe
Mafeteng – Makaung
Mokhotlong – Phahameng
Thaba-Tseka – Mohlakeng
Maseru – Thaba-Bosiu

RE: PULANE NKHABUTLANE – RESEARCH AUTHORISATION

Dear Madam

This letter serves to acknowledge receipt of application letter to conduct a research study.

Pulane Nkhabutlane who is a lecturer at the National University of Lesotho and currently studying at the University of Pretoria, pursuing PhD in Consumer Science, has been authorised to carry out research in your area on the topic:

An investigation of culinary practices and consumer acceptance of traditional Basotho bread.

Please accord her the necessary assistance.

L.A. BERENG - CHIEF NUTRITION OFFICER

Yours faithfully

MINISTRY OF AGRICULTURE AND FOOD SECURITY
DIRECTOR
2009 -12- 15
FIELD SERVICES

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ADDENDUM 3

LETTER REQUESTING PERMISSION TO WORK WITH NUTRITION EXTENSION OFFICERS OF THE VILLAGES CONCERNED

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

AN INVESTIGATION OF CULINARY PRACTICES AND CONSUMER ACCEPTANCE OF TRADITIONAL BASOTHO BREAD

The Nutrition Extension Officer

Leribe – Maputsoe
Mafeteng - Makaung
Mokhotlong - Phameng
Thaba-Tseka - Mohlakeng
Maseru - Thaba Bosiu (Lihaseng)

RE: PERMISSION TO CONDUCT RESEARCH

Dear Sir/Madam

This letter serves to request your permission for the researcher (Pulane Nkhabutlane) who is a PhD student in the department of Consumer Science – University of Pretoria, to conduct a survey in your area. The survey will begin with recruitment of participants for focus group discussions and subjects for face to face survey questionnaire during the preliminary research in January 2011 prior to data collection which is intended to start in March – April 2011.

The survey is conducted to investigate the culinary practices of Basotho with regard to traditional Basotho bread and to explore the consumers' perceptions of traditional bread and how these perceptions influence the ultimate acceptance of traditional bread. Secondly the study intends to apply the cultural hedonic framework to consumer perceptions of traditional Basotho bread in order to facilitate understanding and provide insights that will help explain the concept of consumer food acceptance in terms of cultural context. The results of the research will provide valuable information that will enable understanding of food values, food cultures, eating habits of Basotho and acceptance of traditional bread which will ultimately encourage the utilization of various cereals in bread making and therefore increase variety in the Basotho diet.

The survey will mainly focus on the following areas:

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1. Culinary practices of traditional Basotho bread
2. Sensory characteristics of traditional Basotho bread
3. Perceptions of sensory characteristics of traditional Basotho bread
4. Consumer acceptance of traditional Basotho bread.

I hope my request will reach your favourable consideration. Should you require any further information regarding this survey, you are more than welcome to contact Dr. G du Rand at Tel: (012) 420 3547.

………………………………………………..

Pulane Nkhabutlane

RESEARCHER

Department of Consumer Science

University of Pretoria, Pretoria 0002, Republic of South Africa. Tel. 012 420 3111

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ADDENDUM 4

AUTHORISATION LETTER FROM NUTRITION OFFICE HEADQUARTERS - MINISTRY OF AGRICULTURE AND FOOD SECURITY LESOTHO

MINISTRY OF LOCAL GOVERNMENT
CHIEFTAINSHIP & PARLIAMENTARY AFFAIRS
P.O. BOX 686
MASERU 100

10th December, 2009

TO: Pulane Nkhabutlane
P.O. Box 15828
Maseru – 100
Lesotho.

RE: RESEARCH AUTHORISATION

Dear Sir/Madam,

Following your application to conduct research on – **An investigation of culinary practices and consumer acceptance of traditional Basotho bread** in Lesotho.

This letter serves to grant you permission to carry out research in:

Leribe	-	Maputsoe
Mafeteng	-	Makaung
Mokhotlong	-	Phahameng
Thaba-Tseka	-	Mohlakeng
Maseru	-	Thaba-Bosiu (Lihaseng)

Your permission to conduct your study in these areas is valid from 3rd January, 2010 to 30 December, 2010.

Please not that you are expected to report to the chief of the area before commencing your study.

E.K. MPASA
DIRECTOR CHIEFTAINSHIP

LEKALA LA PUSO EA LIBAKA LE BORENA
MINISTRY OF LOCAL GOVERNMENT
AND CHIEFTAINSHIP
2009 -12- 10
CHIEFTAINSHIP REGISTRY
P.O. BOX 686, MASERU 100

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ADDENDUM 5

PRELIMINARY STUDY QUESTIONAIRE

For Office Use

CULINARY PRACTICES OF BASOTHO TRADITIONAL BREAD

PRELIMINIARY INVESTIGATION

Please answer the questions by drawing a circle around an appropriate number in a shaded box or by writing your answer clearly in the shaded space provided

Preliminary Questionnaire Number — V1 [| |] 1

1. What is your **name**?

2. What is your **contact number**?

3. What **district** do you reside in?

	1	V2		5
	2			
	3			
	4			
	5			
	6			

4. Which of the following types of **Basotho Traditional bread** are you **familiar** with?

Steamed Wheat Bread (Leqebekoane)	1	V3		7
Steamed Fresh Sorghum Bread (Senkhoana)	2	V4		9
Steamed Wheat Bread (Mochahlama 1)	3	V5		11
Steamed Reground Maize Bread (Monepola 2)	4	V6		13
Steamed Maize Mealk Bread (Mochahlama 3 - formerly Lipolokoe Method)	5	V7		15
Steamed Fresh Maize Bread (Monepola 1 - formerly Monopola)	6	V8		17
Steamed Sorghum Bread (Ntsoanatsike)	7	V9		19
Baked bread (Bohobe ba Polata)	8	V10		21
Steamed Wheat + Sorghum Bread (Mochahlama 2)	9	V11		23
Roasted Bread (Liphaphatha)	10	V14		29
	11	V15		32

5. From the list in ***Question 4***, which **Basotho Traditional Bread** do you ***prepare regularly***? (Please enter a ***single*** name only)

	V12		25
	V13		27

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ADDENDUM 6

MAIN STUDY QUESTIONNAIRE

CULINARY PRACTICES OF BASOTHO TRADITIONAL BREAD

Circle numbers in a shaded box or write an answer in the shaded space

For official use

C1

V1 2

1 What is your **name**

2 What is your **contact number**?

3 What is the **date** of the interview?

4 Which **district** do you reside in?

Leribe	1	V2 6
Mafeteng	2	
Maseru	3	
Mokhotlong	4	
Thaba-tseka	5	

SECTION A ***Demographic information***

5 How would you describe your **residential location**?

Rural	1	V3 8
Urban	2	

6 What is your **highest** level of formal **education**?

I do not have any formal education	1	V4 10
Primary School	2	
Secondary School	3	
Tertiary education	4	

7 What was your age at your last birthday?

V5 12

SECTION B ***Types of Traditional Bread***

8 Which of the following types of **Traditional bread** have you **prepared**?

Steamed Wheat Bread (Leqebekoane)	1	V6 15
Steamed Fresh Sorghum Bread (Senkhoana)	2	V7 17
Steamed Wheat + Maize Bread (Mochahlama 1)	3	V8 19
Steamed Reground Maize Bread (Monepola 2)	4	V9 21
Steamed Fresh Maize Bread (Monepola 1)	5	V10 23
Steamed Sorghum Bread (Ntsoanatsike)	6	V11 25
Baked bread (Bohobe ba Polata)	7	V12 27
Roasted Bread (Liphaphatha)	8	V13 29
Steamed Maize bread (Mochahlama 2)	9	V14 31
Steamed Wheat + sorghum Bread (Mochahlama 3)	10	V15 33

1

9 Which of the following types of **Traditional bread** do you still prepare in your household?

For official use

Steamed Wheat Bread (Leq.)	1	V16 36
Steamed Fresh Sorghum Bread (Senk.)	2	V17 38

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Steamed Wheat + Maize Bread (Moch.1)	3	V18		40
Steamed Reground Maize Bread (Mon.2)	4	V19		42
Steamed Fresh Maize Bread (Mon.1)	5	V20		44
Steamed Sorghum Bread (Ntsoa.)	6	V21		46
Baked bread (Bohobe ba Polata)	7	V22		48
Roasted Bread (Liphaphatha)	8	V23		50
Steamed Maize bread (Moch. 2)	9	V24		52
Steamed Wheat+Sorghum Bread (Moch.3)	10	V25		54

10 What are the reasons for **continuing to prepare** traditional bread you indicated in question 9 above?

	Ingredients available	Good taste	Less work	Know recipe			
Steamed Wheat Bread (Leq.)	1	2	3	4	V26		57
Steamed Fresh Sorghum Bread (Senk.)	1	2	3	4	V30		65
Steamed Wheat + Maize Bread (Moch.1)	1	2	3	4	V34		73
Steamed Reground Maize Bread (Mon.2)	1	2	3	4	V38		81
Steamed Fresh Maize Bread (Mon.1)	1	2	3	4	V42		89
Steamed Sorghum Bread (Ntsoa.)	1	2	3	4	V46		97
Baked bread (Bohobe ba Polata)	1	2	3	4	V50		105
Roasted Bread (Liphaphatha)	1	2	3	4	V54		113
Steamed Maize bread (Moch. 2)	1	2	3	4	V58		121
Steamed Wheat+Sorghum Bread (Moch.3)	1	2	3	4	V62		129

11 Which of the following traditional BaSotho bread do you no longer prepare?

Steamed Wheat Bread (Leq.)	1	V66		137
Steamed Fresh Sorghum Bread (Senk.)	2	V67		139
Steamed Wheat + Maize Bread (Moch.1)	3	V68		141
Steamed Reground Maize Bread (Mon.2)	4	V69		143
Steamed Fresh Maize Bread (Mon.1)	5	V70		145
Steamed Sorghum Bread (Ntsoa.)	6	V71		147
Baked bread (Bohobe ba Polata)	7	V72		149
Roasted Bread (Liphaphatha)	8	V73		151
Steamed Maize bread (Moch. 2)	9	V74		153
Steamed Wheat+Sorghum Bread (Moch.3)	10	V75		155

2

12 For any of the breads you decided to **no longer prepare** in your household, please indicate the reasons for not preparing them anymore.

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C2

	unavailable ingredients	Labour intensive	Not tasty	Bread outdated	Unknown			
Steamed Wheat Bread (Leq.)	1	2	3	4	5	V76		2
Steamed Fresh Sorghum Bread (Senk.)	1	2	3	4	5	V81		12
Steamed Wheat + Maize Bread (Moch.1)	1	2	3	4	5	V86		22
Steamed Reground Maize Bread (Mon.2)	1	2	3	4	5	V91		32
Steamed Fresh Maize Bread (Mon.1)	1	2	3	4	5	V96		42
Steamed Sorghum Bread (Ntsoa.)	1	2	3	4	5	V101		52
Baked bread (Bohobe ba Polata)	1	2	3	4	5	V106		62

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Roasted Bread (Liphaphatha)	1	2	3	4	5	V111						72
Steamed Maize bread (Moch. 2)	1	2	3	4	5	V116						82
Steamed Wheat+Sorghum Bread (Moc.3)	1	2	3	4	5	V121						92

13 For the traditional breads that you prepared and that you still prepare, indicate the **time of the year** you prepare each one.

	All year round	Summer	Autumn	Winter	Spring							
Steamed Wheat Bread (Leq.)	1	2	3	4	5	V126						102
Steamed Fresh Sorghum Bread (Senk.)	1	2	3	4	5	V131						112
Steamed Wheat + Maize Bread (Moch.1)	1	2	3	4	5	V136						122
Steamed Reground Maize Bread (Mon.2)	1	2	3	4	5	V141						132
Steamed Fresh Maize Bread (Mon.1)	1	2	3	4	5	V146						142
Steamed Sorghum Bread (Ntsoa.)	1	2	3	4	5	V151						152
Baked bread (Bohobe ba Polata)	1	2	3	4	5	V156						162
Roasted Bread (Liphaphatha)	1	2	3	4	5	V161						172
Steamed Maize bread (Moch. 2)	1	2	3	4	5	V166						182
Steamed Wheat+Sorghum Bread (Moc.3)	1	2	3	4	5	V171						192

14 What is the reason for preparing different traditional breads in **different seasons** of the year?

C3

	Ingredients available	Diet variety	Affordability	Storage stability						
Steamed Wheat Bread (Leq.)	1	2	3	4	V176					2
Steamed Fresh Sorghum Bread (Senk.)	1	2	3	4	V180					10
Steamed Wheat + Maize Bread (Moch.1)	1	2	3	4	V184					18
Steamed Reground Maize Bread (Mon.2)	1	2	3	4	V188					26
Steamed Fresh Maize Bread (Mon.1)	1	2	3	4	V192					34
Steamed Sorghum Bread (Ntsoa.)	1	2	3	4	V196					42
Baked bread (Bohobe ba Polata)	1	2	3	4	V200					50
Roasted Bread (Liphaphatha)	1	2	3	4	V204					58
Steamed Maize bread (Moch. 2)	1	2	3	4	V208					66
Steamed Wheat+Sorghum Bread (Moch.3)	1	2	3	4	V212					74

3

SECTION C ***Traditional Bread Consumption***

For official use

15 How often do you **consume** traditionally prepared bread in your home?

	Every day	Once a week	2-3 times a week	Rarely			
Steamed Wheat Bread (Leq.)	1	2	3	4	V216		82
Steamed Fresh Sorghum Bread (Senk.)	1	2	3	4	V217		84
Steamed Wheat + Maize Bread (Moch.1)	1	2	3	4	V218		86
Steamed Reground Maize Bread (Mon.2)	1	2	3	4	V219		88
Steamed Fresh Maize Bread (Mon.1)	1	2	3	4	V220		90
Steamed Sorghum Bread (Ntsoa.)	1	2	3	4	V221		92
Baked bread (Bohobe ba Polata)	1	2	3	4	V222		94
Roasted Bread (Liphaphatha)	1	2	3	4	V223		96
Steamed Maize bread (Moch. 2)	1	2	3	4	V224		98

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Steamed Wheat+Sorghum Bread (Moch.3)	1	2	3	4	V225		100

16 Which traditional BaSotho bread is served in the **listed ceremonies**?

	Christmas	Help team	Moshoeshoe's day	Trip's provision	Traditional feasts							
Steamed Wheat Bread (Leq.)	1	2	3	4	5	V226						102
Steamed Fresh Sorghum Bread (Senk.)	1	2	3	4	5	V231						112
Steamed Wheat + Maize Bread (Moch.1)	1	2	3	4	5	V236						122
Steamed Reground Maize Bread (Mon.2)	1	2	3	4	5	V241						132
Steamed Fresh Maize Bread (Mon.1)	1	2	3	4	5	V246						142
Steamed Sorghum Bread (Ntsoa.)	1	2	3	4	5	V251						152
Baked bread (Bohobe ba Polata)	1	2	3	4	5	V256						162
Roasted Bread (Liphaphatha)	1	2	3	4	5	V261						172
Steamed Maize bread (Moch. 2)	1	2	3	4	5	V266						182
Steamed Wheat+Sorghum Bread (Moc.3)	1	2	3	4	5	V271						192

17 How **soon** do you eat traditional bread after cooking?

	Immediately	When cool	Next day			
Steamed Wheat Bread (Leq.)	1	2	3	V276		202
Steamed Fresh Sorghum Bread (Senk.)	1	2	3	V277		204
Steamed Wheat + Maize Bread (Moch.1)	1	2	3	V278		206
Steamed Reground Maize Bread (Mon.2)	1	2	3	V279		208
Steamed Fresh Maize Bread (Mon.1)	1	2	3	V280		210
Steamed Sorghum Bread (Ntsoa.)	1	2	3	V281		212
Baked bread (Bohobe ba Polata)	1	2	3	V282		214
Roasted Bread (Liphaphatha)	1	2	3	V283		216
Steamed Maize bread (Moch. 2)	1	2	3	V284		218
Steamed Wheat+Sorghum Bread (Moch.3)	1	2	3	V285		220

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18 What is the reason for the choice you made in **question 17** above?

C4

	Soft & tasty	Good flavour	Lasts longer	Easyly sliced						
Steamed Wheat Bread (Leq.)	1	2	3	4	V286					2
Steamed Fresh Sorghum Bread (Senk.)	1	2	3	4	V290					10
Steamed Wheat + Maize Bread (Moch.1)	1	2	3	4	V294					18
Steamed Reground Maize Bread (Mon.2)	1	2	3	4	V298					26
Steamed Fresh Maize Bread (Mon.1)	1	2	3	4	V302					34
Steamed Sorghum Bread (Ntsoa.)	1	2	3	4	V306					42
Baked bread (Bohobe ba Polata)	1	2	3	4	V310					50
Roasted Bread (Liphaphatha)	1	2	3	4	V314					58
Steamed Maize bread (Moch. 2)	1	2	3	4	V318					66
Steamed Wheat+Sorghum Bread (Moch.3)	1	2	3	4	V322					74

SECTION D ***Obtaining Ingredients for Traditional bread***

19 Indicate the **availability** of each of the following **cereals** in your area.

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	Plenty	Little	Not available			
Maize	1	2	3	V326		82
Wheat	1	2	3	V327		84
Sorghum	1	2	3	V328		86

20 Please indicate , how you **obtain** wheat flour, sorghum or maize meal and fresh grains for making traditional BaSotho bread?

	Buy wheat flour	Buy maize meal	Home grinding	Village mill	Fresh grains -							
Steamed Wheat Bread (Leq.)	1	2	3	4	5	V329						88
Steamed Fresh Sorghum Bread (Senk.)	1	2	3	4	5	V334						98
Steamed Wheat + Maize Bread (Moch.1)	1	2	3	4	5	V339						108
Steamed Reground Maize Bread (Mon.2)	1	2	3	4	5	V344						118
Steamed Fresh Maize Bread (Mon.1)	1	2	3	4	5	V349						128
Steamed Sorghum Bread (Ntsoa.)	1	2	3	4	5	V354						138
Baked bread (Bohobe ba Polata)	1	2	3	4	5	V359						148
Roasted Bread (Liphaphatha)	1	2	3	4	5	V364						158
Steamed Maize bread (Moch. 2)	1	2	3	4	5	V369						168
Steamed Wheat+Sorghum Bread (Moc.3)	1	2	3	4	5	V374						178

21 What is your main **reason for buying** wheat flour, sorghum meal or maize meal from shops?

Not applicable - I do not buy wheat flour from shops	1	V379		188
It is convenient (saves time and less laborious)	2			
I do not have grain to produce my own flour	3			
The commercial flour tastes better than home ground flour	4			
Bought flour is hygienic	5			

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22 If you use **meal or flour ground at home,** what are the reasons for this?

Not applicable - I do not grind meal/flour at home	1	V380		190
I do not have money to buy flour from the shops	2	V381		192
I am able to produce fine flour/meal at home	3	V382		194
I am able to produce flour/meal as required by the recipe	4	V383		196
Home ground flour/meal produces bread with good taste	5	V384		198
Home ground flour/meal produces bread with body	6	V385		200
I cannot afford to pay mills	7	V386		202
I have grains at home, it is convenient to grind any time I want to	8	V387		204

23 If you do use **mills** for producing flour/meal, what is the main **reason** for that?

Not applicable - I do not use mills to produce flour/meal	1	V388		206
The mills are convenient they save time and labour	2			
I have a lot of grain to mill	3			
I have a large family	4			
It is cheaper to use mills than to buy flour	5			

24 If you buy wheat flour for traditional bread making, **which wheat flour** do you buy?

Not applicable - I do not buy wheat flour from shops	1	V389		208

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Whole wheat flour	2			
Easy bake flour	3			
Bread flour	4			

25 What is the main **reason** for using **refined wheat** flour?

Not applicable - I do not use fine flour	1	V390		210
Fine textured bread is tasty	2			
Bread apprearance is appetising	3			
Bread is soft	4			

26 What is your main **reason** for using **whole wheat flour** for bread making?

Not applicable - I do not use whole wheat flour for bread making	1	V391		212
To give bread body	2			
Bread tastes better	3			
No option	4			

27 What is the **main** reason for **compositing wheat flour** with other cereals?

To reduce costs	1	V392		214
To improve taste	2			
To improve colour	3			
To improve satiety ability	4			
To improve the shelf life	5			

6

SECTION E ***Raising Agent***

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28 Which **raising agent** do you use for making the traditional BaSotho bread?

C5

	Sour dough	Traditional beer	Commercial yeast	Sour dough + commercial	None							
Steamed Wheat Bread (Leq.)	1	2	3	4	5	V393						2
Steamed Fresh Sorghum Bread (Senk.)	1	2	3	4	5	V398						12
Steamed Wheat + Maize Bread (Moch.1)	1	2	3	4	5	V403						22
Steamed Reground Maize Bread (Mon.2)	1	2	3	4	5	V408						32
Steamed Fresh Maize Bread (Mon.1)	1	2	3	4	5	V413						42
Steamed Sorghum Bread (Ntsoa.)	1	2	3	4	5	V418						52
Baked bread (Bohobe ba Polata)	1	2	3	4	5	V423						62
Roasted Bread (Liphaphatha)	1	2	3	4	5	V428						72
Steamed Maize bread (Moch. 2)	1	2	3	4	5	V433						82
Steamed Wheat+Sorghum Bread (Moc.3)	1	2	3	4	5	V438						92

29 What are the **reasons** for using the type of **raising agent/s** you indicated?

	Quick	Good tasting bread	Easily available	High volume bread						
Sour dough	1	2	3	4	V443					102
Traditional beer	1	2	3	4	V447					110
Commercial yeast	1	2	3	4	V451					118
Sour dough + commercial yeast	1	2	3	4	V455					126

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None	1	2	3	4	V459					134

SECTION F ***Fuel used***

30 What type of **fuel** do you use for cooking traditional BaSotho bread in your household?

	Wood	Dried cow dung	Paraffin	Gas	Electricity							
Steamed Wheat Bread (Leq.)	1	2	3	4	5	V463						142
Steamed Fresh Sorghum Bread (Senk.)	1	2	3	4	5	V468						152
Steamed Wheat + Maize Bread (Moch.1)	1	2	3	4	5	V473						162
Steamed Reground Maize Bread (Mon.2)	1	2	3	4	5	V478						172
Steamed Fresh Maize Bread (Mon.1)	1	2	3	4	5	V483						182
Steamed Sorghum Bread (Ntsoa.)	1	2	3	4	5	V488						192
Baked bread (Bohobe ba Polata)	1	2	3	4	5	V493						202
Roasted Bread (Liphaphatha)	1	2	3	4	5	V498						212
Steamed Maize bread (Moch. 2)	1	2	3	4	5	V503						222
Steamed Wheat+Sorghum Bread (Moc.3)	1	2	3	4	5	V508						232

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31 What are the **reasons** for using the type of fuel you indicated?

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	Recipe requires this fuel	Easily available	Cheaper	Produces good quality product		C6	
Wood	1	2	3	4	V513		2
Dried cow dung	1	2	3	4	V514		4
Paraffin	1	2	3	4	V515		6
Gas	1	2	3	4	V516		8
Electricity	1	2	3	4	V517		10

SECTION G ***Storage Stability***

32 How do you **keep** traditional BaSotho bread after cooking?

	Same pot used for cooking	Sotho meal basket	Mixing bowl			
Steamed Wheat Bread (Leq.)	1	2	3	V518		12
Steamed Fresh Sorghum Bread (Senk.)	1	2	3	V519		14
Steamed Wheat + Maize Bread (Moch.1)	1	2	3	V520		16
Steamed Reground Maize Bread (Mon.2)	1	2	3	V521		18
Steamed Fresh Maize Bread (Mon.1)	1	2	3	V522		20
Steamed Sorghum Bread (Ntsoa.)	1	2	3	V523		22
Baked bread (Bohobe ba Polata)	1	2	3	V524		24
Roasted Bread (Liphaphatha)	1	2	3	V525		26
Steamed Maize bread (Moch. 2)	1	2	3	V526		28
Steamed Wheat+Sorghum Bread (Moch.3)	1	2	3	V527		30

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33 How **long** can you keep the traditional BaSotho bread in your houshold in **summer?**

	1-2 days	3 days	4 days			
Steamed Wheat Bread (Leq.)	1	2	3	V528		32
Steamed Fresh Sorghum Bread (Senk.)	1	2	3	V529		34
Steamed Wheat + Maize Bread (Moch.1)	1	2	3	V530		36
Steamed Reground Maize Bread (Mon.2)	1	2	3	V531		38
Steamed Fresh Maize Bread (Mon.1)	1	2	3	V532		40
Steamed Sorghum Bread (Ntsoa.)	1	2	3	V533		42
Baked bread (Bohobe ba Polata)	1	2	3	V534		44
Roasted Bread (Liphaphatha)	1	2	3	V535		46
Steamed Maize bread (Moch. 2)	1	2	3	V536		48
Steamed Wheat+Sorghum Bread (Moch.3)	1	2	3	V537		50

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34 How **long** can you keep the traditional BaSotho bread in your household in **winter?**

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	1-2 days	3 days	4 days			
Steamed Wheat Bread (Leq.)	1	2	3	V538		52
Steamed Fresh Sorghum Bread (Senk.)	1	2	3	V539		54
Steamed Wheat + Maize Bread (Moch.1)	1	2	3	V540		56
Steamed Reground Maize Bread (Mon.2)	1	2	3	V541		58
Steamed Fresh Maize Bread (Mon.1)	1	2	3	V542		60
Steamed Sorghum Bread (Ntsoa.)	1	2	3	V543		62
Baked bread (Bohobe ba Polata)	1	2	3	V544		64
Roasted Bread (Liphaphatha)	1	2	3	V545		66
Steamed Maize bread (Moch. 2)	1	2	3	V546		68
Steamed Wheat+Sorghum Bread (Moch.3)	1	2	3	V547		70

35 How can you **preserve** traditional BaSotho bread?

Cannot be preserved	1	V548		72
No known preservation techniques	2			
Storing in cool conditions	3			

Thank you for your time and co-operation

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ADDENDUM 7

FOCUS GROUP GUIDE

DATA COLLECTION PLAN FOR PHASE 1

Week beginning	Regions
28 – 02 -2011	Leribe - Maputsoe
07- 03 – 2011	Mafeteng - Makaung
14 – 03 – 2011	Maseru - Thaba-Bosiu
21 – 03 – 2011	Mokhotlong - Phahameng
28 – 03 – 2011	Thaba-Tseka - Mohlakeng

5 days for each region

Day 1 General Introduction and Survey Questionnaire (20 – 30 women that prepare bread in their households from each region will be recruited by extension workers for this study)

Day 11 1 focus group per region consisting of 10 women that have participated in the survey questionnaire, but with expertise in traditional bread culinary practices as observed from the preliminary data and how they were responding to the questionnaire will discuss ways of preparing traditional bread.

Pre–preparation steps for 10 breads will also be done.

Day 111 Focus group participants will demonstrate collection of ingredients; preparation and cooking of the first 5 breads. The researcher will measure the ingredients before they start, so that the remaining ingredients can be measured again to give the difference of the amount that has been used. Steps for preparing bread will be recorded, photos will be taken, and they will also be videotaped. The **dough will be measured**, **bread will also be measured.**

Day IV Focus group participants will demonstrate collection of ingredients; preparation and cooking of the other 5 breads. The researcher will measure **the ingredients** before they start, so that the remaining ingredients can be measured again to give the difference of the amount that has been used. Steps for preparing bread will be recorded, photos will be taken, and they will also be videotaped. The **dough will be measured**, **bread will also be measured.**

Focus group members will discuss the physical properties of 5 breads prepared previous day, and the reasons for liking and disliking certain breads.

Day V Focus group members will discuss the physical properties of 5 breads prepared previous day, and the reasons for liking and disliking certain breads.

continues …

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To be translated in Sesotho

CONSENT FORM FOR SUBJECTS WILLING TO PARTICIPATE IN SURVEY QUESTIONNAIRE

Thank you for your willingness to participate in the investigation of culinary practices and quality criteria for choosing various traditional Basotho bread.

Date of Participation: ......………………………………………………………………………………

Nature of Involvement: I understand that the project involves participating in a survey questionnaire. The researcher will ask me questions related to culinary practises and consumption of traditional Basotho bread using a structured questionnaire.

Voluntary Nature of Participation: I understand that my participation in this project is totally voluntary. I have the freedom to withdraw from participating any time if need be.

Medical Liability: I understand that I will not be financially compensated should I incur any physical injury or illness resulting from my participation in this project.

Confidentiality: All responses to questions will be treated confidentially. The researcher will not reveal personal information (e.g. age, names of participants) to third parties.

Researcher (Student): Mrs. Pulane Nkhabutlane ……………………………………………………………

Project Supervisor (Dr. G du Rand) ……………………………………………………………………….

Should you require any further information regarding this survey, you are more than welcome to contact Pulane Nkhabutlane on +266-58997109 Lesotho.

I ……………………………………………………………..declare that I have read the consent form and I understand the nature of my involvement very well. I therefore agree to participate in this project.

My Contact Telephone Number

Participant's Signature: …………………………………….. Date:....………………………………………..

continues …

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TUMELLANO SEBAKENG SA HO NKA KAROLO LIPATLISISONG TSA HO ETSA, LE HO PHEHA MAHOBE A FAPANENG A SESOTHO.

Ke leboha haholo ka boithaopo bahau, ba ho lumela ho nka karolo lipatlisisong tsa ho etsa le ho pheha mahobe a fapaneng a sesotho.

Letsatsi la ho nka karolo ....

Tsela ea ho nka karolo: Kea utlioisisa hore ho nka karolo litabeng tsena tsa boithuto ba mahobe ho tla tsamaisa ho araba lipotso tse lokisitsoeng ke moithuti. Ke hlokomelisitsoe hore re tla nkuoa lits'oantso.

Boleng ba boithaopo ho nkeng karolo: Ke utloisisa hantle hore ho nka karolo boithutong bona ke boithaopo, ha se ho tlamelloa. Kena le bolokolohi ba ho tlohella ha ho hlokahaha hore ke tlohele ka mabaka.

Maemo a bophelo: Ke utloisisa hantle hore nkeke ka fuoa chelete ea ho ea ngakeng, ebang nka hlaheloa ke mathata a bokuli nakong ea ho araba lipotso.

Lekunutu: Ke ts'episoa hore moithuti o tla boloka litaba tsohle tse etsahalang mona e le lekunutu. A ke ke a bolella mang kapa mang lilemo tsa ka, kapa lebitso la ka.

Moithuti: (Pulane Nkhabutlane)......................... …………..……………………………………………………..….

Mokoetlisi: (Dr. G du Rand) ……………………………………………………………………………...............….

Sebakeng sa litlhakisisetso tse ling, botsa moithuti (Pulane Nkhabutlane) kapa o moletsetse linomorong tsena tsa mohala +266-58997109 Lesotho.

'Na ....ke amohela hore ke balile litaba tse kaholimo tsa boitlamo. Ke utloisisa hantle ho re na ke tlilo nka karolo ka tsela e joang. Ke lumela ho nka karolo boithutong bona.

Linomoro tsa ka tsa mohala ....

Lebitso .... Letsatsi ....

continues …

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To be translated in Sesotho

CONSENT FORM FOR SUBJECTS WILLING TO PARTICIPATE IN FOCUS GROUPS

Thank you for your willingness to participate in the investigation of culinary practices and consumer acceptance of traditional Basotho bread project.

Date of Participation: ……………………………………………......…………………………..……

Nature of Involvement: I understand that the project involves participating in a focus group discussion and tasting different types of traditional Basotho breads prepared from the main cereals (Wheat, sorghum and maize) found in Lesotho. I am also aware that the focus group session will be videotaped, audio taped and photographed.

Voluntary Nature of Participation: I understand that my participation in this project is totally voluntary. I have the freedom to withdraw from participating any time if need be.

Risk Implications: I understand that the Basotho traditional breads contain wheat, maize, sorghum and sour dough. Any person that is allergic to any of the listed ingredients should not participate.

Medical Liability: I understand that I will not be financially compensated should I incur any physical injury or illness resulting from my participation in this project.

Confidentiality: All responses to questions will be treated confidentially. The researcher will not reveal personal information (e.g. age, names of participants) to third parties.

Researcher (Student): Mrs. Pulane Nkhabutlane ………...…………………………………………...….

Project Supervisor (Dr. G du Rand) ………………………………………………………………………….

Should you require any further information regarding this survey, you are more than welcome to contact Pulane Nkhabutlane on +266-58997109 Lesotho.

I ……………………………………………………………..declare that I have read the consent form and I understand the nature of my involvement very well. I therefore agree to participate in this project.

My Contact Telephone Number

Participant's signature:...............................…………………………………..Date: ....

continues …

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TUMELLANO SEBAKENG SA HO NKA KAROLO LIPATLISISONG TSA HO ETSA, LE HO PHEHA MAHOBE A FAPANENG A SESOTHO

Ke leboha haholo ka boithaopo bah au, ba ho lumela ho nka karolo lipatlisisong tsa ho etsa le ho pheha mahobe a fapaneng a Sesotho.

Matsatsi a ho nka karolo ....

Tsela ea ho nka karolo: Kea utlioisisa hore ho nka karolo litabeng tsena tsa boithuto ba mahobe ho tla tsamaisa ho arolelana maikutlo le batho ba bang, ho ja mahobe a entsoeng ka phoofo ea koro, mabele le poone tse fumanehang Lesotho. Ke hlokomelisitsoe hore re tla nkuoa lits'oantso re be re hatisoe mantsoe nakong eo re buoang.

Boleng ba boithaopo ho nkeng karolo: Ke utloisisa hantle hore ho nka karolo boithutong bona ke boithaopo, ha se ho tlamelloa. Kena le bolokolohi ba ho tlohella ha ho hlokahaha hore ke tlohele ka mabaka.

Mathata a ka hlahang: Ke ea utloisisa hore ke tla ja mahobe a entsoeng ka phoofo ea koro, ea mabele le ea poone, hammoho le litomoso tsa Sesotho. Ha eba mmele oa ka o hloloa ke enngoe ea lisebelisoa tsena tse boletsoeng, nke ke ka nka karolo boithutong bona.

Maemo a bophelo: Ke utloisisa hantle hore nkeke ka fuoa chelete ea ho ea ngakeng, ebang nka hlaheloa ke mathata a bokuli a bakuoeng ke hoja mahobe.

Lekunutu: Ke ts'episoa hore moithuti o tla boloka litaba tsohle tse etsahalang mona e le lekunutu. A ke ke a bolella mang kapa mang lilemo tsa ka, kapa lebitso la ka.

Moithuti: (Pulane Nkhabutlane)......................... ………..………………………………………………...…

Mokoetlisi: (Dr. G du Rand) …………………………………………………………………................…

Sebakeng sa litlhakisisetso tse ling, botsa moithuti (Pulane Nkhabutlane) kapa o moletsetse linomorong tsena tsa mohala +266-58997109 Lesotho.

'Na ....ke amohela hore ke balile litaba tse kaholimo tsa boitlamo. Ke utloisisa hantle ho re na ke tlilo nka karolo ka tsela e joang. Ke lumela ho nka karolo boithutong bona.

Linomoro tsa ka tsa mohala ....

Lebitso .... Letsatsi ....

continues …

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<u>Focus Group Interview Session</u>

Introduction (10 minutes)

Researchers' introduction

i. Name of the researcher and background on the researcher.

My name is Pulane Nkhabutlane. I am a Mosotho woman, born and raised in Lesotho. I am currently studying PhD with the University of Pretoria. We are conducting a study on the investigation of culinary practices of traditional Basotho bread and consumer acceptance towards it, of which I am the chief researcher. Let me also take this opportunity to also introduce.............................. who will be playing the role of an assistant moderator throughout the focus group discussions and activities.

Thank you very much for agreeing to come and be part of this evaluation task. You have been chosen on the basis that you are a Mosotho woman, born and raised in this region, also that you are knowledgeable about the culinary practices of traditional Basotho bread.

We are going to have a discussion about factors determining the culinary practices of traditional Basotho breads. By traditional Basotho breads we refer to breads prepared from commonly grown cereals in Lesotho (wheat, maize and sorghum) using traditional methods that include the use of sour dough. The main issue is to discover traditional and current ways of preparing and serving bread in Basotho households. The physical characteristics of breads will be discussed and the reasons for liking and disliking certain flavours, texture and appearance of various traditional breads.

ii. General nature and purpose of focus group

The focus group will take the form of discussion about the culinary practices of various traditional Basotho bread and the demonstrations of each step that has been mentioned during the discussion. Evaluation of prepared breads accompanied by tasting will also be done. You are expected to freely share your knowledge about this topic and remember there are no right or wrong answers.

Focus Group Session

This interview session proceeded in 3 parts.

The first part was a discussion on culinary practices of Basotho regarding traditional bread (ingredients, flavouring, equipment, preparation steps and cooking procedure).

The second part was demonstrations accompanied by explanation of the why of each preparation and cooking step.

continues …

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Thirdly the focus group members were presented with samples of sliced bread and given chance to taste. Focus group members were asked to discuss the reasons for liking or disliking certain flavours, appearance and texture of various breads.

iii. Objectives of this focus group

To investigate traditional and current culinary practices related to Basotho traditional bread.

To investigate the main quality criteria concerning choice and consumption of traditional Basotho bread

Set up ground rules

During the discussion sessions, written notes will be taken, you will be videotaped when talking and doing demonstrations. Photos will be used to capture all the process of making different kinds of traditional Basotho bread.

Everybody should make the voice clear when speaking. As indicated on the consent form that you have already completed, confidentiality will be highly recognised. There should be no interruptions when someone is speaking. Avoid communicating to each other during the discussion. Mention your name every time you speak.

Please remember to switch off you cell phones while focus group discussion is going on.

You will be awarded after the discussion.

Self Introductions

Please kindly introduce yourself to the group and tell us what comes to your mind, when you hear the term “traditional bread” or “Basotho bread”?

continues …

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FOCUS GROUP GUIDE PARTICIPANTS' INFORMATION

CULINARY PRACTICES REGARDING BASOTHO TRADITIONAL BREAD

Site:... **Moderator:...**

Number of participants:...................... **Assistant Moderator:.....................................**

Date: .... **Transcriber: ....**

Start: .... **End: ....**

1. What is your **name**?

2. What is your **contact number**?

3. What **district** do you reside in?

4. How would you describe your **residential location**?

5. What was your age at your last birthday?

continues …

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Priors – Ice breaker (5 Minutes)

<u>FOCUS GROUP DISCUSSION TOPICS (for each bread)</u>

1. Ingredients
2. Equipment
3. Preparation procedure
4. Cooking procedure & Steamer
5. Serving
6. Quality criteria
7. Cultural, Social and Psychological Aspects

1. Which **ingredients** are used for preparing ....bread?

2. How do you prepare sourdough?

3. What determines the length of time in which sourdough can be kept before use?

4. Give names of **equipment** and their use to prepare .... bread?

5. List all the steps for **preparing** .... and reasons for each step.

6. How do you know that the ....dough is ready to be cooked?

Cooking bread

7. Describe the **cooking procedure** and how the steamer is prepared for ....bread.
8. What special precautions should be observed for steaming bread once the water boils?

9. Describe how baking of bread is done and the reasons for each step.

10. Describe the procedure for roasting bread and the reasons for each step.

11. How do you test the readiness of .... bread?

12. How do you serve .... bread?

    11 a. Lifting out from the pot

    11 b. Portioning

    11 c. Accompaniments
13. Discuss the influence of status (poor/rich, children/parents, men/women) associated with consumption of ....bread.

14. Which quality criteria (appearance, texture, flavour) are important in the consumption of ....bread?

continues …

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15. For each and every quality criterion mentioned, specify the kind of that quality criterion that is generally desired for this bread.

    e.g **Colour** (white, greyish, light brown, brown, dark brown, greenish, yellowish, reddish).

    Texture (hard, soft, rough surface, dense, stickiness, porous)

    Taste (sweet, neutral, sour, bitter)

16. Discuss failures in .... bread making.

Physical Properties of traditional Basotho breads (Done the following day using bread samples).

17. Evaluate the quality of prepared..bread, in terms of :
    - Colour
    - Texture
    - Taste
    - Overall acceptability

    Discuss the reasons for the like or dislike of this bread.

18. Discuss the beliefs and symbolic value of bread in Basotho culture.

13. Do you think the experiences about bread from your past have an influence on the way you accept and consume bread now? What examples can you give for your answer?

continues …

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FOCUS GROUP GUIDE SEATING ARRANGEMENT

CULINARY PRACTICES REGARDING BASOTHO TRADITIONAL BREAD

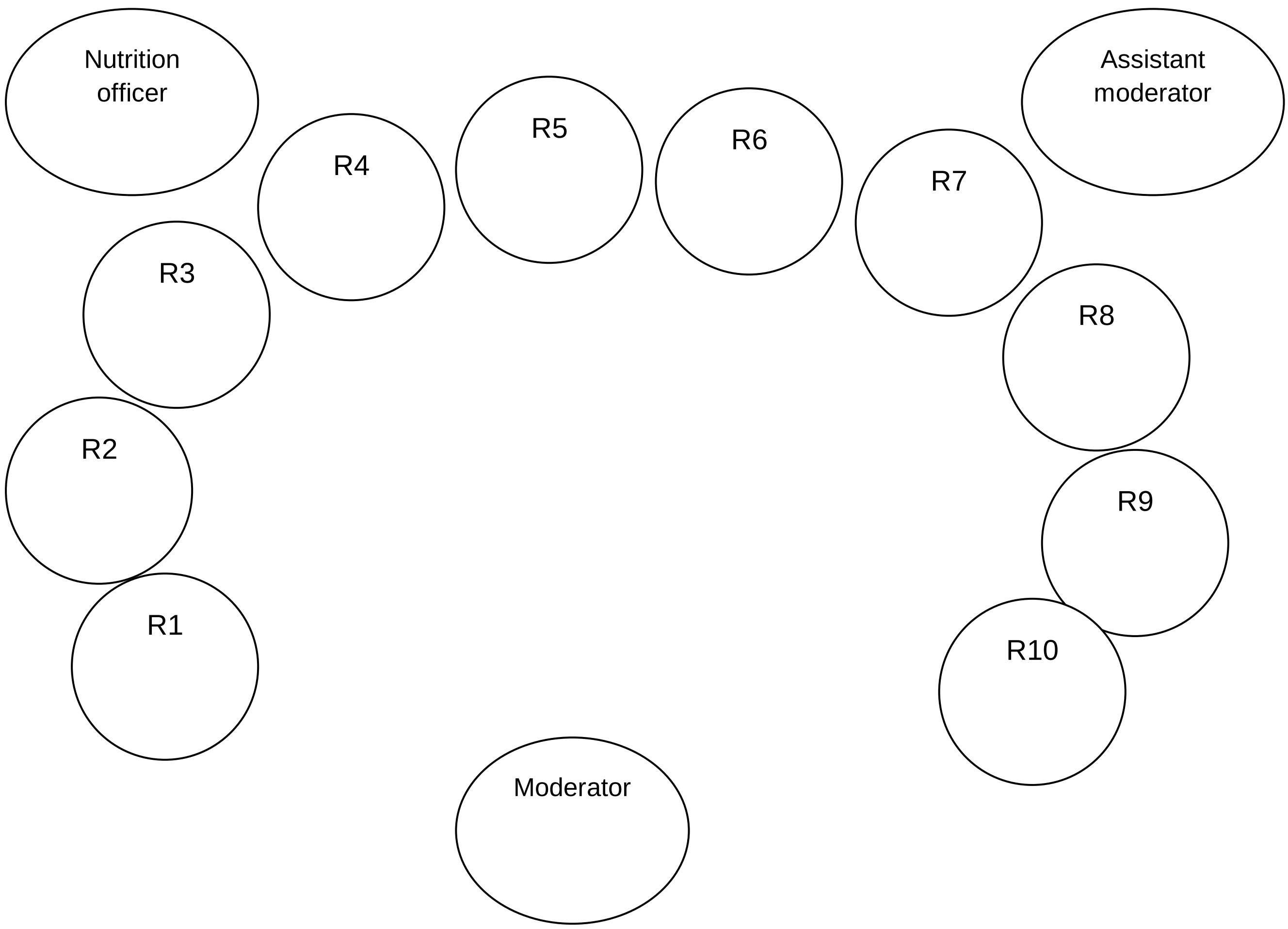
Site:.. Moderator:...

Number of participants:....................... Assistant Moderator:......................................

Date: .... Transcriber: ....

Start: .... End: ....

Focus group seating chart:



R= Respondent

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ADDENDUM 8

FOCUS GROUP NOTE-TAKER FORM

Date: .... Note-taker: ....

Question	Responses	Observation

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ADDENDUM 9A

STANDARDISATION

RECIPE EVALUATION

Date ___________________________

Quantity prepared ____

Is the yield prepared enough for the desired purpose?

____

If not what quantity was obtained?

____

What changes in quantity of ingredients are necessary?

____

Is the bread shape going to allow uniform portions for further evaluations?

____

If not how would you alter the shape of the product?

____

____

Was the cooking time too short or too long?

____

Any suggestions on cooking time

____

Was the product well accepted ____

Any other suggestions ____

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ADDENDUM 9B

SENSORY EVALUATION OF THE RECIPES

Name ____

Date ____

Type of bread ____

Quality characteristics of breads	Recommendations
Appearance (Colour and shape)	
Taste and flavour	
Texture	
Portion size	
Overall acceptability	

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ADDENDUM 10

SENSORY EVALUATION PANEL MEMBERS

Panellist No:	Names	GSM NO
1	Matthew Aijuka	0720404688
2	Lerato Mokoka	0793528380
3	Mokhaetji Marebane	0822186121
4	Lauren Smith	0729968740
5	Zinzile Zodwa	0836674189
6	Thuli Mthombeni	0787529702
7	Edwinah Apunda	0792926623
8	Malekoa Mase Mokhele	0833576137
9	Likeleli Qhomane	0731244609
10	Ruth	0720301620

Panellists Names and Contacts

Monday: 22 – 08 – 2011

Recruitment of Panellists for sensory evaluation

- Welcome and introductions
- Background and objectives of the study
- Expectations for and of the panellists participating in the DSP
  . Healthy individuals
  . Availability during testing sessions
  . Keep time
  . Reward
  . Total commitment is necessary
- Abilities of panellists
  . That panellists need not to be super tasters, but they will be trained until they all understand the attributes.
- Explore panellists senses
  Explain the difference between retro nasal aroma perception and tasting by:

… continues

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Addendum 10 (continued)

1. The 'jelly bean test'

Ask people to pinch their noses tightly. Take a jellybean into the mouth and chew while at the same time keeping the nose tightly pinched. Ask them to tell you, while keeping the nose pinched what they perceive.

Tell them to open their noses, breath out and experience the aroma of the jelly bean.

2. Custard

Panellists were presented with 2 samples of custard and asked to compare the custards and write all the sensory attributes.

Monday: 22 – 08 – 2011

Panellist Information

1. Name: ....
2. Surname: ....
3. Date of Birth: ....
4. Course of Study:..
5. Student Number:..
6. Contact Details: Email ....Cell No: ....
7. Do you have any food allegy? Yes/No...
8. If yes, please specify
....
....
9. Have you done sensory evaluation of food before? Yes/No
……………………………………………… .
10. If yes, which sensory evaluations have you done before?
....
....
11. Why do you want to participate in this particulare sensory evaluation panel?
....
....
12. Please indicate with an X the afternoon times in which you are available for this task

Monday	Tuesday	Wednesday	Thursday	Friday
14 – 16hrs	14 – 16hrs	14 – 16hrs	14 – 16hrs	14 – 16hrs

… continues

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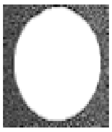
Thank you very much

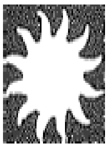
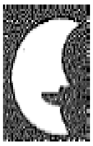
<u>Name:</u> ……………………………………………………………… Wednesday: 24 – 08 – 2011

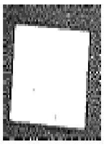
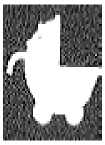
<u>Exercise 1</u>

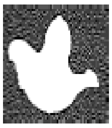
You have received a foil wrapper with 10 different shapes inside. Please carefully unfold the wrapper (be careful not to loose the shapes). Put each paper in your mouth and identify the taste. Fill the answer next to the appropriate shape below.

 ________  ________

 ________  ________

 ________  ________

 ________  ________

 ________  ________

<u>Exercise 2</u>

You have received five smell samples on strip of papers, carefully open the bottle and describe the smell of the strips. Write the code that is on the bottle and describe the smell.

1. ____
2. ____
3. ____
4. ____

… continues

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5. ____

<u>Exercise 3:</u> **White Paper Ranking Test**

You are provided with four coded paper squares with different shades of white. Please rank the papers from most white to least white by placing a "1" (most white), "2", "3" and "4" (least white) in the relevant blocks.

1 = most white; 4 = least white

855	**804**	**720**	**738**

<u>Exercise 4</u>

You have received two packets of Mini Cheddars; please describe the differences in colour, texture, taste and aroma between the two.

____

____

____

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ADDENDUM 11

WEIGHT OF DOUGH AND BREAD

Sample	Dough Before Fermentation	Dough After Fermentation	Bread
Coarse Whole Wheat	329.0	323.5	323.7
Fine Whole Wheat	330.0	324.9	329.4
Commercial Wheat	328.2	323.6	337.5
Commercial White Maize	355.6	349.7	350.2
Commercial Red Sorghum	360.6	350.4	340.8
Whole Red Sorghum	354.2	345.6	329.7
Whole White Maize	367.6	359.3	360.2
Whole White Sorghum	357.0	348.1	332.0

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ADDENDUM 12

LANGUAGE EDITOR'S LETTER

LANGUAGE EDITOR'S LETTER

TO WHOM IT MAY CONCERN

I have copy-edited this thesis in terms of language use (grammar, spelling, clarifying meaning) manually, using a red pen. Recommended changes and explanations were given as comments. The edited manuscript was discussed face-to-face. The edit includes suggesting changes to sentence structure, spelling (adopting the English (UK) spelling form and standardising on the form-ise-), vocabulary and word usage, punctuation and hyphenation (double vowel prefixes e.g. co-operate) without changing the meaning of the original text. The edit excluded paying attention to content, correctness of truth of information, spelling of specific technical terms, unfamiliar names and proper nouns, specific formulae, symbols or illustrations or references.

F Moloi

Francina Liako Moloi

Francina Liako Moloi (PhD, University of the Witwatersrand)

Professor (National University of Lesotho)

Full Member: Editing Group, English Department, National University of Lesotho

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