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The development of an innovative culinary product prepared from green leafy vegetables for the urban consumer

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The development of an innovative culinary product prepared from green leafy vegetables for the urban consumer

By

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Dissertation submitted in fulfilment of the requirements for the degree Masters in Consumer Science: Food Management

Department of Consumer and Food Sciences

Faculty of Natural and Agricultural Sciences

University of Pretoria

Supervisor: Prof. G E du Rand

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Die ontwikkeling van ‘n innoverende kulinêre produk berei van groenblaargroente vir die stedelike verbruiker

Deur

Ana Dinorah Bupo

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Verhandeling ingedien ter voldoening van die vereistes vir die graad Magister in Verbruikerswetenskap (Voedselbestuur)

Departement Verbruikers- en Voedselwetenskap

Fakulteit Natuur- en Landbouwetenskappe

Universiteit van Pretoria

Studieleier: Prof. G E du Rand

Februarie 2020

DECLARATION

I, Ana Dinorah Bupo, hereby declare that the dissertation for the degree Master of Consumer Science: Food Management at the University of Pretoria, submitted by myself, is my own work and has not previously been submitted for a degree at this or any other university or tertiary institution and that all reference material contained herein has been acknowledged.

_____

Ana Dinorah Bupo

February 2020

ETHICS STATEMENT

The author, whose name appears on the title page of this dissertation, has obtained research ethics approval for the research described in this work. The research proposal was accepted by the Ethics Committee of the Faculty of Natural and Agricultural Sciences (reference number: EC 161103-079), and the confirmation letter can be seen in Addendum G.

The author declares that she has observed the ethical standards required by the University of Pretoria's code of ethics for researchers and the policy guidelines for responsible research and has applied them to her research study.

DEDICATION

This work is dedicated to my family,
especially my father, Oscar Humberto Bupo,
and my mother, Dinorah Luisa Bupo.

Thank you for all your love and support as well
as believing in me when I felt like giving up.

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ABSTRACT

Title: **The development of an innovative culinary product prepared from African green leafy vegetables for the urban consumer**

Author: **Ana Dinorah Bupo**

Supervisor: **Prof. G E du Rand**

Department: **Consumer and Food Sciences**

Faculty: **Natural and Agricultural Sciences**

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

Indigenous or wild leafy vegetables are very nutritious foods which are underutilised. They have made a positive impact on the nutrient intake of local communities for many years due to their vitamin and mineral content, as well as their phytochemicals and antioxidants. The increase in the desire and need for convenience foods also makes it imperative that healthy options are made available amongst other convenience food products: time is valuable to the modern urban consumer, but issues of poor health attributed to convenience foods are on the rise around the world, especially obesity in South Africa. The use of African green leafy vegetables (AGLVs) helps to prevent traditional foods from becoming lost in a westernised environment, and also allows a healthier alternative product to be made available. In order to do this, consumers are vital to the process of product development as they are the ones who have the final say as to whether a product will be successful or not.

The aim of this study was to investigate and determine the desired characteristics and specifications of AGLV products, to develop four culinary products using these vegetables, and lastly to evaluate one selected culinary product by means of sensory evaluation and consumer acceptance. This study was conducted in three phases. During the first phase a data content analysis was conducted to determine trends in the market in order to identify four possible product options for consumers to select from. In this first phase, a research questionnaire was applied to collect demographic information, establish background knowledge and product characteristics of these vegetables as well as consumption information of the participants to determine what type of convenience food product is desired. This was done to obtain background knowledge of the subjects. During Phase 2 the four products were developed by following an experimental procedure. In Phase 3 one developed product was selected for sensory evaluation, which ultimately aimed to describe and evaluate the final product.

The target population for this study was urban consumers residing in Gauteng who were from different education levels, gender, race and age groups (over the age of 18 so that they were able to make their own purchasing decisions). The participants also had to be able to communicate in English, read and write English, and be computer literate.

Overall the findings confirmed that the participants in the study desired morogo pasta to be developed to the convenience stage of ready-to-cook. Apart from the type of product chosen by the participants, it was evident that the morogo pasta should be seasoned (to mask the strong vegetable taste), could have a green colouring (as it was not indicated whether it should have a green colour or not) and could have a morogo or vegetable odour.

This study contributes to closing the gap in the knowledge of the development of innovative indigenous leafy vegetable products. The process used would enable another innovative culinary product to be developed. It also promotes the use of indigenous leafy vegetables which are sometimes seen as inferior but have the potential to be developed. The growth in the consumption of products provided by the local ecosystem is also recognised internationally and is becoming more widespread. Value was also added to the study by a combination of culinary innovation and traditional recipe development used in the development process.

Keywords:

African green leafy vegetables (AGLVs), morogo, recipe development, consumer-led product development, sensory evaluation, Check All That Apply (CATA)

OPSOMMING

Titel:	**Die ontwikkeling van ‘n innoverende kulinêre produk berei van groenblaargroente vir die stedelike verbruiker**
Outeur:	**Ana Dinorah Bupo**
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Graad:	**Meesters in Verbruikerswetenskap (Voedselbestuur)**

Inheemse of wilde blaargroente is baie voedsame voedselsoorte wat egter tans onderbenut word. Hierdie tipe groente het oor baie jare 'n positiewe invloed deur hul bydrae van vitamiene, minerale, fitochemikalieë en antioksidante tot die daaglikse nutriënt inname van plaaslike gemeenskappe gehad. Die groeiende behoefte aan geriefs voedsel maak dit ook noodsaaklik dat gesonde opsies, onder andere geriefs voedselprodukte, beskikbaar gestel word, aangesien tydsbestuur vir die moderne stedelike verbruiker belangrik is, terwyl gesondheidskwessies wêreldwyd, en veral vetsug in Suid-Afrika, aan die toeneem is. Die gebruik van groenblaargroentes in Afrika help dat tradisionele kosse nie verlore gaan in 'n al meer verwesterse omgewing nie, maar ook om 'n gesonder alternatiewe produk beskikbaar te stel. Verbruikers is noodsaaklik in die proses van produkontwikkeling, want hulle insette is deurslaggewend of 'n produk suksesvol sal wees al dan nie.

Die doel van hierdie studie was om die eienskappe en spesifikasies wat in die groenblaar-groenteprodukte beskikbaar in Afrika verkies word, te ondersoek en vas te stel. Die studie het ook verder gepoog om vier kulinêre produkte te ontwikkel met van hierdie groente as bestanddeel en laastens om een geselekteerde kulinêre produk deur middel van sensoriese evaluering en verbruikersaanvaarding te evalueer. Hierdie studie is in drie fases uitgevoer. Gedurende die eerste fase is 'n inhoudsanalise uitgevoer om marknavorsing en tendense te bekom ten einde vier moontlike produksopsies te identifiseer waaruit verbruikers kon kies. In die eerste fase is 'n navorsingsvraelys saamgestel om demografiese inligting te versamel, en om 'n agtergrondkennis oor hierdie groente, produkkenmerke en verbruiksinligting van die deelnemers vas te stel om te bepaal watter tipe geriefs voedselproduk verlang word. Gedurende fase twee is die vier produkte ontwikkel deur 'n eksperimentele prosedure te volg. In fase drie is een geselekteerde ontwikkelde produk deur middel

van sensoriese evaluering getoets, wat uiteindelik ten doel gehad het om die finale produk te beskryf en te evalueer.

Die teikenpopulasie vir hierdie studie was stedelike verbruikers vanuit Gauteng, van verskillende onderwysvlakke, geslag, ras en ouderdomsgroepe (ouer as 18 jaar om in staat te wees om aankoopbesluite te neem). Die deelnemers moes ook in Engels kon kommunikeer, moes kon lees en skryf, en moes rekenaarvaardig wees.

In die geheel het die bevindinge bevestig dat verbruikers wou hê dat morogo pasta ontwikkel moet word tot ‘n gereed-om-te-kook stadium. Afgesien van die tipe produk wat deur die verbruiker gekies is, was dit duidelik dat die morogo pasta gegeur moes word (om die sterk groentesmaak te verdoesel), ‘n groen kleur kon hê (aangesien daar nie aangedui was dat dit ‘n groen kleur moes hê of nie) en dat dit ‘n morogo of groente reuk kon hê.

Hierdie studie dra by tot die vermindering in die kennisgaping in die ontwikkeling van innoverende inheemse blaargroenteprodukte. Die proses wat gebruik word, sou navorsers in staat stel om ander innoverende kulinêre produkte te ontwikkel. Dit bevorder ook die gebruik van inheemse blaargroente wat soms as minderwaardig gesien word, maar die potensiaal het om ontwikkel te word. Hierdie groei in die verbruik van die unieke plaaslike ekosisteem word ook internasionaal erken**.** Waarde is ook tot die studie toegevoeg deur 'n kombinasie van kulinêre innovasie en tradisionele resepontwikkeling in die ontwikkelingsproses te gebruik.

Sleutelwoorde:

Groenblaargroenteprodukte beskikbaar in Afrika Afrikaanse groenblaargroente, morogo, resep ontwikkeling, verbruikersgeleide produkontwikkeling, sensoriese evaluering, “Check All That Apply”(CATA)

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CHAPTER 1: THE STUDY IN PERSPECTIVE

This chapter provides a background to the study, introduces the research problem and justification of the research and briefly explains the methodology and theoretical model used. The structure of the study and important definitions, abbreviations and acronyms used in the text are also explained.

1.1 INTRODUCTION AND BACKGROUND

In most developed parts of the world, indigenous leafy vegetables are viewed as weeds, but in Africa these vegetables are an essential part of rural household diets (Senyolo, Wale and Ortmann, 2014). In South Africa, green leafy vegetables are commonly referred to as morogo, which means edible green leafy vegetable (Jansen van Rensburg, Van Averbeke, Slabbert et al., 2007). The World Health Organization (WHO) has noticed that African green leafy vegetables (AGLVs) are widely used as traditional foods, usually as a relish or potherb (cooked in a pot) and served as an accompaniment to carbohydrate staples such as maize porridge or sorghum (Jansen van Rensburg et al., 2007; Smith and Eyzaguirre, 2007; Voster, Jansen van Rensburg, Van Zijl et al., 2007). These vegetable dishes can be made from a single species of leafy vegetable or a combination of different species (Senyolo et al., 2014). The edible parts of AGLVs that are commonly consumed include the young succulent stems, the flowers and the young fruit (Jansen van Rensburg et al., 2007).

Although AGLVs are still used throughout South Africa by the African community, consumption has decreased due to westernisation (Voster et al., 2007). Other factors that influence their consumption are whether the consumers are urban or rural dwellers, whether they have access to fresh food markets or fields where the vegetables are grown, as well as the availability of AGLVs (Senyolo et al., 2014). The different types of vegetables are found throughout different regions in Africa, and are mostly picked where they grow in the wild, apart from a few species which are cultivated (Jansen van Rensburg et al., 2007).

There is a stigma attached to these AGLVs: they are labelled as “poverty foods” or having a “backwards knowledge”. This has caused younger generations to lack interest in their consumption or knowledge of their preparation, which is an issue which should be investigated as knowledge of traditional food is being lost (Voster et al., 2007).

According to the WHO, a low intake of fruits and vegetables worldwide is one of the top ten reasons contributing to mortality (WHO, 2019; Ezzati, Lopez, Rodgers *et al.*, 2002). African green leafy

vegetables have made a significant positive contribution to the total nutrient intake of African communities for many years (Faber, Van Jaarsveld and Laubscher, 2007), and have been found to significantly contribute to the daily intake of calcium, iron, zinc, magnesium, folic acid, riboflavin, vitamin C, vitamin A and copper (Faber et al., 2007; Smith and Eyzaguirre, 2007; Agte, Tarwadi, Mengale et al., 2000). These vegetables have also been found to have a higher amount of bioavailable micronutrients than cereal-legume-based meals (Agte et al., 2000) and have also been proven to contain phytochemicals and antioxidants, which are linked to protection against cardiovascular diseases and other degenerative diseases (Smith and Eyzaguirre, 2007).

There has been a boom in the emphasis and importance of innovation in the culinary industry locally and internationally (Hu, 2010), which is something that should be considered when developing new food products. “Innovation is defined as the creation of something new which has value to the customer” (Hu, 2010:3). This is needed in today’s growing food culture in order to stay ahead in a competitive industry (Nebel, Pieroni and Heinrich, 2006). Although the consumption of local foods may not seem innovative, it has become novel and trendy to consume local foods (Hesterman and Horan, 2017; Zacka, 2017; Food Stuff SA, 2012; Inwood, Sharp, Moore et al., 2008). In new product development there has been an increasing awareness of the importance of indigenous products, although it remains relatively unexplored in South Africa. Some products have been developed, such the Maggi 2-minute noodles with real morogo made by Nestle in association with the CSIR (Nestlé, 2015). With this product, one packet of noodles contains one serving of morogo (Nestlé, 2015). There are also indigenous products available which have been explored extensively, such as Rooibos tea (especially in the espresso form), marulas, moringa and aloes for use in different products (Van Wyk, 2011). Another green leafy vegetable product which has become popular in the USA is kale: there has been an increase in the sale of kale products of 42.3% from 2013 to 2014 (Burfield, 2015). The number of products made from kale are growing, from juices to chips to dips. Its use is not only increasing in the produce department, but also in convenience items (Burfield, 2015). Rhythm Superfoods in Texas and Woolworths in South Africa have also created a range of different-flavoured kale chips which have been air-dried and are a healthy snack option for on-the-go consumers (Rhythm Superfoods, 2016). Another product available in Woolworths is the raw bites range, which even contain moringa and kale as a health component (Woolworths, 2016).

African green leafy vegetable consumers are usually African individuals residing in rural areas who have access to the plants; in addition, many of them do not have enough money to purchase vegetables sold in the marketplace. Consumers residing in urban areas have limited access to open fields where the plants grow, but are more willing to pay for them because they can afford them

(Jansen van Rensburg et al., 2007). If AGLVs are found in the marketplace, they are inexpensive, which makes them a viable product to work with if it is desired by the urban consumer (Mpandeli, 2014). Very little research has been done on the exploitation of green leafy vegetables in Africa, which are underexploited and underutilised. This makes them viable for the urban consumer market and gives a competitive edge to the development of an innovative food product, apart from the fact that the development of traditional foods has gained interest worldwide (Van Wyk, 2011; Smith and Eyzaguirre, 2007).

1.2 PROBLEM STATEMENT

African green leafy vegetables are ideal food sources in Africa, particularly in South Africa, where many of the species still flourish during low rainfall seasons and droughts. This makes them convenient as they are able to be obtained almost all year round (Jansen van Rensburg et al., 2007). These vegetables are also high in nutrients, significantly contributing to the daily intake of micronutrients (Faber et al., 2007; Smith and Eyzaguirre, 2007). Low intake of fruits and vegetables is one of the main reasons contributing to the high rate of mortality from malnutrition worldwide (WHO, 2019; Ezzati *et al.*, 2002). The many health benefits of AGLVs need to be taken into consideration when developing a culinary product made from these vegetables.

Studies have shown that the consumption of AGLVs has decreased in Africa due to many factors, which is a pity as these vegetables are nutritious, they are part of traditional African food culture and occur abundantly in nature (Smith and Eyzaguirre, 2007; Voster et al., 2007). Some of the factors which have led to the decrease in consumption of these AGLVs include urbanisation, westernisation of cuisine, changing food consumption patterns, availability, changing food attitudes and the introduction of other exotic vegetable items sold in retail food establishments (Smith and Eyzaguirre, 2007). Urbanisation has decreased the consumption of traditional foods such as AGLVs. This decrease in consumption does not necessarily mean that the urban consumer is not interested in the vegetables. A possible reason could be that urban consumers do not have access to areas in which the vegetables naturally grow, and also because most of these vegetables are not commercially harvested (Jansen van Rensburg et al., 2007). African green leafy vegetables have always been a part of African cuisine and are seen as a comfort food, which has become a challenge in today's culture as westernised food culture has made traditional foods seem unappealing to younger generations (Smith and Eyzaguirre, 2007). For this reason innovation is needed to create a unique product which will be appealing and applicable to today's food culture.

Innovation is a means to provide a product which could address the decrease in consumption of AGLVs by the urban consumer. Little research has been done on innovative AGLV products (Smith and Eyzaguirre, 2007). Innovation could therefore be seen as an area of potential development in the food industry as consumers are becoming interested in new and unique products (Van Wyk, 2011; Harrington, 2004a). African cuisine, which is something unique and competitive, still remains an area which has been relatively unexplored by the rest of the world as well as locally. The following research question was therefore formulated for this study:

How can innovation be used to create nutritionally dense convenient culinary products produced from AGLVs for the urban consumer?

1.3 JUSTIFICATION OF THE STUDY

Evidence suggests that there is a knowledge gap in the area of development and innovation regarding AGLVs (Smith and Eyzaguirre, 2007). These vegetables have the potential to be developed in terms of availability and commercialisation, but this has not been done as most consumers of the vegetables harvest the plants directly in the wild or view them as inferior products (Jansen van Rensburg et al., 2007; Maunder and Meaker, 2007). To use AGLVs as an ingredient of a new product will encourage the growth and consumption of the local ecosystem. This is recognised internationally and the idea is taking hold in the food industry. It is also becoming an expanding niche market (Mpandeli, 2014). This development will contribute to the body of knowledge of AGLVs which lacks product development, and which will also allow a similar procedure to be followed when developing other innovative new products, as the process of culinary innovation has not been clearly formulated (Harrington, 2004b). African green leafy vegetables could make a positive contribution to the food industry as they adapt easily to harsh and difficult environments and are more resistant to pests and pathogens. The input required for growing them is therefore lower than that of other vegetable crops as they require fewer chemicals and pesticides (Maseko, Mabhaudhi, Tesfay et al., 2017; Kruger, Mongwaketse, Faber et al., 2015).

Local and traditional food has a structure of resistance to conventional globalising food systems, which needs to be overcome in order for consumers to accept it as part of their food culture and not regard it as old fashioned (Feagan, 2007). That being said, there is a current and increasing interest and demand for healthy eating and traditional foods (Trichopoulou, Soukara and Vasilopoulou, 2007). The modern consumer is interested in new and unique products which are innovative and provide solutions to the need for convenience (Forbes, 2019b; Harrington, 2004a). Product development using AGLVs are rare, but it is an area for growth due to the increasing interest in developing traditional

foods worldwide (Van Wyk, 2011). This research would help consumers by assisting them to eat healthy food in a tasty, convenient way. The food would take little time to prepare, while at the same time would increase the consumers' nutrient intake, which is an area of concern. According to the WHO, a low intake of fruits and vegetables worldwide is one of the main contributors to malnutrition (WHO, 2019; Ezzati *et al.*, 2002). This can be overcome with healthy products which are available commercially, without sacrificing the flavourful component in comparison to other products on the market. By creating recipes or products using these vegetables, consumers will be shown different ways to prepare these vegetables other than the traditional ways, and this could stimulate an increase in consumption (Maseko et al., 2017). Awareness creation will also help to extend demand even to those who are not familiar with the product, thus broadening the market (Maseko et al., 2017).

The information which was found in this study will contribute to the existing limited body of knowledge (Smith and Eyzaguirre, 2007), and could also be used as a reference point for further investigation into the introduction of new food products using traditional foods. The increase in the development of innovative food products using AGLVs could encourage the increase in consumption by urban consumers nationally and internationally, or it could also be used to encourage the production of innovative food products from other traditional foods. Value was added to the study through the combination of culinary innovation and traditional recipe development, which used the Check All That Apply technique (CATA), an innovative sensory technique used to obtain market research data as well as to determine the sensory and hedonistic characterisation of a food product (Belusso, Nogueira, Breda et al., 2016). This technique assisted in the development of a healthy and convenient food product that responded to the needs of the consumer market. The CATA technique was also used as an analysis procedure, adding value to the research methodology of traditional ethnic food products.

The development phase of the product was assisted by four final-year Hospitality Management students under the subject VDS 413 (Recipe Development) who also ultimately learned the process of developing a new product as well as working with indigenous foods. They were managed and controlled by the researcher, but also added value to the subject as well as to the development of the product.

1.4 RESEARCH AIM AND OBJECTIVES

The principal aim of the study was to explore, describe and develop a culinary product produced from AGLVs for the urban consumer in Gauteng in order to address issues of urbanisation, accessibility,

convenience and health. These issues were addressed in terms of sample selection and the type of product developed.

The following objectives and sub-objectives were used:

Objective 1: To investigate and determine what type of African green leafy vegetable culinary product is desired

1.1 To establish market trends of African green leafy vegetables in order to identify four possible product options
1.2 To investigate why consumers do not consume African green leafy vegetables
1.3 To determine the characteristics desired in an African green leafy vegetable product

Objective 2: To develop four innovative culinary products using African green leafy vegetables

Objective 3: To evaluate the one selected culinary product produced

3.1 To describe the one selected developed product by means of sensory evaluation
3.2 To determine consumers' liking and purchase intention of the one selected developed product

1.5 STUDY AREA

The investigation was conducted in the province of Gauteng, South Africa. Even though this is the smallest province of South Africa, it has the largest population of all the provinces, 11.2 million people, which is 22.4% of the South African population (Gauteng, 2017). Although urbanisation is associated with a decrease in the consumption of AGLVs for reasons such as availability and accessibility, when developing a new food product a larger, more prominent target group would be able to be reached in a more densely populated area (StatsSA, 2018; Cernansky, 2015).

The unit of analysis was the urban consumer of Gauteng from different educational levels, gender, race and age groups (over the age of 18 in order to be able to make purchasing decisions). They also had to be able to communicate in English, read and write English and be computer literate.

South Africa has a high rate of obesity, with almost 70% of women being overweight or obese, and 39% of men being overweight or obese (Healthy Living Alliance, 2018). There is a general belief that convenience foods are one of the main reasons why the rate of obesity in countries around the world is increasing. Convenience foods are perceived to be unhealthy and contain more calories than food prepared at home (Okrent and Kumcu, 2016). The consumption of unhealthy food items has been

linked directly to increasing urbanisation and globalisation in the food industry (Logan and Jacka, 2014). This is a reason why it is crucial to have healthy and nutritious options available in the market. Developing a culinary product using AGLVs will assist in addressing the need for a convenient and healthy food product.

1.6 RESEARCH DESIGN AND METHODOLOGY

The summary of the research design and methodology aims to introduce the reader to the study – more detail is provided in Chapter 4. A research design is a plan which the researcher follows when carrying out a project (Monette, Sullivan and De Jong, 2008:9). The principal aim of the study was to explore, describe and develop a culinary product produced from AGLVs for the urban consumer in Gauteng, and addresses issues of urbanisation, accessibility, convenience and health. The research design aims to deliver a structure for the procedure which the researcher followed in this study (Leedy and Ormrod, 2013:74). This research study was experimental and explorative. Explorative research aims to look at new perceptions of a chosen area of research which is useful when there is not much known about the topic or when there is little information available (Salkind, 2012:213; Page and Meyer, 2003:22). This is applicable to this research project as there is little information available regarding the development of AGLV culinary products (Opabode, 2017; Smith and Eyzaguirre, 2007).

The study was cross-sectional in design therefore the information was collected at one point in time (January to October 2017, except for the data content analysis given in Section 4.7) so that the information and product would still be current and not outdated (Salkind, 2012:253; Babbie and Mouton, 2001:92). The study was conducted in Gauteng and consisted of three phases. Gauteng was chosen as the sample area as it has the highest GDP (gross domestic product) in the country as well as the highest economic growth (StatsSA, 2017).

Phase 1 of the study consisted of a data content analysis and a structured self-administered electronic questionnaire (Addendums A and B) which was used to determine the product's concept and specifications as well as the sensory characteristics which interested urban consumers with regard to a new culinary product containing AGLVs. In the data content analysis, market research data was obtained as it is important to have an idea of which products will have a higher chance of succeeding and what type of product consumers will be interested in (Harrington, 2004a). Four possible product options were identified which were given as options to consumers to select from in the survey questionnaire. In this phase, the search for trends examined the topics of AGLVs and products/dishes, indigenous foods and flavours, foods with perceived health benefits and convenience foods. Various aspects such as the use of ingredients, dishes and cooking or processing methods were also

investigated. This market research was used to determine what type of products/dishes have a potential for development by determining what consumers would be interested in and what type of products should be developed in Phase 2.

The second part of Phase 1 consisted of a structured self-administered electronic questionnaire (Addendum B) and was developed on Qualtrics (which is an online research and survey tool) and was distributed electronically by means of snowball sampling using various social media platforms (Facebook and WhatsApp) which encouraged the readers to share the questionnaire among their acquaintances with the aim of recruiting more participants (De Vos, Strydom, Fouche et al., 2011:233). Snowball sampling is a good technique to use when the researcher is investigating a relatively unknown subject (De Vos et al., 2011:233). In total, 183 consumers who lived in Gauteng and were over the age of 18 answered the questionnaire. The structured, self-administered questionnaire consisted of four sections: demographics; background knowledge of AGLVs; perception of products; and the CATA technique. CATA is an innovative sensory technique which aims to capture consumer information quickly without the need for trained panellists by presenting participants with a choice of options from which they select as many as they think are applicable (Belusso et al., 2016). The questionnaire was discussed and verified by a qualified statistician and then pre-tested with 20 participants in order to identify and address or remove any possible errors. This feedback was analysed to determine whether there were any problems or whether there were any changes that needed to be made.

Phase 2 and 3 of the study followed an experimental procedure for the development of the four products (Phase 2 is shown in Addendum C) as well as the sensory evaluation of the one product selected in Phase 3 (see Addendum D). The development of the four product options was assisted by four final-year hospitality management students under the subject VDS 413 (Recipe Development), who were managed by the researcher. The one product that was selected by consumers from among the four product options in Phase 1 was then used for sensory evaluation in Phase 3 by means of a structured self-administered electronic questionnaire, which was developed on Qualtrics. A pre-test was also conducted before the consumers tasted the product. Participants in this final phase were recruited from among those who responded in Phase 1 and indicated that they would be willing to taste the developed product. In this phase there were 72 consumers who tasted the one selected product.

After the data was collected, it was processed with the assistance of a qualified statistician. Descriptive as well as inferential statistics were used to analyse the data. Experts verified the content of the

questionnaire, product development and sensory analysis in order to enhance face and construct validity.

The study made use of primary and secondary data: primary data was collected in the form of the completed questionnaires, and secondary data was obtained by conducting a literature review of relevant and reliable sources (De Vos et al., 2011).

1.7 DATA ANALYSIS

Data analysis involves processing the data collected and analysing it as well as verifying it against the literature in order to bring order, structure and meaning to the collected data (De Vos et al., 2011:76). The data obtained from the research was analysed according to the aims and objectives which were set for this study. Data was captured electronically, and the information was then presented visually using tables and figures.

In **Phase 1** regarding the market research, the data was captured and then classified into the aspects of health, African influences, indigenous ingredients and plant-based eating according to the trend analysis procedure of the Centre for Culinary Development, whereby trends are classified into five stages (Centre for Culinary Development, 2007). This data was then used to identify four possible product options which would be used as the input for the survey questionnaire and which would ultimately determine what type of product was to be developed. In this phase, the trends were discussed only to determine where product possibilities were regarding AGLVs.

In **Phase 1** regarding the survey questionnaire, the data was captured directly onto Qualtrics and exported into a Microsoft Excel spreadsheet. The data was then analysed using XLSTAT 2017, version 19.4.1.46344 (a statistical and analysis add-on software for Microsoft Excel). Two methods were used to analyse the data collected statistically: descriptive statistics and inferential statistics. These two methods assisted in translating the data into information which would assist in objective interpretation when addressing the predefined objectives. The information was then presented visually using graphs and tables. Descriptive statistics were used to analyse the demographic variables, the background questions of AGLVs, CATA, the product characteristics and the yield tests during the product development stage. Measures of central tendency were used, which included frequencies, percentages and means. The measures of dispersion used included range and variance. Descriptive statistics allowed the data to be easily portrayed visually and made it easier to describe in terms of graphs and tables (Brown and Saunders, 2008:2). The inferential statistics used in this study consisted of Z-tests and significant differences. Z-tests are used to determine whether the means of two groups

are statistically significantly different from each other. A statement would be indicated as being significantly different when there is a 5% significance level ($\alpha = 0.05$).

In **Phase 2** the process of product development was followed in order to create the four product options which were specified in Phase 1. Only one selected product was then used for sensory testing in Phase 3 (see Section 5.4). In this phase, the data analysis involved yield tests, discussions of changes and adaptations with subject experts, and descriptive ratings of sensory characteristics by an internal panel.

In **Phase 3**, descriptive and inferential statistics were used to analyse the data collected. These two methods assisted in translating the data into information which would assist in achieving the desired objectives set out for this study. The resulting information was then presented visually using graphs and tables of numeric measurements, frequencies, percentages, means and standard deviations, which provided the basis for the descriptive and inferential analysis. In this study, descriptive statistics were used to organise the data in order to obtain an overview of the data and to describe the characteristics of the sample as seen in Phase 1 (Babbie, 2010:G4). The data was captured directly onto Qualtrics and exported into a Microsoft Excel spreadsheet. The data was then analysed using XLSTAT 2017, version 19.4.1.46344. Descriptive statistics were used to analyse the demographic variables, CATA, hedonic reactions and purchase intention of the developed product. The measures of dispersion used included range and variance. Descriptive statistics allowed the data to be easily portrayed visually and made it easier to describe in terms of graphs and tables (Brown and Saunders, 2008:2). The main purpose of inferential statistics is to identify and quantify correlations between variables which will allow interpretation and testing of the relations of the research variables so that conclusions can be drawn (Walliman, 2011:213). The inferential statistics used in this study consisted of Z-tests, significant differences, correspondence analysis and acceptance indexes in the CATA and hedonic questions when drawing conclusions about the sensory evaluation of the one selected product developed.

1.8 THE CULINARY INNOVATION MODEL

The culinary product innovation model was used as the theoretical model for this study in order to develop a new culinary product. Innovation is an area in which competitive advantage is grown and is needed in today's world to compete in mature markets and to grow market share and create new markets (Fuller, 2011:10; Ottenbacher and Harrington, 2007). The culinary innovation process is a model which is used to create a food product in the business setting or service sector setting with a

competitive advantage (Harrington, 2004a). The purpose of this model is to create value and competitive advantage through product differentiation.

The model illustrated in Figure 1.1 consists of four main phases which are used to introduce a valuable food product: culinary innovation formulation; culinary innovation implementation; evaluation and control; and lastly innovative introduction (Harrington, 2004a). This model was used to develop the product using AGLVs as it assisted with the process of the creation of an innovative competitive product.

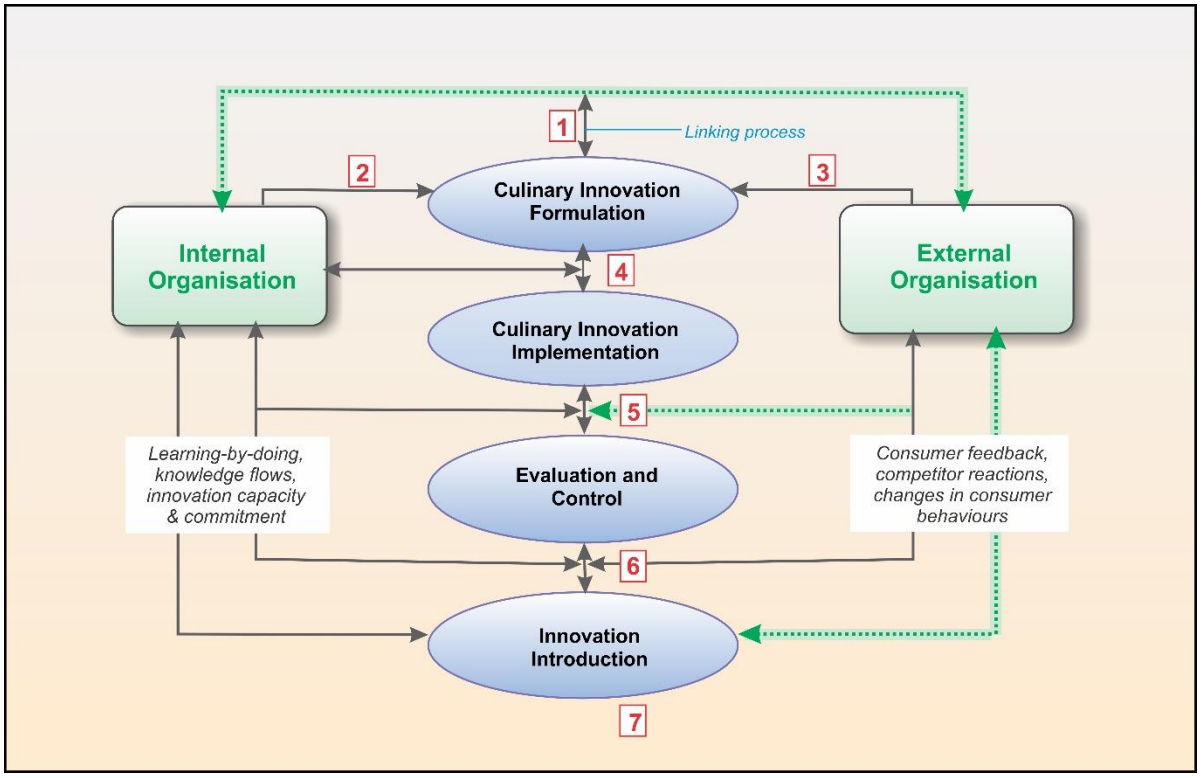


FIGURE 1.1: CULINARY PRODUCT DEVELOPMENT MODEL (HARRINGTON, 2004A)

Phase 1 (culinary innovation formulation) is where the culinary product is conceptualised and defined (Ottenbacher and Harrington, 2007; Dougherty, 1997:424-429). During the planning and linking process in this phase, the main areas involve market research in terms of understanding the customer's needs, ingredient functionality and sensory techniques (Pyne, 2000:332-343).

Phase 2 (innovation implementation) is where the product is developed and tested until a prototype is developed, which is then benchmarked against competing products. "In this stage, innovators should address aspects which need improvements such as flavour, texture or balance when compared to similar products of competitors" (Rudolph, 2008:77).

Phase 3 of this process is evaluation and control. This can be done through consumer testing, up-scaling, and HACCP control.

Phase 4 (innovation introduction) is the final phase where the product is made available to the market. This phase was not included in this study and is only mentioned for theoretical purposes and can be addressed in future research projects.

The culinary innovation process was used as a point of departure for this study as it offered a holistic approach with a comprehensive framework which would contribute to the development of a new culinary product using AGLVs for the urban consumer.

1.9 ETHICS

Ethics are seen as a set of moral principles which are set as rules or expectations regarding the most correct conduct towards experimental subjects and participants (De Vos et al., 2011:114). Ethics serve as guidelines which one aims to conduct oneself so that the treatment of participants remains humane and sensitive (De Vos et al., 2011:115). It is the researcher's responsibility to ensure that his/her study is ethical in various ways (Walliman, 2011:240-248):

- Honesty in one's work with regard to intellectual ownership and plagiarism as well as citation and acknowledgement of resources
- Responsibility and accountability of the researcher regarding every part of his/her work
- Data and interpretation of results to make sure that answers are analysed correctly and evidence is not concealed
- Ethics in relation to other people

Ethical considerations are crucial when conducting research. The researcher aimed to act professionally in all areas of the study. The research proposal of this study was submitted to the Ethics Committee of the Faculty of Natural and Agricultural Sciences of the University of Pretoria and was approved before data collection of this study began (Ethics approval number: EC161103-079 as shown in Addendum G).

Informed consent was sought from the participants who volunteered to answer the questionnaires, and they were ensured that their opinions would remain anonymous and that their demographic information would only be used for research purposes and would not made available to the public. The purpose and rationale of the questionnaire in Phase 1 and 3 were explained prior to the

participants commencing with the questionnaire, and they were free to omit questions with which they were uncomfortable.

All the literature used in this dissertation has been cited and acknowledged, and has also been recorded in the reference list. The confidentiality of each respondent was also preserved.

1.10 PRESENTATION AND STRUCTURE OF THE RESEARCH

TABLE 1.1: STRUCTURE OF CHAPTERS IN THIS DISSERTATION

Chapter Descriptions
Chapter 1: **The study in perspective** This chapter provides the background to and an overview of the study. It also briefly introduces the research problem, the aim of the study and the motivation for the research which was conducted, as well as how the research was designed and the data analysed. It also introduces the concepts covered in the dissertation.
Chapter 2: **Literature review** This chapter reviews the literature relevant to this dissertation in order to support the study as well as to provide meaning to the research. This chapter aims to indicate how the literature links to the significance of the research conducted as well as to the theoretical model.
Chapter 3: **Theoretical model** This chapter presents the theoretical model applied to this research. It gives an overview of all the concepts and processes and emphasises the applicability of the model to this research.
Chapter 4: **Research design and methodology** This chapter expands on the research approach which was followed in this study. It elaborates on the design and methodology followed including unit of analysis, measuring instrument, data collection procedures, data analysis and operationalisation.
Chapter 5: **Results and discussion** This chapter presents the data which was collected to carry out this research. The respective research objectives and their results are discussed and analysed and interpreted in line with the reviewed literature. The results are presented according to the three phases in which the study was conducted.
Chapter 6: **Conclusion** This chapter provides a summary of the main findings of the study. It also indicates the limitations and makes recommendations for future research.

1.11 DEFINITIONS, ACRONYMS AND ABBREVIATIONS

TABLE 1.2: LIST OF DEFINITIONS, ACRONYMS AND ABBREVIATIONS

AGLV	African Green Leafy Vegetables: AGLVs are indigenous leafy plants which can be used as vegetables and form part of the culinary repertoire of African communities (Van Jaarsveld, Faber, Van Heerden et al., 2014). The edible parts which can commonly be consumed are the leaves, young succulent stems (tender stems are used as the hard stems become unpalatable when cooked), the flowers and the young fruit (Senyolo, Wale and Ortmann, 2018; Joy, Aswini and Siddhuraju, 2017; Van Jaarsveld et al., 2014; Jansen van Rensburg et al., 2007)
Al dente	Al dente (Italian) refers to pasta (or rice) that is cooked but remains firm to the bite. It refers to the ideal consistency for pasta (Hazan, 2011).
AP	As Purchased. This is the part of food that is in the raw state before any cutting, processing, peeling, etc. has occurred.
***Asystasia gangetica* (creeping foxglove)**	A species of AGLV. It is a less common type of AGLV and is commonly found in most parts of Africa and flourishes in KwaZulu-Natal province in South Africa (Odhav, Beekrum, Akula et al., 2006). This AGLV is a dark green-leaved groundcover foliage with small white flowers which have purple markings in the throat.
CA	Correspondence Analysis: Correspondence analysis is a statistical method used to investigate the relationship between two qualitative variables.
CATA	Check All That Apply: The CATA technique is an important innovative sensory technique used for researching the consumer market which will ultimately indicate the type of product that needs to be developed and the desired features it should have (Belusso et al., 2016). It is also a simple and quick user-friendly way to assess consumers' perceptions of food products without the need for trained panels of experts (Ares, Barreiro, Deliza et al., 2010).
Convenience Foods	Convenience foods are foods which assist consumers by decreasing resources spent on preparing the food, such as time, effort, skills and equipment (Brunner, Van der Horst and Siegrist, 2010). These foods are processed in such a way as to make consumption of food easier with minimal effort (Jabs and Devine, 2006).
EP	Edible Portion: This is the portion of a food item that is usually eaten, excluding shells, bones, pips, skin, etc.
Exotic Vegetables	Exotic vegetables are vegetables which are not indigenous to a country but has been introduced. Many exotic vegetables are not adapted to the local conditions as indigenous vegetables are, which could make production and consumption of them expensive and thus contribute to food insecurity and malnutrition (Nyadanu and Lowor, 2015).
FAO	United Nations Food and Agriculture Organization.
Functional Food	The term "functional food" is generally used to communicate either that the food may provide health benefits beyond those delivered by traditional nutrients, or that the food has the potential to prevent disease or improve the quality of life (Santeramo, Carlucci, De Devitiis et al., 2018; Griffiths, Abernethy, Schuber et al., 2009).
Innovative Food Product Development	Innovation is recognised as the main factor which drives the success and survival of a business (Bigliardi and Galati, 2013a; Bigliardi and Galati, 2013b; Betoret, Betoret, Vidal et al., 2011). Innovative food product development is a relatively new and fast-paced developing area in food operations (Albors-Garrigós, Martinez-Monzo and Garcia-Segovia, 2018). An organisation which adopts innovation when developing new products gains the advantage by making their product and business more sustainable through a process of continual product innovation (Fuller, 2011; Dougherty, 1997:426).
Morogo	Edible green leafy vegetable (see AGLV).
Pasta	An unleavened dough made from wheat flour, water and eggs. The dough can be flavoured and coloured with a variety of herbs, spices or other ingredients and cut or extruded into a variety of shapes and sizes (Labensky, Hause and Martel, 2011:1135).
PROTA	Plant Resources of Tropical Africa.
Sensory Characteristics	The physical properties of products which are used to describe a product, e.g. appearance, colour, smell, taste, texture (Van Kleef, Van Trijp and Luning, 2005:327).

continues …

TABLE 1.2: LIST OF DEFINITIONS, ACRONYMS AND ABBREVIATIONS *(CONTINUED)*

Sensory Evaluation	Sensory testing is an important aspect of new product development and should be carried out carefully with proper experimental design as well as trained sensory panellists in order to minimise errors that can arise during the sensory analysis (Fuller, 2011:60-65). Organoleptic tests are done to evaluate food in terms of odour, flavour, texture and appearance (Fuller, 2011:60-65).
Simmer	A moist heat cooking method that uses convection to transfer heat from a hot liquid to the food submerged in it (Labensky et al., 2011:1139).
Urban Area	An urban area is usually recognised as a location which has features of towns or cities in terms of size, population and density. In these areas the population is diverse, and is comprised of different racial groups, age groups and economic brackets (Gracia and De Magistris, 2007). An urban area encompasses a wide variety of people and cultures, which will, in effect, influence the food choices of others (Feagan, 2007).
WHO	World Health Organization.

1.12 CONCLUSION

This first chapter provided an introduction to all the aspects which will be discussed further in the subsequent chapters.

Chapter 2 provides a review of the literature relevant to the study.

CHAPTER 2: LITERATURE REVIEW

From the literature consulted, this chapter provides the theoretical background to the study in order to present and conceptualise the constructs of the study. This chapter focuses on African green leafy vegetables, innovation and product development, the urban consumer and lastly convenience foods.

2.1 INTRODUCTION

African green leafy vegetables are still used throughout South Africa in many households and are known for their health properties (Senyolo et al., 2014; Faber et al., 2007). They are widely used as traditional foods such as potherbs (cooked in a pot), but their consumption has decreased for many reasons (Voster et al., 2007). Innovation is seen as an important means to stay ahead in a competitive environment such as the food industry (Albors-Garrigós et al., 2018; Hu, 2010; Nebel et al., 2006). Very little has been done about investigating AGLVs, which makes it a viable market and could provide a competitive edge (Opabode, 2017; Smith and Eyzaguirre, 2007). In new product development there has been an increasing awareness of the importance of indigenous products, although it remains relatively unexplored in South Africa. This chapter provides an overview of the following topics: AGLVs; innovation and product development; the urban consumer; and lastly convenience foods.

2.2 AFRICAN GREEN LEAFY VEGETABLES

In this section AGLVs are discussed in terms of what they are, method of preparation, availability, health aspects, consumption, and research.

2.2.1 What are African green leafy vegetables?

African green leafy vegetables are indigenous leafy plants which can be used as vegetables and form part of the culinary repertoire of African communities (Van Jaarsveld et al., 2014). The edible parts which can commonly be consumed are the leaves, young succulent stems (tender stems are used as the hard stems become unpalatable when cooked), the flowers and the young fruit (Senyolo et al., 2018; Joy et al., 2017; Van Jaarsveld et al., 2014; Jansen van Rensburg et al., 2007). In South Africa, AGLVs are commonly referred to as morogo (in Sesotho or isiPedi) or imifino (in isiZulu or isiXhosa) which means leafy vegetable (Osawaru, Ogwu, Braimah et al., 2014; Jansen van Rensburg et al., 2007). The most common species used in South Africa include the following (Maseko et al., 2017; Faber, Oelofse, Van Jaarsveld et al., 2010; Jansen van Rensburg et al., 2007):

- *Amaranthus* spp (pigweed)
- *Cleome gynandra* L. (spider plant)
- *Brassica rapa* L. subsp. Chinensis (Chinese cabbage)
- *Solanum nigrum* complex (nightshade)
- *Corchorus olitorius* and *C. tridens* (Jew's mallow)
- *Vigna unguiculata* (cowpeas)
- *Cucurbita pepeo*, *C. moschata,* and *C. maxima* (pumpkin)
- *Citrillus lanatus* and *Cucumis melo* (bitter melon)

2.2.1.1 Asystasia gangetica

The species of AGLV used for this study was *Asystasia gangetica* (creeping foxglove) and is a less common type of AGLV. It is readily found in most of Africa and flourishes in KwaZulu-Natal province of South Africa (Odhav et al., 2006). This AGLV is a dark green-leafed groundcover foliage with small white flowers which have purple markings in the throat (see Figure 2.1). It was commonly used by ethnic populations due to its health properties, as it has mineral concentrations exceeding 1% of the plant's dry weight, which is higher than the mineral concentrations found in commercial leafy vegetables (Aworh, 2018; Odhav et al., 2006). In terms of minerals, creeping foxglove is rich in calcium,

FIGURE 2.1: ASYSTASIA GANGETICA (PLANTBOOK, 2018)

phosphorus, sodium, zinc, manganese, magnesium and iron (Sivakumar, Chen and Sultanbawa, 2018). It is also a rich source of antioxidants and provides important dietary phytochemicals (Sivakumar et al., 2018). Table 2.1 shows the nutritional composition of *Asystasia gangetica*. In Table 2.1 it can be seen that *Asystasia gangetica* contains high levels of minerals, especially calcium and phosphorus.

Asystasia gangetica does not require formal cultivation, but it does have the potential to be commercially cultivated (Aworh, 2018).

TABLE 2.1: APPROXIMATE NUTRITIONAL COMPOSITION OF ASYSTASIA GANGETICA (SIVAKUMAR ET AL., 2018)

Nutritional analysis of *A. gangetica* per 100 g fresh weight (approximately 3 cups of leaves)							
Energy	**Moisture**	**Protein**	**Fat**	**Fibre**	**Ash**	**Carbohydrates**	
50 kCal	85 g	3 g	0.5 g	1.63 g	2.84 g	8.27 g	
Minerals found in *A. gangetica* per 100 g dry weight (approximately 3 cups of leaves)							
Calcium	**Phosphorus**	**Sodium**	**Manganese**	**Copper**	**Zinc**	**Magnesium**	**Iron**
2566 mg	814 mg	933 mg	18 mg	4 mg	7 mg	961 mg	21 mg
Antioxidant activity of *A. gangetica* (% inhibited per 100 mg/ml of methanol extract)							
84 % inhibited							

2.2.2 Methods of preparation of African green leafy vegetables

The World Health Organization has noticed that AGLVs are widely used in traditional foods, usually as a relish, soup, sauce or potherb (cooked in a pot) and served as an accompaniment to carbohydrate staples such as maize porridge or sorghum (Maseko et al., 2017; Jansen van Rensburg et al., 2007; Smith and Eyzaguirre, 2007; Voster et al., 2007). These vegetable dishes can be made from one species of leafy vegetable or a combination of different species (Senyolo et al., 2014; Jansen van Rensburg et al., 2007). When these vegetables are cooked, ingredients such as salt, oil, butter, groundnuts, coconut, milk, dried melon, tomato, onion, chillies or spices are also sometimes added depending on availability and preference to enhance the taste (Moyo, Mavumengwana and Kayitesi, 2018; Jansen van Rensburg et al., 2007; Nguni and Mwila, 2007; Ogoye-Ndegwa and Aagaard-Hansen, 2003). The method of preparation tends to be similar within particular cultural groups (Jansen van Rensburg et al., 2007).

Traditionally AGLVs are boiled, blanched or steamed although they can be eaten raw. With boiling and blanching, the water is usually replaced if the vegetable is bitter (such as nightshade – *Solanum retroflexum*), or it is boiled in milk before the above-mentioned ingredients are added (Jansen van Rensburg et al., 2007). More delicate AGLVs (such as pumpkin leaves and flowers) are steamed (Moyo et al., 2018; Jansen van Rensburg et al., 2007). AGLVs which have a slimy texture are usually boiled in salt water with bicarbonate of soda in order to decrease this texture, which may be unappetising (Faber et al., 2010). As a result of the short shelf life, seasonality and perishability of the leaves, they are sometimes blanched and sun dried for storage or blanched and frozen to make them more readily available (Smith and Eyzaguirre, 2007; Voster et al., 2007). They are also suitable for processing as canned foods (Van Wyk, 2011). The perishability of these AGLVs must be taken into consideration

when developing a product as this quality can create problems in processing, distribution and marketing (Smith and Eyzaguirre, 2007). Storage, methods of cooking and drying can also reduce the micronutrient and antioxidant content of these vegetables, so care should be taken not to compromise the contents of these vegetables (Essack, Odhav and Mellem, 2017; Moyo, Mavumengwana and Kayitesi, 2017; Uusiku, Oelofse, Duodu et al., 2010).

The micronutrients of AGLVs are affected differently depending on the type of AGLV used as well as the type of processing (Uusiku et al., 2010). A study was done in KwaZulu-Natal, South Africa, in which 13 different AGLVs were processed to determine the effect of processing on their nutrient levels (Essack et al., 2017). It was determined that boiling the vegetables for a minimum of 5 minutes and a maximum of 15 minutes would not affect those micronutrients which are beneficial to the consumer (Essack et al., 2017).

2.2.3 Availability of African green leafy vegetables

The organization Plant Resources of Tropical Africa (PROTA) has discovered that of the 6 376 indigenous African plants available, 397 are edible/vegetables found all over the continent (Smith and Eyzaguirre, 2007). African green leafy vegetables can be found in the wild or can be cultivated and are ideal food sources in Africa, specifically South Africa, as many of the species flourish during low rainfall seasons and droughts (Uusiku et al., 2010; Jansen van Rensburg et al., 2007).

African green leafy vegetables are found in the wild in rural areas, in cultivated and fallow fields (as weeds), or are sold in informal markets in urban areas (Cernansky, 2015; Faber et al., 2010). They can also be cultivated, but this is rarely done, so the population relies on the abundance of AGLVs which are found naturally and readily available. Moreover, they are rarely available commercially, and if they are they are in the form of a dried product but still in limited quantities (Opabode, 2017; Cernansky, 2015; Jansen van Rensburg et al., 2007). This has to do with the shelf life of the product as well as the demand (Opabode, 2017; Jansen van Rensburg et al., 2007). Marketing of AGLVs is low in South Africa, and they are rarely found in supermarkets, which also contributes to their low consumption (Maseko et al., 2017). In other parts of Africa, AGLVs are produced and sold commercially, so there is no reason why the same cannot be done in South Africa (Cernansky, 2015; Mpandeli, 2014).

Due to the high nutrient content of AGLVs, promotion of them as a crop in South Africa and other developing countries should be encouraged, as this will assist with the promotion of biodiversity and combating malnutrition, as well as addressing the issue of accessibility and availability (Osawaru et al., 2014; Schönfeldt and Pretorius, 2011).

2.2.4 Health aspects of African green leafy vegetables

According to the WHO, a low intake of fruits and vegetables worldwide is one of the top ten reasons contributing to malnutrition and mortality (WHO, 2019; Ezzati *et al.*, 2002). The WHO recommends that one should consume at least 400 g of vegetables and fruit daily for a healthy lifestyle, which is about double the amount consumed by the average South African (Aworh, 2018; Faber et al., 2010). As a result of African diets being predominantly based on carbohydrate staples, the re-introduction of vegetables is necessary to overcome these low intakes of vegetables and reduce malnutrition as well as to promote health (Joy et al., 2017; Agte et al., 2000). African green leafy vegetables have an important role in maintaining health, especially for rural populations (Joy et al., 2017). As a result, the WHO has created an initiative to increase fruit and vegetable consumption in Africa by making use of indigenous and traditional vegetables as they have been known to be essential ingredients in traditional soups and sauces accompanying carbohydrate staples, and contain bioactive compounds possessing health-promoting and protective properties (Sivakumar et al., 2018; Smith and Eyzaguirre, 2007).

African green leafy vegetables are increasingly being recognised as possible contributors of micronutrients and bioactive compounds in the diet and are thus classified as functional foods (Van der Walt, Loots, Ibrahim et al., 2009; Siró, Kapolna, Kapolna et al., 2008; Smith and Eyzaguirre, 2007). The term “functional food” is generally used to communicate either that the food may provide health benefits beyond those delivered by traditional nutrients, or that the food has the potential to prevent disease or to contribute to a better quality of life (Santeramo et al., 2018; Griffiths et al., 2009).

African green leafy vegetables have made a significant positive impact on the total nutrient intake of African communities for many years due to their health-protecting properties (Faber et al., 2007; Smith and Eyzaguirre, 2007) and have been found to contribute significantly to daily dietary vitamin and mineral intakes, such as calcium, iron, zinc, magnesium, folic acid, riboflavin, vitamin C, vitamin A, copper, fibre and antioxidants (Aworh, 2018; Faber et al., 2007; Smith and Eyzaguirre, 2007; Agte et al., 2000). These vegetables have also been found to have a 3.6 times higher bioavailability in micronutrient amounts than cereal-legume-based meals (Agte et al., 2000) and have also been proven to contain phytochemicals and antioxidants which are linked to the protection against cardiovascular diseases and other degenerative diseases (Smith and Eyzaguirre, 2007). Increasing awareness of and attention to the health-protecting properties of non-nutrient bioactive compounds in fruits and vegetables have directed a strong focus on vegetables as vital components of one’s daily diet (Smith and Eyzaguirre, 2007).

Indigenous vegetables should be promoted as much as “exotic” vegetables in order for them not to be viewed as inferior even when they are nutritionally superior and higher in micronutrients (Cernansky, 2015; Labadarios and Steyn, 2001). With the nutritional dilemma facing Africa, many individuals are suffering from micronutrient deficiencies, which is a strong reason why consumption of traditional food should be encouraged (Schönfeldt and Pretorius, 2011). African green leafy vegetables can provide 10% of the recommended daily allowance of many minerals, which is why these vegetables should be promoted as they contribute to improvement of the diet (Odhav et al., 2006).

Consumers also want to see more local and traditional foods on the market as they are perceived as being of higher quality and being more sustainable (Cernansky, 2015; Risku-Norja, Hietala, Virtanen et al., 2008; Asebo, Jervell, Lieblein et al., 2007; Chambers, Lobb, Butler et al., 2007; Fandos and Flavian, 2006). The use of local and indigenous ingredients has also recently become a culinary trend (Unilever, 2019; Eat Out, 2017).

2.2.5 Consumption of African green leafy vegetables

Although AGLVs are still used throughout South Africa by the African community, consumption has decreased for various reasons such as westernisation and urbanisation (Cernansky, 2015; Voster et al., 2007). Urban households consume less AGLVs because they lack access to areas where the vegetables grow naturally (Jansen van Rensburg et al., 2007). This decline in consumption, production and utilisation of AGLVs poses a threat to the status of food security and sustainability (Senyolo et al., 2018). Urban areas encompass a wide variety of people and cultures, which influences the food choices of people living in these areas (Feagan, 2007). Other factors that influence the consumption of AGLVs are the consumers’ access to fresh food markets or fields where the vegetables grow, as well as their availability and seasonality, the consumers’ taste preferences, income levels, gender, cultural background and ethnicity, and age (Moyo et al., 2018; Senyolo et al., 2014; Jansen van Rensburg et al., 2007). Another significant reason why people do not consume these vegetables is because they do not know how to prepare them (Cernansky, 2015). It is also generally believed that the introduction of exotic vegetables has contributed to a decrease in the production and consumption of AGLVs as, despite their abundance, they remain underexplored and underutilised (Maseko et al., 2017).

Many communities in South Africa are not aware of the nutritional value of AGLVs and view them as inferior and a poor person’s food (Cernansky, 2015; Faber et al., 2007; Steyn, Olivier, Winter et al., 2001; FAO, 1997). Historically women are the major custodians of the gathering of AGLVs as well as the knowledge associated with them, but the stigma of AGLVs being regarded as an inferior product

has led to younger generations not being interested in their consumption or knowledge of their preparation. This is an issue which should be looked at as knowledge of traditional food is being lost and younger generations are becoming more and more unfamiliar with these vegetables (Maseko et al., 2017; Cernansky, 2015; Jansen van Rensburg et al., 2007; Voster et al., 2007). Indigenous vegetables should be promoted as much as exotic vegetables are in order for them not to be viewed as inferior, despite the fact that they are nutritionally superior and higher in micronutrients (Cernansky, 2015; Labadarios and Steyn, 2001).

Consumers are beginning to see the importance of eating locally produced foods over imported or exotic foods especially when they begin to realise that local foods taste better, are of higher quality and provide environmental benefits and sustainability. This is why promoting and developing a product using AGLVs is advised (Hempel and Hamm, 2016; Cernansky, 2015; Feldmann and Hamm, 2015; Campbell, Mhlanga and Lesschaeve, 2013; Grebitus, Lusk and Nayga, 2013; Cranfield, Henson and Blandon, 2012; Shafie and Rennie, 2012; Stanton, Wiley and Wirth, 2012; Adams and Adams, 2011; Bingen, Sage and Sirieix, 2011; Dunne, Chambers, Giombolini et al., 2011; Onozaka and Mc Fadden, 2011; Conner, Colasanti, Ross et al., 2010). A possible strategy would be to introduce these vegetables into urban areas through developed recipes to show traditional and modernised ways of preparing them (Smith and Eyzaguirre, 2007).

2.2.6 Research on African green leafy vegetables

In spite of evidence confirming the nutritional contribution that AGLVs make to one's diet and their health-protecting properties, very little research has been done on the exploitation of AGLVs in Africa. Their properties make them a viable market as they are nutritious and provide a competitive edge (Opabode, 2017; Smith and Eyzaguirre, 2007). Other advantages of using AGLVs over exotic vegetables are that they are easy to grow, are high in micronutrients, require few resources (such as water) and can help provide food security and sustainability (Croft, 2016; Mpandeli, 2014). Consumers would increase their nutrient intake by adding AGFLVs to their diet, but further research is first needed to on how to promote and increase the consumption of these vegetables such as the potential of value-added products (Odhav et al., 2006).

Micronutrient deficiency is a worldwide problem affecting over 2 billion people (WHO, 2019; Flyman and Afolayan, 2006). African green leafy vegetables could make an important contribution to the prevention of micronutrient malnutrition, and they could also provide food security as they are cost-effective and sustainable (Kruger et al., 2015; Van Jaarsveld et al., 2014; Flyman and Afolayan, 2006). Three main strategies have been applied by the World Health Organization (WHO) to address

micronutrient malnutrition, namely: supplementation; fortification; and dietary modification (Kruger et al., 2015; Flyman and Afolayan, 2006). Fortification entails using widely accessible and commonly consumed foods to deliver micronutrients. African green leafy vegetables are important in promoting food security and wellness in Africa on account of their availability, affordability, nutritional value and health-promoting properties (Aworh, 2018).

Functional foods contain bioactive components that have proven physiological effects and provide additional health benefits and reduced risks of diseases. Bioactive components are present in AGLVs, which would therefore be beneficial in the creation of fortified food products to improve their nutritional value and contribution to nutrient security (Aworh, 2018). In order to promote the consumption and commercialisation of AGLVs, further research is required in South Africa (Maseko et al., 2017).

In new product development, there has been an increasing awareness of the importance of indigenous products, although this remains relatively unexplored in South Africa (Opabode, 2017). Some products have been developed, such as the Maggi 2-minute noodles with real morogo made by Nestle in association with the CSIR (Nestlé, 2015). In this product, one packet of noodles contains one serving of morogo (Nestlé, 2015). Woolworths, a popular retail chain, has also developed various products such as moringa yoghurts and granola as well as kale smoothies, granola and chips (Woolworths, 2018).

Another green leafy vegetable product which has become popular in the USA is kale – there has been an increase in the sale of kale products being of 42.3% from 2013 to 2014 (Burfield, 2015), as well as an increase in the consumption of moringa (Cernansky, 2015). The number of products made from kale are growing, and its use is increasing in the produce department as well as in convenience items (Burfield, 2015).

For traditional foods to remain popular, innovation is needed to increase market share in terms of improvement (e.g. health, convenience etc.) (Guerrero, Guardia, Xicola et al., 2009). In all product markets, new products with an ethnic positioning in terms of flavour or ingredients have increased in demand and availability, especially in snacks, bakery items, cereals, dairy foods, sauces and dressings (Milton, 2003). African green leafy vegetables are becoming very popular in East Africa as local residents are not only seeing the importance of these vegetables in terms of health, but also in terms of food security and maintaining their food culture (Cernansky, 2015). Various dishes containing AGLVs are now becoming more popular in restaurants, which is a good indication as to where these vegetables have the potential to go to in South Africa (Cernansky, 2015).

Worldwide, chefs have increasingly been going back to their roots and are using traditional cooking methods with changes and innovations in ingredients, techniques and preparation styles (Unilever, 2019; Maloney, 2017). Superfoods are also starting to become mainstream as consumers are becoming more aware of the health benefits of food (Maloney, 2017). Even though AGLVs are underutilised at present, it seems that there is a strong indication that they have the potential to become a trend and gain in popularity due to the culinary trends observed. This can be done by using innovation and food product development.

2.3 INNOVATION AND FOOD PRODUCT DEVELOPMENT

Innovation is recognised as the main factor that drives the success and survival of a business (Bigliardi and Galati, 2013a; Bigliardi and Galati, 2013b; Betoret et al., 2011). Innovative food product development is a relatively new and fast-paced developing area in food operations (Albors-Garrigós et al., 2018). An organisation which adopts innovation when developing new products has an advantage by making their product and business more sustainable through a process of continual product innovation (Fuller, 2011; Dougherty, 1997:426).

Traditional food product development does not show all the aspects within real-time food product development, which could be problematic when developing new products as they have a high chance of failing (Harrington, 2004b). During the process of traditional food product development, a greater number of steps are needed to complete the process, which in a real-time setting would occur in a more integrative manner. This is why it is necessary to use a model which integrates both traditional product development as well as innovation when developing a new product; such a model exists, namely the Culinary Innovation Model (Harrington, 2004b).

Given the current complex and competitive food industry, creating innovative systems and products (which is different to those of competitors) will enable and promote a culture which encourages continuous innovation in the future (Fuller, 2011; Moskowitz, 2001:40-52; Dougherty, 1997:427).

Rising consumer expectations make new product development necessary in order to keep up with what the consumer wants (Grunert, 2017; Milton, 2003). Key areas for new product development include convenience foods, foods with perceived health benefits (functional foods), premium quality foods, sustainability, range extensions, product improvements and new product categories (Grunert, 2017; Milton, 2003). Consumers have increased their desires and demands for convenience foods (Milton, 2003), therefore novel products have become essential to retain competitive advantage (Jaeger, Rossiter, Wismer et al., 2003).

When implementing innovation in their traditional food items/dishes, producers consider factors such as novelty and change (e.g. ingredients or methods of preparation/storage, etc.), variety (e.g. taste), processing and technology, and convenience (as well as level of convenience, e.g. ready to eat, ready to cook) (Guerrero et al., 2009).

The following sections are based on the Culinary Innovation Framework by Harrington (2004), which can be found in more detail in Chapter 3.

2.3.1 Culinary innovation formulation

During this phase, there is a combination of strategy, consumer research, culinary techniques and food science technology, which are required to successfully formulate, test and launch new products into the market (Harrington, 2004b). Innovators should make sure that the design of the product reflects the customers' needs, market structure, organisational capabilities and abilities/skills (Betoret et al., 2011; Dougherty, 1997:424-429). The main elements that are included in the process of this phase include setting the scenario, selecting the team, planning and linking, product definition, chefmanship and food science (Harrington, 2004b), which are shown in Table 2.2 and discussed in more detail in Chapter 3.

TABLE 2.2: ASPECTS OF CULINARY INNOVATION FORMULATION

Aspects of culinary innovation formulation	Details
Setting the scenario	In the food industry it is estimated that more than 80% of new products are terminated within the first year of introduction, which costs the industry billions of dollars in underutilised resources (Fuller, 2011:60-65; Rudolph, 1995). To have a greater chance of succeeding or producing a successful product, one should carefully consider the team members and the organisation (Pyne, 2000:330) as well as the linking requirements of the organisation's objectives with the external environment (Rudolph, 1995:60-65). In this step it is essential to balance the needs of the external environment with the needs and abilities of the internal environment.
Selecting the team	In the traditional product development process, the research and development team is usually set up as a separate unit from other operations until the implementation and introduction phases of the final product (Harrington, 2004b). In a real-time setting, the team is usually involved in every phase of the project as this will increase the probability of a clear understanding of customer needs and market knowledge, and of overcoming potential technical difficulties (Stewart-Knox and Mitchell, 2003). In order to be creative and innovative during product development, the team developing the product must be able to strike a balance between internal and external tensions (Harrington, 2004b).
Planning and linking	In the food product development process the main concepts one is dealing with include market research and technical feasibility based on projected cost parameters (Pyne, 2000:330-340), as well as food safety design, ingredient functionality and formal sensory techniques. In this phase, internal and external factors must also be considered (these factors will be discussed in Chapter 3).
Chefmanship and food science techniques	Chefmanship involves all aspects of culinary knowledge such as food preparation, presentation, flavour combinations and ethnic influences (Harrington, 2004b). Food science techniques involve aspects such as the chemical properties of food, the ability to use advanced food preservation and cooking techniques (e.g. sous vide and dehydration), the use of speciality food products and sensory analysis techniques (Harrington, 2004b).
Product definition	Once all the above aspects have been covered, the culinary innovation team advances to the stage of product definition, which is the final step before the development of the product begins.

2.3.1.1 Culinary trend mapping

It is essential to be modern and take into consideration the trends of the food industry in order to keep ahead and competitive and not fall behind. Important aspects which food organisations should look at include ingredients, cooking styles and products (Centre for Culinary Development, 2007). The Centre for Culinary Development (Centre for Culinary Development, 2007) (an American food and beverage product development company which combines culinary creativity with strategic marketing) identifies the maturity level of food trends according to five stages:

- Stage 1: The ingredient, dish/cooking technique appears in fine dining/ethnic restaurants created by chefs
- Stage 2: The item (ingredient, dish/cooking technique) features in speciality consumer-orientated TV food channels and magazines
- Stage 3: The item starts to feature in mainstream restaurants and retail stores
- Stage 4: The item features in popular women's or family-orientated magazines/publications
- Stage 5: The item has finally reached quick service restaurants and grocery stores and has become a mainstream product

By following these steps one will be using a validated method to identify at what stage the specific food product is in and whether it is gaining popularity or is short-lived, e.g. if the product is still unknown/unexplored (stage 1) or is in the highest and most explored stage (stage 5).

2.3.2 Culinary innovation implementation

In this second phase, many issues are assessed through a process of formulation, testing and ultimately prototype development and benchmarking against competing products (Harrington, 2004b). Sensory techniques are also used. Aspects that should be considered in this phase include general preferences, production capabilities, consistency requirements, cost considerations, taste, appearance, preferences, timing and process improvement (Harrington, 2004b).

Once the prototype has been developed any recommendations or improvements should be taken into consideration and adapted. These could include improvements in flavour, texture and balance, or properties which competing products have which are desired (Rudolph, 1995). Once these improvements have been taken into account, an evaluation needs to be done, and a product profile assessment should be established by multiple evaluators to minimise variances (Brockhoff, 2003).

2.3.2.1 Product development process

The product development process begins when ideas are gathered and explored regarding appropriateness for the business, capability, marketability, and technical and manufacturing feasibility (Fuller, 2011:60-65). Once all these aspects have been established, a product concept is drawn up, which will determine what specifications the product should have. At this point, technical research on the project is done, and basic recipes are searched and formulated by the culinologist/chef (Fuller, 2011:60-65). The existing recipes are tested and adapted to create the new recipe or prototype. This prototype is subject to product testing, cost analysis, shelf life testing and food safety testing (Fuller, 2011:60-65).

2.3.3 Evaluation and control

This phase is based on feedback loops (see Chapter 3) from the internal and external environments to correct any problems and implement control systems to ensure a high-quality product. In this phase consumer testing comes into effect, which adds value to the product being developed. Characteristics such as taste, appearance, pricing and perceived quality can be measured (Harrington, 2004b). After evaluation a product is typically adapted to be tested for a larger volume situation. This is when product transfer occurs, which will indicate how much variance a product can withstand before it is outside the areas of specification and is unacceptable to the consumer (Harrington, 2004b; Schonberger, 1994). Processing in this phase can also be applied, e.g. whether the product should be microwavable, or whether it can be transferred and made in another establishment or made with other equipment and facilities (Harrington, 2004b; Schonberger, 1994). The last area covered by evaluation and control is the application of HACCP in order to prioritise and minimise any possible hazards that may occur during the product introduction (Harrington, 2004b; Rudolph, 1995:3-11).

2.3.4 Sensory evaluation techniques

Sensory testing is an important aspect of new product development and should be carried out carefully with proper experimental design as well as selected and trained sensory panellists in order to minimise errors that can arise in the sensory analysis (Fuller, 2011:60-65). Organoleptic tests are done which evaluate food in terms of odour, flavour, texture and appearance (Fuller, 2011:60-65). There are three types of sensory techniques, namely:

Difference testing: In this type of testing participants attempt to determine whether they can detect any noticeable differences between two types of products tasted. These tests are also referred to as

discrimination tests (Lawless and Heyman, 2010:5). Different types of testing methods include triangle tests, duo-trio tests and paired comparison tests (Lawless and Heyman, 2010:6).

Descriptive analysis: This type of testing method aims to quantify the perceived intensities of the sensory characteristics of a product (Lawless and Heyman, 2010:6). Descriptive analysis methods include the Flavour Profile® method, the Texture Profile method and Quantitative Descriptive Analysis® (Lawless and Heyman, 2010:6-7).

Affective testing: This last type of sensory test attempts to quantify the degree of liking or disliking of a product, and can also be referred to as an hedonic test method (Lawless and Heyman, 2010:7). In this method a choice of options is offered to the participants to determine whether there is a clear preference. However, the only problem with this method is that it is not very informative about the magnitude of liking or disliking (Lawless and Heyman, 2010:7). Nine-point hedonic scales are often used in this method (Lawless and Heyman, 2010:7-8).

2.3.4.1 Check All That Apply

Information about the sensory characteristics of food products is critical for the successful development and marketing of new products. Traditionally, sensory data has been obtained by using descriptive sensory analysis using trained panels of food testers (Stone and Sidel, 2004), but this has become expensive and time consuming. Thus a need has arisen to create alternative descriptive tools which will allow data and product descriptions to be obtained directly from the consumer, which is why novel descriptive methods are necessary (Ares and Jaeger, 2013). Novel descriptive methods are simple and flexible alternatives to classic sensory descriptions by trained panels (Varela, 2015). One such method is CATA.

The CATA technique is an important innovative sensory technique used for researching the consumer market. It ultimately indicates the type of product needed to be developed as well as the desired features it should have (Belusso et al., 2016). It is also a simple and quick user-friendly method to assess consumers' perceptions of food products without the need for trained panels of experts (Ares et al., 2010).

CATA is a versatile multiple-choice question format in which aspects of a product that need to be evaluated are simply ticked off by the participants, or the participants select terms which have been provided which they think best describe the product. The relevance of each response option is then determined by calculating its frequency of use (Ares and Jaeger, 2013). Participants are allowed to select as many of the options as they like which they consider the most appropriate. In market

research, multiple choice is a popular question format, because it has been shown to reduce the response burden and does not fatigue the participants when they answer the questions (Smyth, Dillman, Melani Christian et al., 2006; Best and Krueger, 2004; Rasinski, Mingay and Bradburn, 1994). A CATA test should incorporate a minimum of 50 participants (Meyners and Castura, 2014).

Apart from knowing how much consumers like a product, food companies need information about the sensory characteristics consumers expect to find in the product (i.e. which sensory attributes drive consumer liking). This is done in order to design food products which will meet the consumers' sensory expectations (Ten Kleij and Musters, 2003; Guinard, Uotani and Schlich, 2001). This could also be achieved through the use of CATA.

A study in Brazil has recently used this technique for market research as well as for a sensory and hedonistic characterisation of a final fish-based product. Check All That Apply was used at the beginning of the study in order to gain quick market research results in the form of a questionnaire and also at the end to determine the sensory description of the product developed and its acceptance. The questionnaire consisted of 20 sentences (regarding sensory characteristics, types of products and consumer habits regarding fish products), each of which had an opposing sentence. The sentences were presented in random order in order to obtain accurate results (Ares and Jaeger, 2013). Statements in which both opposites were chosen were discarded. A 9-point hedonic scale was used in the sensory evaluation stage in order to evaluate acceptance of the product, and another CATA questionnaire containing sensory and hedonistic attributes related to the product was also applied.

When listing CATA terms for product descriptions, the study indicated that the terms should be randomised to obtain accurate data and to avoid any mistakes related to the order in which the terms appear. On the other hand, when evaluating the food product, it is necessary to list the sensory attributes (CATA terms) in the order in which they will be perceived (i.e. questions about appearance will be asked first because the consumer looks at a product before eating it) (Ares and Jaeger, 2013).

The consumer's role is crucial in each stage of new product development as the product should be in accordance with the preferences of the consumer in order to achieve acceptance (Van Kleef et al., 2005). The advantage of using this method is that it is a quick technique which can be applied to consumers without the need for trained panels of experts (Belusso et al., 2016).

2.3.5 Product Introduction

This is the final step in the process of innovative new product development and is where sales, marketing and distribution of the product will occur. For this study, this phase will not be included as the focus is on the theory behind new product development, but it could be pursued in future studies.

It is suggested that urban consumers are more responsive to new food products and have a greater impact on the urban market segment (Cullen and Kingston, 2009). Factors identified which urban consumers take into consideration when buying new food products include price, quality, taste, health issues and nutritional composition (Cullen and Kingston, 2009).

2.4 THE URBAN CONSUMER

In this section urban consumers are discussed in terms of characteristics and lifestyle. Lastly, urban consumers in South Africa and Gauteng are discussed.

2.4.1 Characteristics of urban consumers

Urban consumers are individuals residing in urban areas. Urban areas are usually recognised as locations which has features of towns or cities in terms of size, population and density. In these areas, the population is diverse, comprising of different racial groups, age groups and economic brackets (Gracia and De Magistris, 2007). The urban consumer is increasingly becoming self-aware, informed and connected, and demands new and exciting experiences (Clark, 2012).

People residing in urban areas usually reside in areas with a better infrastructure than in rural areas and have access to many different services, including food establishment and retail outlets, and thus these areas have a high level of consumption in comparison to rural areas. Urban dwellers do not have access to open fields or natural areas, which would enable them to harvest naturally growing vegetation (Cernansky, 2015; Faber et al., 2010).

Urban areas encompass a wide variety of people and cultures, which will influence the food choices of people living in the area (Feagan, 2007). The Food and Agriculture Organization of the United Nations (FAO) has predicted that there will be nine billion people living in urban areas worldwide by 2050 (70% of the world's population), mostly in low-income and developing countries (FAO, 2019); thus food and nutrition security and sustainability for urban dwellers is at stake. With a growing population and increasing difficulty in accessing natural vegetation to harvest it, home-grown and local foods are becoming an important aspect of sustainability. The FAO (2019) recognises that one way that the food industry can assist in providing food to urban consumers is to identify opportunities for innovative processing of local and regional ingredients and foods (FAO, 2019). This will be seen by the development of the AGLV product in this study.

2.4.2 Lifestyle of the modern urban consumer

In today's modern society, time is something which most people do not have to prepare meals (Degreef, 2015; Jabs and Devine, 2006). The modern urban consumer is often busy and on-the-go and

has fast-paced lifestyle due to increased work pressure and has less time to devote to food preparation and family, therefore convenience foods are an important area in the food industry as they meet the need for this change in lifestyle and increasing work pressure (Jabs and Devine, 2006; Linnemann, Benner, Verkerk et al., 2006). This has led consumers to opt for convenience food as it reduces effort and time, is easy to warm-up and eat and also often provides shortcuts to the cooking and preparation of dishes (Guerrero et al., 2009; Jabs and Devine, 2006).

In the past consumers looked for products that were seen to have value for money, provided variety, were convenient and were attractive to the senses (Earle, 1997). This has changed as consumers now also desire new types of food and convenient nutritional products. They want to know where their food comes from, and they want local foods (in terms of ingredients that are also part of their culinary heritage), easy-to-prepare dishes, and sustainable foods (International Food Information Council Foundation, 2018; Feldmann and Hamm, 2015; Nebel et al., 2006). Consumers have become more interested in the consumption of local foods, which is also evident from the fact that the amount of research on consumers' attitudes and purchasing behaviour of local food has increased (Feldmann and Hamm, 2015).

There has been an increasing demand for healthy food products due to the rising concern for health (International Food Information Council Foundation, 2018; Grunert, 2017; Jordana, 2000). Four out of five products offer health advantages such as high fibre content, less saturated fats, reduced kilojoules, higher calcium content, etc. (Jordana, 2000). Consumers believe that food directly impacts their health, and that food not only satisfies hunger but also prevents nutrition-related diseases and improves their physical and mental wellbeing (Menrad, 2003; Mollet and Rowland, 2002; Roberfroid, 2002). Research indicates that consumers do not buy the characteristics of food products, but rather the benefits they obtain from these products (which can be functional, symbolic or experiential (Valentin, 2015).

In a quantitative study done in restaurants in Ohio (USA) regarding the purchasing of local foods, it was noted that taste, convenience and price were significant motivating factors for purchasing local foods (Inwood et al., 2008). Every day consumers wish to have more local and traditional foods on the market as they are perceived as being of higher quality and more sustainable (Hempel and Hamm, 2016; Risku-Norja et al., 2008; Asebo et al., 2007; Chambers et al., 2007; Fandos and Flavian, 2006). In recent years consumers have been living at a faster pace and therefore demand more convenient products that are quick-to-prepare dishes packed with flavour (Jabs and Devine, 2006; Milton, 2003).

2.4.3 The urban consumer in South Africa

South Africa is a developing country of approximately 57.73 million people (in 2018) of different origins, cultures, languages and religions (StatsSA, 2019b). Approximately 29.5% of the population of South Africa is younger than 15 years of age, and about 8.5% are 60 years or older. Of the total population in South Africa, 51% is female (StatsSA, 2019b). With regard to ethnicity, South Africa is made up of 80.9% black African, followed by coloured and then white. The make-up of the groups is shown in Figure 2.2.

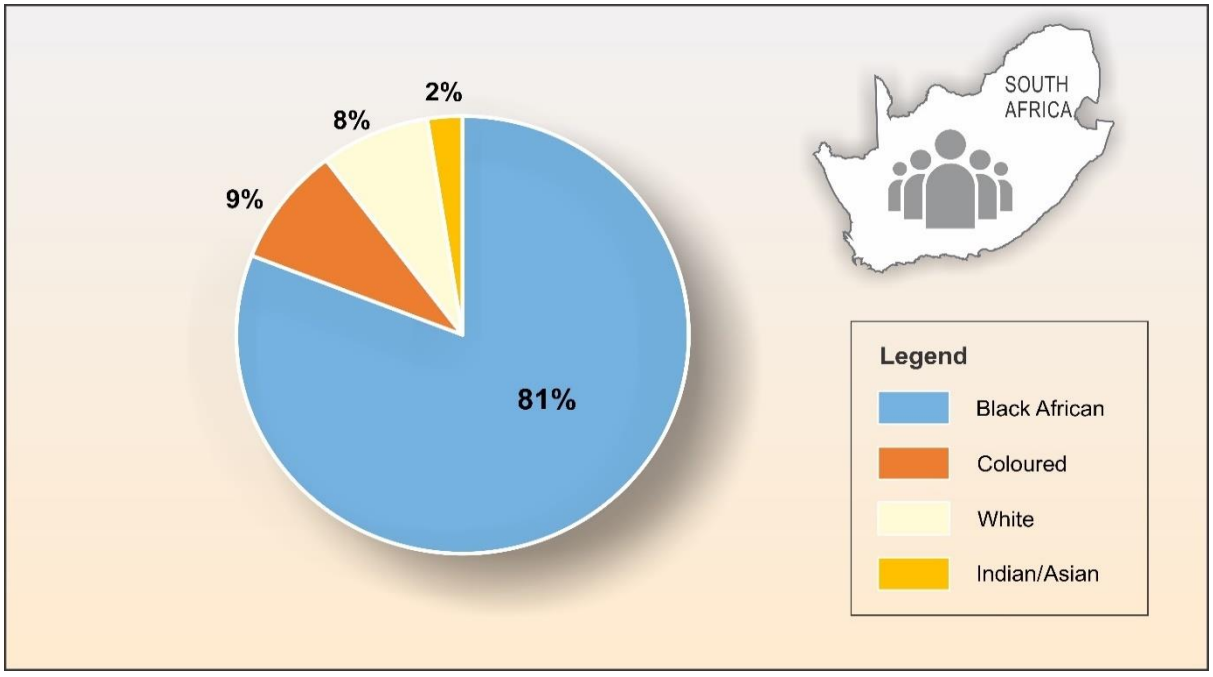


FIGURE 2.2: POPULATION DISTRIBUTION OF SOUTH AFRICA (STATS SA, 2019)

The top 10 major urban areas in South Africa are: Johannesburg; Cape Town; Durban; Pretoria; Port Elizabeth; Soshanguve; Evaton; Pietermaritzburg; Bloemfontein and Vereeniging (City Population, 2018). It is estimated that 69% of South Africa's population will be urbanised by 2025 as compared to the current 60% (Nielsen, 2018b), which will result in urban areas becoming crowded. According to Nielsen (2018), "in a more urbanised world, space and time will be at a premium". Living areas will thus become smaller with less storage space, which will require consumers to purchase more accessible and more efficient alternatives in order to be on par with their on-the-go lifestyle (Nielsen, 2018b). Many South Africans have a stressful and busy lifestyle, which has created a demand for convenient solutions which simplify their lives (Nielsen, 2018d). One such area which would assist in this lifestyle is convenience food.

This has affected South Africa's economy, which has prompted a deceleration in the rate of economic growth (StatsSA, 2019a). Of the nine provinces in South Africa, the three provinces that contribute the most to the economy (over 60% of the economy) are Gauteng, KwaZulu-Natal and the Western Cape (StatsSA, 2019a). South Africa's GDP (real gross domestic product) also increased by 1.4% in the fourth quarter of 2018, which means that the country is increasing the amount of production taking place in the economy, and could also mean that citizens have a higher income and could start to spend more (Trading Economics, 2019). This may be an indication that a new commercially available product would be more able to succeed than if the GDP decreased. As South Africa is still a developing country, there is a high percentage of unemployment and poverty; however, unemployment rates have decreased to 27.1% in the 4th quarter of 2018 from 27.5% in the previous quarter of 2018 (Trading Economics, 2019). This means that the employment rate rose to 16.54 million in the fourth quarter of 2018 (Trading Economics, 2019).

Various studies related to food have been conducted over the past few decades, which have indicated that food consumption shifts in South Africa have been moving towards a more Western-influenced diet (Ronquest-Ross, Vink and Sigge, 2015). It has been found that food consumption shifts have been towards an increasing daily kilojoule intake as well as an increase in packaged and processed food, and a shift away from vegetables (Ronquest-Ross et al., 2015). This is a problem as the way consumers are eating is contributing to increased obesity and other non-communicable diseases (Ronquest-Ross et al., 2015).

With regard to food availability in South Africa, supermarkets tend to be the leading distribution channels for food (this could be due to the fact that these distribution channels are present nationwide and that they offer convenient solutions to the purchasing of products) (Euromonitor International, 2018c). In line with global trends, South African consumers are increasing their awareness of health and wellness, especially among middle and high-income consumers (Euromonitor International, 2018c). These consumers are becoming more aware of the health benefits of the food they consume and are looking for products that provide various health benefits such as added vitamins and minerals when shopping for food (Euromonitor International, 2018a). They are also beginning to read food labels more and better understand the nutritional value of the products they consume (Euromonitor International, 2018a).

South African consumers have increasingly busy lifestyles, which in turn leads to the increasing demand for convenience foods to cater for their fast-paced lifestyle (Euromonitor International, 2018b).

2.4.3.1 The urban consumer of Gauteng

Gauteng is the smallest province of South Africa with an area of 18 176 km² (StatsSA, 2018). Although it has the smallest land area, it has the largest population (25.4% of South Africa's population) and the highest GDP (contributing over 34.72% to South Africa's economy), which can influence the consumption of a new product available on the market in Gauteng (StatsSA, 2019a). Although urbanisation is associated with a decrease in consumption of AGLVs, a bigger target group can be reached in a more densely populated area, which would provide greater availability and accessibility of a new food product (StatsSA, 2018; Cernansky, 2015).

Gauteng has the highest population density with 14.7 million people, and is comprised of 50.4% male and 49.6% female (City Population, 2018). With regard to population distribution, the largest population group in Gauteng is black African (77.4%) followed by white. The population group distribution is shown in Figure 2.3. Traditionally consumers of AGLVs have been from the black African ethnic group (Jansen van Rensburg et al., 2007), but Gauteng is comprised of a mix of different ethnic groups, which could influence the consumption of these vegetables if they are made more accessible and available to different ethnic groups.

Concerning the age groups in Gauteng, the age group with the highest number of people is the 25-29 age group followed by the 30-34 age group. The age distribution of the population of Gauteng is shown in Table 2.3 (StatsSA, 2019b). These two age groups fall into the generational cohort of Generation Y

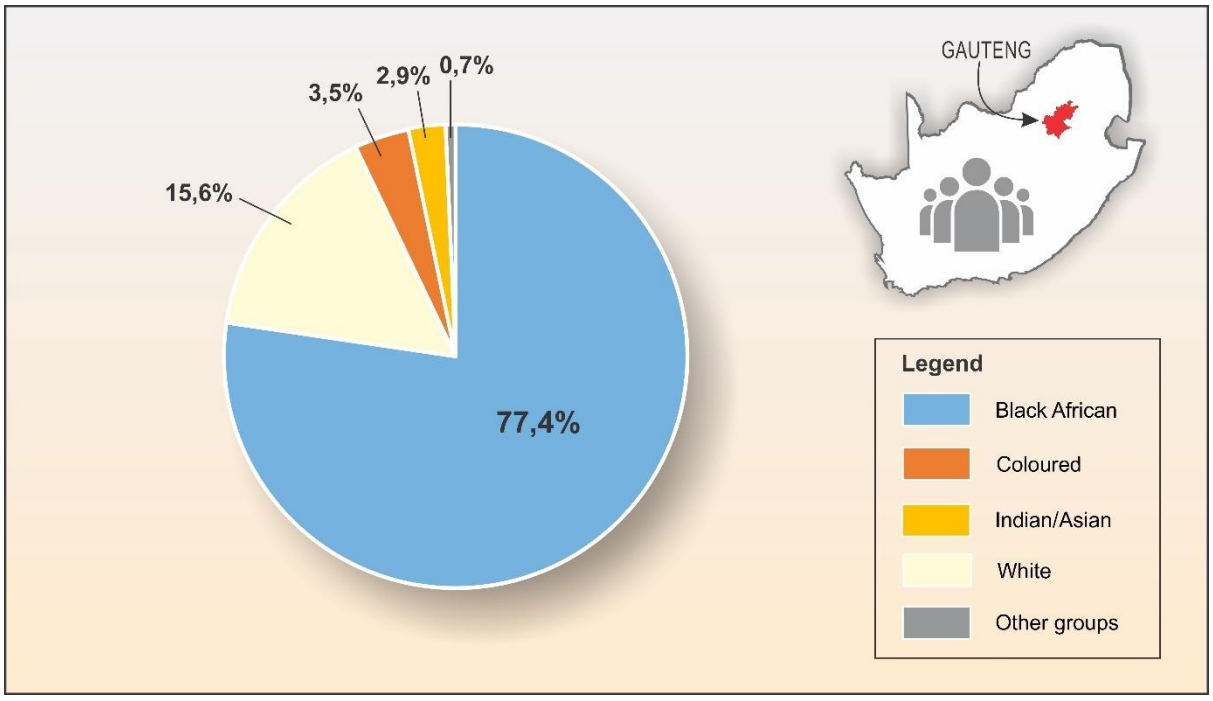


FIGURE 2.3: POPULATION DISTRIBUTION OF GAUTENG (STATS SA, 2019)

(StatsSA, 2011), which is characterised as being influenced by various media, as technology and innovation provide a bottomless source of information and entertainment (Ordun, 2015).This is something to take note of when developing a new product.

TABLE 2.3: AGE DISTRIBUTION OF GAUTENG (STATS SA, 2018)

Gauteng Estimated Population Per Age Group Mid-Year 2018	
Age Group	**Estimated Population**
0-4	1 289 558
5-9	1 238 980
10-14	1 073 784
15-19	1 033 968
20-24	1 295 014
25-29	**1 583 867**
30-34	**1 575 352**
35-39	1 304 733
40-44	1 035 258
45-49	848 107
50-54	684 064
55-59	571 442
60-64	449 283
65-69	323 435
70-74	209 248
75-79	117 024
80+	83 924
Total	**14 717 041**

With regard to the level of education, Figure 2.4 shows the highest level of education attained by persons older than 20 years of age and by gender (StatsSA, 2018). As one can observe, the level of education obtained with the highest percentage of people in Gauteng is Grade 12 (68.8%). Thirty-six point three percent of residents of Gauteng have a higher qualification than Grade 12, with females having a higher percentage of 18.6% in comparison to 17.7% of males (StatsSA, 2018). Although income affects the accessibility of certain foods, the level of education also influences consumers' overall decision-making ability (Bain, 2016).

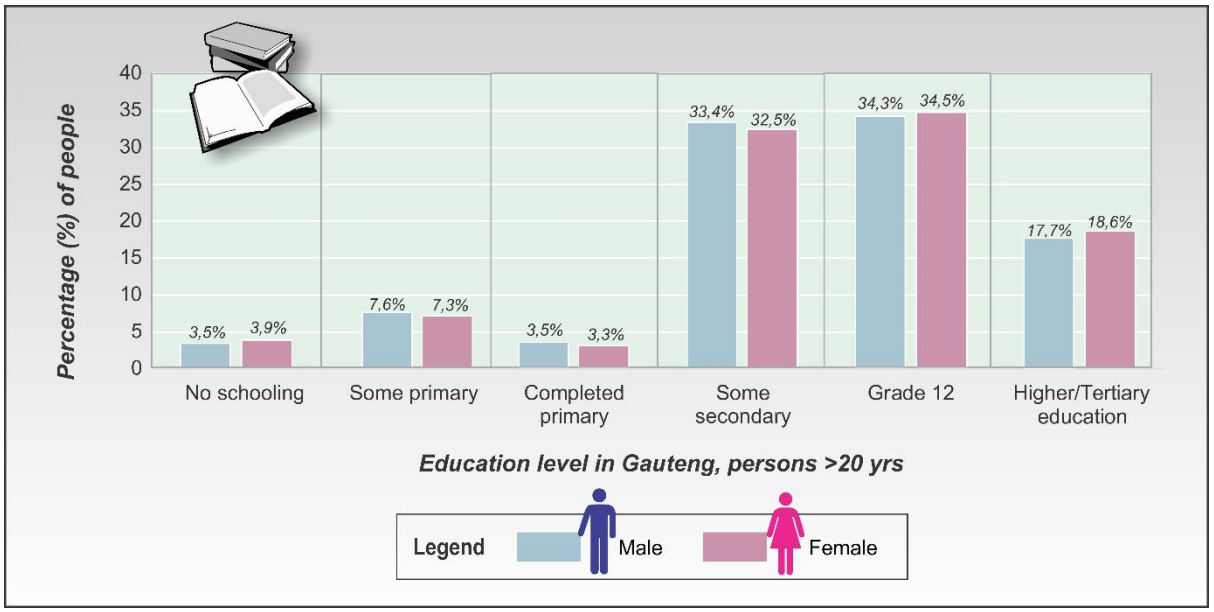


FIGURE 2.4: HIGHEST LEVEL OF EDUCATION ATTAINED IN GAUTENG BY PEOPLE AGED 20 YEARS AND OLDER (STATS SA, 2018)

2.5 CONVENIENCE FOOD

Convenience foods are foods that assist consumers by decreasing the resources spent on preparing the food, such as time, effort, skills and equipment (Brunner et al., 2010). These foods are usually processed in such a way as to make consumption of food easier with minimal effort (Jabs and Devine, 2006). Food processing in this study also refers to the techniques or methods used to convert whole fresh foods into a final food product.

2.5.1 Development of convenience foods

The term “convenience food” was coined by Charles Mortimar of General Foods in the 1950s as a result of the growing demand for foods that were “easy to buy, store, open, prepare and eat” (Moss, 2013:56). The prominence of convenience foods is the result of increasing urbanisation of societies in the nineteenth and twentieth centuries (Tillotson, 2003). Industrialisation and technological advancements (such as the microwave oven) in terms of food technology, as well as transportation and communication, have played a major role in the growth of commercialisation of the food supply (Brunner et al., 2010; Tillotson, 2003). Other factors such as economic, social, technical and political have also played a role in shaping convenience foods over the years (Tillotson, 2003).

Food has been preserved or processed since as early as 400 BC with methods such as drying, salting, smoking and pickling, but in the mid-nineteenth century a food supply revolution began which has

continued until the present, and which was to bring about fundamental changes in the way that people eat (Tillotson, 2003). Urbanisation that started during the industrial revolution in the nineteenth century brought about the need for a better organised and widespread system of food processing and distribution (Tillotson, 2003).

2.5.2 Present situation of convenience foods

Today convenience foods have become central to supplying society's nourishment (Tillotson, 2003). The universal consumption of convenience foods has arisen due to the demands of modern lifestyles in urban areas, where people want the convenience and availability of these foods (Tillotson, 2003). If one also looks at the current food supply, it is evident that convenience foods have entered into almost every category, e.g. one can buy whole eggs, or in liquid form, or boiled, fried, peeled, chopped, dried or even pre-prepared (like omelettes) (Daniels and Glorieux, 2015). It has also been observed that consumers are willing to pay for the convenience they seek (Brunner et al., 2010).

Market research confirms that convenience foods are part of the most successful and fastest-growing sectors of the food industry (Daniels and Glorieux, 2015). Even if people decide to eat at home, they still seek products that will save time and energy (Okrent and Kumcu, 2016). According to food producers, convenience foods will continue to gain importance, especially in terms of consumption and volume and diversity (Verbeek, Debackere and Wouters, 2003). Many people's lifestyles today have led to a demand for food which saves time in meal preparation. This has been increasing significantly over the past decades (Okrent and Kumcu, 2016; Brunner et al., 2010), and may be due to the following factors (Okrent and Kumcu, 2016; Jabs and Devine, 2006):

- Consumers want foods that are easy to prepare
- People are busier due to work demands and have little time to spare for food preparation
- Convenience foods are not very expensive any more
- There is more advertising of convenience foods than of non-convenience foods (which encourages the purchase of convenience foods)

2.5.3 The future of convenience foods

During the past few decades, the global dynamics of food production and consumption have evolved and changed drastically (Santeramo et al., 2018). The recent economic crisis has had many consequences for global trade, production and the availability of food (Santeramo et al., 2018; Santeramo, Carlucci, De Devitiis et al., 2017; Santeramo, Lamonaca, Contò et al., 2017; Bellemare, 2015), yet the demand for convenience foods is increasing (Brunner et al., 2010).

The need for convenience is driven by consumers' busy and on-the-go lifestyles in urban areas (Nielsen, 2018c). The global convenience food market is expected to grow at a healthy compound annual rate from 2014 to 2020 according to Future Market Insights (a market intelligence company that creates customised and syndicated market research reports) (Future Market Insights, 2019).

There is an increasing demand for meal solutions, especially in terms of enhancing consumers' at-home dining experience with convenience, as well as meals using local ingredients and global flavours (Future Market Insights, 2019). This would be beneficial as it would encourage consumers to purchase/consume a convenience food product containing local ingredients such as AGLVs. Large multinational companies employ many strategies to develop and enter the market for convenience foods in different regions, but it has been found that providing products that match local consumers' taste is a critical factor (Future Market Insights, 2019). This is important to take into consideration when developing a product using traditional ingredients. Another important factor concerning convenience foods is pricing, as recently it has been found that consumers are willing to pay more for a convenience food product if it is of high quality with health benefits (Future Market Insights, 2019). This increasing trend towards healthy convenience foods is important to consider when developing a new product. Even though the aspect of health is becoming more prominent, consumers also want convenience foods which do not sacrifice or compromise on taste (Forbes, 2019a).

The evolving demand for convenience has also created a market for food products that simplify one's life (Nielsen, 2018c). A few such products that have surfaced include ready-prepared and on-the-go meals, home/office grocery delivery services, and technology-driven, on-demand services (Nielsen, 2018c). Technology is changing the way consumers eat, cook and shop for food, and will continue making an impact on the need for convenience (Forbes, 2019a).

2.5.4 Classification of convenience food

The classification of convenience food is necessary to determine what kind of convenience food product one is dealing with. The classification, in this case, will be dependent on the amount of time saved in meal preparation (Okrent and Kumcu, 2016). This classification, as indicated in Table 2.4, will be used as a tool to determine what type of convenience food product was ultimately developed in this study (Okrent and Kumcu, 2016).

TABLE 2.4: CLASSIFICATION OF CONVENIENCE FOOD (OKRENT AND KUMCU, 2016)

Classification category	Type of classification	Examples of food products
1. Basic ingredients which are minimally processed and usually contain one commodity	Non-convenient	Rice, milk, butter, cream, dried beans, meat, poultry, seafood, etc.
2. Complex ingredients which are processed and usually contain more than one commodity	Semi-convenient	Sour cream, canned vegetables, sauce, frozen meat, etc.
3. Ready-to-cook (RTC) meals and snacks which require minimal preparation (heating, cooking, adding hot water) before consumption	Semi-convenient	Frozen meals, dried soups, frozen pizza, dry meal mixes, soup, powdered drinks, etc.
4. Ready-to-eat (RTE) meals and snacks which require no preparation before consumption	Fully prepared	Yoghurt, refrigerated meals, sweets, canned fruit, liquid drinks, flavoured milk, etc.
5. Meals and snacks purchased at fast-food restaurants	Fully prepared	Foods which customers order and pay for at the counter
6. Meals and snacks purchased at sit-down restaurants	Fully prepared	Foods which are ordered from waiting staff and are paid for at the end of the meal

As one can see, when moving down the table from category one to category six, convenience increases in terms of reduced time and energy needed for meal preparation. These categories are explained below (Okrent and Kumcu, 2016):

1. Basic ingredients which are minimally processed and usually contain one commodity: these commodities are the most non-convenient and take the longest time and most effort to prepare. These foods could be said to be unprepared, which means that little to no processing other than preserving has been done. These foods also usually make up the ingredients in meals, e.g. milk.
2. Complex ingredients which are processed ingredients and usually contain more than one commodity: these foods are semi-convenient and more processed than the foods in group one, and require time and effort to process them further for the consumer. These foods could be said to be semi-prepared as some effort/skill has been applied prior to use by the consumer, e.g. frozen puff pastry.
3. Ready-to-cook (RTC) meals and snacks which require minimal preparation: this group is more convenient than group two and is also semi-convenient as the foods require few resources in terms of time and effort to prepare. These foods are also semi-prepared as significant effort/skill has been applied before being cooked by the consumer. An example would be dried pasta, which is prepared and only requires simmering in hot water before eating.

4. Ready-to-eat (RTE) meals and snacks which require no preparation before consumption: this group of convenience foods are fully prepared and do require no further processing – they can be eaten as is. An example would be drinking yoghurt.
5. Meals and snacks purchased at fast food restaurants: this group of convenience foods is fully prepared and only requires payment for the meal and can be eaten at the establishment or at home. These foods are fully prepared and can be eaten as is.
6. Meals and snacks purchased at sit-down restaurants: This is the most convenient fully prepared form of food, whereby an item is ordered and eaten without the effort of preparation and cleaning up, and is brought to the consumer, who only pays after finishing the meal. These foods are fully prepared and are eaten as is.

In the USA, ready-to-cook and ready-to-eat products comprised 26% of the average household budget between 1999 and 2010 (Okrent and Kumcu, 2016). It was also found that the portion of the household budget allocated to ready-to-eat products has been increasing significantly since 2007 (Okrent and Kumcu, 2016). This may indicate that convenience foods have become an important part of today's food consumption patterns (Jabs and Devine, 2006).

2.5.5 Convenience food in South Africa

With more women in the workforce, the demand for convenience foods is rising in developing countries (Future Market Insights, 2019). South African consumers are leading busier and more stressful lives, which has created a growing demand for convenient solutions in all aspect of their lives. This creates many opportunities for the food industry (Nielsen, 2018a).

There has been an increasing interest in convenience foods by South African consumers, especially concerning the solutions of ready-prepared meals, on-the-go meals, home or office grocery deliveries, and technology-driven food services (Nielsen, 2018a). Studies have shown that one-third of South African consumers (34%) are now using restaurant delivery (e.g. Uber Eats and Mr Delivery) or meal kit services (e.g. Ucook and Daily Dish).

According to Pick n Pay (the second-largest supermarket chain store in South Africa), consumer research has indicated that South Africans' dining preferences are starting to shift as many consumers are seeking to entertain at home as a more affordable option to eating out; thus many innovations in convenience and ready-made meals are taking place (Food Stuff SA, 2018). A recent poll in 2018 by Business Tech revealed that out of 6 022 middle to high-income South African consumers, 31% indicated that they would be willing to cut their spending on eating out and entertainment in order to save money (Food Stuff SA, 2018). Pick n Pay has also done research which shows that there is an

increasing number of customers who are choosing to buy quality convenience foods to entertain and dine at home; it was found that consumers look for value and convenience, as well as place increasing emphasis on healthier food choices (Food Stuff SA, 2018). This is something to consider when developing a new product for the South African market (a convenient food product with an emphasis on health).

2.5.6 Health issues regarding convenience food

Various research studies conducted have indicated that there is a rise in obesity and other non-communicable diseases in South Africa due to the increasing consumption of unhealthy convenience foods (Ronquest-Ross et al., 2015). Some issues which are evident in the category of convenience foods include public health, family wellbeing and the increasing number of lifestyle diseases such as diabetes, obesity, cardiovascular disease, etc. which are starting to reach epidemic proportions according to the WHO (Cutler, Glaeser and Shapiro, 2003). There is a general belief that convenience foods are one of the main reasons why the amount of obesity in countries around the world is increasing: convenience foods are perceived to be unhealthy and contain more calories than food prepared at home (Okrent and Kumcu, 2016). This issue has become evident because often convenience foods are linked to negative aspects such as high levels of salt and fat, which can lead to obesity. This is regarded as undesirable in an increasingly health-conscious world (Degreef, 2015). The FAO has estimated that the calorie availability of 2 196 kcal/day in 1961 has now increased to 2 870 kcal/day in 2011 (Santeramo et al., 2018; FAO, 2015). The consumption of unhealthy food items has been directly linked to increasing urbanisation and globalisation in the food industry (Logan and Jacka, 2014). This is a reason for the importance of having healthy and nutritious options available in the market.

Consumer demand for health-enhancing food products, such as functional foods, has grown rapidly and is increasingly appearing (Santeramo et al., 2018). Consumers are realising and believing that foods contribute directly to their health (Siró et al., 2008; Mollet and Rowland, 2002). This has led to consumer demand for healthy foods. One of the most important new categories of foods in the market is convenient and functional foods (foods which promise benefits to physiological functions) (Siegrist, 2007). This category of functional foods has developed due to consumers understanding the relationship between nutrition and health. It is a more practical approach to maintaining one's health and therefore, in the long run, reducing medical bills (Siró et al., 2008). Developing a convenience food product using AGLVs will ensure that healthy and functional foods are made more accessible to consumers (Maseko et al., 2017).

Functional and healthy foods have been the foundation of innovation over the past few years, and this area has seen a big investment by large food corporations as well as chefs in adapting their strategies to meet the consumers' demands (Khan, Grigor, Winger et al., 2013; Bleiel, 2010). Even though consumers are interested in nutritious or functional foods, they are not willing to compromise on taste even if the product has various health benefits (Verbeke, 2006; Tuorila and Cardello, 2002). This is due to the fact that "consumers no longer believe that good taste and healthiness are mutually exclusive" (Siegrist, 2007).

2.5.7 Accessibility of convenience food in terms of traditional foods

Marketing of AGLVs is low in South Africa. These vegetables are rarely available in supermarkets, which also contributes to their reduced consumption (Maseko et al., 2017). In other parts of Africa traditional foods, including AGLVs, are produced and sold commercially, so there is no reason why the same cannot be done in South Africa (Cernansky, 2015; Mpandeli, 2014). The perishability of AGLVs must also be taken into consideration when developing a product as this can create problems in processing, distribution and marketing (Smith and Eyzaguirre, 2007). The creation of a product using these vegetables will assist in traditional foods not being forgotten, and will also allow urban consumers to have access to them although they do not live in areas where these vegetables naturally occur (Jansen van Rensburg et al., 2007).

African green leafy vegetables have been a part of African cuisine for many years and are seen as a comfort food. The challenge is that westernised food culture has made traditional foods seem unappealing to the younger generations (Smith and Eyzaguirre, 2007), which is why innovation is needed to create a unique product that will be appealing and applicable to today's food culture and suit the urban consumers' busy lifestyle.

African green leafy vegetables are becoming popular in East Africa as local residents are seeing the importance of these vegetables not only in terms of health, but also in terms of food security and maintaining their food culture (Cernansky, 2015). Various dishes made with AGLVs are now becoming more popular in restaurants, which is a good indication as to where these vegetables have the potential to go in South Africa (Cernansky, 2015).

2.5.8 Impact of urbanisation on convenient food

As mentioned previously in Section 2.4.2, the modern urban consumer often has a busy, on-the-go and fast-paced lifestyle due to increasing work pressure and decreased time for activities such as food preparation (Jabs and Devine, 2006; Linnemann et al., 2006). This has led consumers to opt for

convenience foods as they reduce effort and time and correspond to this change in lifestyle brought about by increasing work pressure (Jabs and Devine, 2006; Linnemann et al., 2006). People residing in urban areas come from a variety of different backgrounds and cultures which, in effect, influences the food choices of other people (Feagan, 2007). The increasing levels of urbanisation often means that people are living in smaller spaces with more limited resources, for which convenience foods could provide a solution (Jabs and Devine, 2006; Linnemann et al., 2006).

With a growing population and increasing difficulty of accessing and harvesting natural vegetation, home-grown and local foods are becoming an important aspect of sustainability (FAO, 2019). The FAO (2019) recognises that one way that the food industry can assist in providing food for urban consumers is to identify opportunities for innovative processing of local and regional ingredients and foods (FAO, 2019). This is seen in the development of the AGLV product developed in this study.

2.6 CONCLUSION

Despite the significance of AGLVs in food and nutrition security, there is limited availability and access to these crops. This leads to underutilisation (Maseko et al., 2017) so that there is a need for these vegetables to be more accessible. Functional foods have been the foundation of innovation over the past few years and have seen a large investment by food corporations as well as chefs in adapting their strategies to meet consumer demands (Bleiel, 2010). Consumers are realising that foods directly contribute to their health (Siró et al., 2008; Mollet and Rowland, 2002), which has led to consumer demand for healthy foods. One such food which would benefit consumers would be AGLVs.

African green leafy vegetables are still used throughout South Africa in many households and are known for their beneficial health properties (Senyolo et al., 2014; Faber et al., 2007). They are widely used in traditional foods, but their consumption has decreased for many reasons (Voster et al., 2007). Very little done in the exploitation of AGLVs, which makes it a viable market and provides a competitive edge (Smith and Eyzaguirre, 2007), especially in the creation of an innovative new food product. In new product development there has been an increasing awareness of the importance of indigenous products, although this remains relatively unexplored in South Africa.

Innovation is recognised as the main factor which drives the success and survival of a business (Bigliardi and Galati, 2013a; Bigliardi and Galati, 2013b; Betoret et al., 2011). Innovation is seen as a means to stay ahead in the competitive food industry (Hu, 2010; Nebel et al., 2006). There has been an increase in the emphasis of innovation and new product development to provide a competitive edge (Smith and Eyzaguirre, 2007). Convenience foods are gaining more importance because

consumer lifestyles are becoming busier, and a need is arising for fast and healthy meal solutions (Rootman and Galloway, 2013). Functional foods is an area on which the food industry is focusing in terms of new product development (Khan et al., 2013).

This chapter provided an overview of the concepts applied in this research.

The next chapter (Chapter 3) will discuss the theoretical model which was used in the study.

CHAPTER 3: THEORETICAL MODEL

This chapter outlines the theoretical model of this research study. It provides an overview of all the concepts included in the culinary innovation model and emphasises the applicability of the model to the research design. It also conceptualises the features of the model and illustrates its relevance to the research.

3.1 INTRODUCTION

The main purpose of the theoretical model is to guide the researcher in the process of innovative product development and to understand the process and concepts of the model as well as important steps which needed to be taken throughout the study.

The theoretical model used in this study is the culinary innovation model (Harrington, 2004b). This model is used when developing a new product using innovation. The model has been adapted to include the process of traditional product development with innovation. This model assisted the researcher in developing a convenient culinary product made with AGLVs for the urban consumer to address issues of urbanisation, accessibility, convenience and health.

3.2 THEORETICAL MODEL

The theoretical model which was used in this study (the culinary innovation model) is discussed and applied to this research project in terms of the phases used.

3.2.1 Culinary innovation model

The area of culinary product development is rapidly growing and in constant need of innovation (Culinary Institute of America, 2018). Although culinary product development is not a new concept, existing models are mostly used in a manufacturing setting and do not represent development and its characteristics in a real-time food service operation (Culinary Institute of America, 2018; Harrington, 2004a; Stewart-Knox and Mitchell, 2003; Pyne, 2000). Even though attempts at innovation have been shown to increase the competitive advantage of a business, the process of culinary innovation development has not been clearly established (Culinary Institute of America, 2018; Harrington, 2004a).

Innovation is an area of growing competitive advantage and is needed in today's world in order to compete in mature markets, improve quality, grow in market share, create new markets and increase

sustainable food choices (Culinary Institute of America, 2018; Ottenbacher and Harrington, 2007). The culinary innovation process is a model which is used to create a food product in the business setting or service sector with a competitive advantage (Harrington, 2004a). The purpose of this model is to create value and competitive advantage through product differentiation. In order for a product to have a competitive advantage, it should be unique and innovative, not be able to be easily imitated, have no substitutes and must have value for the intended consumers (Bigliardi and Galati, 2013a).

This study used the model for culinary product innovation (Harrington, 2004b). This model synthesises earlier models of strategy, product development and innovation into a reformulated model (Rudolph, 2008:75; Farjoun, 2002; Pyne, 2000:330; Dougherty, 1997:424). Due to the current attitude towards AGLVs by urban consumers, it is essential to reintroduce these vegetables in the form of a new and innovative product which would increase awareness of and desire for them in the urban consumer, as well as assist in addressing issues of accessibility, urbanisation, accessibility, convenience and health. Therefore a pot of traditionally cooked AGLVs will not suffice in the modern environment where tastier and more accessible healthy products are available. This model was used as a platform to develop the product using AGLVs as it assisted in the creation of an innovative, competitive product.

The culinary innovation model consists of four main phases that are used to introduce a valuable food product into the market. The four phases are: culinary innovation formulation; culinary innovation implementation; evaluation and control; and innovative introduction (Harrington, 2004a). The model also considers the link between internal and external resources and emphasises learning-by-doing throughout the process of development.

3.2.1.1 Creating a sustainable competitive advantage through integration

In traditional food product development, research and development is normally a separate division in a food-producing establishment, and there are clear distinctions between the steps of the product development process, but in a food service setting this is done in a more integrative manner (Harrington, 2004a). The integration in innovative product development is what assists in creating a competitive advantage (Harrington, 2004a; Reed and De Fellippi, 1990).

The food service industry is complex and competitive, which makes it difficult for food producers to establish a sustainable competitive advantage. By creating barriers to imitation (by integrating all aspects in the process of product development), a product can be created which will ultimately be unique and have a sustainable advantage (Harrington, 2004a; Reed and De Fellippi, 1990).

3.2.2 Modelling the culinary innovation model

The theoretical model used in this study is the culinary innovation model, which is presented in Figure 3.1. This model illustrates the process organisations should follow to develop a product by implementing innovation throughout the process.

The model consists of four main phases: culinary innovation formulation; culinary innovation implementation; evaluation and control; and innovation introduction. As illustrated in Figure 3.1, the culinary innovation model is a complex process influenced by both internal and external factors. The solid single-sided arrows show a direct relationship with the phases and processes, whereas the double-sided arrows indicate an iterative/reciprocal relationship. The dotted arrows indicate an indirect relationship. The following discussion provides an exploration and explanation of the concepts in the culinary innovation model.

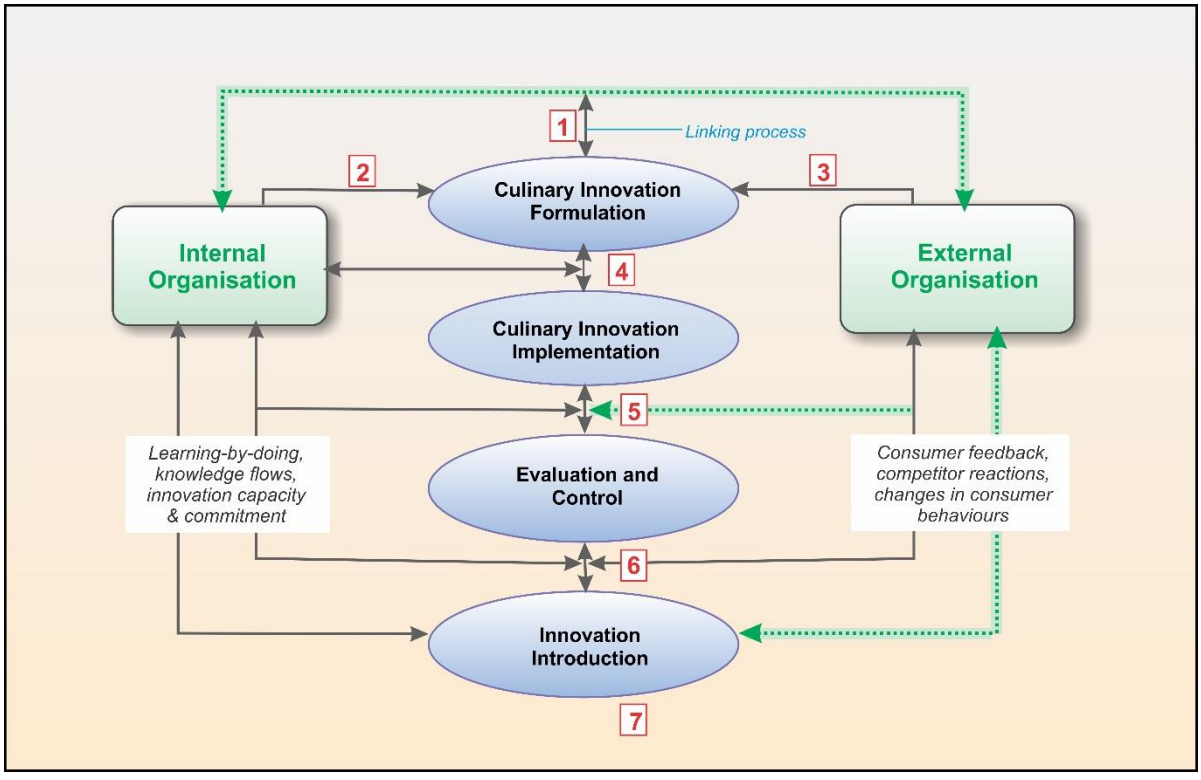


FIGURE 3.1: CULINARY INNOVATION MODEL (HARRINGTON, 2004A)

3.2.3 Phase 1: Culinary innovation formulation

Culinary innovation formulation is the beginning of the product development process where the culinary product is conceptualised and defined and linked to the requirements of the internal and external environments (Ottenbacher and Harrington, 2007; Dougherty, 1997:424). During this phase there is a combination of strategy, consumer research, culinary techniques and food science which

are required to successfully formulate, test and launch new products into the market (Harrington, 2004b). Innovators should ensure that the design of the product reflects the consumers' needs, the market structure, and organisational capabilities and abilities/skills (Harrington and Ottenbacher, 2013; Betoret et al., 2011; Dougherty, 1997:424). This is indicated in link 1 in Figure 3.1, which demonstrates the relationship and integrative component of ensuring that the needs of the external environment are balanced with the needs and abilities of the internal environment. The main elements which are included in the process of this phase are setting the scenario, selecting the team, planning and linking, product definition, chefmanship and food science (Harrington, 2004b).

It is estimated that more than 80% of products introduced into the market are unsuccessful, which costs the industry billions of dollars in underutilised resources (Fuller, 2011:60; Rudolph, 1995). In order to have a product which stands a better chance in the competitive market, care should be taken in the selection of team members who will be responsible for the development of the product; they must constantly evaluate and re-evaluate organisational operations and objectives, and link these to the internal and external environment (Pyne, 2000:330; Rudolph, 1995:60).

3.2.3.1 Staff selection

Traditionally the team responsible for product development is a separate unit from the rest of the operations until the product is ready to be introduced into the market (Harrington, 2004b). Today the culinary innovation team would typically be involved in every phase of the development process as this increases the potential of a clear understanding of customer needs and market knowledge, as well as overcoming potential technical difficulties (Stewart-Knox and Mitchell, 2003). In order to be creative and innovative during product development, the development team must be able to strike a balance between internal and external tensions (Harrington, 2004b). This is seen in Link 1 of Figure 3.1. This inter-functional approach is vital in order to achieve success in the development of the culinary product as well as to create a culture of innovation within the organisation (Stewart-Knox and Mitchell, 2003; Moskowitz, 2001; Pyne, 2000).

3.2.3.2 Planning and linking process

In the planning and linking process, internal and external elements must be taken into consideration, as seen in Link 2 and 3 in Figure 3.1. This is important to ensure that the product being developed has a greater chance of being more successful. During the planning and linking process, involvement in market research is necessary for understanding the customer's needs, technical feasibility within cost parameters, as well as food safety, ingredient functionality and sensory techniques (Pyne, 2000:332).

3.2.3.3 Product or innovation definition

Once all the aspects in the culinary innovation formulation are determined, and the internal and external factors have been considered, the culinary innovation team will move forward to determine the definition of the products. In order to define the product, the team needs to use the information gathered previously and combine it with the use of chefmanship and food science techniques.

Chefmanship involves all aspects of culinary knowledge such as food preparation, presentation and flavour combinations (Harrington, 2004b). Food science techniques involve aspects such as the chemical properties of food, the ability to use advanced food preservation and cooking techniques (e.g. sous vide and dehydration), the use of speciality food products and sensory analysis techniques (Harrington, 2004b).

3.2.4 External environment

The external environment is an important area to take into consideration when developing new products. The most relevant factors to the innovation formulation phase are listed in Table 3.1 (Santoro, Vrontis and Pastore, 2017; Stewart-Knox and Mitchell, 2003; Moskowitz, 2001; Kimes, 1999; Dougherty, 1997:424). The external factors include changing consumer behaviours (past, present and future); competitor analysis; trends, fashion and development; seasonality; food safety; nutrition and dietary considerations; regulations; and demand analysis (revenue management).

TABLE 3.1: EXTERNAL ENVIRONMENT FACTORS IN THE CULINARY INNOVATION MODEL (HARRINGTON, 2004A)

Factor	Explanation
Consumer behaviour (past, present and future)	Before a possible product can be defined, a clear understanding of consumer behaviour (past, present and future) and anticipated competitor reactions should be determined. This evaluation is the start of linking the internal abilities and the needs/impact of external actions in the environment. This can be done through quantitative or qualitative methods and as a formal or informal process.
Competitor analysis	
Food trends and seasonality	Food trends/fashions and ingredient/product seasonality are significant in the process of culinary product innovation as organisations can take advantage of them to satisfy consumers' desire for new products. Seasonal ingredients are also advantageous as they offer maximum food quality while minimising food costs. The culinary innovation team should also combine present and anticipated trends in food safety and nutrition during the formulation process.
Demand analysis	The ability to anticipate changes in demand can be an advantage to the organisation. Due to the uncertainty of the food service industry, the ability to anticipate changes in demand is important in order for establishments to increase value during high-demand periods and by increasing products or offering affordable items during periods of low demand

3.2.5 Internal organisation

The internal organisation of a food establishment is vital to the development of a new product. In order to begin the process of product development, the internal characteristics of an organisation need to be considered, such as the level of knowledge and capabilities required (Harrington, 2004a). Factors that influence the internal organisation include knowledge; capabilities; relationships and resource sharing; equipment; space and other limitations; and culinary identity (Harrington, 2004b; Dahni, 2003). Table 3.2 shows the different factors that influence operations within an organisation (Harrington, 2004b; Dahni, 2003).

TABLE 3.2: INTERNAL ORGANISATION FACTORS IN CULINARY INNOVATION FORMULATION (HARRINGTON, 2004B)

Factor Influencing	Explanation
Knowledge	Important aspects which the organisation should consider before developing new products are: • Does the organisation have the capacity to create innovative products? • Can the organisation utilise and exploit knowledge from across the organisation? • Does the organisation have the capacity to exploit and utilise knowledge?
Capabilities	• Creative problem solving: it is important to create a capacity for creative problem solving by communicating throughout the organisation. • Tacit know-how and situated judgement: this is learnt through experience and creates an instinct in employees to be able to judge and determine the needs of the internal and external environment. • Organisation-wide monitoring and evaluation: monitoring and evaluation are required throughout the organisation and are needed in all the phases of product development. This promotes an environment that values change, risk-taking and continuous learning. • Organisation-wide commitment to innovate: the organisation must establish and maintain a commitment to innovation. To establish and maintain commitment, the organisation must value contributions of knowledge, expertise and different opinions.
Relationships and resource sharing	The organisation should evaluate and consider existing and potential relationships in order to maximise the benefits for all the parties. This relationship could be with the supplier, education facilities, agricultural research centres or other entities.
Equipment, space and other limitations	One should clearly evaluate equipment needs, space and other aspects which could be a possible limitation on the development of the new product.
Culinary identity	Elements one should be taken into consideration to differentiate the organisation's culinary identity from that of competitors are the following: • Geographic location of the product being developed • Increasing trends in regional foods and cultural diversity • Five basic characteristics of taste that provide a flavour profile and culinary identity to the product: sweet, sour, salty, bitter and umami • Local recipes, as these provide the typical ingredients, techniques and presentations commonly used

3.2.6 Phase 2: Culinary innovation implementation

Throughout Phase 2 there is an ongoing evaluation of whether changes need to be made due to "general preferences, capabilities, consistency requirements, cost considerations, taste and appearance preferences, timing issues, and process improvement considerations" (Harrington, 2004a). These changes are assessed through the process of formulation, testing and ultimately prototype development and benchmarking against competing products.

The four product options which were available for consumers to choose from in Phase 1 were developed and tested until a prototype was developed, which was then benchmarked against competing products and analysed in terms of sensory characteristics (Rudolph, 2008:75; Harrington, 2004b). "In this stage, innovators should address aspects which need improvements such as flavour, texture or balance when compared to similar products of competitors" (Rudolph, 2008:77). The sensory analysis can be done by internal panellists, customers or both (Harrington, 2004a).

Once the prototype has been developed any recommendations or improvements should be taken into consideration and adapted. Improvements could be made to such aspects as flavour, texture and balance, or aspects which competing products have which are desired (Rudolph, 1995). This feedback will increase the flow of knowledge due to the learning-by-doing process, which will increase the capacity of innovation.

3.2.7 Phase 3: Evaluation and control

This phase deals with the evaluation and control of the product described in Phase 1 and implemented in Phase 2. This phase involves continuous feedback loops from the internal and external environments to correct any problems to ensure that the product remains of high quality. Some aspects that assist in the evaluation and control of the developed product include consumer testing, up-scaling and HACCP control, which will be discussed below.

3.2.7.1 Consumer testing

Consumer testing (whether it be internal consumers such as a panel, or external consumers through customer feedback) adds value to a product as feedback is important in order to resolve any issues regarding the product. Taking feedback and consumers' opinions into account helps to create a product which has a higher chance of succeeding in the market (Fuller, 2011:60)

In this phase consumer testing comes into effect, which is an important part of developing a product which has value-added characteristics for the consumer (Harrington, 2004a). Consumers in this phase

test and give their opinions about the one specified product developed in terms of taste, appearance, pricing and perceived quality, which are then measured and taken into consideration (Harrington, 2004b).

3.2.7.2 Up-scaling

After evaluation has been done, a product is normally upscaled to be tested for larger volume production. This is when product transfer occurs, which will indicate how much variance a product can withstand before it is outside the areas of specification and becomes unacceptable to the consumer (Harrington, 2004b; Schonberger, 1994). Processing in this phase can also be applied, e.g. whether the product should be microwavable and whether it can be transferred and made in another establishment or made by other people with other equipment and facilities (Harrington, 2004b; Schonberger, 1994).

3.2.7.3 HACCP control

The last area which needs to be covered in the evaluation and control phase is the application of HACCP (hazard analysis and critical control points) in order to determine, prioritise and minimise any possible quality or consistency hazards during product introduction (Harrington, 2004b; Rudolph, 1995:4).

3.2.8 Phase 4: Innovation introduction

This is the final step in the process of innovative new product development and is where sales, marketing and distribution of the product will occur. It is the final stage at which the product is made available to the market. This phase will not be included in this study and is only mentioned for theoretical purposes – it can be addressed in future research projects.

3.3 JUSTIFICATION OF THE USE OF THE CULINARY INNOVATION MODEL

The culinary innovation model was used as the theoretical model to organise and guide the concepts in the study. This model offers a holistic approach to innovative product development, which will contribute to the development of a new culinary product for the urban consumer using AGLVs. This model adapts the process of traditional product development to include the aspect of innovation. Innovation is an area of growing competitive advantage and is needed in today's world to compete in mature markets, improve quality, grow in market share and create new markets (Culinary Institute of

America, 2018; Ottenbacher and Harrington, 2007; Dougherty, 1997:424). The purpose of this model is to create value and competitive advantage through product differentiation.

Due to the current attitude towards AGLVs by urban consumers, it is essential to reintroduce this vegetable in a new and innovative way to the urban consumer to address issues of urbanisation, accessibility, convenience and health.

3.4 CONCLUSION

The culinary innovation model was the selected theoretical model, which was applied in this study. An area which is growing in the food industry is competitive advantage in terms of the development and continuous use of culinary product innovation (Culinary Institute of America, 2018; Kendall and Harrington, 2004), which is what this model provides. This chapter aimed to provide an overview of the concepts that were applied in this research project as well as the process it followed. One selected developed product followed the first three stages of the culinary innovation model, namely: culinary innovation formulation; culinary innovation implementation; and evaluation and control.

The next chapter (Chapter 4) will discuss the research aims, research design and methodology, and conceptual framework which were followed in the study.

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

This chapter outlines and discusses the research design, research objectives, conceptual framework, operationalisation and methodology which were used in this research project. This chapter also indicates the measures that were taken to enhance the quality of the study as well as to ensure that the results were captured in an ethical manner.

4.1 INTRODUCTION

This chapter discusses the research design and explains the methodology which was followed in this study to achieve the desired end result and ultimately fulfil the desired aims and objectives. This chapter also discusses the conceptual framework structured for this research as well as its aims, objectives and operationalisation. The sampling population and procedure, measuring instruments, data collection and data analysis are presented with regard to the three phases of the investigation. Measures were also taken to ensure that the study was of high quality, concerning validity and reliability, and that information was captured in an ethical manner.

4.2 RESEARCH DESIGN

A research design is a plan which the researcher follows when carrying out a project (Monette et al., 2008:9). The principal aim of the study was to explore, describe and develop a culinary product produced from AGLVs for the urban consumer in Gauteng to address issues of urbanisation, accessibility, convenience and health. The research design aims to deliver a structure for the procedure which the researcher followed in this study (Leedy and Ormrod, 2013:74). This research is experimental and explorative in nature as it involves the phenomenon of “cause and effect”, which means making a change in the independent variable and observing the effect it has on the dependent variable (Walliman, 2011:14). Explorative research examines new perceptions of a chosen area of research, which is useful when not much is known about the topic or when little information is available (Salkind, 2012:213; Page and Meyer, 2003:22). This is applicable to this research project as little information is available on the development of culinary products from AGLVs (Opabode, 2017; Smith and Eyzaguirre, 2007).

An experimental quantitative methodology was used in this study as it allowed for a more statistical way to analyse results (Cresswell, 2014:11) and also allows continued research in the future. A quantitative content analysis was used in Phase 1 to determine market trends and identify four

possible product options. Quantitative content analysis is a procedure followed for the systematic replicable analysis of text (Rose, Spinks and Canhoto, 2015:1). It involves the classification of parts of a text through the application of a structured, systematic coding plan from which conclusions can be drawn, and can be applied to written text or other visual media to examine the components as well as the meaning behind the content (Rose et al., 2015:1-2). This was done manually by investigating each trend stage in Phase 1 according to the Centre for Culinary Development (Centre for Culinary Development, 2018) which will be discussed in more detail in Section 4.3. Quantitative data content analysis was only used in the first section of Phase 1.

The theoretical model used in this study (the Culinary Innovation model) applied an experimental procedure whereby the researcher assesses whether a specific treatment influences an outcome (Cresswell, 2014:13). The quantitative data obtained included closed-ended responses as can be seen in the questionnaires (Cresswell, 2014:14-15). Quantitative research mostly uses closed-ended responses to questions, which are used as the measuring instrument (Cresswell, 2014:11). This research project followed a post-positivistic approach, which is typical of quantitative research as it involves careful observation and measurement (Walliman, 2011:74). This is especially evident in the recipe development of the four products as well as the sensory evaluation of the one developed product that was selected.

The study was cross-sectional in design, therefore the information was collected at one point in time (May–October 2017) so that the information and product would still be current and not outdated (Salkind, 2012:253; Babbie and Mouton, 2001:92), but can be used for similar research in the future. The study was conducted in Gauteng and consisted of three phases. Gauteng was chosen as the sample area as it has the highest GDP in the country as well as the highest economic growth (StatsSA, 2017).

Phase 1 of the study consisted of two sections. The first section consisted of a desktop content analysis which reviewed various data sources to determine four possible product options which would be used as input for the second section of Phase 1. Four product options were chosen as the CATA technique used was based on a previous study done by Belusso et al. (2016). The procedure was followed whereby four product options were made available for the participants to select from and only one selected product was tasted in the sensory evaluation phase (Belusso et al., 2016).

In the second section of Phase 1, a structured self-administered electronic questionnaire (Addendum B) was conducted which was used to determine the products' concept and specifications as well as the sensory characteristics that urban consumers were interested in with regard to a new culinary

product containing AGLVs. In total, 183 participants who lived in Gauteng and were over the age of 18 answered the questionnaire. The structured self-administered questionnaire consisted of four sections: demographics, background knowledge of AGLVs, perception of products and the innovative sensory technique of CATA. Check All That Apply is an innovative sensory technique which aims to capture consumer information quickly without the need for trained panellists by presenting participants with a choice of options – they select as many as they think are applicable (Belusso et al., 2016).

The questions in the questionnaire were structured in such a way that it was possible to measure and statistically analyse consumer responses (Salkind, 2012:253). After the questionnaire was compiled, it was pre-tested with 20 participants to identify and address or remove any possible errors. This test was done to determine whether there were any problems or whether there were any changes that needed to be made, which would improve the quality of the data collected. The questions were asked in English and were structured in a simple manner so that participants could select their responses or indicate their agreement/perception/likelihood on a Likert-type scale.

Phase 2 and 3 of the study followed an experimental procedure for the development of the product (Phase 2 is available in Addendum C), as well as its sensory evaluation in Phase 3 (see Addendum D). The development of the four products was assisted by four final-year hospitality management students under the subject VDS 413 (Recipe Development), who were managed by the researcher. Of the four developed products, only one product was used for sensory evaluation in Phase 3. The one product which was used for sensory evaluation in Phase 3 was indicated by participants in the questionnaire in Phase 1. The sensory evaluation in Phase 3 consisted of a structured self-administered electronic questionnaire. A pre-test was also conducted as was done in Phase 1 before the participants tasted the product. The participants in Phase 3 were recruited from among those who responded to the questionnaire in Phase 1 and indicated that they would be willing to taste the developed product. In this phase 72 participants tasted the product.

After the data was collected, it was processed and a qualified statistician was consulted. Descriptive as well as inferential statistics were used to analyse the data. Experts verified the content of the questionnaire, product development and sensory analysis to enhance face and construct validity.

The study made use of primary and secondary data. The primary data was collected in the form of the completed questionnaires, and the secondary data was obtained by conducting a literature review of relevant and reliable sources (De Vos et al., 2011).

4.3 RESEARCH AIMS AND OBJECTIVES

The principal aim of the study was to explore, describe and develop a culinary product produced from AGLVs for the urban consumer in Gauteng to address issues of urbanisation, accessibility, convenience and health. These issues were addressed with regard to sample selection and the type of product developed.

The following objectives and sub-objectives were used:

Objective 1: To investigate and determine what type of African green leafy vegetable culinary product is desired

1.1 To establish market trends of African green leafy vegetables in order to identify four possible product options

1.2 To investigate why consumers do not consume African green leafy vegetables

1.3 To determine the characteristics desired in an African green leafy vegetable product

Objective 2: To develop the four innovative culinary products using African green leafy vegetables

Objective 3: To evaluate the one selected culinary product produced

3.1 To describe the one selected product by means of sensory evaluation

3.2 To determine consumers' liking and purchase intention of the one selected product produced

4.4 CONCEPTUAL FRAMEWORK

The conceptual framework designed for this research was adapted from the original Culinary Innovation Model (Harrington, 2004a) as discussed in Chapter 3, as well as from the literature study in Chapter 2. The aim of the research was to develop an innovative culinary product made from AGLVs for urban consumers residing in Gauteng, South Africa. The framework illustrated in Figure 4.1 indicates the process that would be followed to develop an innovative culinary product and how the different phases would be linked in the process of new product development. Phase 1 (culinary innovation formulation) aimed to conceptualise and specify the desired culinary product that would meet the set criteria and serve as the input to the development of the four products in Phase 2. In Phase 3, consumer panellists tasted and evaluated the one chosen product developed from Phase 2 (which was determined from the results of the questionnaire in Phase 1). The conceptual framework served as a guide for this study.

In Phase 1 of the study, the objectives and influences were combined with the development of optimum recipes as well as the project planning pattern (Hullah, 1984) to organise the framework better. The original models of the development of optimum recipes as well as the project pattern are shown in Addendum E and F.

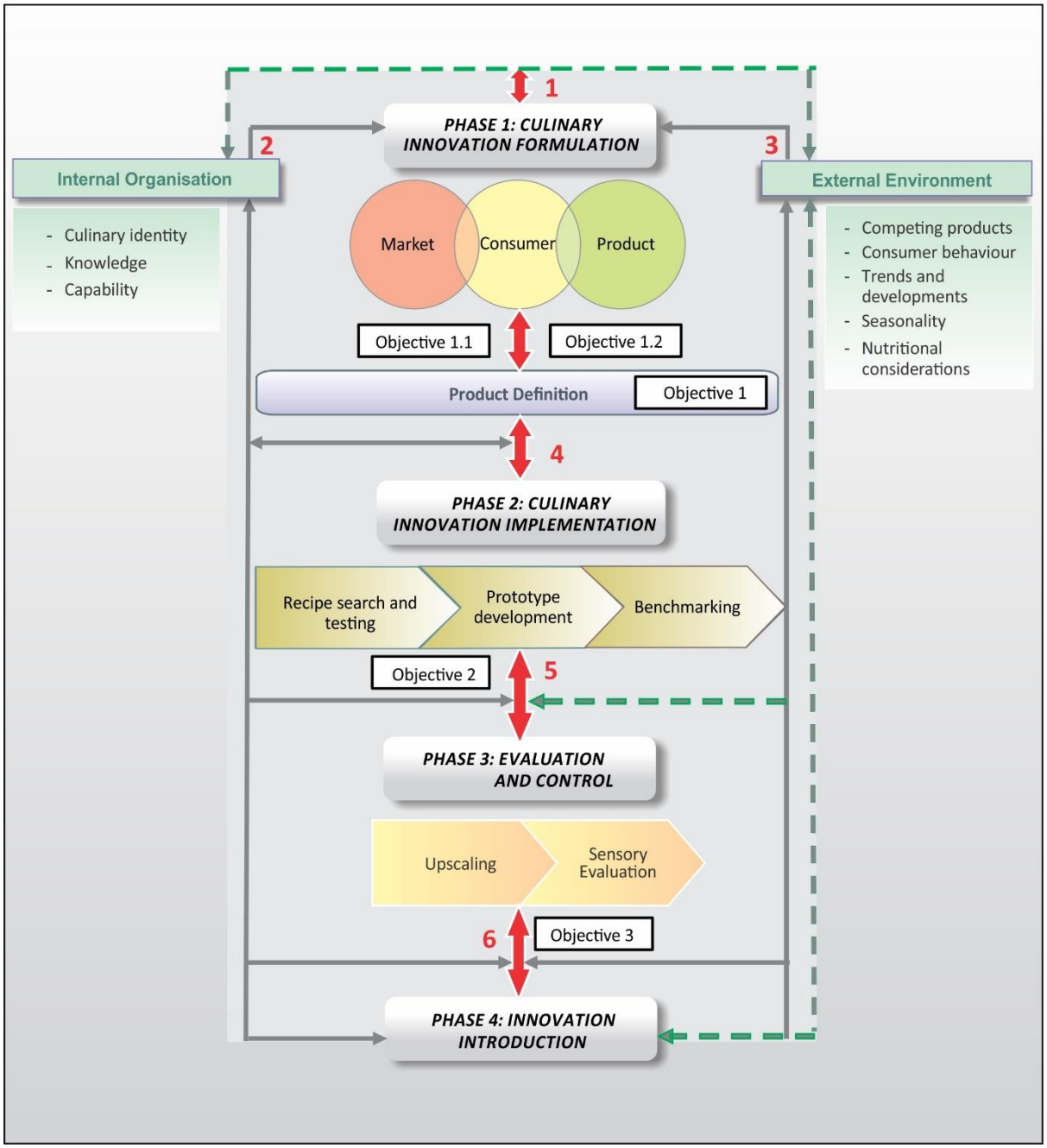


FIGURE 4.1: CONCEPTUAL FRAMEWORK

4.4.1 Phase 1: Culinary innovation formulation

Culinary innovation formulation is the beginning of the product development process where the culinary product is conceptualised and defined and linked to the requirements of the internal and

external environments (Harrington and Ottenbacher, 2013; Dougherty, 1997:424). During Phase 1, four culinary products were conceptualised and specified, which were then used as the input to Phase 2 (culinary innovation implementation). The defined products had to reflect the customers' needs, the market structure, organisational capabilities and abilities/skills (Harrington and Ottenbacher, 2013; Betoret et al., 2011; Dougherty, 1997:424). This is indicated in link 1 in Figure 4.1.

4.4.1.1 Internal organisation and external environment as a component of Phase 1

The first step in Phase 1 was to establish an area of interest for four possible products by linking the internal organisation and the external environment. External considerations included consumer behaviour, evaluation of competitors' products, trends, regulations and demand analysis, whereas internal considerations included knowledge and capabilities, commercial production limitations, resource sharing opportunities and the culinary identity perspective. The arrows and loops in the internal environment ensured that knowledge flowed throughout the process which then increased the capacity for innovation and development, whereas the external loops provided a recurring process of consumer feedback and assessment (Harrington and Ottenbacher, 2013; Harrington, 2004b).

An important internal consideration in this case is culinary identity, as the four products developed needed to have an African heritage and contain an AGLV. Capabilities were also important in terms of having the capacity to prepare a convenience food item using AGLVs. With regard to the external environment, considerations included trends and developments, competing products, consumer behaviour, seasonality as well as nutritional aspects in order to address aspects of health, accessibility, convenience, and availability.

4.4.1.2 Market research as a component of Phase 1

The aspect of market research in culinary innovation formulation was influenced by trends and competing products on the market in order to see what was available in the industry regarding AGLVs, convenience foods and healthy alternatives. This information was then used to identify gaps in the market for a new product and to identify four possible product choices.

4.4.1.3 Consumer information as a component of Phase 1

With regard to consumer information, demographic elements (such as age, gender, ethnic groups, total income and education levels) were applied to determine the type of consumers who would be interested in the product, and to determine their needs and desires for a potential new product as well as their reasons for not consuming AGLVs.

4.4.1.4 Product possibilities as a component of Phase 1

To give the developed product a greater chance of succeeding, the participants were asked for their views on what type of product they would like to see developed and what its characteristics should be.

4.4.1.5 Product definition as a component of Phase 1

Once all the aspects in Phase 1 (culinary innovation formulation) were determined and the internal and external factors had been considered, the culinary innovation team moved on to determine what four types of product should be developed, and what characteristics they should have which would begin the process of development in Phase 2 (culinary innovation implementation).

4.4.2 Phase 2: Culinary innovation implementation

Phase 2 (innovation implementation) is where the product concept and specifications set in Phase 1 were used to develop a prototype product. In order to do this, recipes had to be searched for, tested and adapted until an acceptable prototype had been obtained. This prototype was then benchmarked against competing products in the food industry in order to determine its comparability (Fuller, 2011:60). The prototype created was then used as the input to Phase 3 (evaluation and control).

Throughout Phase 2 there was an ongoing evaluation of whether changes needed to be made due to "general preferences, capabilities, consistency requirements, cost considerations, taste and appearance preferences, timing issues, and process improvement considerations" (Harrington, 2004a). These changes were assessed throughout the process of formulation, testing, prototype development and benchmarking against competing products. This feedback increased the flow of knowledge due to a learning-by-doing process, and increased the capacity of innovation.

4.4.3 Phase 3: Evaluation and control

Phase 3 dealt with the evaluation and control of the product described in Phase 1 and then implemented (developed) in Phase 2. It was possible to observe the continuous feedback loops from the internal and external environment in order to detect any problems and implement control systems to ensure that the product remained of high quality. This phase dealt with up-scaling and evaluation of the one selected product by means of sensory evaluation by a consumer panel in order to determine the acceptability of the product.

4.4.3.1 Up-scaling as a component of Phase 3

The developed product in this stage was upscaled to be tested for a larger volume situation. This is when product transfer occurs, which indicates how much variance a product can withstand before it is outside the areas of specification and unacceptable to the consumer (Fuller, 2011:364; Harrington, 2004b; Schonberger, 1994).

4.4.3.2 Consumer testing as a component of Phase 3

In this phase consumer testing came into effect. This was an important component of product development as it added value to the product and presented value-added characteristics to the consumer (Fuller, 2011:238; Harrington, 2004a). In this phase the participants tested the one selected developed product (using sensory evaluation) and gave their opinions about it regarding taste, appearance, pricing and perceived quality, which were then measured and taken into consideration (Fuller, 2011:238; Harrington, 2004b).

4.4.4 Phase 4: Innovation introduction

This was the final step in the process of innovative new product development and is where sales, marketing and distribution of the developed product occurs. This is the final stage in which the product is made available to the market. This phase was not included in this study as it was intended only for theoretical and academic purposes and lies outside the scope of this project. This phase is only mentioned for theoretical purposes and can be addressed in future research projects.

4.5 OPERATIONALISATION

This section describes the measuring techniques that were used in this study as well as how the concepts were measured. Operationalisation refers to the way in which concepts in the conceptual framework are measured (De Vos et al., 2011:34; Babbie and Mouton, 2001). The operationalisation of this research is summarised in Table 4.1, which gives details as to how the research instrument was used. This table gives a summary of the objectives, sub-objectives, concepts, dimensions, indicators and methods for measuring them.

TABLE 4.1: OPERATIONALISATION TABLE

Objectives	Sub-objectives	Issue addressed	Concepts	Dimension	Indicator	Questions	Measuring Instrument	Data analysis
Objective 1: To investigate and determine what type of AGLV culinary product is desired	1.1 To establish market trends of AGLVs in order to identify four possible product options	Convenience	• Trends and developments in AGLV products • Competing products • Culinary identity	Stages of trends: 1. Item appears at a fine dining establishment 2. Item features in speciality TV food channels and magazines 3. Item features in mainstream restaurants 4. Item features in popular magazines/publications 5. Item reaches quick service restaurants and grocery stores	• Use of ingredient • Dishes • Cooking method • Products available • African influence (morogo)	N/A (Desktop review)	Trend analysis table	Trend analysis report
	1.2 To investigate why consumers do not consume AGLVs	Accessibility Urbanisation	Consumer behaviour	Consumer behaviour in AGLV consumption	• Access • Knowledge • Perception	Phase 1 Questionnaire Q2.1-2.12	Questionnaire: 5-point agreement scale	Descriptive statistics: frequencies, percentages, means
	1.3 To determine the characteristics desired in an AGLV product	Convenience Accessibility	Product	• Type of food product desired • Level of convenience	• Bread, pasta, soup, or granola • Ready to eat or ready to cook	Phase 1 Questionnaire Q3.1-3.20	Questionnaire: CATA	Descriptive statistics: frequencies, percentages, means XLSTAT: Inferential statistics: Z-test, significant difference
			Sensory characteristics	• Colour • Smell • Flavour • Taste	Sensory characteristics desired in a new AGLV product: • Green colour • Morogo smell • Vegetable flavour • Seasoned flavour			
			Consumer habits	Intention of purchase	If offered at the supermarket: • Would not, would or would only purchase an AGLV product			

Objectives	**Sub-objectives**	**Issue addressed**	**Concepts**	**Dimension**	**Indicator**	Questions	Measuring Instrument	Data analysis
Objective 2: To develop the four innovative culinary products using AGLVs		Health Accessibility Convenience	Product development (prototype development) Benchmarking Up-scaling	• Recipe search • Baseline recipe • Recipe adaptations • Final product (prototype) • Triple testing • Benchmarking • Up-scaling	• Potential recipes • AGLV substitution • Ingredients • Method • Sensory aspects of product • Competing products • Standardised recipe	Not Applicable	• Recipe T-Structure • Factor method • Adaptation and changes table • Star diagrams • Standardisation • Triple testing • Up-scaling	• Descriptive ratings of sensory characteristics • Discussion of changes and adaptations • Yield test
Objective 3: To evaluate the one selected culinary product produced	3.1 To describe the one selected developed product by means of sensory evaluation	Urbanisation Health Accessibility Convenience	Sensory evaluation	Sensory evaluation of pasta product characteristics: • Colour • Smell • Taste • Flavour • Texture • Liking	• Vivid or dull green • Strong or weak vegetable flavour • Seasoned or strong morogo flavour • Al dente or overcooked • Sticky or dry • Good or bad	Phase 3 Questionnaire Q2.1-2.12	CATA questionnaire	Descriptive statistics: frequencies, percentages, means XLSTAT: Inferential statistics: Z-test, significant difference, correspondence analysis
	3.3 To determine consumers' liking and purchase intention of the one selected developed product		Hedonic reactions Consumer behaviour	Liking of product Intention of purchasing	Liking score of product Purchase intention score	Phase 3 Questionnaire Q3 and Q4	9-point hedonic scale and purchase intention scale	

4.6 RESEARCH METHODOLOGY

This section aimed to provide a discussion of the sampling techniques and measuring instrument used, data collected, and the way the data was analysed. The research methodology is presented in terms of the phases in which the data was gathered.

Figure 4.2 illustrates the process of the methodology in which this study was done.

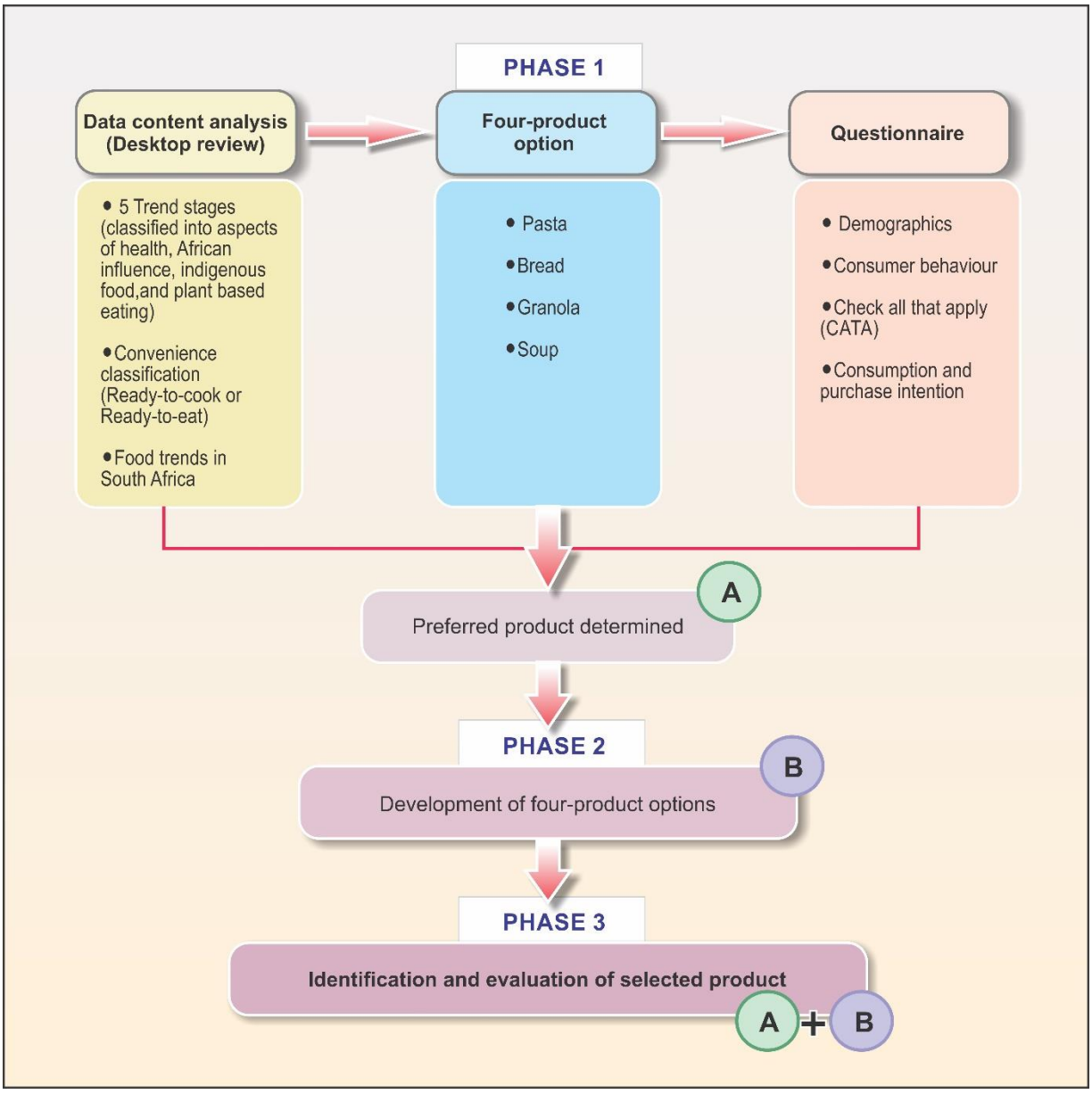


FIGURE 4.2: METHODOLOGICAL PROCESS

4.6.1 Study area and unit of analysis

A sample is a subdivision of the demographic group which the researcher aims to study and is an important process to follow to allow the collection of data that guarantees that the sample size and characteristics are representative of the research population (Salkind, 2012:223; De Vos et al., 2011).

This research project was conducted in the Gauteng province of South Africa. Although this is the smallest province in South Africa, it has the largest population of all the provinces (14.7 million people), which is 25.4% of South Africa's population (StatsSA, 2019a). This province was chosen as it is a major urban area and makes the highest contribution to the country's GDP (contributing over 34.72% to South Africa's economy) (StatsSA, 2019a; City Population, 2018). Although urbanisation is associated with a decrease in consumption of AGLVs, a bigger target group would be able to be reached in a more densely populated area, and this would provide more availability and accessibility of a new food product (StatsSA, 2018; Cernansky, 2015). As covered by the literature review, it was observed that a possible reason for a decrease in morogo consumption was that consumers in urban areas do not have access to areas where AGLVs grow naturally (Cernansky, 2015; Senyolo et al., 2014; Faber et al., 2010; Feagan, 2007; Voster et al., 2007).

The unit of analysis was the urban consumer residing in Gauteng from different education levels, gender, race and age groups (over the age of 18 to be able to make purchasing decisions). They also had to be able to communicate in English, read and write English and be computer literate.

The demand for food that saves time in meal preparation has increased significantly over the past few decades (Okrent and Kumcu, 2016). This may be due to the fact that consumers want foods that are easy to prepare. People are busier due to work demands and have little time to prepare food. Moreover, convenience foods are not so expensive anymore, and there is more advertising of convenience foods than non-convenience foods (this indicates the power of the media, which encourages one to purchase more convenience foods) (Okrent and Kumcu, 2016).

South Africa has a high rate of obesity. Almost 70% of women are overweight or obese, and 39% of men are overweight or obese (Healthy Living Alliance, 2018). There is a general belief that convenience foods are one of the main reasons why the rate of obesity in countries around the world is increasing. Convenience foods are perceived to be unhealthy and contain more calories than food prepared at home (Okrent and Kumcu, 2016). The consumption of unhealthy food items has been linked directly to

increasing urbanisation and globalisation of the food industry (Logan and Jacka, 2014). This is why it is crucial to have healthy and nutritious options available in the market. The development of a culinary product using AGLVs will help to address the need for a convenient and accessible healthy food product for urban consumers.

4.7 PHASE 1: CULINARY INNOVATION FORMULATION

Phase 1 involved market research as well as a survey questionnaire to determine what type of product out of four product options consumers were interested in. The research methodology will be discussed for each stage in Phase 1. Market research is discussed first, followed by the survey questionnaire.

4.7.1 Market research

4.7.1.1 Sampling technique and size as a component of market research

Market research is important to give an idea of which products will have a greater chance of succeeding (Harrington, 2004a) and what type of product consumers will be interested in. During the market research phase, four possible product options were identified as options for the participants to select from in the survey questionnaire. In this phase, the search for trends looked at the topics of AGLVs and products/dishes, indigenous foods and flavours, foods with perceived health benefits and convenience foods. Various aspects such as the use of ingredients, dishes and cooking or processing methods were also be looked at. This data content analysis was used to determine what four types of products had the potential for development in order to find out what consumers would be interested in and what types of product should be developed in Phase 2. Figure 4.3 shows the process that was followed to obtain the four product options. The figure is shown below with the applicable sections highlighted.

The Centre for Culinary Development developed a validated trend-mapping technique that identifies which trends are increasing in popularity or which trends are short-lived. The basis of trend mapping is that all major food trends go through five stages before they become a mainstream product (Centre for Culinary Development, 2007). In this phase, the search for trends looked at the topics of AGLVs and products/dishes, indigenous foods and flavours, foods with perceived health benefits and convenience foods. Various aspects such as the use of ingredients, dishes/products and cooking or processing methods

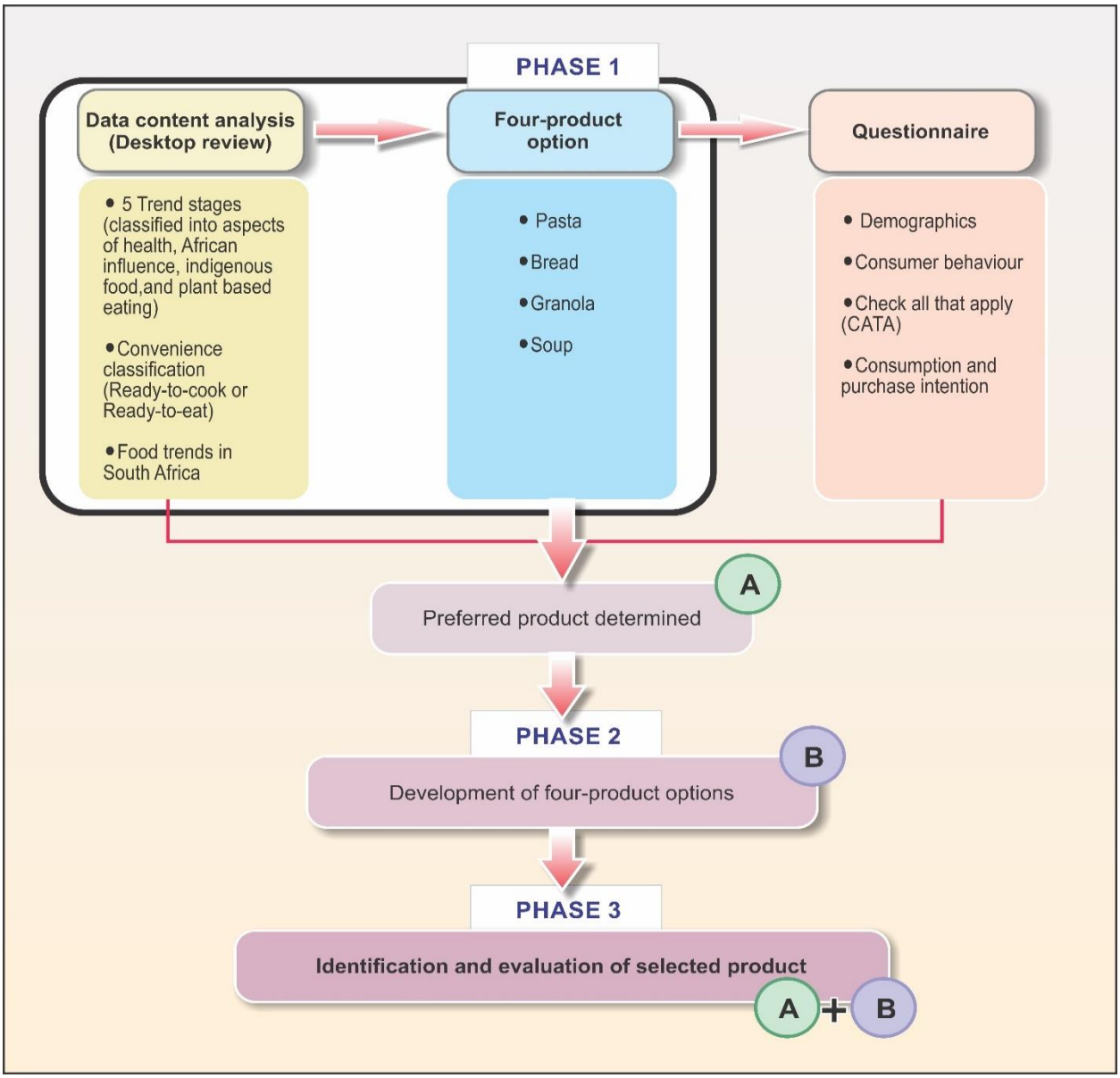


FIGURE 4.3: METHODOLOGICAL PROCESS: MARKET RESEARCH

were also investigated. This search was done as a desktop review and presented in the different stages of trends as follows (Centre for Culinary Development, 2018):

1. Item appears at a fine dining establishment
2. Item features in speciality TV food channels and magazines
3. Item features in mainstream restaurants
4. Item features in popular magazines/publications
5. Item reaches quick-service restaurants and grocery stores

In the following section, the measuring instrument and the data collection will be discussed together to avoid any confusion.

4.7.1.2 Measuring instrument and data collection as a component of market research

This market research section covers Objective 1.1 of **Objective 1: To investigate and determine what type of African green leafy vegetable culinary product is desired**. The sub-objective of Objective 1 is **Objective 1.1: To establish market trends of African green leafy vegetables in order to identify four possible product options**. Market research is important to get an idea of which products will have a greater chance of succeeding (Harrington, 2004a) and what type of product consumers will be interested in. This phase consisted of a data content analysis to obtain market research and identify trends, and was done as a desktop review.

The measuring instrument and data collection in this market research phase consisted of a trend analysis (trend mapping) table to allow the analysis to be given in the form of a report (see Addendum A). This table was a convenient way of documenting the findings to determine what areas/products had the potential to be developed into a product which would interest consumers and be used as product options in the survey questionnaire. The aim of the trend analysis table and report was to identify trends and four possible options for a convenient AGLV product. The information and trends obtained had to link to the requirements of addressing issues of urbanisation, accessibility, convenience and health through the AGLV product options determined.

The trends were identified in terms of the five stages according to the Centre of Culinary Development (2007), and the data was obtained using the aspects identified in the template in Table 4.2. This template was used to capture the data quickly to identify under which aspects the item was classified (health, African influence, indigenous food and plant-based eating). The data captured in this phase was used to determine what type of products/dishes are available in South Africa to see what consumers would be interested in and to identify four possible options which participants could select from in the survey questionnaire. The data that was included covered the period of January 2015–July 2018 by looking at the five stages in the trend mapping which were developed by the Centre for Culinary Development (2007). The data was obtained from the resources shown in Table 4.3.

TABLE 4.2: MEASURING INSTRUMENT FOR MARKET RESEARCH

STAGE1: THE INGREDIENT/DISH BEGINS TO APPEAR AT UPSCALE, FINE DINING RESTAURANTS				
Name of Restaurant	Aspect of Interest			
	Health	African Influence	Indigenous Food	Plant-Based Eating
STAGE 2: THE ITEM STARTS TO FEATURE IN SPECIALITY TV FOOD CHANNELS				
Name of Programme	Aspect of Interest			
	Health	African Influence	Indigenous Food	Plant-Based Eating
STAGE 2: THE ITEM STARTS TO FEATURE IN SPECIALITY MAGAZINES				
Name of Magazine	Aspect of Interest			
	Health	African Influence	Indigenous Food	Plant-Based Eating
STAGE 3: THE ITEM STARTS TO FEATURE IN MAINSTREAM RESTAURANTS				
Name of Restaurant	Aspect of Interest			
	Health	African Influence	Indigenous Food	Plant-Based Eating
STAGE 4: THE ITEM FEATURES IN POPULAR MAGAZINES/PUBLICATIONS				
Name of Magazine	Aspect of Interest			
	Health	African Influence	Indigenous Food	Plant-Based Eating
STAGE 5: ITEM REACHES QUICK-SERVICE RESTAURANTS				
Name of Quick-Service Restaurant	Aspect of Interest			
	Health	African Influence	Indigenous Food	Plant-Based Eating
STAGE 5: ITEM REACHES GROCERY STORES				
Name of Product	Aspect of Interest			
	Health	African Influence	Indigenous Food	Plant-Based Eating

TABLE 4.3: DATA COLLECTION OF MARKET RESEARCH

Stage	Resource Used
1. Item appears at a fine dining establishment	Eat Out (South African Restaurant Directory) - January 2017–July 2019
2. Item features in speciality TV food channels and magazines	Speciality Magazines - January 2015–June 2018: Taste Magazine The South African Food Review Magazine Gourmet South Africa Speciality TV Food Channels - January 2017–January 2018: South African chefs were looked at who had cooking programmes that were aired in South Africa on DStv (a Sub-Saharan African direct broadcast satellite service)
3. Item features in mainstream restaurants	Eat Out Restaurant Directory - January 2017–July 2017
4. Item features in popular magazines/publications	Food and Home Entertaining - January 2015–June 2018
5. Item reaches quick-service restaurants and grocery stores	Quick-Service Restaurants - January 2017–July 2017: Eat Out Restaurant Directory Grocery Stores - January 2017–June 2018: Checkers Pick n Pay Woolworths

With regard to **Stage 1** of trend mapping (the item appears at a fine dining establishment), a popular online South African restaurant directory was used called Eat Out. This directory has a search function which allows one to search for different establishments using keywords. Various fine dining establishments were identified using the search function of the website and identifying fine dining establishments according to the following classifications: health; African influenced; indigenous food; and plant-based eating. This was done by entering keywords into the search function, e.g. “fine-dining”, and then sifting through the list of establishments that were categorised into that group. After sifting through the list of establishments provided and the menus which were available per establishment, the aspects of interest as shown in Table 4.2 were used as an input into the search function. The restaurant and the aspect of interest were then entered into the template as shown in Table 4.2 if they were applicable or if any of the aspects which were of interest were mentioned (health, African influence, indigenous food or plant-based eating). Eat Out was the only online restaurant directory used in this stage in order to limit the amount of information obtained. The number of applicable establishments were then counted. The data content search for this stage was compiled from January–July 2017 and can be found in Addendum A. The Eat Out restaurant directory was consulted once a month during this period.

In **Stage 2** (the item features in speciality TV food channels and magazines), Woolworths’ Taste magazine, the South African Food Review Magazine and Gourmet South Africa were used as the main sources for speciality magazines. The data content search for this stage was compiled from January 2015–June 2018. All issues from January 2015 to June 2018 were looked at, and only those that were applicable to the aspects of interest were identified and reported on. The magazines from this period were obtained either in hard copy or electronically and then analysed. This was done by reading through the articles or promotional material, and if they were applicable they were classified according to the aspects of interest. The number of applicable articles were then counted. After completion of the table as shown in Table 4.2, notes were made on aspects that were repeated or of interest which could be applicable to four possible product ideas.

With regard to S**tage 2** and the item featuring in speciality TV food channels, South African television programmes were viewed which are aired on DStv (a Sub-Saharan African direct broadcast satellite service owned by MultiChoice). The channels viewed were channel 101 (M-Net), 174 (BBC Lifestyle) and 175 (Food Network). This was done by identifying programmes on the DStv’s website and reading about the different programmes offered. The applicable programmes were also classified according to the aspects of interest if they were covered by the programmes (health, African influence, indigenous food and plant-

based eating). The programmes found were aired at least once during the period January 2017 - January 2018. The number of applicable establishments were then counted. Notes were then made on aspects that were repeated or of interest which could be applicable to four possible product ideas.

In **Stage 3** the Eat Out Restaurant Directory was again used as it was in Stage 1, with the focus on mainstream restaurants. A filter was used on the website's search engine as in Stage 1. When using the platform, the keyword from each stage was typed into the search function, which then provided a list of establishments that were categorised into that group. The following keywords were used as input into the search function in order to identify mainstream restaurants: informal; casual; coffee and quick meals. A list of establishments was then provided and were categorised into that group. After sifting through the list of establishments provided and the menus that were available per establishment, the aspects of interest shown in Table 4.2 were used as inputs into the search function. The establishment and the aspect of interest were then listed if they were applicable (health, African influence, indigenous food, plant-based eating). Eat Out was the only online restaurant directory used in this stage in order to limit the amount of information obtained. The number of applicable establishments were then counted. The data content search for this stage was compiled from January–July 2017 and can be found in Addendum A. The Eat Out restaurant directory was consulted once a month during this period.

Stage 4 is when the item features in popular magazines/publications. For this stage a popular South African magazine called Food and Home Entertaining was used to identify aspects of health, African influences, convenience foods and plant-based eating. All issues from January 2015 to June 2018 were viewed, and only those that were applicable to the aspects of interest were identified and reported on. The magazines from this period were obtained in hard copy or electronically and then analysed according to the aspects of interest. This was done by reading through the articles or promotional material, and if they were applicable, they were classified according to the aspects of interest (health, African influence, indigenous food and plant-based eating). The number of applicable articles were then counted. Notes were taken on those aspects that were repeated or of interest which could be applicable to four possible product ideas.

In **Stage5** the item reaches quick-service restaurants and grocery stores. For the quick-service restaurants, once again the Eat Out Restaurant Directory was used as in Stage 1 and 3. This was done by using a filter on the website's search engine. The following terms were selected to identify mainstream restaurants: quick meals and fast food. This provided a list of establishments that were categorised according to the

terms selected. After sifting through the list of establishments provided and menus that were available per establishment, the aspects of interest as shown in Table 4.2 were used as input into the search function. The restaurant as well as the aspect of interest was then listed in the template as in Table 4.2 if it was applicable or if any of the aspects which were of interest were mentioned (health, African influence, indigenous food or plant-based eating). Eat Out was the only online restaurant directory used in this stage in order to limit the amount of information obtained. The number of applicable establishments were then counted. The data content search for this stage was compiled from January–July 2017 and is shown in Addendum A. The Eat Out restaurant directory was consulted once a month during this period.

In **Stage 5** with regard to grocery stores, three large retail food chains were examined according to their products with a focus on African influence, health, indigenous food, convenience and plant-based foods. The retail food chains viewed were: Checkers; Pick n Pay; and Woolworths. These stores were visited once a month in person or online during the period January 2017–June 2018. The product of interest was then classified according to aspect of interest and price (at the time that the data was obtained) and the quantity that the product was available for purchase. The number of applicable products available were then counted.

After the data content analysis had been done according to the five stages and aspects of interest (health, African influence, indigenous food and plant-based eating) in conjunction with the convenience classification desired for the new product and the food trends observed in South Africa, four product options were identified which participants could select from in the survey questionnaire. This relationship can be seen in Figure 4.4. Four product options were selected as the CATA procedure on which the questionnaire was based. Belusso et al. (2016) used four predetermined products, one of which participants could select which was tasted and evaluated in the sensory evaluation phase (Phase 3). The four products selected had the potential to be developed into a culinary food product which would address

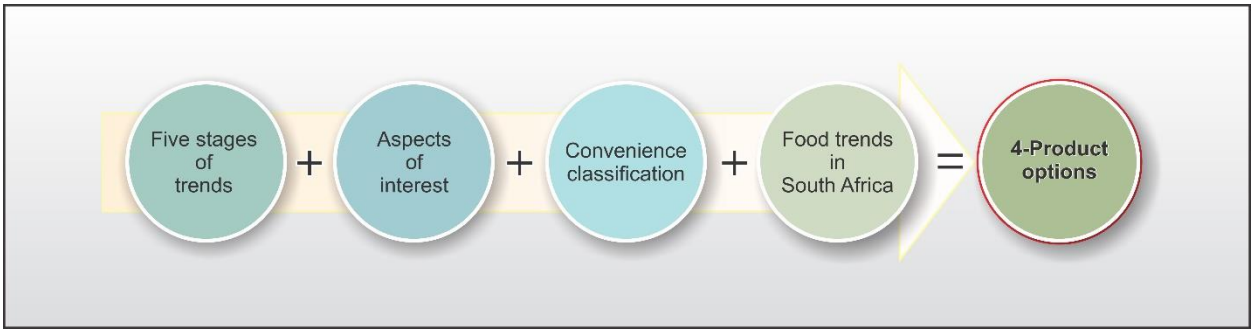


FIGURE 4.4: PROCESS OF THE SELECTION OF FOUR PRODUCTS

issues of urbanisation, accessibility, convenience and health by using morogo as an ingredient. These four products were used as options in the survey questionnaire.

In relation to the trends observed, popular trend forecasting platforms were also observed during 2015–2018, such as Kalsec (a leading global producer of natural herbal and spice extracts for the food and beverage industry) (Kalsec, 2018), Innova Market Insights (an international market research company) (Innova Market Insights, 2018), Euromonitor (a global market intelligence publisher) (Euromonitor International, 2018c; Euromonitor International, 2018a; Euromonitor International, 2018b), Forbes (a global media company focusing on business, technology, entrepreneurship and lifestyle) (Forbes, 2019a; Forbes, 2018), McCormick (a spice, seasoning and condiment manufacturer) (McCormick, 2018), and Campbell's Culinary and Baking Institute (an institute of Campbell's Soup made up of chefs, culinary professionals and researchers) (Campbell's Culinary and Baking Institute, 2018). Food Stuff South Africa was also observed (Food Stuff SA, 2018; Food Stuff SA, 2012). This was to check whether the trends were in accordance with the research results obtained.

4.7.1.3 Data analysis as a component of market research

The data obtained from the research was analysed according to the aims and objectives which were set for this phase (**To establish market trends of African green leafy vegetables in order to identify four possible product options**). The data was captured electronically, and the information was then presented visually using tables (see Addendum A). The data was then classified into the aspects of health, African influences, indigenous ingredients and plant-based eating according to the five stages of trends. The number of applicable entries according to each stage were then counted and reported on. After the data content analysis was obtained with regard to the five stages and aspects of interest in conjunction with the convenience classification that the developed product should have and food trends observed in South Africa, four product options were determined which participants could select from in the survey questionnaire. In this phase, the trends were only discussed in order to determine where product possibilities were regarding AGLVs.

Four product options were selected just like the CATA procedure on which the questionnaire was based on. Belusso et al. (2016) used four predetermined products. The participants then selected one product which was tasted and evaluated in a sensory evaluation (Belusso et al., 2016). The four products selected showed the potential to be developed into a culinary food product in order to address issues of

urbanisation, accessibility, convenience and health by using morogo as an ingredient. These four products were used as product options in the survey questionnaire.

4.7.2 Survey questionnaire

4.7.2.1 Sampling technique and size as a component of the survey questionnaire

A sample is a subdivision of the population that the researcher aims to study and is necessary in order to enable the data collection to be representative of the research population (Salkind, 2012:95; De Vos et al., 2011:223). A survey questionnaire was used to determine what type of product was to be developed and its characteristics in order for it to be developed in Phase two. The questionnaire was a self-administered electronic questionnaire which was developed on Qualtrics (an online research survey tool). Due to limited time and resources, the questionnaire was distributed electronically by means of snowball sampling using various social media platforms (Facebook and WhatsApp), which encouraged the readers to share the questionnaire among their acquaintances with the aim of recruiting more participants (De Vos et al., 2011:233). In snowball sampling, there is no way of checking if the sample is representative of the subset of the population, so the results can only be applied to this sample (Leedy and Ormrod, 2013:214; Salkind, 2012:102; Walliman, 2011:188). The main aim of this research study was not to make generalisations about the population but rather to gain better insight into how to develop an innovative new culinary product using AGLVs as this could provide valuable information to the food industry when developing new products (Harrington and Ottenbacher, 2013; Harrington, 2004b) and thus meeting the aim of the study.

The questionnaire used in this phase was based on a tested questionnaire which uses CATA as an instrument for the development of a new product (Belusso et al., 2016). In the original questionnaire, CATA was applied in two phases of the process of product development using 60 participants. In total, 183 participants answered the questionnaire used in this phase of the study. The screening of the questionnaire prevented anyone from answering who was not over the age of 18 or if they lived outside Gauteng in order to meet the aim of developing an AGLV product for the urban consumer of Gauteng. The participants also had to indicate their consent to participate in the study.

At the end of the questionnaire, the participants were also asked to fill in their email addresses voluntarily and indicate if they would like to participate in the sensory evaluation of the developed product in Phase

3 (Section 4.9). Figure 4.5 shows the process that was followed to obtain the four product options. This figure is shown below with the applicable sections highlighted.

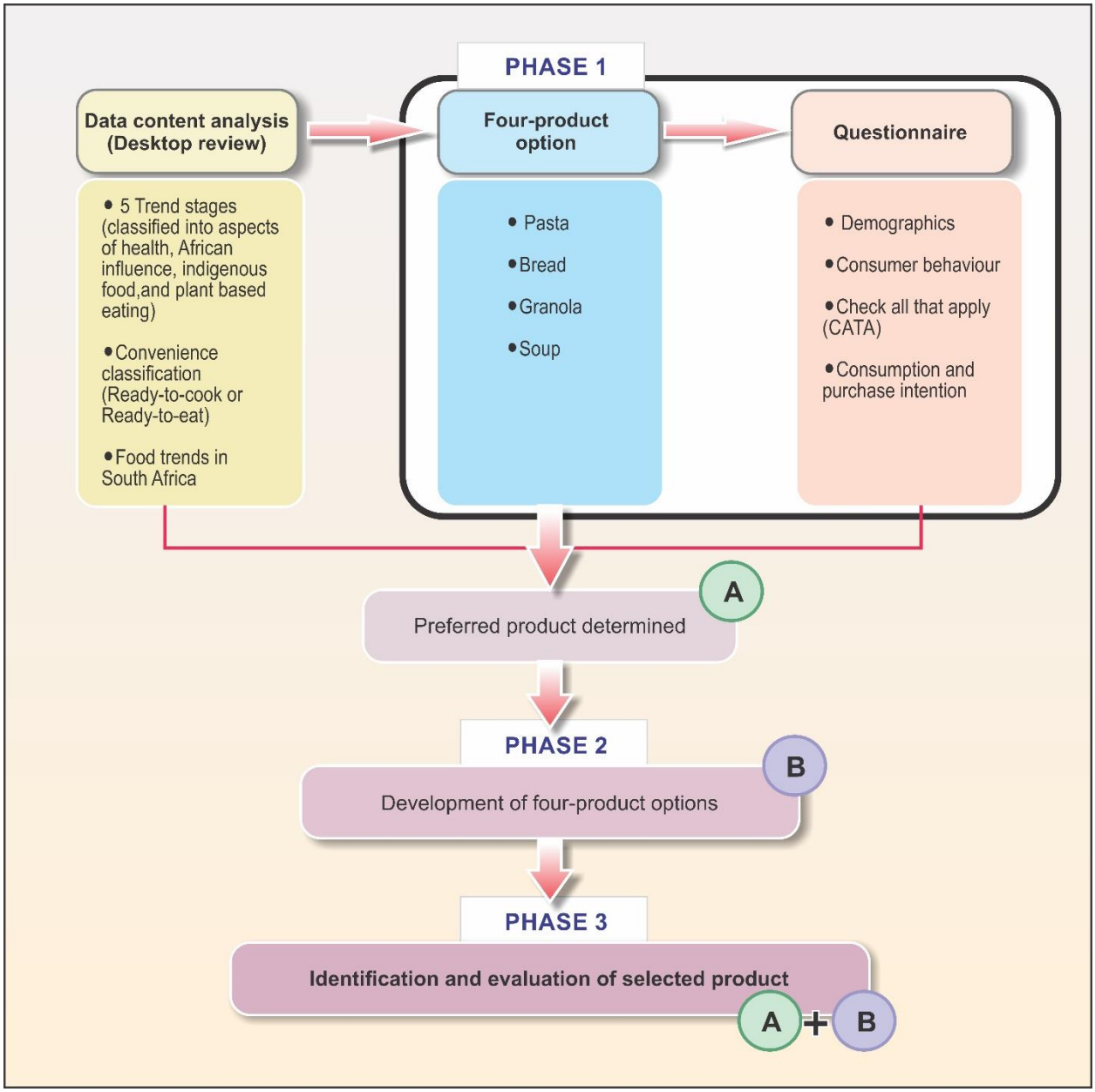


FIGURE 4.5: METHODOLOGICAL PROCESS: SURVEY QUESTIONNAIRE

4.7.2.2 Measuring instrument as a component of the survey questionnaire

A measuring instrument should be an instrument which can reliably measure what the researcher intends to measure, and should be easy and efficient to use (Leedy and Ormrod, 2013:215). A structured self-administered electronic online questionnaire was used as the measuring instrument to collect primary

data in this phase (shown in Addendum B). This survey questionnaire aimed to cover **Objective 1: To investigate and determine what type of African green leafy vegetable culinary product is desired**. The sub-objectives covered in this questionnaire were **Objective 1.2: To investigate why consumers do not consume African green leafy vegetables** and **Objective 1.3: To determine the characteristics desired in an African green leafy vegetable product.** The objectives also aimed to address issues of urbanisation, accessibility, convenience and health.

The concepts that were measured by means of the measuring instrument were designed and tested in a recent study in Brazil (Belusso et al., 2016). The measuring instrument was used in this phase as well as in Phase 3 – see Section 4.9 (the original study was made up of two phases). The measuring instrument was adapted to reflect the topic of investigation and the context of the study. The original instrument used the CATA questionnaire as an instrument for the development of a fish-based product. Check All That Apply is an innovative sensory technique which is used to gather information about the market and consumer quickly without the need for trained panellists (Belusso et al., 2016). This is done by presenting the participants with a list of statements to choose from and asking them to select as many statements which they think are applicable. In the questionnaire, CATA was applied in two stages of the development of the product, market research and sensory and hedonic characterisation of the final product (Belusso et al., 2016). The CATA questionnaires used in this study were based on the study done by Belusso et al. (2016) but applied to the context of an AGLV product. After obtaining the necessary information from the literature, the instrument was slightly adapted to reflect the topic of investigation and therefore to allow the aim of the study to be met.

In the original study 60 participants were used in the first Phase. They answered a CATA questionnaire which included 20 sentences with opposing sentences about sensory characteristics, types of products (with four product options that the participants could choose from, which is why four product options were used in this study) and consumer habits related to fish consumption (Belusso et al., 2016). In this study, 183 participants answered a multi-sectioned, structured, self-administered electronic questionnaire which was used to determine what type of product should be developed in Phase 2. The questionnaire was developed on Qualtrics (an online research survey tool). An electronic questionnaire helped to ensure that the data was captured immediately. It is also more economical and environmentally friendly than paper-based questionnaires (Schleyer and Forrest, 2000).

The questionnaire was distributed with a brief of the project (introducing the study to all willing participants) and contained a link to the online questionnaire which the participants could answer on their own electronic device (computer, laptop, tablet or cellphone). The cover page of the questionnaire included a short explanation of the purpose of the study, ensured anonymity of the participants and lastly included instructions for completion of the questionnaire. The participants were made aware that participation was voluntary and that it would take approximately 12 minutes to complete. The screening of the questionnaire prevented anyone from answering who was not over the age of 18 or if they lived outside Gauteng in order to meet the aim of developing an AGLV product for the urban consumer of Gauteng. At the end of the questionnaire the participants were also asked to fill in their email addresses voluntarily and indicate if they would like to participate in the sensory evaluation of the developed product in Phase 3 (see Addendum B).

The questionnaire contained four sections, and the questions were asked in a simple manner for the participants to be able to answer without needing the researcher to be present (see Addendum B). Likert-type scales were used because they are popular in research, are easy to prepare, and simple for participants to interpret and complete without the presence of the researcher (Kumar, 2014:206; Hair, Black, Babin et al., 2009:329). The sections are described below:

Section A (Demographics): contained questions pertaining to the demographics of the participants regarding gender, age, level of education, population group according to the South African Population Act and level of income.

Section B (Consumer Behaviour): consisted of background questions to establish why the participants do not consume AGLVs in order to address issues of urbanisation, accessibility, convenience and health. The participants were asked to indicate their level of agreement with various statements on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Section C (CATA): consisted of CATA questions from which the participants could select as many as they thought were applicable. In this questionnaire, CATA was used to find out what product the participants were interested in out of four product options (determined from the market research discussed in Section 4.7.2.1), the level of convenience it should have (ready-to-cook or ready-to-eat) and sensory aspects related to AGLVs which would ultimately determine the type of product to be developed as well as its characteristics. Each statement in the CATA section also included an opposing statement so that responses which were both marked were discarded to ensure validity (Belusso et al., 2016). In the original CATA

study as well as in this study, 20 sentences with opposing sentences about sensory characteristics and hedonic reactions were used (Belusso et al., 2016).

The CATA questions consisted of product options as well as sensory attributes adapted to the participants' preferences regarding a morogo product. The classification of the statements adapted from the original study done by Belusso et al. (2016) are shown in Table 4.4.

TABLE 4.4: CLASSIFICATION OF CATA TERMS ADAPTED FROM BELUSSO ET AL. (2016)

Original CATA statement according to Belusso et al. (2016)	Adapted CATA statement used in this study	Product or Sensory Characteristic
If offered at the supermarket, I would consume a fish hamburger	If offered at the supermarket, I would consume morogo bread	Product 1
When I think of a fish product, I do not mind if the meat is dark	When I think of a morogo product, I do not mind if the product is green	Appearance/Colour
Even if offered in the supermarket I would not consume a fish meatball	Even if offered in the supermarket, I would not consume morogo pasta	Product 2
I feel uneasy when I smell fish	I feel uneasy when I smell morogo	Smell/Aroma
A fried fish product does not appeal to me	A ready-to-cook convenient morogo product does not appeal to me	Cooking method 1 or Stage of convenience 1
I prefer a well-seasoned fish product	I prefer a well-seasoned morogo product	Taste/Flavour
When I think of a fish product, I expect the meat to be very white	When I think of a morogo product, I expect the product to be green	Appearance/Colour
Even if offered at the supermarket I would not consume a fish nugget	Even if offered at the supermarket, I would not consume morogo instant soup (e.g. Cup a Soup)	Product 3
I would not consume a baked fish product	I would not consume a ready-to-eat convenient morogo product	Cooking method 2 or Stage of convenience 2
Even if offered at the supermarket I would not consume fish sausage	Even if offered at the supermarket, I would not consume morogo granola (e.g. Kellogg's granola)	Product 4
I would only consume a baked fish product	I would only consume a ready-to-eat convenient morogo product	Cooking method 2 or Stage of convenience 2
I would consume a fried fish product	I would consume a ready-to-cook convenient morogo product	Cooking method 1 or Stage of convenience 1
I prefer to consume a fish-based product that has a characteristic fish flavour	I prefer to consume a morogo-based product that has a characteristic morogo flavour	Taste/Flavour
Even if offered at the supermarket I would not consume a fish hamburger	Even if offered at the supermarket, I would not consume morogo bread	Product 1
If offered at the supermarket I would consume fish meatballs	If offered at the supermarket, I would consume morogo pasta	Product 2
I would consume a baked fish product	I would consume a ready-to-eat convenient morogo product	Cooking method 2 or Stage of convenience 2
I would only consume a fried fish product	I would only consume a ready-to-cook convenient morogo product	Cooking method 1 or Stage of convenience 1
I do not mind fried fish odour	I do not mind the smell of morogo	Smell/Aroma
If offered at the supermarket I would consume fish sausage	If offered at the supermarket, I would consume morogo granola (e.g. Kellogg's granola)	Product 4
If offered at the supermarket I would consume fish nugget	If offered at the supermarket, I would consume morogo instant soup (e.g. Cup a Soup)	Product 3

Section D (Consumption and Purchase Intention): In this section the four product options were illustrated which the participants had the option of choosing from and were asked to rate how likely they would be to consume or purchase the product (based on the image) on a 5-point Likert scale ranging from 1 (extremely unlikely) to 5 (extremely likely). This section could only be completed at the end of the questionnaire so that the image would not influence the participants' initial response.

Once the questionnaire was approved, it was pre-tested with 20 participants in order to identify and address any uncertainties. This feedback and comments were taken into account and addressed before distribution of the questionnaire. The questions were randomised in order to confirm their validity (Belusso et al., 2016). The questionnaire took approximately 12 minutes to complete, which also helped participants not to feel tired when answering the questionnaire.

4.7.2.3 Data collection as a component of the survey questionnaire

Data collection includes the process of collecting primary and secondary data in order to draw conclusions to complete the research study. A structured, self-administered, electronic online questionnaire was used as the main instrument to collect primary data. The survey questionnaires were developed on Qualtrics which captured the information automatically when the participants completed it, and the data was exported into a Microsoft Excel spreadsheet. The data was collected from February-November 2017. The results obtained from this questionnaire determined which product the participants wanted, as well as the sensory characteristics it should have which will be used as an input for the product development phase (Phase 2: see Section 4.8).

The data was captured in the form of a self-administered electronic questionnaire (Addendum B) which was developed on Qualtrics and distributed by means of snowball sampling. A total of 60 participants were needed to complete the questionnaire, but in the end 183 participants participated. The participants could answer the questionnaire in their own time and on any electronic device (smartphone, computer or IPad). At the end of the questionnaire, the participants were asked if they would like to participate in the sensory evaluation of the developed product and were asked to include their email address or cellphone number so that they could be informed of the tasting sessions for Phase 3 (see Section 4.9).

In the CATA section, CATA was used to determine which product the consumers were interested in out of four product options (determined from the market research as discussed in Section 4.7.1), the level of convenience it should have (between the options of ready-to-cook and ready-to-eat as the aim was to

develop a convenient culinary product) and sensory aspects related to AGLVs which would ultimately determine the type of product to be developed as well as its characteristics.

Once the questionnaire was approved, it was pre-tested with 20 participants in order to identify and address any uncertainties. This feedback and comments were taken into account and addressed before the questionnaire was distributed. The questions were randomised in order to confirm their validity (Belusso et al., 2016). The questionnaire took approximately 12 minutes to complete, which also helped prevent the participants from become fatigued when answering the questionnaire.

The results obtained from this questionnaire determined which product the participants wanted, as well as the sensory characteristics it should have, which would be used as an input for the product development phase (Phase 2).

4.7.2.4 Data analysis as a component of the survey questionnaire

Data analysis involves processing the data collected and analysing it, as well as verifying it against the literature to bring order, structure and meaning to the collected data (De Vos et al., 2011:76). The data obtained from the research was analysed according to the aims and objectives which were set for this research study. The data was captured directly onto Qualtrics and exported into a Microsoft Excel spreadsheet. The data was then analysed using XLSTAT 2017, version 19.4.1.46344 (a statistical and analysis add-on software for Microsoft Excel).

Two methods were used to analyse the statistically collected data, namely descriptive statistics and inferential statistics. These two methods assisted in translating the data into information which would assist in objective interpretation when addressing the predefined objectives. The information was then presented visually using graphs and tables. Table 4.5 shows how the data was analysed.

Descriptive statistics are used to organise data in order to obtain an overview of the data and describe the characteristics of the sample (Babbie, 2010:G4). Descriptive statistics were used to analyse the demographic variables, the background questions concerning AGLVs, CATA, the product characteristics and the yield tests during the product development stage. Measures of central tendency were used, which included frequencies, percentages and means. The measures of dispersion used included range and variance. Descriptive statistics allowed the data to be easily portrayed visually, and made it easier to describe in terms of graphs and tables (Brown and Saunders, 2008:2).

Inferential statistics allowed the data collected from the sample to be studied so as to draw inferences that are assumptions of possibility (Brown and Saunders, 2008:2). The main aim of inferential statistics is to assist the researcher in identifying and quantifying correlations between variables which will enable interpretation and ultimately allow conclusions to be drawn (Walliman, 2011:213). The inferential statistics used in this study consisted of Z-tests and significant differences. Z-tests are used to determine whether the means of two groups are statistically significantly different from each other. A statement would be regarded as being significantly different when there is a 5% significance level ($\alpha = 0.05$).

Z-tests are statistical tests which are used for hypothesis testing, which allow a null hypothesis and can be approximated by a normal distribution. Z-tests observe whether the means of two groups are statistically different from each other or whether the difference between them is due to chance (XLSTAT, 2017). In this study, independent sample Z-tests were used which compare significant differences between two means based on two independent groups (as seen in the CATA tests) (Salkind, 2012:184).

TABLE 4.5: DATA ANALYSIS OF SURVEY QUESTIONNAIRE

Questionnaire Section	Data Analysis
Section A: Demographics	**Descriptive statistics:** Frequencies, percentages, means, range
Section B: Consumer Behaviour	**Descriptive statistics:** Frequencies, percentages
Section C: CATA	**Descriptive statistics:** Frequencies, percentages **Inferential statistics:** Z-tests, significant differences
Section D: Consumption and Purchase Intention	Descriptive statistics: Percentages

4.8 PHASE 2: CULINARY INNOVATION IMPLEMENTATION

Phase two involved the recipe development of the product specified in Phase 1, which aimed to develop a suitable prototype for the sensory testing in Phase 3. Figure 4.6 shows the process which was followed to obtain the four product options. The applicable sections are highlighted in the figure.

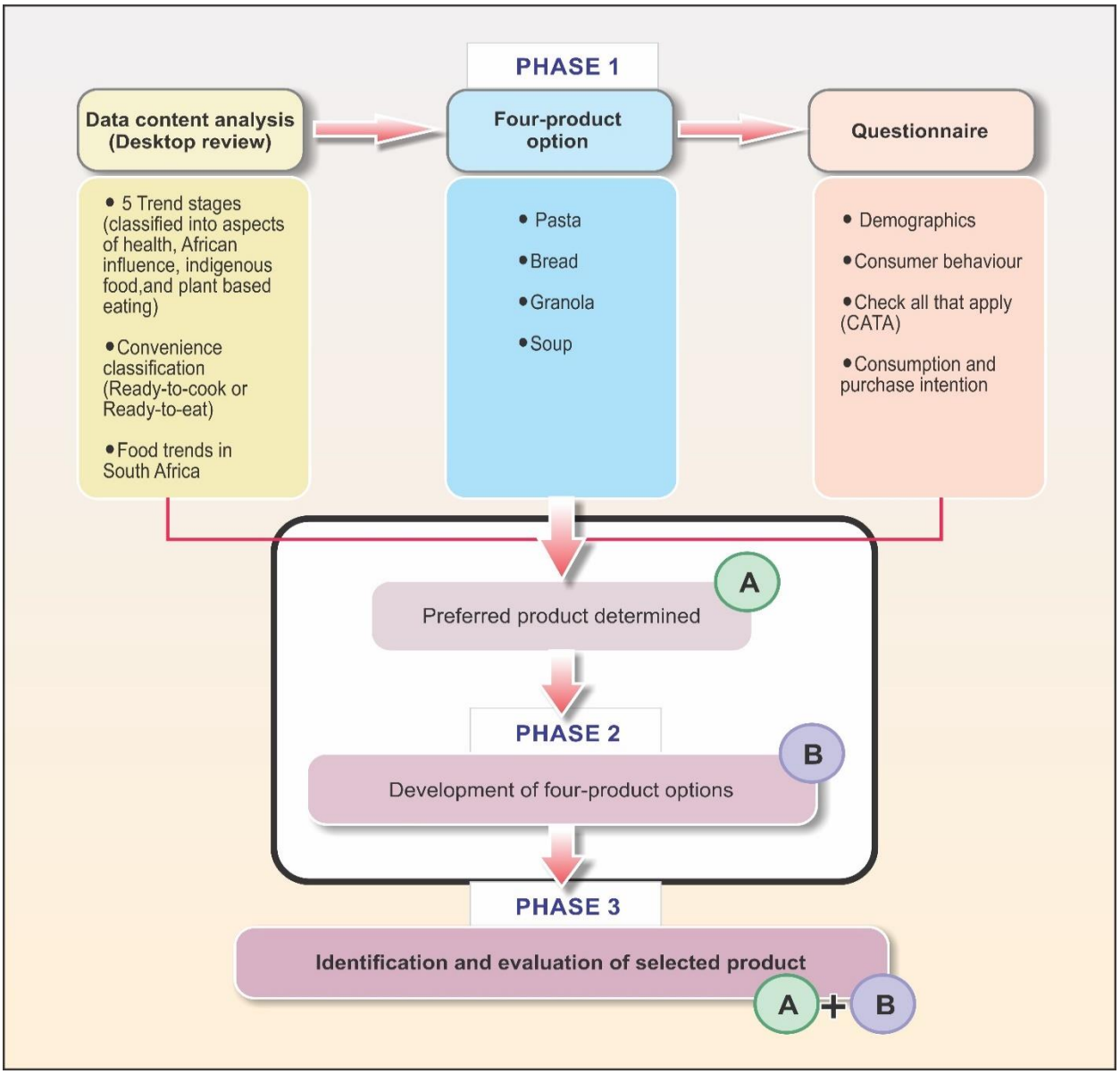


FIGURE 4.6: METHODOLOGICAL PROCESS: PRODUCT DEVELOPMENT

4.8.1 Sampling technique and size as a component of product development

The sample selected in the product development phase was the AGLV. In this research project, the plant used was *Asystasia gangetica*, commonly known as creeping foxglove (more information about this type of plant can be found in Chapter 2, Section 2.2). The plants were grown and maintained at the University of Pretoria by the Botanical Department for research purposes. Only the green leaves of the plant were used to develop the product. The product development process was assisted by four final-year hospitality management students under the subject Recipe Development (VDS 413).

The leaves were collected by the students prior to each practical session. The leaves were planted in various locations on the main campus of the University of Pretoria by the curator of the Manie van der Schijff Botanical Garden, Jason Sampson, who instructed the students on how to properly collect the samples so as not to damage the plant. The students only cut the leaves and collected the sample prior to the practical. About one kilogram of leaves were collected each week when a practical session took place.

Five expert panellists were selected at the start of the product development process. These panellists objectively evaluated the products after every development session (for colour, appearance, odour, taste, texture and mouthfeel) to ensure that consistent and accurate data was collected.

4.8.2 Measuring instrument as a component of product development

A measuring instrument should be a reliable instrument for what the researcher intends to measure and should be easy and efficient to use (Leedy and Ormrod, 2013:215). The concepts which were measured by the process of recipe development in Phase 2 are established scientific methods which are followed when developing new products (Fuller, 2011:2). Phase 2 involved the development of the product defined in Phase 1. This section aims to cover **Objective 2: To develop the four culinary products using African green leafy vegetables**. In Phase 1, after the data content analysis was obtained in terms of the five stages and aspects of interest (health, African influence, indigenous food, and plant-based eating) in conjunction with the convenience classification desired for the new product and food trends observed in South Africa, four product options were identified which the participants could select from in the survey questionnaire. Four product options were selected, as the CATA procedure by Belusso et al. (2016) on which the questionnaire was based used four predetermined products from which the participants selected one which they tasted and evaluated in the sensory evaluation (Phase 3). The four products selected showed the potential to be developed into a culinary food product to address issues of urbanisation, accessibility, convenience and health using morogo as an ingredient.

The product for which the participants indicated a strong preference based on the results of Phase 1 was morogo pasta (see Section 5.2). To run the processes simultaneously and be ready for the sensory evaluation, all four products that were identified were initially developed so as to be ready to proceed with the next phase of the study. The development of the three other products can be seen in Addendum C. Four final-year hospitality management students under the subject Recipe Development (VDS 413) assisted with the development of the four products. The development of the four products followed the process of product development, which is a tried and tested process used for developing new products

(Fuller, 2011; Hullah, 1984:21). The process of product development is shown in Figure 4.7. It begins with searching for recipes, the establishment of a baseline recipe, recipe adaptations and alterations, prototype development (baseline recipe), triple testing and lastly benchmarking. Phase 2 ultimately aims to develop a culinary product produced from AGLVs for the urban consumer in Gauteng which will assist in addressing issues of accessibility, convenience and health by making it available.

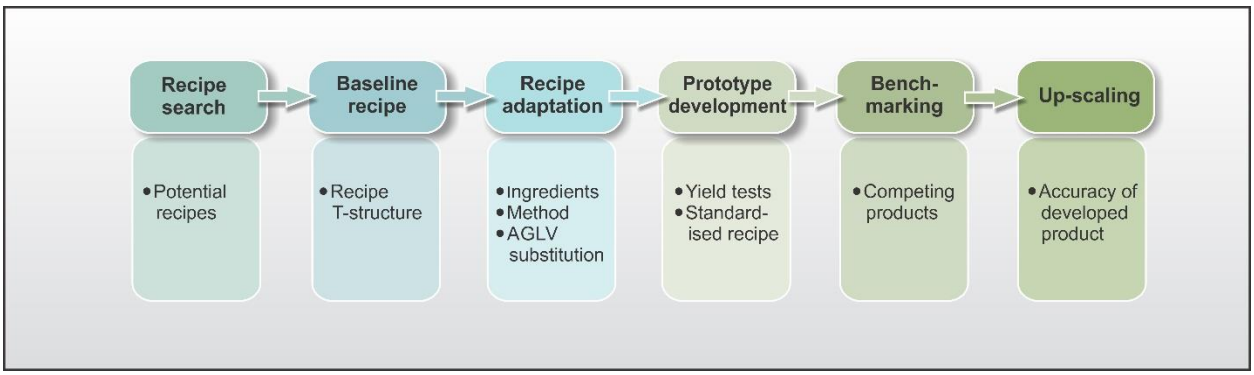


FIGURE 4.7: RECIPE DEVELOPMENT PROCESS

4.8.2.1 Recipe search as a component of recipe development

The process of the recipe development began by searching for possible recipes which could be used as a starting point. The recipes which were obtained had to meet the aim of the study, namely of being for the urban consumer of Gauteng. The recipes had to address issues of urbanisation, accessibility, convenience, health, and trends. The recipes had to be able to be made into a convenience food product (to meet the lifestyle of urban consumers) so that it could be made available in a retail setting such as a supermarket, which would make it accessible to consumers. The product also had to have a health aspect as AGLVs are classified as functional foods because they have health benefits beyond basic nutrition (Van der Walt et al., 2009; Siró et al., 2008).

Pasta was the desired product chosen by the participants in Phase 1 (see Section 5.2). As explained in Section 4.8.2, all four products that were identified were initially developed so as to be ready to proceed with the next phase of the study. The development of the three other products is shown in Addendum C. The four students who assisted in the development of the four products were given a project brief which they had to bear in mind when beginning the process of recipe searching (and throughout the whole process of the product development).

Recipes were searched for in published recipe books or trusted websites where recipes had been tested previously. After all the recipes had been collected, a baseline recipe was chosen which would be the basis for changes and adaptations. The recipe chosen was carefully assessed to ensure that it was a good foundation from which to change and adapt until the final prototype was developed. The recipe was chosen according to the performance criteria which were determined according to each of the four products.

4.8.2.2 Baseline recipe as a component of recipe development

The baseline recipe selected served as a basis from which to make changes and adaptations. These changes were in the form of method, cooking method, ingredients and yield. Once a baseline recipe was selected which showed potential due to the performance criteria determined, changes and adaptations were made to create a product that suited the brief given to the four students who assisted with the development. The changes and adaptations had to incorporate AGLVs without compromising on the quality of the product, i.e. even though the product selected by the participants was morogo pasta, it still had to have the characteristics of pasta and not be compromised by the inclusion of AGLVs (see Section 5.3).

A T-structure was then developed for the baseline recipe, which aimed to determine the structure and function of the dish in terms of its ingredients (Du Rand, 2015). This structure is used to observe the role of each ingredient in the dish as well as to determine how the ingredients fit together to create the final dish. The ingredients that determined the character of the dish, including the predominant flavour, body and texture are on the left of the T-structure. The ingredients contributing to the supporting roles of the dish are on the right side of the T-structure, which includes flavour builders and seasonings. An example of a T-structure is shown below in Figure 4.8.

FIGURE 4.8: INGREDIENTS DETERMINING CHARACTER AND CONTRIBUTING SUPPORT TO THE DISH

4.8.2.3 Recipe adaptations as a component of recipe development

Once a baseline recipe was chosen, it acted as a platform upon which changes and adaptations were made. These changes could take place in the optimisation of a recipe format and the design, yield, portion size, ingredients, cooking method, method of preparation, time, equipment, apparatus and measuring instruments (Hullah, 1984:24). The recipe components were converted to metric units (grams) and the recipes were then followed precisely as instructed to determine what changes needed to be made and how to adapt the recipe to include AGLV as an added health benefit and to adapt it as a convenience food product for the urban consumer in Gauteng.

Recipe adaptations in terms of quantity adjustment were determined using the Percentage Method (Swanepoel, Loubser and Visser, 1992:10). To do this the weight needed to provide the desired number of servings (with an added percentage for handling loss) was established. All the ingredient quantities (the edible portion of the ingredients) were converted to grams and the total weight of all the ingredients in the recipe were added together to obtain the combined weight. The percentage of each ingredient in the recipe was calculated in relation to the original total weight of the ingredients to obtain a percentage. The desired total weight of the recipe was then multiplied by the percentage of each ingredient to calculate the new amount needed for that ingredient. This formula is shown below in Figure 4.9.

$$\frac{\text{Original ingredient weight}}{\text{Combined weight of original yield}} \times 100\% = \text{Percentage of ingredient in relation to total weight (A)}$$

$$= \text{Combined weight of desired yield} \times \text{A (\% of ingredient in relation to total weight)}$$

$$= \text{New ingredient amount needed}$$

FIGURE 4.9: PERCENTAGE METHOD

With each practical session of the subject VDS 413 (Recipe Development), each change and adaptation was objectively evaluated by subject experts, who made recommendations for the adaptations or changes which needed to be made for the subsequent practical. Some aspects which had to be considered were nutrition (the recipe should retain health aspects due to the nature of the vegetables), cost (for the urban dweller in Tshwane to be able to afford it), practicality (it should be convenient for the end-user), appearance (due to the nature of the green vegetable), overall appeal, flavour, texture, appropriate

product use (it should be a convenient product which would encourage consumption and accessibility), and ease of preparation (Hullah, 1984:38).

Throughout the weeks of the VSD413 practical, the problems and adjustments were recorded, and comments were made which were tabulated. The changes were accurately recorded and controlled by making changes to the independent variables while leaving the dependent variable unchanged, which is typical of experimental research (Cresswell, 2014:11).

The product was also evaluated by the researcher, two subject experts, and the four final-year students who assisted in the development of the products. The four students were trained in the use of the sample and were briefed and closely involved throughout the practical sessions with the researcher and the subject experts. The evaluators discussed and evaluated the four products throughout the practical sessions and assessed the products using the evaluation sheets shown in Table 4.6. This was done by the same evaluators every week to ensure consistency of the data obtained. The categories evaluated were appearance, flavour, texture and convenience in preparation, which were evaluated on a 5-point Likert scale.

TABLE 4.6 EVALUATION SHEET OF MOROGO PASTA USED DURING PRACTICAL SESSIONS BY TASTERS

Evaluate the following characteristics out of 5		
Date:		**Product: Morogo Pasta**
Participant name:		
Rate characteristic out of 5: 1 being most undesirable and 5 being most desirable		
Sensory Characteristics	**Criteria**	**Score**
Appearance	The pasta is bright green in colour The pasta is firm and has little to no water retention (i.e. not soggy)	
Flavour	Earthy taste Morogo flavour Tastes like a wheat-like pasta Flavour is present but subtle enough to be eaten with a variety of sauces	
Texture	Al dente (retains some hardness when biting) Not grainy Smooth mouthfeel	
Convenience in Preparation	Easy steps to follow to cook Remains al dente and firm after following instructions	
	Comments:	

4.8.2.4 Prototype development as a component of recipe development

Once all the changes and adaptations to the recipes had been made, consumer experts and the researcher approved the final recipe which was then standardised for small-scale use (4 servings-appropriate for household use) and was used as the basis for triple testing and up-scaling to ensure a reliable product of high quality. According to Hullah (1984: 2-6), the developed recipe and product should have the following elements, which subject experts took into account to determine whether the product was of acceptable quality to the consumer:

- Reproducibility: for the recipe to be made repeatedly with consistent results and that the written recipe coincides with the developed product
- Ease of preparation: the recipe followed (when producing the product and when consumers prepare the product) involved a minimum number of steps in a logical sequence to obtain the product described
- Concise: the recipe was brief yet clear
- Interesting: had an appeal and was unique
- Pleasing to the senses: the product was stimulating and appealing
- Economical: had qualities of economy (not only in the monetary sense but also in resources such as time, human, equipment, etc.)

The standardised recipe was important as it ensured that the product and recipe were complete, accurate and reliable, and also gave credibility to the value of the product (Hullah, 1984:2).

4.8.2.5 Yield tests as a component of recipe development

Recipe testing is essential for creating a recipe of high standard and an accurate and reliable product leaving no room for error (Harrington, 2004a; Hullah, 1984:21). Once the final product (prototype) had been developed, it was standardised and repeated three further times to ensure that the recipe was accurate and produced reliable results in terms of mass, yield and sensory characteristics, e.g. flavour, appearance, texture, odour and mouthfeel. The measuring instrument used for triple testing is shown Table 4.7.

TABLE 4.7: TRIPLE TESTING MEASURING INSTRUMENT

YIELD FACTOR	TRIPLE TEST 1	TRIPLE TEST 2	TRIPLE TEST 3
Total raw mass			
Total cooked mass			
Yield factor			
Yield factor %			
Yield average			
Handling loss			
	Comments:		

4.8.2.6 Benchmarking as a component of recipe development

With regard to benchmarking, the developed products were compared to similar products on the market to determine how the developed product would compare if it were to be available commercially (Harrington, 2004a). This was done in a tabular format to highlight and compare any similarities and differences such as product type, quantity available, convenience, health aspects and price.

4.8.2.7 Upscaling as a component of recipe development

Once the standardised recipe was deemed acceptable, the recipe was scaled up to a larger volume so that the sensory evaluation could be done in Phase 3 (see Section 5.4). With regard to upscaling, the recipe developed was made for a larger number of portions and was once again standardised in terms of ingredients, preparation/handling techniques, equipment, and portion sizes. The upscaled version of the recipe is similar to the standardised household recipe in that it includes the yield, ingredients by weight, method, cooking times and temperatures, and portioning information. Where it differs is that the upscaled recipe also includes the time it takes to produce the product, details about costing, a description of the product, and the purchased as well as edible portion of the ingredients. The standardised upscaled recipe is important so that each time the product is produced it will have a standard quality (in terms of taste, appearance, etc.) and quantity (same yield each time) (Harrington, 2004a). The tried and tested standardised recipe will also emphasise the recipe's reliability and accuracy (Harrington, 2004a).

The percentage method was also used as the method of quantity adjustment in the large-scale version of the developed product (see Section 4.8.2.3).

The standardised recipe is important as it ensured that the four products and recipes were complete, accurate and reliable (Hullah, 1984:2). The standardised recipe was also used as the basis for further testing in terms of sensory evaluation of the one selected product in Phase 3 (see Section 5.4).

4.8.3 Data collection as a component of product development

In Phase 1 after the data content analysis had been done for the five stages and aspects of interest (health, African influence, indigenous food and plant-based eating) in conjunction with the convenience classification desired for the new product and food trends observed in South Africa, four product options were identified which the participants could select from in the survey questionnaire. Four product options were selected, as the CATA procedure of the questionnaire based on Belusso et al. (2016) used four

predetermined products which the participants could select from, one of which was tasted and evaluated in the sensory evaluation (Phase 3). The product that the participants indicated as having a strong preference for based on the results from Phase 1 was morogo pasta (see Section 5.2). As mentioned in Section 4.8.2, all four products which were identified were initially developed so as to be ready to proceed with the next phase of the study. The development of the three other products can be seen in Addendum C.

The data collection was done according to the process of traditional recipe development by beginning with a search for recipes, establishing a baseline recipe, recipe adaptations and alterations, prototype development, triple testing and lastly benchmarking. The recipe development process was assisted by four final-year hospitality management students under the subject Recipe Development (VDS 413) and was managed by the researcher as well as subject experts. Due to available resources and time constraints, all four products were developed from February to May 2017, which fell in line with the VDS 413 subject.

4.8.4 Data analysis as a component of product development

The data obtained for this phase was collected and analysed according to the aims and objectives which were set for this research study, which were to develop a culinary product produced from AGLVs for the urban consumer in Gauteng in order to address issues of urbanisation, accessibility, convenience and health. The aim of this phase was to develop the product specified in Phase 1 (see Section 5.2), so statistical analysis was not used in this phase. As discussed in Section 4.8.2, all four products that were identified were initially developed so as to be ready to proceed with the next phase of the study. Pasta was the desired product selected by the participants in the survey questionnaire. The development of the three other products is shown in Addendum C.

Data analysis involves processing the data collected and analysing it as well as verifying it against the literature to bring order, structure and meaning to the collected data (De Vos et al., 2011:76). In this phase, the process of product development was followed to create the four product options. The one culinary product selected in Phase 1 was then further developed for use in the sensory testing in Phase 3 (see Section 5.4). In this phase the data analysis involved yield tests, discussions of changes and adaptations with subject experts, and descriptive ratings of sensory characteristics.

4.9 PHASE 3: EVALUATION AND CONTROL

Phase 3 involved evaluating the culinary product produced. This was done by means of a sensory evaluation questionnaire used to describe the product, and to determine consumers' liking and purchase intention. Figure 4.10 shows the process followed with the applicable sections highlighted.

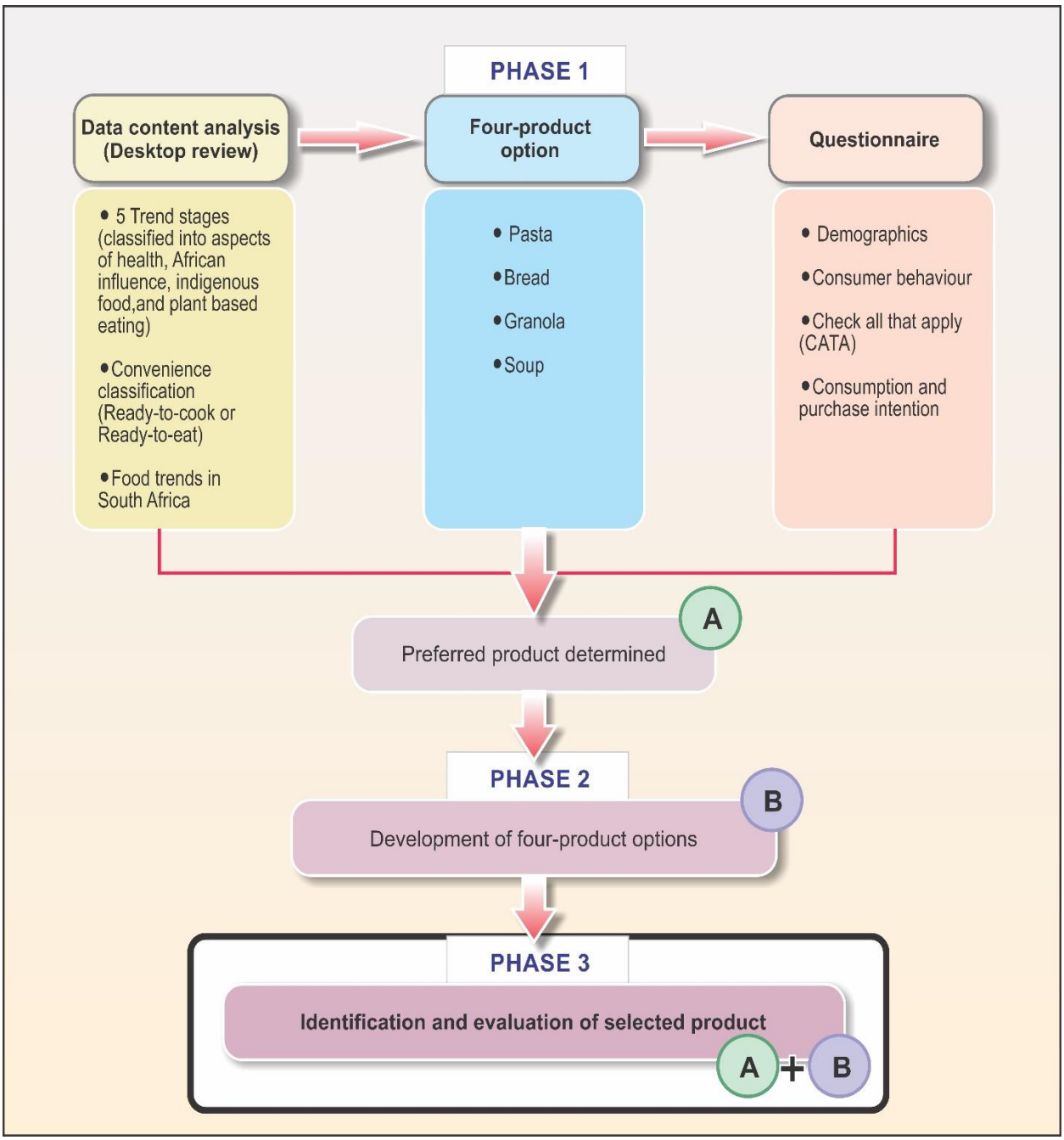


FIGURE 4.10: METHODOLOGICAL PROCESS

4.9.1 Sampling technique and size as a component of sensory testing

As mentioned previously, in Phase 1 (Section 4.7) snowball sampling was used to recruit participants. The participants in Phase 1 voluntarily indicated whether they would be willing to participate in the sensory evaluation of the one selected product developed in Phase 3. In this phase the participants participating in the sensory evaluation of the one selected product developed provided contact details voluntarily, which enabled the researcher to contact potential participants. In this phase, 72 participants participated in the tasting of the product. This ensured that the participants who tasted the product also responded to the questionnaire in Phase 1 (this screening also prevented anyone from answering who was not over the age of 18 or if they lived outside of Gauteng). Once the participants had been recruited, they indicated which session and time slot would suit them to do the sensory tasting. The sessions were all held at the University of Pretoria in the Old Agriculture Building, Room 2-9.

The participants were seated and presented with an IPad on arrival, which contained the project brief and aim as well as a link to the online questionnaire, which was used for the duration of the session. The questionnaire used in this phase was a self-administered electronic questionnaire (as in Phase 1 – see Section 4.7) which was developed on Qualtrics. The participants were asked to indicate their consent to participate in the study and were informed that it would take approximately 15 minutes to complete with the tasting of the one selected product developed. The aim of this phase was to confirm the development of the product for the urban consumer of Gauteng and in turn address issues of urbanisation, accessibility, convenience and health.

The questionnaire used in this phase was also based on the CATA questionnaire that was used in Phase 1 (see Section 4.7) as an instrument for the development of a new product (Belusso et al., 2016). In the original questionnaire, CATA was used in two phases of the process of product development. In the original study, 60 participants were used, and the CATA questionnaire contained sensory and hedonistic attributes, as did this study. Seventy-two participants participated in this phase of the study who also participated in the first phase of the study in the survey questionnaire (see Section 4.7).

4.9.2 Measuring instrument as a component of sensory testing

This survey questionnaire aimed to cover **Objective 3: To evaluate the one selected culinary product produced**. The sub-objectives covered in this questionnaire were **Objective 3.1: To describe the one selected developed product by means of sensory evaluation** and **Objective 3.2: To determine**

consumers' liking and purchase intention of the one selected developed product. The objectives also aimed to address issues of urbanisation, accessibility, convenience and health.

The concepts that were measured with the measuring instrument were designed and tested in a recent study in Brazil (Belusso et al., 2016) as seen in Phase 1 (Section 4.7). The measuring instrument was adapted to reflect the topic of investigation and the context of the study. The original instrument used CATA as an instrument for the development of a fish-based product. In this Phase, the CATA questionnaire was applied in terms of the sensory and hedonic characterisation of the one selected product (Belusso et al., 2016). The CATA questionnaires used in this study were based on the study done by Belusso et al. (2016), but applied to an AGLV product. After the questionnaire had been developed, a qualified statistician was consulted and it was then pre-tested with 20 participants to identify and address any uncertainties.

In the original study, 60 participants were used in the third phase who answered a CATA questionnaire which included 12 sentences with opposing sentences about sensory characteristics and hedonic reactions (Belusso et al., 2016). In this study (in Phase 3), 72 participants responded to a multi-sectioned, structured, self-administered electronic questionnaire (developed on Qualtrics) which was used to determine the sensory characteristics of the one selected developed product as well as the participants' hedonic reactions to and purchase intention of the product. The electronic questionnaire helped to ensure that the data was captured immediately. It was also more economical and environmentally friendly than a paper-based questionnaire (Schleyer and Forrest, 2000). The sensory testing required the participants to taste the product developed at the University of Pretoria and they answered the questionnaire on an IPad while tasting the product. This questionnaire regarding the tasting of the developed product took approximately 15 minutes to complete.

On the cover page of the questionnaire the purpose of the study was explained, the anonymity of the participants was ensured and instructions for completion of the questionnaire were given. The questionnaire was comprised of four sections (see Addendum D for full questionnaire):

Section A (Demographics): contained questions relating to the demographics of the respondent in terms of gender, age, level of education, population group according to the South African Population Act, and level of income.

Section B (CATA): consisted of CATA statements of which the participants could select as many as they thought applicable. In this questionnaire CATA was used to determine the sensory and hedonistic attributes which characterised the one selected product (morogo pasta). Each statement in the CATA section also included an opposing statement so that responses that were both marked were discarded to ensure validity (Belusso et al., 2016; Ares et al., 2010). In the original CATA study by Belusso et al. (2016), as well as in this study, 12 sentences with opposing sentences about sensory characteristics and hedonic reactions were used.

Section C (Hedonic Reaction): consisted of a 9-point hedonic scale on which the participants were instructed to indicate how much they liked the product (morogo pasta) after tasting it. The 9-point hedonic scale ranged from 1 (dislike extremely) to 9 (like extremely).

Section D (Purchase Intention): consisted of a 9-point purchase intention scale on which the participants had to indicate how likely they would be to purchase the product after tasting it. The 9-point purchase intention scale ranged from 1 (I would never buy this product) to 9 (I would buy this product every time I could).

4.9.3 Data collection as a component of sensory testing

Data collection includes the process of collecting primary and secondary data in order to draw conclusions to complete the research study. A structured, self-administered, electronic online questionnaire was used to collect primary data. The survey questionnaire was developed on Qualtrics, which captured the information automatically when participants completed it (see Addendum D).

This phase consisted of the sensory tasting of the one selected product (as indicated in the survey questionnaire in Phase 1) which was developed in Phase 2 (see Section 5.4). A total of 60 participants were needed to complete this phase, but ultimately 72 participants participated. The participants who participated in this phase indicated in Phase 1 that they would like to participate in the tasting of the product (as shown in Addendum B). The data was captured in the form of a self-administered, multi-sectioned, electronic questionnaire (see Addendum D) which was used to determine the sensory characteristics of the selected product as well as the participants' hedonic reactions and purchase intention. The questionnaire consisted of four sections, which included demographics, CATA, hedonic reaction and purchase intention. In this questionnaire, CATA was used to determine the sensory and hedonistic attributes that characterised the one selected developed product (morogo pasta). Once the

questionnaire was approved, it was pre-tested on 20 participants to identify and address any uncertainties. This feedback and comments were taken into account and addressed before the sensory sessions took place. The questions were randomised in order to confirm their validity (Belusso et al., 2016). The questionnaire is shown in Addendum D.

The sensory testing required the participants to taste the one selected developed product in a tasting session at the University of Pretoria in the Old Agricultural building (room 2-9) and participants to answer the questionnaire on an IPad while tasting the product. The questionnaire took approximately 15 minutes to complete with the tasting of the product. On the cover page of the questionnaire the purpose of the study was explained, the anonymity of the participants was ensured and instructions for completion of the questionnaire were given. The questionnaire was comprised of four sections (see Addendum D for full questionnaire).The testing room shown in Figure 4.11 provided a quiet and ventilated environment with a monitored temperature which was suitable for testing without any distractions (Lawless and Heyman, 2010:62). During the CATA stage of the questionnaire, the participants were presented with a tray containing two samples of pasta of 30 g each in separate disposable plastic containers and disposable plastic cutlery. The preparation of the sample tray is shown in Figure 4.12. The participants were instructed to taste the first sample and not evaluate it, but rather to use it as a benchmark. The second sample was the developed product which the participants had to evaluate according to the CATA terms provided (see Addendum D). The participants were also provided with filtered water to cleanse their palates. When the participants had finished, they were each presented with a small gift to thank them for their time and willingness to participate. Figure 4.13 presents a flow diagram of the experimental procedure that was followed during the sensory evaluation.

FIGURE 4.11: SENSORY TESTING AREA

FIGURE 4.12: TRAY PRESENTED TO PARTICIPANTS FOR EVALUATION

Morogo: *Aysestasia Gangetica* (Creeping Foxglove)

Blanching and refreshing

Processing of morogo with flour and eggs to create pasta dough

Kneading of dough to develop gluten

Rolling and cutting of pasta

Drying of pasta

Moist heat cooking: simmering

Time	Specifications	Equipment	Temperature	Pasta shape and amount
7 mins	3 000 ml of water was boiled with 30 ml pf salt (iodated table salt). When at boiling point, dried pasta was placed in boiling water and reduced to a simmer	Induction stove. Pot. Measuring jug. Measuring spoons. Slotted spoon.	Simmering (95°)	160 g linguini

Serving procedure

Proportion information	Materials and equipment	Sample size	Serving temperature	Other
The entire sample was tossed and drained with 10 m lolive oil and 2 ml salt	Colander. Stainless steel bowl. Measuring spoons. Disposable plastic containers. Scale	30 g	Warm (immediately after draining and tossing with olive oil and salt)	A control sample of plain pasta (without morogo) was also prepared in the same manner

Tray preparation

Items on tray:

- Wooden tray
- Disposable cup with filtered water (palate cleanser)
- Disposable plastic container with 30 g morogo pasta
- Two sets of plastic disposable cutlery
- Paper serviette

Evaluation room

- Sufficient natural lighting
- Monitored room temperature (21°)
- Set evaluation time slots to minimise distraction of smell and noise
- Facilitators assisted respondents with iPads and oral instructions
- Respondents were seated in rows to prevent communication (also controlled by facilitators)

FIGURE 4.13: FLOW DIAGRAM FOR THE EXPERIMENTAL PROCEDURE FOR PHASE 3

4.9.4 Data analysis as a component of sensory testing

Data analysis involves processing and analysing the data collected and verifying it against the literature to bring order, structure and meaning to the collected data (De Vos et al., 2011:76). The data obtained from the research was analysed according to the aims and objectives which were set for this research study to develop a culinary product from AGLVs for the urban consumer in Gauteng to address issues of urbanisation, accessibility, convenience and health. The data was captured directly onto Qualtrics and exported into a Microsoft Excel spreadsheet. The data was then analysed using XLSTAT 2017, version 19.4.1.46344.

Descriptive and inferential statistics were used to analyse the data collected. These two methods assisted in translating the data into information which would assist in achieving the desired objectives set for this study. The resulting information was then presented visually using graphs and tables of numeric measurements, frequencies, percentages, means and standard deviations, which provided the basis for the descriptive and inferential analysis. Table 4.8 shows how the data was analysed. More information about the data analysis is given in Chapter 5.

Descriptive statistics are used to discuss findings that are applicable to the sample and provide a method for quantifying the characteristics of the data. In this study, descriptive statistics were used to organise the data to obtain an overview of the data and describe the characteristics of the sample (Babbie, 2010:G4). Descriptive statistics were used to analyse the demographic variables, CATA, hedonic reactions to and purchase intention of the developed product. The measures of dispersion used included range and variance. Descriptive statistics allowed the data to be easily portrayed visually, making it easier to describe in terms of graphs and tables (Brown and Saunders, 2008:2).

Inferential statistics allows one to study the data collected from the sample to draw conclusions that are assumptions of possibility. This goes beyond describing the characteristics of the data (Brown and Saunders, 2008:2). Inferential statistics enable one to test the findings obtained as generalisable to the research population. The main purpose of inferential statistics is to identify and quantify correlations between variables, which will allow interpretation and testing of the relations of the research variables so that conclusions can be drawn (Walliman, 2011:213).

The inferential statistics used in this study consisted of Z-tests, significant differences, correspondence analysis, and acceptance indexes in the CATA and hedonic questions when drawing conclusions about the

sensory evaluation of the one selected product developed (morogo pasta). These tests also generate p-values which are used to asses statistical significance ($p \leq 0.05$). Z-tests are used to determine whether the means of two groups are statistically significantly different from each other. A statement would be indicated as being significantly different when there is a 5% significance level ($\alpha=0.05$).

Z-tests are statistical tests used for hypothesis testing which allow a null hypothesis and can be approximated by a normal distribution. Z-tests observe whether the means of two groups are statistically significantly different from each other or if the difference between them is due to chance (XLSTAT, 2017). In this study, independent sample Z-tests were used which compare significant differences between two means based on two independent groups (as seen in the CATA tests) (Salkind, 2012:184).

Analysis of the CATA data was performed on the Z-tests for two proportions based on the frequencies of the selected terms in the questionnaire. On the first CATA set the test was carried out among all the statements with a 5% significance level ($\alpha=0.05$). The acceptance index was calculated from the average obtained, with the maximum value of the hedonic scale (9) representing 100%. To assess the acceptance of the one selected developed product (morogo pasta), multinomial logistic regression was performed (González, Liste and Felpeto, 2011; Hair et al., 2009). Multinomial logistic regression was used to look for a correspondence between the acceptance of the one selected developed product (morogo pasta) and the consumer (Mitterer-Daltoé, Latorres, Treptow et al., 2013). Multinomial logistic regression is an adjusted statistic whereby the dependent variable is related to quality whereas the independent variable is either categorical or a combination of them (Belusso et al., 2016; González et al., 2011). Multivariate techniques of analysis are often used in sensory and respondent data in order to highlight features of the product and participants most closely related to acceptance (Symoneaux, Galmarini and Mehinagic, 2012).

On the second CATA set, a Z-test was performed to study the differences between opposite sensory attributes. Correspondence analysis was used to interpret the relationship between the CATA terms and the hedonic points of the one selected product which was evaluated (morogo pasta) (Belusso et al., 2016; Beh, Lombardo and Simonetti, 2011; Guerrero, Claret, Verbeke et al., 2010). Correspondence analysis is a multidimensional scaling multivariate technique that uses non-metric data in the crossed design to create percentage maps including all variable categories (Hair et al., 2009).

TABLE 4.8: DATA ANALYSIS OF SURVEY QUESTIONNAIRE

Section of Questionnaire	Data Analysis
Section A: Demographics	**Descriptive statistics:** Frequencies, percentages, means, range
Section B: CATA	**Descriptive statistics:** Frequencies, percentages **Inferential statistics:** Z-tests, significant differences
Section C: Hedonic Reaction	**Descriptive statistics:** Frequencies, percentages, means **Inferential statistics:** Acceptance index, correspondence analysis
Section D: Purchase Intention	**Descriptive statistics:** Frequencies, percentages

4.10 QUALITY OF DATA

In order to have research of high quality, the researcher should aim to obtain outcomes and data which are reliable and valid as well as the best approximation of the truth (Leedy and Ormrod, 2013:250). The researcher should therefore take care and be meticulous with all the elements of the study in order to produce results that are relevant and useful to further studies in the field. It is important to achieve accuracy and precision in research measurement to eliminate errors. This was achieved through the measures of validity and reliability throughout the three phases of the study (Babbie and Mouton, 2001:119).

4.10.1 Validity

Validity is the ability of a measuring instrument to measure what it intends to measure in order to prove that it is logical, effective and represents the concept required to be measured (Leedy and Ormrod, 2013:101; Salkind, 2012:123; Zikmund and Babin, 2007:250). Validity is a measure of accuracy obtained from data which can be obtained in various ways, namely, face validity, construct validity, theoretical validity and content validity. This is explained below as to how they were ensured in the study (Babbie, 2007:92). Questionnaires based on previously established questionnaires that have already been used is a useful way to obtain validity (Bryman, 2012:171).

Face validity is a subjective judgement of the operationalisation of a construct and is based on the link between the questions and objectives of the study (Kumar, 2014:223). Face validity is also what the measuring instrument appears to measure and appears relevant to whom it is administered to for completion (Bryman, 2012:171), as well as the subjective impression the instrument leaves on the respondent. The questionnaires used in this study were based on the design of one which had already been used in the CATA study done by Belusso (2016). During the development of the online questionnaire for data collection, the University of Pretoria branding appeared on it in order emphasise the researcher's affiliation with the university and gave the questionnaire a professional look which could assist the participants' confidence in the study and ensure that the study was trustworthy as it is associated with an academic organisation.

Construct validity refers to the extent or degree to which a scale measures the relevant concepts and is concerned with the meaning of the instrument, what it measures and how and why it operates as it does (Mouton, 2012:127; Babbie and Mouton, 2001:123). It is also based on the statistical procedures and the relationships amongst the variables (Kumar, 2014:224). In this study the constructs were identified, defined and confirmed by means of a thorough and relevant literature review. This is where the theory relevant to the concepts investigated guided the research and adapted to be applicable for the study (as seen with the culinary innovation framework and CATA (Bryman, 2012:173).

Theoretical validity is the extent to which a score accurately represents the concept being measured (Zikmund and Babin, 2007:2250). This is ensured by an extensive and thorough review of the literature as well as by using relevant and reliable resources which present objective definitions of relevant concepts. The researcher compiled a thorough literature review as seen in Chapters 2 and 3 which, in combination with the conceptual framework, helped to guide the research process as well as indicate the relationships amongst concepts based on the literature in order to achieve the aims and objectives of the study.

Content validity refers to the sampling adequacy or representativeness of the study's content as an instrument, and therefore how representative a test is from the area of study (Salkind, 2012:124). The measuring instrument covered a full range of meaning within the concepts being measured (De Vos et al., 2011:162; Babbie and Mouton, 2001:123). This was achieved by checking and making sure that the measurements logically reflected the concepts being measured (Mouton, 2012:112). Existing measuring scales were also used and validated. The concepts, along with their dimensions and indicators, were carefully verified in agreement with the literature obtained to make sure they were represented in the

measuring instruments of the three phases. In this study, the questionnaires and data collected were checked, and subject experts in the field of consumer science and food science were consulted to make sure that the questions covered and represented all the concepts involved in the investigation.

4.10.2 Reliability

Reliability is the extent to which a measurement procedure is consistent and will give similar results under the same or similar conditions (De Vos et al., 2011). This is important for the successful outcome of a research project. Reliability does not deal with what is being measured but rather how well something is being measured while being free from errors (De Vos et al., 2011). This is when a measuring instrument that is used is consistent and dependable with regard to obtaining results and the ability to be used again in the future (Salkind, 2012:115).

In order to achieve reliability in this study, the following precautions were taken during the process of data collection:

The concepts that were covered in the study were able to be supported by relevant literature and the measuring instrument used was pre-tested in order to identify and address any uncertainties and also to make sure it was reliable and captured accurate responses. The feedback and comments of the pre-test were then taken into account and addressed before distribution of the questionnaires. The measuring instrument was checked with subject experts in order to make sure it was accurate, easy to understand, and that clear instructions were given beforehand. The measuring instruments were also based on tried and tested instruments. The questions in the CATA sections of the questionnaires were also randomised in order to confirm its validity (Belusso et al., 2016).

The recipe development and sensory process were subjected to an experimental procedure in which accurate and documented changes were made. Experimental research involves making a change in the independent variable and observing the effect it has on the dependent variable (Walliman, 2011:14). The recipes used on a small-scale and large-scale basis were standardised recipes which would eliminate the possibility of error and allow the same standard of product to be developed over and over again. Triple testing of the product ensured that the product was accurate and could be repeated. This eliminated the probability of errors occurring. It also confirmed the correctness of previous trials. Recipe testing is essential to create a recipe which is of high standard and to create an accurate and reliable product leaving no room for error (Harrington, 2004a; Hullah, 1984:21).

Sensory evaluation is a science of measurement and deals with aspects of precision, accuracy, sensitivity and avoiding false-positive results (Lawless and Heyman, 2010:4). Before each sensory session instructions were given in writing as well as verbally. The sample that the participants tested in the sensory evaluation was controlled with regard to preparation and presentation in order to achieve standardisation (Lawless and Heyman, 2010:3). The testing environment in the sensory evaluation was comfortable and non-threatening with minimal distractions, free from any noise or intrusions, and no odours could be detected from the tasting side that could influence the participants' perception (Meilgaard, Civille and Carr, 2007:33).

4.11 ETHICS

Ethics are seen as a set of moral principles which are set as rules or expectations regarding the most correct conduct towards experiment subjects and participants (De Vos et al., 2011:114). Ethical behaviour is extremely important when conducting research and working with humans (Walliman, 2011:240). For this research study, steps were taken to ensure that the researcher was honest in her results, that the information obtained was handled with the utmost care, and that ethical behaviour was adhered to before, during and after the study. Care was also taken to avoid plagiarism at all times and that all literature used was referenced when consulted.

Approval to commence the study was sought and obtained from the Ethics Committee of the Faculty of Natural and Agricultural Sciences of the University of Pretoria before data collection of this study commenced (Ethics approval number: EC161103-079 as seen in Addendum G). The following ethical issues were taken into account by the researcher:

Voluntary participation and informed consent: A project brief was distributed to potential participants which informed them of the study's purpose and the potential impact of the investigation. Sensory studies of food products do not create risks above the ordinary risks of daily life, but the participants were informed beforehand of possible risks associated when consuming food (such as allergens). In this study, the participants were made aware that the product contained gluten (wheat) and eggs before they sampled the product to avoid any adverse reactions when consuming the product if they were allergic. Willing participants were not forced to participate in the study, and if they agreed to participate, they had to give informed consent prior to commencement of the questionnaires. At the end of Phase 1 the participants were asked for their contact details if they were interested in participating in the sensory evaluation of the developed product and were not forced to do so in any way. The participants were also

informed that they were allowed to withdraw from the study at any point if they did not wish to continue (Mouton, 2012:115).

Anonymity and confidentiality: A covering letter was included prior to commencement of the questionnaire stating the study's purpose as well as the researchers' affiliation to the University with her and her supervisor's contact details. The covering letter also stated and emphasised that the study ensured confidentiality and anonymity and that the information the participants included would be treated with care (Salkind, 2012:85). The participants were also informed that they had the right to withhold any information and opinions which they were not comfortable with sharing.

Plagiarism: The researcher took care not to plagiarise and ensured that all sources used were referenced. A thorough literature reference list indicates all the sources used and consulted. The Harvard referencing method was used according to the requirements of the Department of Consumer and Food Science of the University of Pretoria.

Data interpretation: The researcher treated the collected data with care using statisticians and statistical programs to ensure that the data was correct and valid and that no attempt was made to manipulate the data. The study was conducted under the guidance of the study leader and the data collected was reviewed to ensure that the analysis was done correctly according to the requirements of the University of Pretoria and of the Department of Consumer and Food Science as well in order to ensure ethical correctness.

4.12 CONCLUSION

This chapter provided an overview of the research methods used for the design of the research, sample and sampling procedure, measuring instrument, data collection and analysis of results. The research design and methodology was chosen with care and discussed in this chapter in order to meet the study's aim and objectives. The study was presented in three phases in order to follow the process of using innovation to develop new products. In Phase 1, 183 participants were used, and in Phase 3, 72 participants were used who indicated in Phase 1 that they were willing to participate (these participants had to be of legal age and reside in Gauteng). Primary data was collected in the form of a self-administered electronic questionnaire developed on Qualtrics, which captured results directly. The data was analysed using descriptive and inferential statistics – this was done using XLSTAT 2017, version 19.4.1.46344. Measures were taken to ensure validity and reliability to ensure the quality of the data. Lastly, ethical

considerations were taken into account and respected, and participants were not forced to participate but did so of their own free will.

In Chapter 5 the results that were obtained in the study will be shown and discussed.

CHAPTER 5: RESULTS AND DISCUSSION

This chapter is presented in the three phases in which the data was collected, in which the demographic data of the sample is presented and then related to the objectives set out for this research. The results are then interpreted in line with the literature studies conducted for this research.

5.1 INTRODUCTION

In this chapter the data collected is analysed and discussed. The focus of this chapter is the process of innovative product development. Descriptive and inferential statistics were used to describe and summarise the data. The researcher then analysed the data according to the objectives of the study with the aim of addressing the research problem. The results of the study are presented in the subsequent sections according to the objectives set out for this research, and the data were gathered in accordance with the phases.

This chapter is presented in three phases and ends with a summarising conclusion.

5.2 PHASE 1: CULINARY INNOVATION FORMULATION

Culinary innovation formulation is the beginning of the product development process where the culinary product is conceptualised and defined as well as linked to the requirements of the internal and external environments (Harrington and Ottenbacher, 2013; Dougherty, 1997:424). This phase of the results consisted of two parts, namely market research and a survey questionnaire.

The market research aimed to identify possible areas of development of four AGLV products. The survey questionnaire aimed to define the product which should be developed as well as to determine possible reasons why consumers do not consume AGLVs.

5.2.1 The type of African green leafy vegetable product

Market research is essential in order to gain an idea of which products will have a higher chance of succeeding (Harrington, 2004a) and what type of product consumers will be interested in. It is also important in order to observe what trends and products are already on the market to be able to identify gaps for a new product (Harrington, 2004a). When carrying out the market research, four possible product

options were identified that were used as options for the participants to select from in the survey questionnaire. Four product options were chosen, as the CATA technique used in the survey questionnaires was based on a previous study done by Belusso et al. (2016), and the procedure was followed whereby four product options were available for the participants to select from and only one selected product was tasted in the sensory evaluation phase (Belusso et al., 2016).

This market research was used to determine what type of products/dishes had the potential for development to observe what consumers would be interested in and what type of products should be developed in Phase 2. The information and trends obtained had to link to the requirements of the aims of addressing issues of urbanisation, accessibility, convenience and health through the AGLV product options that were determined.

The Centre for Culinary Development (a food and beverage development company based in the USA which combines culinary creativity with strategic marketing) developed a validated trend-mapping technique that identifies which trends are increasing in popularity or which trends are short-lived, as well as emerging or established ingredients, cooking methods and products available in the market (Centre for Culinary Development, 2007). The basis of trend mapping is that all major food trends go through five stages in order to become a mainstream product (Centre for Culinary Development, 2007).

In this phase, the search for trends investigated the topics of AGLVs and products/dishes, indigenous foods and flavours, foods with perceived health benefits and convenience foods. Various aspects such as the use of ingredients, dishes/products and cooking or processing methods were also investigated. This search was done as a desktop review and presented in the different stages of trends as follows (Centre for Culinary Development, 2018):

1. Item appears in a fine dining establishment
2. Item features in speciality TV food channels and magazines
3. Item features in mainstream restaurants
4. Item features in popular magazines/publications
5. Item reaches quick-service restaurants and grocery stores

The data obtained in this phase is presented in accordance with the five stages of food trends developed by the Centre for Culinary Development (Centre for Culinary Development, 2018). A summary of the trends is given in the subsequent sections (the full results of the trend analysis are given in Addendum A).

5.2.1.1 Item appears at a fine dining establishment as a component of market research (Stage 1)

In Stage one, the ingredient/dish starts to appear at upscale, fine dining or ethnic restaurants. For this stage, a popular online South African restaurant directory was used called Eat Out (Eat Out, 2018). The directory was used as a search platform, and various fine dining establishments were identified by using the search function of the website and identifying restaurants with the following classifications: health, African influenced, indigenous food, and plant-based eating. In this stage, ethnic restaurants with an African influence were explored, as well as restaurants with AGLVs on their menus. The search was compiled from January to July 2017, and was limited to South Africa through the Eat Out search directory. The full list of establishments and their classifications can be seen in Addendum A.

As one can observe from Addendum A, 30 upscale eating establishments were identified which have begun to incorporate indigenous food into their menu options or have an African influence. Health aspects were not really present yet at fine dining establishments, but there did seem to be an increase in vegetable-based dishes, which could indicate that there is a potential for morogo to be introduced to promote awareness. Very little has been done on the exploitation of these AGLVs in Africa, which makes it a viable market as they are very nutritious and provide a competitive edge (Opabode, 2017; Smith and Eyzaguirre, 2007). Another advantage of using AGLVs over exotic produce is that they are easy to grow, are high in micronutrients, require few resources (like water) and can help provide food security (Croft, 2016; Nyadanu and Lowor, 2015; Mpandeli, 2014).

5.2.1.2 Item features in speciality TV food channels and magazines as a component of market research (Stage 2)

In Stage 2 with regard to the item featuring in speciality food magazines, various South African based magazines were examined to identify aspects of health, African influences, convenience foods, and plant-based eating. The following magazines were used: Woolworths Taste, the South African Food Review Magazine and Gourmet South Africa. All issues from January 2015 to June 2018 were examined, and only those that were applicable to the aspects of interest were identified and reported on (see Addendum A). With regard to speciality TV food channels, South African television programmes were identified which aired on DStv (a Sub-Saharan African direct broadcast satellite TV service owned by MultiChoice). The channels that were investigated were channels 101 (M-Net), 174 (BBC Lifestyle) and 175 (Food Network). A full summary of the trends observed is given in Addendum A.

With regard to developments, the Dik Delta culinary gardens in Franschoek have been designed to conserve indigenous edible plants which sustain various indigenous people of the area (the Khoi and San) and to promote their use by the chefs of local restaurants around the area (Solms-Delta, 2018). By increasing their availability and accessibility, the consumption of these plants is encouraged, which could also be applied to the case of morogo.

Of the specialist TV food programmes, five were observed which are aired in South Africa and have a focus on indigenous food as well as African flavours and influences, which could increase the awareness of AGLVs.

With regard to the speciality food magazines, the aspects of health, African influences, indigenous foods, as well as plant-based eating, were examined, with the additional aspect of convenience. In total 42 magazine entries were deemed applicable, which could be an indication that every day consumers wish to see more local and traditional foods on the market, as they are perceived as being of higher quality, being more sustainable and having high nutritional contents (Hempel and Hamm, 2016; Risku-Norja et al., 2008; Asebo et al., 2007; Chambers et al., 2007; Fandos and Flavian, 2006). The full list of magazine entries can be seen in Addendum A; the main trends identified are shown below according to the year of entry:

- 2015:
    - **Healthy breakfast** options were becoming more prominent
    - Consumers are starting to want more products with **health benefits** and **health properties** as a solution to health and wellness
    - Pasta is being produced in more innovative forms in terms of **flavours** and sauces
- 2016:
    - **Leafy super greens** are becoming more evident such as kale
    - **Modernising traditional** and indigenous South African foods by seeing them as occurring more in fine dining establishments, such as in the case of Kobus van der Merwe and Michelin Chef Jan-Hendrik van der Westhuizen
    - The drought affecting South Africa is creating a need for crops that can survive on little water
    - **Health** is becoming a trend due to the increase in obesity worldwide and the increasing amount convenience foods being consumed

    - Consumers are interested in **local produce** as they are interested in knowing where their food comes from
    - **Healthy convenience foods** are becoming a trend as an increase in products is being seen with reduced salt, sugar, kilojoules, and an increased amount of healthy ingredients
- 2017:
    - **Healthier alternatives**, and also affordable healthy alternatives, are becoming more prominent
    - An increase in healthy pasta and vegetable-based carbohydrate staples
    - An increase in **ethnic products and flavours**
    - **An increased use of vegetables** in juices, smoothies and dairy products
    - A large variety of ready-to-cook soup options with a variety of vegetables and serving suggestions
    - More **healthy** ready-to-eat breakfast options available in supermarkets
    - More **plant-based** proteins such as pea proteins
    - Increase in healthy snacks and baked products
- 2018:
    - **Plant-based** foods are becoming more prominent
    - **Vegan and vegetarian options** are increasing
    - Rise of **meal kits,** which include the ingredients and recipe cards for consumers to follow to make them feel as if they had prepared the meals themselves

5.2.1.3 Item features in mainstream restaurants as a component of market research (Stage 3)

In Stage 3, the ingredient/dish starts to appear in mainstream restaurants. In this stage, the Eat Out restaurant directory was once again used and applied as in Stage 1 (Eat Out, 2018), with a focus on mainstream restaurants. The directory was used as a search platform, and various mainstream dining establishments were identified by using the search function of the website and identifying restaurants with the following classifications: health, African influenced, indigenous food and plant-based eating. Mainstream restaurants were identified by using a filter on the website's search engine. The following terms were selected to identify mainstream restaurants: informal, casual, coffee, and quick meals. The search was compiled from January to July 2017. The search was limited to South Africa through the Eat Out search directory. The full list of establishments with their classifications, is given in Addendum A.

As one can observe from Addendum A, 75 mainstream eating establishments were identified which had begun to incorporate indigenous foods into their menu options or have an African influence. There was also a greater number of vegetable-based dishes as well as an increase in health-based eating establishments and eating options. This could be due to the fact that consumers want more healthy eating options and to eat more local foods (Grunert, 2017; Trichopoulou et al., 2007).

5.2.1.4 Item features in popular publications as a component of market research (Stage 4)

Stage 4 is when the item features in popular publications. For this stage a popular South African magazine called Food and Home Entertaining was used to identify aspects of health, African influences, convenience foods and plant-based eating. All issues from January 2015 to June 2018 were examined, and only those that were applicable to the aspects of interest were identified and reported on (see Addendum A). In total, 23 magazine entries were deemed applicable, which could be an indication there has been an increase in local and traditional foods. The full list of magazine entries is given in Addendum A; the main trends identified are shown below according to year of entry:

- 2015:
    - Kale is becoming a very popular vegetable because of its **superfood properties**
    - There is an increase in **vegan and vegetable alternatives**
    - Traditional South African dishes are being seen in a more modern and healthy way
    - There is an **increasing presence of vegetables** in dairy products such as yoghurt in order to limit the addition of sugar

- 2016:
    - Increasing **vegetarian options**
    - Increase **in African products and flavours** in the market
    - Incorporating vegetables into everyday meals

- 2017 - 2018:
    - Vegetable-based pasta products are increasing options
    - Healthy breakfast options are becoming more popular
    - Eating **locally-produced foods**

5.2.1.5 Item reaches quick-service restaurants and grocery stores as a component of market research (Stage 5)

In Stage 5, the item reaches quick-service restaurants and grocery stores. Once again, the Eat Out restaurant directory was used as in Stage 1 and 3, but with a focus on quick-service restaurants. This was applied by using a filter on the website's search engine. The following terms were selected to identify mainstream restaurants: quick meals and fast food. The search was compiled from January to July 2017. The search was limited to South Africa through the Eat Out search directory. The full list of establishments with their classifications can be seen in Addendum A. With regard to grocery stores, three large food retail chains were examined with regard to their products with a focus on African influence, health, indigenous food, convenience and plant-based foods. The food retail establishments that were examined were: Checkers, Pick n Pay and Woolworths. The full analysis can be seen in Addendum A.

Very few quick-service eating establishments were found (on the Eat Out search directory) to serve indigenous foods or have an African influence. In total, only six establishments were identified (some were retail chains). There was a minimal presence of health or plant-based eating options or establishments, which is an area that could be looked at as consumers wish for more healthy eating options and eat more local foods (Grunert, 2017; Trichopoulou et al., 2007). It could also be that indigenous foods are more prepared in informal establishments or rural areas, so they are not available and accessible in urban areas (Cernansky, 2015; Faber et al., 2010).

Of the products identified in the retail chains, 21 were found to be convenient and have aspects of health, African influences, indigenous ingredients/flavours, or have a plant-based eating focus. A few of these aspects applied to some products. Table 5.1 shows the categories of products that were observed in the retail establishments mentioned above. Six different areas of products with developments were identified which were applicable to the focus on African influence, health, indigenous food, convenience and plant-based foods. The categories which showed some development included pasta or pasta adaptations, bread or pastries, soups, snacks, beverages or beverage-related items, and breakfast cereals.

TABLE 5.1: CATEGORIES OF PRODUCTS OBSERVED IN RETAIL ESTABLISHMENTS

Pasta / Pasta Adaption	Bread / Pastry	Soup	Snacks	Beverages / Beverage Related	Breakfast Cereals
Fatti's and Moni's instant noodles chakalaka flavour	Mixed herb and garlic bread mix (which is cooked on the braai)	Knorr packet soup curry vegetable	Organic sweet chilli kale chips	Mageu moringa power	Thrive Energy Cereal (with added vegetable protein)
Moringa noodles	Falafel and beetroot wrap (the wrap is made from beetroot)		Raw kale Activated Date Bites	Low-fat strawberry and baobab drinking yoghurt	Morvite sorghum cereal
Maggi 2-Minute noodles boerewors flavour	Spinach and cheese muffins			Low-fat blueberry and moringa drinking yoghurt	Raw kale, moringa and coconut granola
Serena spinach lasagne				Green smoothie mix	
Baby marrow spaghetti				Moringa leaf powder	
Carb Clever spinach and cauliflower noodles				Cold-pressed Meaner Greener juice shot	

5.2.1.6 Summary of trends identified

After the trend stages had been identified as in the previous stages, the recurring trends and possible areas for development were identified and summarised in Figure 5.1. Figure 5.1 allows one to visualise the trends observed from January 2015 to June 2018. Each trend observed was classified into the five trend stages according to the Centre for Culinary Development (Centre for Culinary Development, 2018). The trends observed included various aspects of interest and areas of product development observed that could be applicable to AGLVs due to the behaviour of the vegetables when processed or cooked. The recurring or most frequent trends/product areas observed have been highlighted.

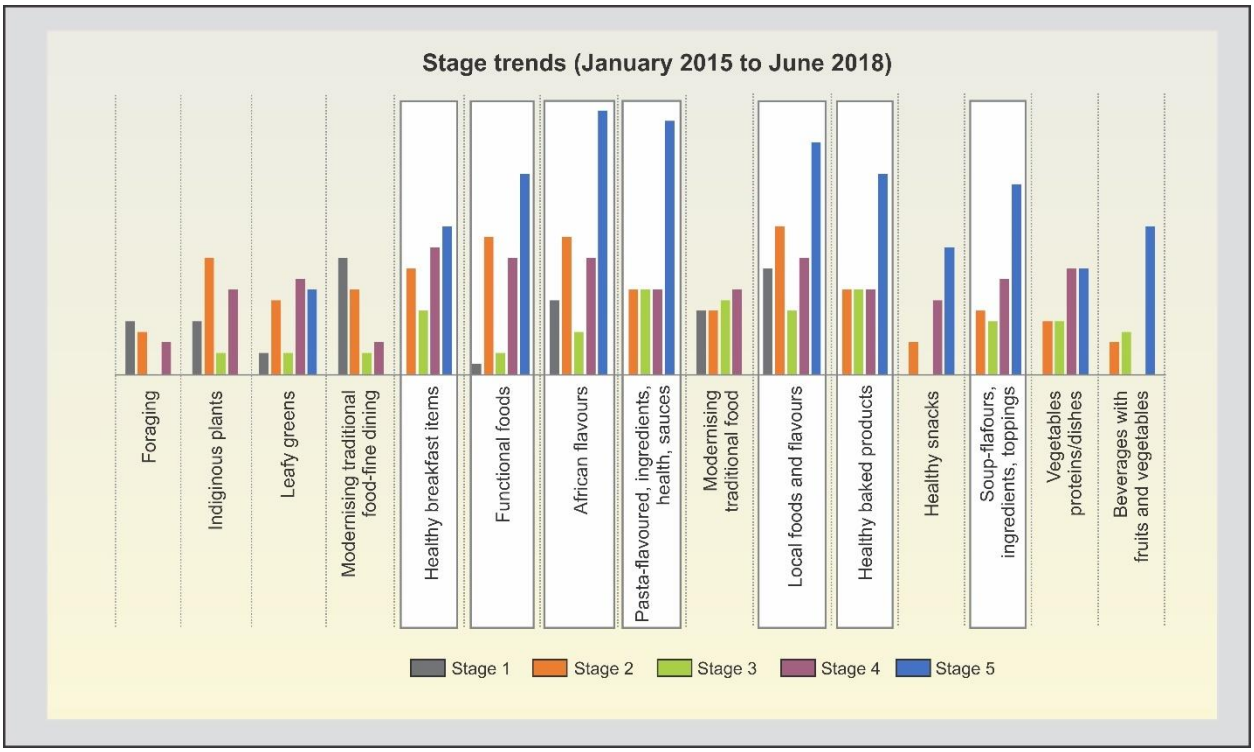


FIGURE 5.1: AREAS OF POTENTIAL DEVELOPMENT FROM TRENDS OBSERVED

The following areas for potential development were found to recur throughout the data captured:

- **Healthy breakfast items**
- Functional foods
- African flavours
- **Developments in pasta** with regard to ingredients, making pasta healthier, sauces, and flavours
- Local foods and flavours
- **Healthy baked products**
- **Soups – flavours, ingredients and toppings**

Regarding the trends observed, popular trend forecasting platforms were also consulted such as Kalsec (a leading global producer of natural herbal and spice extracts for the food and beverage industry) (Kalsec, 2018), Innova Market Insights (an international market research company) (Innova Market Insights, 2018), Euromonitor (a global market intelligence publisher) (Euromonitor International, 2018c; Euromonitor International, 2018a; Euromonitor International, 2018b), Forbes (a global media company focusing on business, technology, entrepreneurship and lifestyle) (Forbes, 2019a; Forbes, 2018), McCormick (a spice,

seasoning and condiment manufacturer) (McCormick, 2018) and Campbell's Culinary and Baking Institute (an institute of Campbell's Soup made up of chefs, culinary professionals and researchers) (Campbell's Culinary and Baking Institute, 2018). These trend platforms were used to confirm that the types of product that were to be developed would be appropriate for the market. Figure 5.2 shows the applicable trends according to the trend forecasting platforms that are linked to the trends obtained from the data content analysis (Campbell's Culinary and Baking Institute, 2018; Forbes, 2018; Innova Market Insights, 2018; Kalsec, 2018; McCormick, 2018).

As shown in Figure 5.2, many of the trends identified linked to the trends obtained in the trend stages. Key trends of interest included ethnic evolution (where traditional global cuisines were becoming more popular as consumers desire new flavours), culinary heritage (which highlights cultural food and the history behind it), plant-based proteins and vegetable alternatives (due to an increase in healthy lifestyles), bold natural colours (which could be applicable to the green colouring of the vegetable), and mindful choices and healthy options (due to consumers enjoying more options which are beneficial to their health).

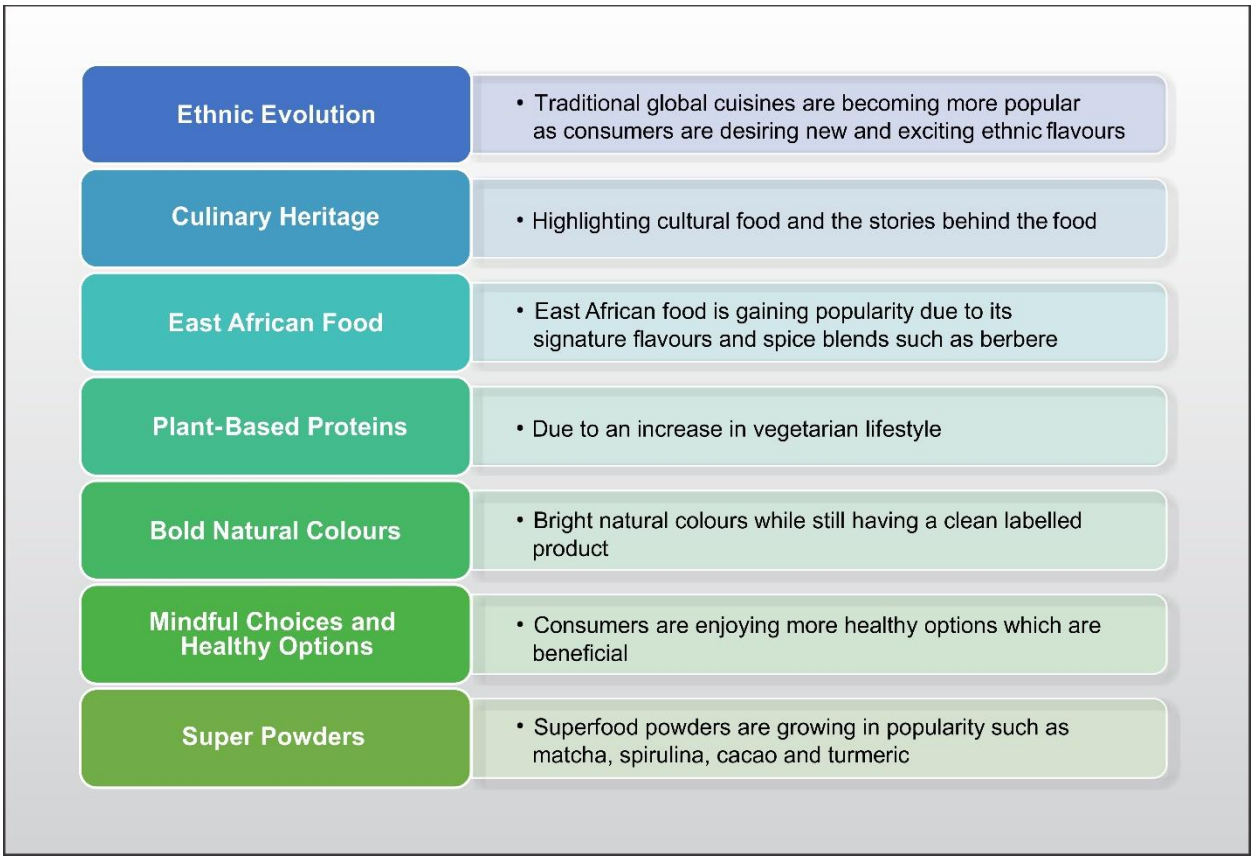


FIGURE 5.2: TRENDS OBSERVED ON VARIOUS TREND-FORECASTING PLATFORMS

5.2.2 Product options identified

After observing the five trend stages and considering the nature of the morogo species which would be used (Aysestasia gangetica), four possible product options were selected which the participants would have the option of selecting from in the CATA section of the questionnaire. Four product options were chosen, as the CATA technique used in the survey questionnaire was based on a previous study done by Belusso et al. (2016), and the procedure was followed whereby four product options were made available for the participants to select from. Only one selected product was tasted in the sensory evaluation phase (Belusso et al., 2016).

After the data content analysis had been done for the five trend stages and aspects of interest (health, African influence, indigenous food and plant-based eating) in conjunction with the convenience classification desired (ready-to-cook or ready-to-eat), and food trends observed in South Africa, four product options were identified which the participants could select from in the survey questionnaire. The four products selected showed the potential to be developed into a culinary food product using morogo as an ingredient which would address issues of urbanisation, accessibility, convenience and health. These four products were used as product options in the survey questionnaire.

The four product options were identified after considering the trends observed, and in conjunction with the four final-year hospitality students who assisted the development under the subject VDS 413 (Recipe Development). Part of the brief given to the students was that they had to identify possible areas of product development where morogo could be introduced, given that it had to be accessible to the urban consumer, be a convenient food product, had to take health aspects into consideration, and could contain African flavours or ingredients.

Before the four possible product options were identified, the students conducted various experiments with the morogo species (Aysestasia gangetica) to determine what type of cooking methods would be appropriate to the sample, taking into consideration the brief for the product as well as shelf-life and trends observed. During the first practical session of VDS 413, the morogo leaves were tasted raw, blanched, steamed, fried, baked and dried by the four students, the researcher and two subject experts. The effect of the cooking methods on the morogo was then discussed, and it was decided that the most appropriate forms of the morogo should be fresh, blanched or dried so that the taste, texture and appearance of the vegetable would be palatable for consumers. However, fresh would not be suitable as the products had to have a shelf life. Therefore, taking into consideration the nature of the vegetables,

the trends observed and the processing of the sample into a convenience food product, the following four product options were deemed appropriate for further exploration: pasta, bread, soup and granola. In Figure 5.3 one can observe how the criteria for the products led to the four possible product options which the participants could choose from in the survey questionnaire (Section 5.2.3.3).

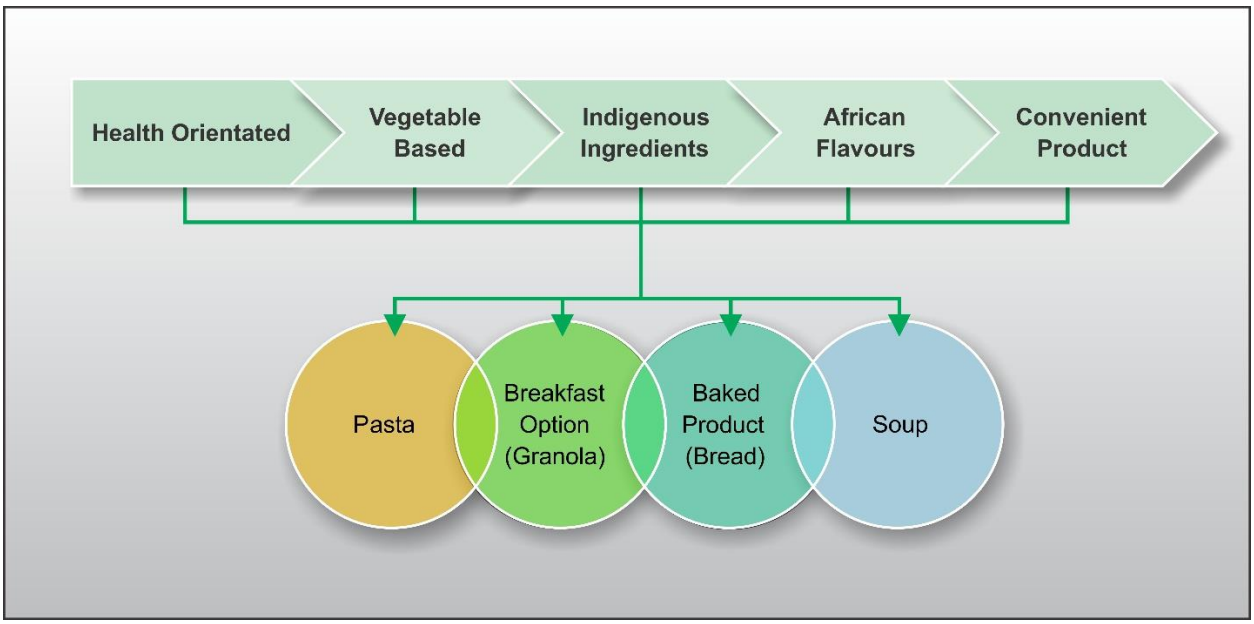


FIGURE 5.3: POSSIBLE PRODUCT OPTIONS IDENTIFIED

5.2.3 Survey questionnaire

The survey questionnaire was a self-administered online electronic questionnaire (shown in Addendum B) and was developed on Qualtrics (an online research survey tool). This questionnaire was used to determine the concept and specifications of the products as well as the sensory characteristics urban consumers were interested in with regard to a new product containing AGLVs. The information obtained was then used as the input to the product development. 183 participants responded to the questionnaire in this phase. On completion of the questionnaire the participants were asked if they would like to participate in the sensory evaluation of the developed product and were asked to include their email addresses or cellphone numbers so that they could be informed of the tasting sessions for Phase 3 (only those who indicated they would like to participate in the tasting were contacted).

The subsequent sections are presented in the order of the questions in the questionnaire (Addendum B), namely the demographics, the reasons for non-consumption of AGLVs, characteristics desired in AGLVs, and the influence of media.

The results obtained from the questionnaire determined which product consumers desired as well as the sensory characteristics it should have. These findings were used as the input for the product development phase and then evaluated in the sensory testing phase.

5.2.3.1 Demographic characteristics of the sample

The profile of the participants shown in Table 5.2 was compiled by asking demographic questions in Section A of the questionnaire (Addendum B). The demographic variables of gender, age, ethnicity, level of education and household income were used in the questionnaire. The demographic information obtained was not used in the analysis but was used to describe the sample. The participants were asked beforehand to state whether they lived in Gauteng and were over the age of 18, and were not allowed to continue with the questionnaire if they did not meet those criteria. This was done to make sure that the participants met the set criteria for the area of research. In total, 183 participants were usable for further analysis.

TABLE 5.2: DEMOGRAPHIC PROFILE OF PARTICIPANTS (N=183)

Gender		**Male**	**Female**				
	n	30	153				
	%	16.39	83.61				
Age		**18-20**	**21-30**	**31-40**	**41-50**	**51-60**	**61-70**
	n	8	140	10	12	11	2
	%	4.37	76.50	5.46	6.56	6.01	1.09
Ethnicity		**Asian**	**Black**	**Coloured**	**White**	**Other**	
	n	2	33	3	142	3	
	%	1.09	18.03	1.64	77.60	1.64	
			Non-Caucasian		**Caucasian**		
		n	41		142		
		%	22.40		77.60		
Level of Education		**Lower than Grade 12**	**Grade 12**	**Undergraduate degree or diploma**	**Post-graduate degree or diploma**		
	n	0	39	92	52		
	%	0.00	21.31	50.27	28.42		
Household total monthly income		**Less than R5 000**	**R5 000 - R9 999**	**R10 000 - R14 999**	**R15 000 - R19 999**	**R20 000 - R24 999**	**R25 000 or more**
	n	27	29	15	12	17	80
	%	15.00	16.11	8.33	6.67	9.44	44.44
	*3 participants did not wish to state their household total monthly income						

5.2.3.1.1 Gender

The majority of the participants who were willing to take part in the study were female (83.61%), as seen in Table 5.2. As the data collected in this research project related to the development of an innovative culinary product produced from AGLVs, it can be assumed that females would be generally more interested in an AGLV product. This could be because women tend to be more health conscious (Bidmon and Terlutter, 2015). Even though the majority of the participants were women, there were a few male participants (16.39%) who participated, which may indicate that males have some interest in an AGLV product.

5.2.3.1.2 Age

The age profile of the participants is shown in Table 5.3. The participants who participated in the study had to be over the age of 18 years in order to take part in the study. This is because they are legally allowed to participate in a study without the consent of their parents (ethical reasons) and also because they are responsible for purchasing decisions as they are considered to be of "working age" by the City of Tshwane Municipality. The youngest respondent was 18 years of age, whereas the oldest was 66 years of age, which therefore gave an age range of 48 years. The average age of the participants was 28.37 years. The age group with the largest number of participants was the 21-30 year age group, which comprised 76.5% of the total participants. This could be an indication that people in this age group were more willing to participate. It could also be that the 20-29 year age group comprises 23.5% of the total population of Gauteng, which is the largest age group (StatsSA, 2011).

TABLE 5.3: AGE PROFILE OF PARTICIPANTS (N=183)

Age profile of participants						
Age groups	**18-20**	**21-30**	**31-40**	**41-50**	**51-60**	**61-70**
Frequency of age group	8	140	10	12	11	2
Percentage of age group	4.37	76.50	5.46	6.56	6.01	1.09
Youngest respondent	18					
Oldest respondent	66					
Range	48					
Mean age	28.37					

If the age profile of the participants were further broken down into the generational cohorts shown in Table 5.4, the largest group would be Generation Y, comprising of 84.7% of the participants. A generational cohort refers to a group of individuals in a particular age group who have similar life experiences (Hung, Gu and Yim, 2007). A particular cohort is typically associated with certain values, characteristics and priorities, which is commonly seen in individuals of that group (Jackson, Stoel and Brantley, 2011). The fact that Generation Y has the largest frequency could be linked to the fact that they are more active on social media, which was the means of distribution of the questionnaire used in this study (Bolton, Parasuraman, Hoefnagels et al., 2013).

TABLE 5.4: GENERATIONAL COHORTS OF PARTICIPANTS (N=183)

Generational Cohort	Baby Boomer	Generation X	Generation Y
Age bracket	54 +	38-53	37 -
Frequency	10	18	155
Percentage	5.46%	9.84%	84.70%

5.2.3.1.3 Ethnicity

As seen in the demographic profile in Table 5.2, the participants indicated which ethnic group they belonged to according to the South African Population Equity Act. The group with the most participants was the white participant group, which made up 77.6% of the total participants. This is significant as the consumption of AGLVs is normally associated with the black population. This could therefore indicate that there is interest in an AGLV product by a population group which is not traditionally associated with its consumption (Cernansky, 2015; Feagan, 2007).

5.2.3.1.4 Level of education

The majority of the participants in this study had an undergraduate degree or diploma (50.27% of the participants, as shown in Table 5.2). All the participants who participated in the study had completed Matric (therefore none of the participants had less than a Grade 12 level of education). The next frequent group of the level of education was the group of participants who had a post-graduate degree or diploma, making up 28.42% of the participants. The least frequent group of the level of education was the group of participants who had Grade 12, making up 21.31% of the total participants. This high level of education could possibly be due to the fact that the study was university related and that participants were interested in the study.

5.2.3.1.5 Household income

Household income influences the participants' ability to spend money on purchases. Five different categories were distinguished in the questionnaire as follows (according to monthly income) (Business-Tech, 2016):

1. Lower income: Less than R5 000
2. Low emerging middle income: R5 000-R9 999
3. Emerging middle income: R10 000-R14 999, R15 000-R19 999
4. Lower middle: R20 000-R24 999
5. Upper middle to affluent groups: R25 000 or more

The group which comprised highest percentage was the income group of R25 000 or more (44.44%), followed by the R5 000-R9 999 group comprising 16.11% of the participants. Therefore the majority of the participants had a high income level. This was interesting because consumers of AGLVs are normally individuals living in rural areas, and these vegetables are often stigmatised as poverty foods (Cernansky, 2015; Jansen van Rensburg et al., 2007; Labadarios and Steyn, 2001). The interest in the vegetable could be the result of consumers beginning to see the importance of eating locally produced foods and being more willing to pay for them because they can afford it (Cernansky, 2015; Adams and Adams, 2011; Jansen van Rensburg et al., 2007).

5.2.3.2 Reasons for non-consumption of African green leafy vegetables

Section B of the questionnaire (see Addendum B) consisted of background questions to establish why consumers do not consume AGLVs in relation to the concepts of access, knowledge and perception. The results aimed to gain some knowledge and to discover possible areas which could be addressed to help increase or promote the consumption of AGLVs. In the survey questionnaire this was achieved by including a 5-point agreement scale on which the participants had to indicate their level of agreement as to why they did not consume AGLVs.

The top three statements on which the participants strongly agreed were that they did not live in an area where the product was available for picking (52% of participants), they did not know how to source it for picking (49% of participants) and it was not available in their local supermarket (45% of participants). The top three statements on which the participants strongly disagreed was whether they viewed AGLVs as a poverty food (57% of participants), whether they have never heard of the product (56% of participants)

and whether they saw it as old fashioned (52% of participants). This could mean that consumers have heard of morogo but do not consume it because they do not have access to it or know how to source it (Cernansky, 2015; Faber et al., 2010). It was also observed that the participants did not regard AGLVs as a poverty food or see it as being old fashioned, which could be due to the current trend in consuming local foods and foods with perceived nutritional benefits (Grunert, 2017; Valentin, 2015). 77.6% of the participants were white, which could thus also have an effect on the results obtained. A more in-depth analysis of non-consumption of AGLVs could be done in the future, but this was not the main aim of the study.

5.2.3.2.1 Non-consumption associated with the issue of knowledge

Figure 5.4 shows the highest percentages of the statements associated with knowledge: unfamiliarity with the product, the consumer does not know how to prepare the product, does not know how to source the product for picking, and has never heard of the product (Cernansky, 2015; Senyolo et al., 2014; Faber et al., 2007; Jansen van Rensburg et al., 2007; Voster et al., 2007). The participants gave high agreement to the first three statements (they are unfamiliar with the product, do not have the knowledge to prepare the product and do not know how to source it for picking it), but highly disagreed with the statement that they had never heard of the product. This could indicate that the participants had heard of AGLVs but did not consume it because they do not know where to access it or how to prepare it. This could be addressed by the creation of a convenience food product if it were to be made more available to consumers.

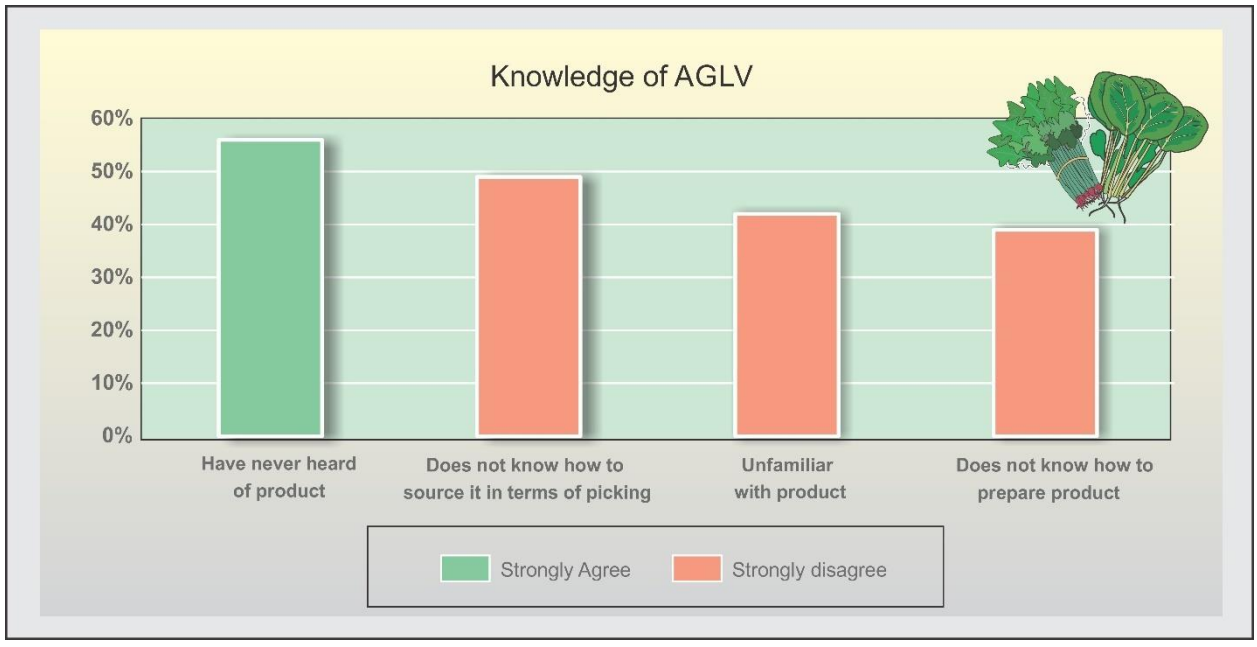


FIGURE 5.4: HIGHEST PERCENTAGES ASSOCIATED WITH KNOWLEDGE OF AGLVS

5.2.3.2.2 Non-consumption associated with the issue of access

Figure 5.5 shows the highest percentages of the statements associated with access, namely that the product is not available in the local supermarket, that the participants did not have access to an area where the vegetables can be picked, that the product is not commercially available and that it is seen as not being convenient (Opabode, 2017; Cernansky, 2015; Mpandeli, 2014; Senyolo et al., 2014; Faber et al., 2007; Jansen van Rensburg et al., 2007). The participants had the highest percentage of highly agreeing with the statement that the product was not available in the local supermarket, that they did not live in an area where they had access to the vegetables, and that the product was not commercially available. With regard to the product not being convenient, the participants seemed to be impartial, as they neither agreed nor disagreed with the statement. The factors associated with access could indicate to the researcher that consumers do not consume AGLVs as accessibility is an issue for them, which could be a reason why urban consumers do not consume these vegetables. This issue could be addressed by creating a convenient product using AGLVs which would be accessible to consumers.

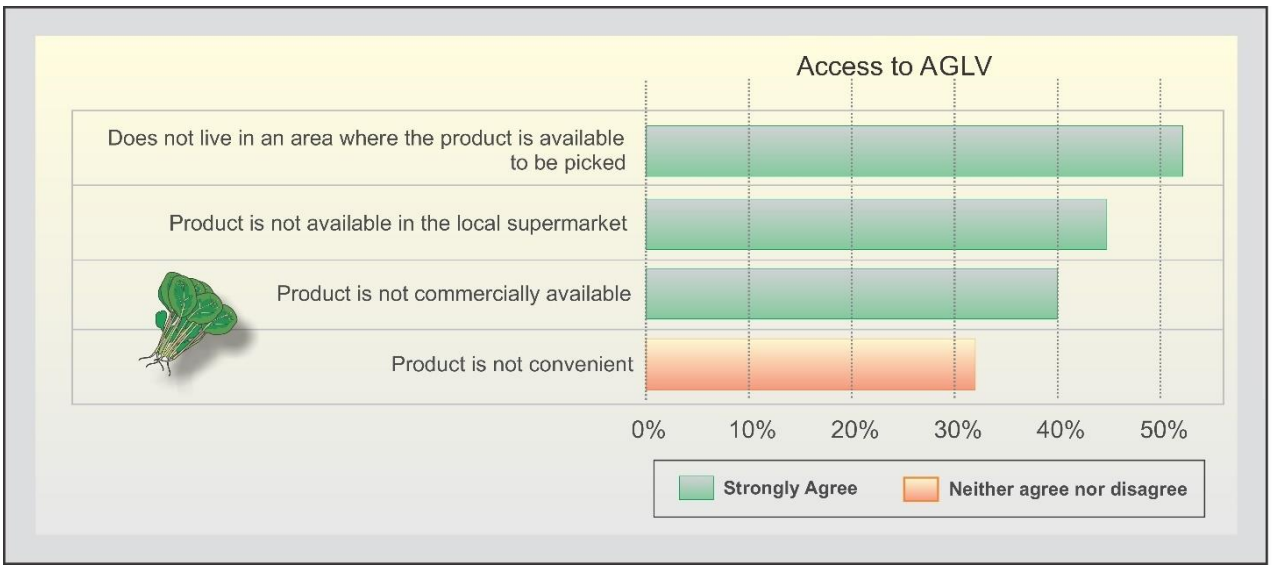


FIGURE 5.5: HIGHEST PERCENTAGES ASSOCIATED WITH ACCESS TO AGLVS

5.2.3.2.3 Non-consumption associated with the issue of perception

In Figure 5.6 the highest percentages of the statements associated with the perception of AGLVs can be seen, namely the product being viewed as a poverty food, whether it is perceived to be old fashioned, whether it is seen as being difficult to prepare, and whether the product is disliked. The participants had the highest inclination towards strongly disagreeing with the vegetables being seen as a poverty food and

as being old fashioned (Opabode, 2017; Cernansky, 2015; Jansen van Rensburg et al., 2007; Labadarios and Steyn, 2001). This may be a result of the fact that consumers wish to eat more local as well as healthy foods and are beginning to see the benefits which were previously overlooked (Joy et al., 2017; Siró et al., 2008; Asebo et al., 2007; Agte et al., 2000). With regard to the product as being seen as difficult to prepare and being disliked, the highest frequency recorded was in the neither agree nor disagree option, which may indicate that the participants were not sure whether they disliked it or found it difficult to prepare.

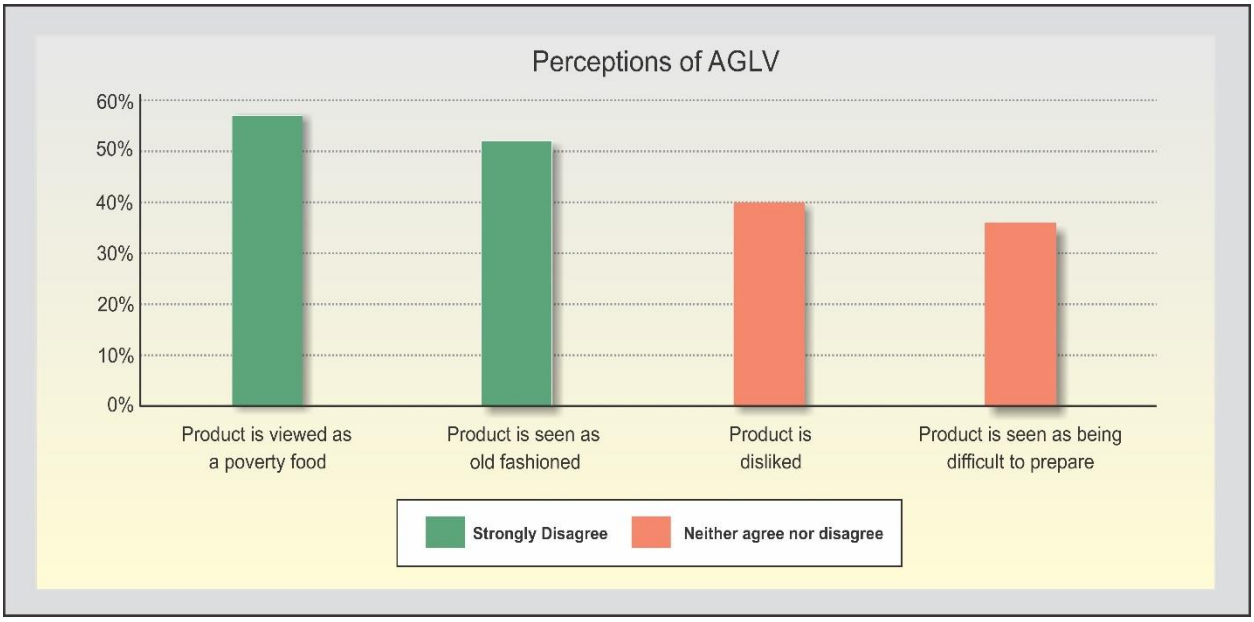


FIGURE 5.6: HIGHEST PERCENTAGES ASSOCIATED WITH THE PERCEPTION OF AGLVS

5.2.3.3 Characteristics desired in an African green leafy vegetable product

Section C of the questionnaire (as shown in Addendum B) aimed to determine what type of product is desired by the participants as well as what sensory characteristics it should have. This was done in order to involve the consumer in the process of product development in order to produce a more sustainable product or a product that is less likely to fail (Harrington, 2004b). This section consisted of CATA questions.

In this questionnaire, CATA was used to find out what product the participants were interested in out of four options (determined from the market research in Section 5.2.2: bread, pasta, granola and soup) and what sensory characteristics it should have. Four product options were chosen as the CATA technique used in the survey questionnaire based on a previous study done by Belusso et al. (2016). The procedure was followed whereby four product options were available for the participants to select from and only one selected product was tasted in the sensory evaluation phase (Belusso et al., 2016). Each statement in

the CATA section also included an opposing statement so that responses which were both marked were discarded to ensure validity. The questions were randomised to assist validity as well.

The participants had the option of selecting as many terms as they liked, relating to product choice (out of bread, pasta, soup and granola – as seen from the market research in Section 5.2.1), level of convenience (ready-to-cook and ready-to-eat) and sensory aspects of morogo which in the end would determine the type of product to be developed and its characteristics.

5.2.3.3.1 Statistical analysis of CATA questions

In order to determine the product to be developed, the innovative CATA technique (shown in Addendum B) was used which consisted of 20 statements which the participants had to select from which they thought applicable or represented their opinion about an innovative culinary convenience food product made with AGLVs. The participants were instructed to select as many statements they thought were applicable. These statements were based on an original CATA questionnaire developed by Belusso et al. (2016) (as discussed in Chapter 4).

Four product options were chosen as the CATA technique used in the survey questionnaire was based on a previous study done by Belusso et al. (2016). The procedure was followed whereby four product options were available for the participants to select from and only one selected product was tasted in the sensory evaluation phase (Belusso et al., 2016). Each statement (which was randomly presented) also had an opposing statement in order to produce reliable results (Ares and Jaeger, 2013). The sentences consisted of the four product options to be developed as well as sensory attributes adapted to the participants' preferences regarding a morogo product. The classification of the CATA terms is shown in Table 5.5. The statements that were marked with their opposites were discarded. The data was analysed on XLSTAT 2017, version 19.4.1.46344, a statistical software and data analysis add-on for Microsoft Excel.

TABLE 5.5: CLASSIFICATION OF CATA TERMS

CATA statements	Classification
If offered at the supermarket, I would consume morogo bread	Product 1
Even if offered at the supermarket, I would not consume morogo bread	Product 1
If offered at the supermarket, I would consume morogo pasta	Product 2
Even if offered in the supermarket, I would not consume morogo pasta	Product 2
If offered at the supermarket, I would consume morogo instant soup (e.g. Cup a Soup)	Product 3
Even if offered at the supermarket, I would not consume morogo instant soup (e.g. Cup a Soup)	Product 3
If offered at the supermarket, I would consume morogo granola (e.g. Kellogg's granola)	Product 4
Even if offered at the supermarket, I would not consume morogo granola (e.g. Kellogg's granola)	Product 4
When I think of a morogo product, I expect the product to be green	Appearance/Colour
When I think of a morogo product, I do not mind if the product is green	Appearance/Colour
I do not mind the smell of morogo	Smell/Aroma
I feel uneasy when I smell morogo	Smell/Aroma
I prefer to consume a morogo-based product that has a characteristic morogo flavour	Taste/Flavour
I prefer a well-seasoned morogo product	Taste/Flavour
I would only consume a ready-to-cook convenient morogo product	Cooking method 1 or Stage of convenience 1
I would consume a ready-to-cook convenient morogo product	Cooking method 1 or Stage of convenience 1
A ready-to-cook convenient morogo product does not appeal to me	Cooking method 1 or Stage of convenience 1
I would only consume a ready-to-eat convenient morogo product	Cooking method 2 or Stage of convenience 2
I would consume a ready-to-eat convenient morogo product	Cooking method 2 or Stage of convenience 2
I would not consume a ready-to-eat convenient morogo product	Cooking method 2 or Stage of convenience 2

Table 5.6 shows the number of times each statement was selected (frequency). This is followed by Table 5.7, which is a Z-test, indicating the significant difference between each statement with a 5% significant difference level (α=0.05) which has been highlighted. The statements which had the highest frequency (in descending order of frequency) were:

- If offered at the supermarket, I would consume morogo pasta
- I would consume a ready-to-cook convenient morogo product
- I would consume a ready-to-eat convenient morogo product

- If offered at the supermarket, I would consume morogo bread
- I do not mind the smell of morogo
- If offered at the supermarket, I would consume morogo granola (e.g. Kellogg's granola)
- If offered at the supermarket, I would consume morogo instant soup (e.g. Cup a Soup)
- I prefer a well-seasoned morogo product

The analysis of the CATA data can be seen in the subsequent sections.

TABLE 5.6: RESULTS OF CATA QUESTIONNAIRE - FREQUENCIES FOR EACH STATEMENT (N=183)

Number	CATA statement used in the questionnaire	Total (Frequency)
1	If offered at the supermarket, I would consume morogo pasta	121
2	I would consume a ready-to-cook convenient morogo product	121
3	I would consume a ready-to-eat convenient morogo product	114
4	If offered at the supermarket, I would consume morogo bread	95
5	I do not mind the smell of morogo	89
6	If offered at the supermarket, I would consume morogo granola (e.g. Kellogg's granola)	78
7	If offered at the supermarket, I would consume morogo instant soup (e.g. Cup a Soup)	59
8	I prefer a well-seasoned morogo product	50
9	Even if offered at the supermarket, I would not consume morogo instant soup (e.g. Cup a Soup)	47
10	I would only consume a ready-to-cook convenient morogo product	45
11	When I think of a morogo product, I do not mind if the product is green	33
12	I would not consume a ready-to-eat convenient morogo product	31
13	When I think of a morogo product, I expect the product to be green	30
14	A ready-to- cook convenient morogo product does not appeal to me	29
15	Even if offered at the supermarket, I would not consume morogo granola (e.g. Kellogg's granola)	29
16	I would only consume a ready-to- eat convenient morogo product	29
17	Even if offered at the supermarket, I would not consume morogo bread	25
18	I prefer to consume a morogo-based product that has a characteristic morogo flavour	16
19	Even if offered at the supermarket, I would not consume morogo pasta	10
20	I feel uneasy when I smell morogo	9

The results of this CATA test indicated the direction of the kind of convenience food product consumers desired containing morogo which was developed in Phase two, which will be discussed in the subsequent sections. This product aimed to address issues of urbanisation, accessibility, convenience and health.

5.2.3.3.1.1 Product choice

With regard to product choice, the participants were more inclined to select morogo pasta, morogo bread and granola (statements 1, 4 and 6) as the Z-tests shown in Table 5.7 and high frequencies indicated a preference for these products. The participants rejected the morogo instant soup (statement 7) as there was no significant difference as well as a low frequency. This indicates that there is no clear preference for soup. What can be concluded from the frequencies and Z-tests is that there was an inclination for the participants to select bread, granola and pasta. Although all three of these products were more inclined to be chosen by the participants, only one product can be taken further, which is why pasta was chosen as the product for testing as it had the highest consumption potential (frequency) of the three products which the participants had shown an interest in.

5.2.3.3.1.2 Level of convenience

With regard to the level of convenience between a ready-to-eat and ready-to-cook morogo product, there was no clear preference in the consumption observed. The participants were more inclined to select a ready-to-eat as well as a ready-to-cook item as both statements 2 and 11 had a high frequency ($p \geq 0.05$) and indicated that there was a significant difference from its opposite (statement 14 and 12). This suggests the possibility of the developed product to be either a ready-to-cook or a ready-to-eat product. Even though the product could be either ready-to-cook or ready-to-eat, ready-to-cook had a slightly higher frequency, which is why it was chosen as the level of convenience for the product which was developed in Phase 2.

5.2.3.3.1.3 Sensory attributes

With regard to the sensory attributes, the participants were able to indicate the direction of the qualities that the chosen product should have. The sensory attribute options were appearance/colour (with regard to the product being green in colour), smell/aroma (with regard to the product having a strong vegetable smell), and taste/flavour (with regard to the product either having a strong morogo flavour or being more seasoned to conceal the morogo flavour).

Due to morogo being a leafy vegetable, the green colouring is an important sensory aspect when developing a product (Prescott, 2015; Spence, Levitan, Shankar et al., 2010). No clear preference was recorded with regard to the appearance/colour of the product as the participants did not mind if the

TABLE 5.7: SIGNIFICANCE LEVEL BETWEEN HYPOTHESES FOR THE Z-TEST (N=183)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1		**7.669***	**10.472***	**11.302***	**7.443***	**5.445***	**7.664***	**5.062***	**7.153***	**7.443***	**8.090***	3.233	**10.832***	**7.230***	**4.303***	2.426	**5.495***	0.697	2.364	**4.759***
2			3.622	**4.054***	0.524	2.129	0.377	1.658	0.267	0.543	0.533	**10.667***	2.516	1.089	**10.997***	**9.714***	1.460	**6.542***	**5.702***	3.656
3				0.277	**3.949***	6.065	3.782	**5.870***	**4.223***	3.788	3.114	**14.836***	1.281	3.549	**13.873***	**13.291***	**5.129***	**10.266***	**8.702***	**6.657***
4					**3.926***	**6.177***	**4.061***	**6.306***	**4.357***	3.653	3.333	**14.486***	1.464	3.217	**15.277***	**13.434***	**5.241***	**10.049***	**9.280***	**6.892***
5						2.566	0.160	2.533	0.446	0.000	0.000	**9.908***	2.289	0.666	**10.405***	**9.166***	2.050	**6.761***	**5.400***	3.408
6							2.422	0.350	2.426	2.647	2.647	**8.496***	**4.389***	3.344	**8.752***	**7.762***	0.610	**4.693***	3.252	1.069
7								2.237	0.149	0.145	0.142	**10.568***	2.297	0.780	**11.366***	**9.645***	**1.873***	**6.663***	**5.512***	**3.447***
8									2.121	2.699	2.352	**8.461***	**4.383***	3.497	**8.816***	**7.543***	0.246	**4.857***	3.159	1.167
9										0.315	0.282	**9.270***	2.501	0.925	**9.808***	**8.389***	1.819	**6.402***	**5.210***	3.089
10											0.000	**10.832***	2.158	0.706	**10.832***	**9.389***	1.985	**7.036***	**5.043***	3.500
11												**12.515***	2.048	0.565	**11.315***	**11.587***	**2.884***	**7.579***	**5.846***	**3.653***
12													**13.661***	**11.817***	0.000	1.220	**9.442***	**3.977***	**5.685***	**8.190***
13														1.484	**14.417***	**12.668***	**3.995***	**9.739***	**8.493***	**6.400***
14															**10.865***	**10.338***	2.579	**7.649***	**6.077***	**4.121***
15																1.094	**8.905***	**4.106***	**6.011***	**7.917***
16																	8.960*	3.230	**4.526***	**7.299***
17																		**5.599***	3.569	1.572
18																			1.272	3.408
19																				2.706
20																				

*Presented a significant difference $\alpha = 0.05$ $Z_{\alpha} = 1.96$

product developed was green, and it was also not important whether the developed product was expected to be green (statement 11 and 13). This is seen in the low frequency as well as the fact that neither of the statements are significant. Thus, the product developed could be green in colour as the participants tended not to be affected by the colour according to the results observed.

With regard to smell, the participants could indicate whether the smell of morogo made them feel uneasy (statement 20) or if they did not mind the smell of morogo (statement 5). There was a clear preference for the participants not minding the smell of morogo, which means that the product could have a morogo smell. This is seen from the high frequency as well as the fact that it presented a significant difference ($p \geq 0.05$) from its opposing statement.

The last sensory attribute covered in the CATA questionnaire was taste/flavour. The participants were able to indicate whether they would prefer to consume a product that has a strong characteristic morogo flavour (statement 18) or if they preferred a product which was seasoned (statement 8). It was observed that the participants preferred a seasoned product due to the high frequency of statements preferring a seasoned product and the fact that it presented a significant difference from its opposing statement ($p \geq 0.05$). This could be because consumers want healthy convenience food options but do not necessarily desire it to taste healthy. Seasoning could be used to mask or weaken undesirable flavours (in this case a strong vegetable taste) (Belusso et al., 2016). Even though consumers are interested in nutritious or healthy foods, they are not willing to compromise on taste even if the product has various health benefits (Verbeke, 2006; Tuorila and Cardello, 2002). This could be due to the fact that consumers no longer believe that good taste and healthiness are mutually exclusive (Siegrist, 2007).

After completion of the CATA questionnaire it was possible to obtain data about what type of morogo product consumers desire, the level of convenience it should have and the sensory characteristics that fulfil the needs of consumers (as this will assist in the sustainability of a developed product) (Grunert, 2017; Milton, 2003). Morogo pasta was indicated by the participants as the preferred product which was developed in Phase 2 (see Section 5.3). Figure 5.7 indicates the requirements of the morogo product which was developed in Phase 2.

Apart from the type of product chosen by the participants, it was evident that the morogo pasta should be seasoned (in order to mask the strong vegetable taste), could have a green colour (as it was not indicated that it should or should not have a green colour) and should have a morogo or vegetable smell.

The participants also indicated that the product should be made available in the convenience stage of ready-to-cook.

Now that the product has been defined it is ready to be developed in Phase 2.

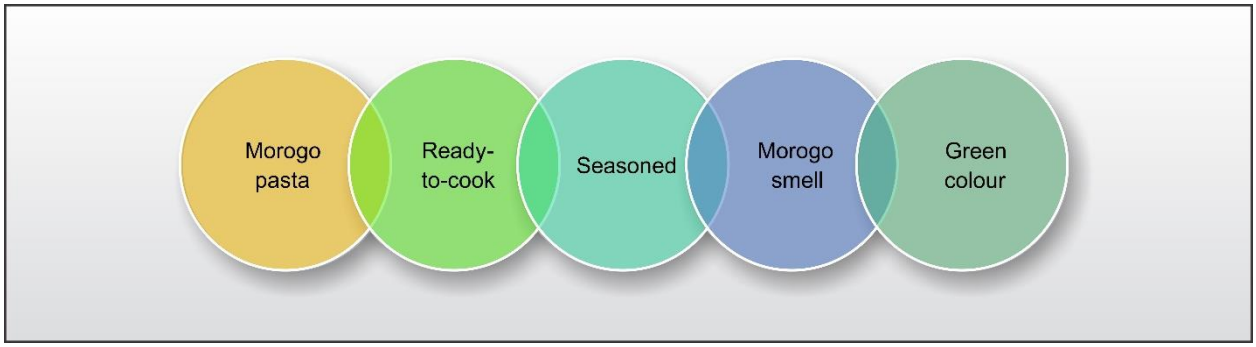


FIGURE 5.7: REQUIREMENTS FOR THE SELECTED MOROGO PRODUCT DEVELOPED IN PHASE 2

5.2.3.4 Influence of the media

Section D of the questionnaire was added for interest's sake (Addendum B) to determine whether there was any interest in all four product options (pasta, granola, soup and bread) and if the media had an effect on the consumers' product choice (Dahl, Hales and Turner-McGrievy, 2016; Vaterlaus, Patten, Roche et al., 2015; Vukmirovic, 2015; Tobey and Manore, 2014; Zimmerman and Shimoga, 2014). This question was asked after the CATA section so that the images did not influence the results of the CATA data. This section of the questionnaire included images of the four products developed, and the participants were then asked how likely they would be to consume and purchase the product. This was done on a 5-point likelihood scale.

Morogo pasta

The image of the morogo pasta used in the questionnaire is shown in Figure 5.8. With regard to the morogo pasta, one can see the percentage of likelihood of consumption and purchase in Figure 5.9. As can be seen, there seemed to be a high likelihood of consumption of morogo pasta as the majority of the participants indicated that they were somewhat (37.87% of total responses) or extremely likely (46.75% of total responses) to consume the pasta. Thus, one could say that after seeing the image of the pasta, 84.62% of the participants had a positive attitude towards the consumption of the pasta. With regard to the likelihood of their purchasing the morogo pasta, once again the majority of the participants indicated that they were somewhat (39.29% of total responses) or extremely likely (39.29% of total responses) to purchase the pasta. Thus, one could say that after seeing the image of the pasta, 78.58% of the participants

had a positive attitude towards purchasing the pasta. This positive attitude towards the consumption and purchase emphasises the interest in the development of the pasta in Phase 2 as observed in the CATA question in Section 5.2.3.3.

FIGURE 5.8: MOROGO PASTA

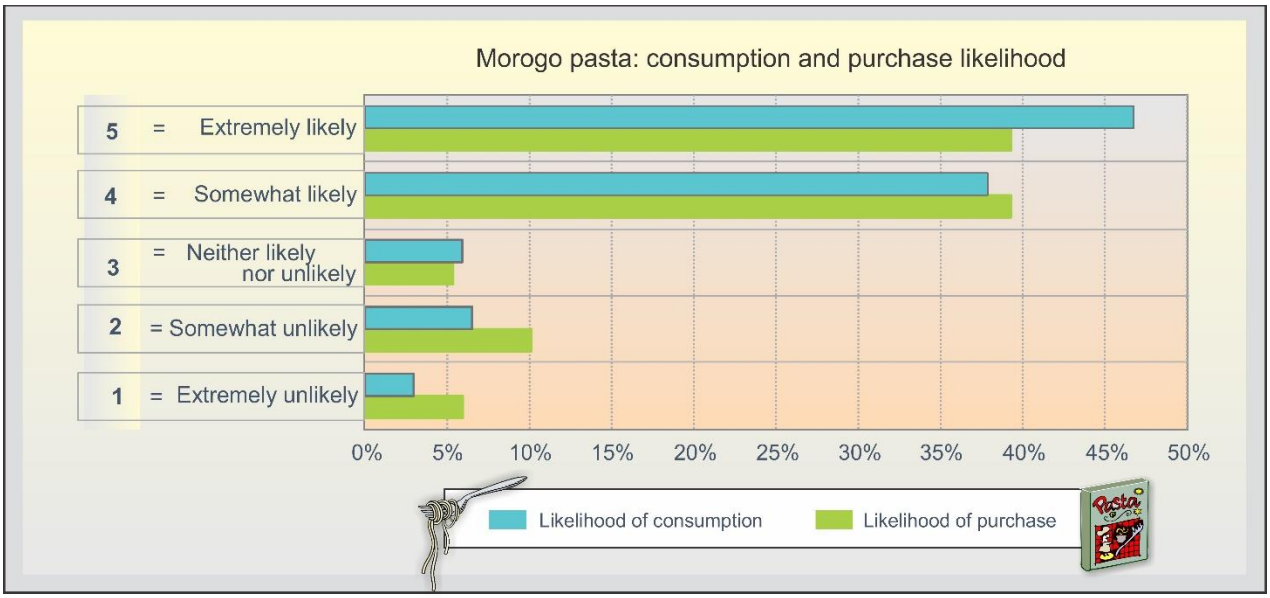


FIGURE 5.9: LIKELIHOOD OF CONSUMPTION AND PURCHASE OF MOROGO PASTA

Morogo bread

The image of the morogo bread used in the questionnaire is shown in Figure 5.10. With regard to the morogo bread, the percentage of likelihood of consumption and purchase can be seen in Figure 5.11. As one can see, there is a high likelihood of the consumption of morogo bread as the majority of the participants indicated that they were somewhat (35.71% of total responses) or extremely likely (46.43% of total responses) to consume the bread. Thus, one could say that after seeing the image of the bread, 82.14% of the participants had a positive attitude towards the consumption of the bread. With regard to the likelihood of them purchasing the morogo bread, once again the majority of the participants indicated that they were somewhat (37.72% of total responses) or extremely likely (40.12% of total responses) to purchase the bread. Thus, one could say that after seeing the image of the bread, 77.84% of the participants had a positive attitude towards purchasing the bread, and it was confirmed that there was an interest in the bread can be seen in the CATA question in Section 5.2.3.3.

FIGURE 5.10: MOROGO BREAD

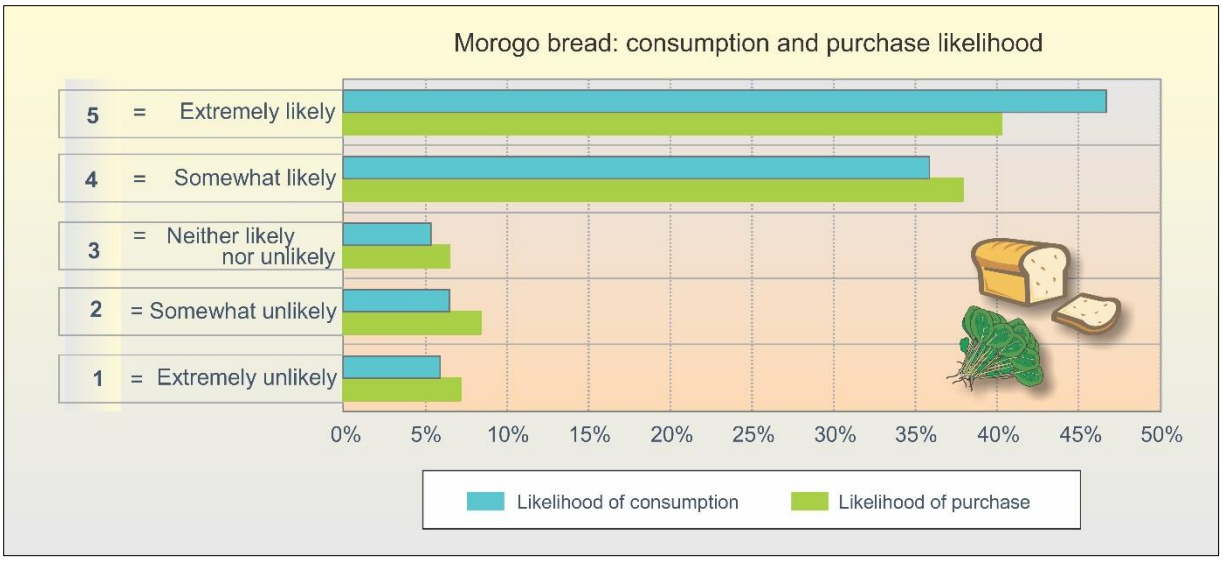


FIGURE 5.11: LIKELIHOOD OF CONSUMPTION AND PURCHASE OF MOROGO BREAD

Morogo granola

The image of the morogo granola used in the questionnaire is shown in Figure 5.12. With regard to the morogo granola, the percentage of likelihood of consumption and purchase can be seen in Figure 5.13. The participants were less inclined to select this product in comparison to the pasta and the bread, but were still interested in the product. A likelihood for the consumption of morogo granola was observed as the participants indicated that they were somewhat (29.34% of total responses) or extremely likely (27.54% of total responses) to consume the granola. Thus, one could say that after seeing the image of the granola, 56.88% of the participants had a positive attitude towards the consumption of the granola, which is just over half of the participants. With regard to the likelihood of purchase of the morogo granola, the participants indicated that they were somewhat (25.3% of total responses) or extremely likely (26.51% of total responses) to purchase the granola. Thus, it could be said that after seeing the image of the granola, 51.81% of the participants had a positive attitude towards purchasing the granola, which is a little over half of the participants. This could indicate that the participants were interested in the product but were less positive about it in comparison to the pasta and bread, which could confirm the CATA results from Section 5.2.3.3.

FIGURE 5.12: MOROGO GRANOLA

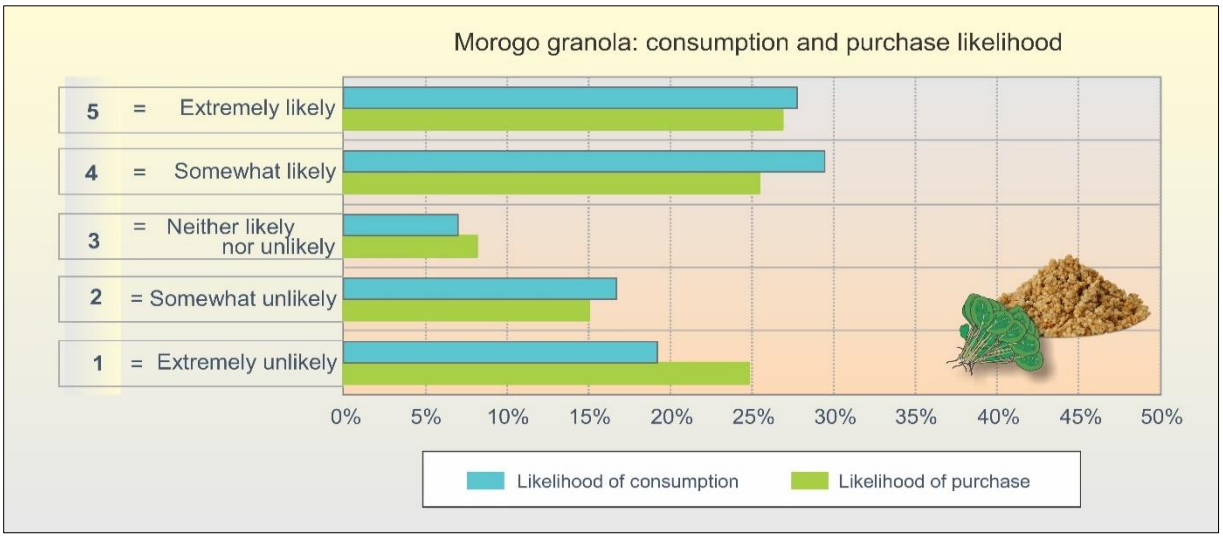


FIGURE 5.13: LIKELIHOOD OF CONSUMPTION AND PURCHASE OF MOROGO GRANOLA

Morogo soup

An image of the morogo soup used in the questionnaire is shown in Figure 5.14. With regard to the morogo soup, Figure 5.15 shows the percentage likelihood of consumption and purchase. As can be seen, a greater unlikelihood was observed for the consumption of morogo soup as the majority of the participants indicated that they were somewhat (30.36% of total responses) or extremely unlikely (22.02% of total responses) to consume the soup. It can therefore be said that after seeing the image of the soup, 52.382% (more than half) of the participants had a negative attitude towards consumption of the soup, and 41.08% had a positive attitude towards the soup, which is less than half of the participants. With regard to the likelihood of purchase of the morogo soup, the majority of the participants indicated that they were somewhat (28.57% of total responses) or extremely unlikely (26.19% of total responses) to purchase the soup. It can therefore be said that after seeing the image of the soup, 35.12% of the participants had a positive attitude towards purchasing the soup. This decreased interest in morogo soup links with the CATA results of Section 5.2.3.3, no significant interest was observed for a morogo soup product.

FIGURE 5.14: MOROGO SOUP

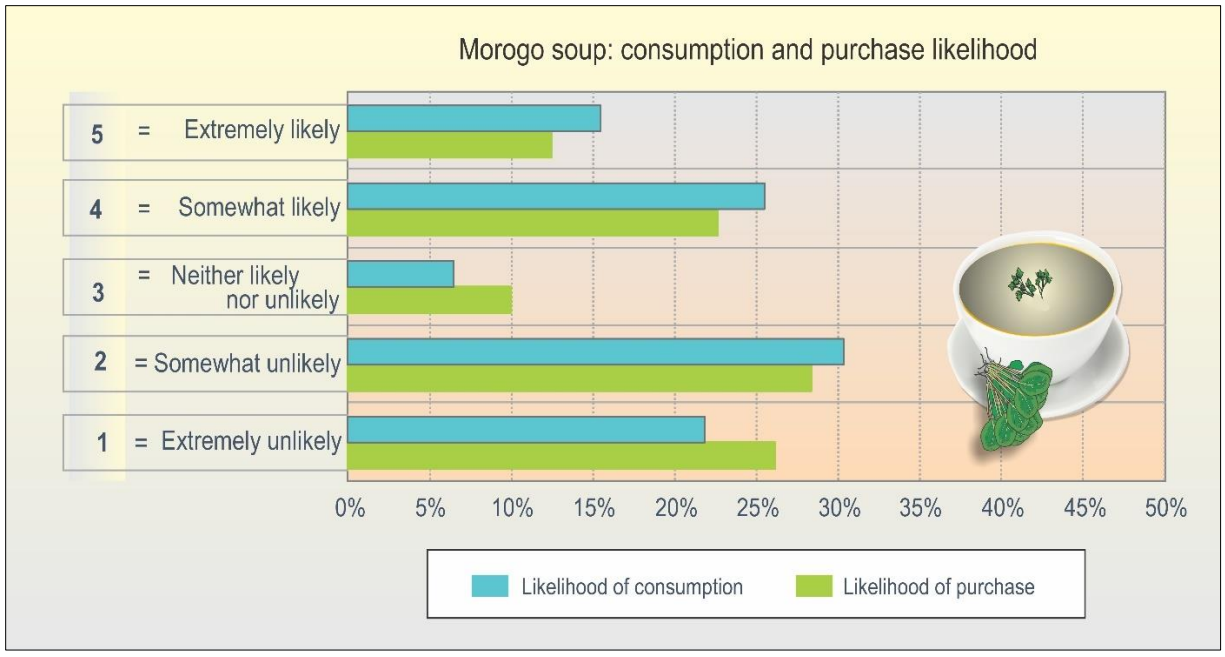


FIGURE 5.15: LIKELIHOOD OF CONSUMPTION AND PURCHASE OF MOROGO SOUP

With regard to the influence of the media, it was evident that in this study the image of the food product did not significantly impact the participants' decision as to whether they would consume and purchase a product. Even though consumer decisions are not really swayed in this study, one should take care when using the media to advertise a product as it could positively or negatively affect the consumers' decision to consume/purchase a product (Tobey and Manore, 2014; Zimmerman and Shimoga, 2014).

5.3 PHASE 2: CULINARY INNOVATION IMPLEMENTATION

Culinary innovation implementation is the second stage in the product development process where the culinary product is developed which was conceptualised and defined in the first stage of culinary innovation formulation (made up of a market analysis and survey questionnaire as seen in Phase 1) (Harrington, 2004a). This phase aimed to develop four culinary products using the AGLV. This phase was assisted by four final-year hospitality management students from the University of Pretoria under the subject VDS 413 (Recipe Development). The students were managed by the researcher and assisted by subject experts and the researcher throughout the development.

5.3.1 Design brief

The following design brief was given to the four students assisting with the development of the products to aid them with the development process:

In most developed parts of the world, indigenous leafy vegetables are regarded as weeds, but in Africa these vegetables are an important part of the diet of rural households (Senyolo et al., 2014). In South Africa, green leafy vegetables are commonly referred to as morogo, which means edible green leafy vegetable (Jansen van Rensburg et al., 2007). The World Health Organization has noted that AGLVs are widely used as traditional foods, usually as a relish or potherb (cooked in a pot) and served as an accompaniment to carbohydrate staples such as maize porridge or sorghum (Jansen van Rensburg et al., 2007; Smith and Eyzaguirre, 2007; Voster et al., 2007).

Although AGLVs are still used throughout South Africa by the African community, consumption has decreased due to many factors such as urbanisation, accessibility and the stigma of these vegetables being labelled as being "poverty foods" or having a "backwards knowledge", which has caused younger generations not to be interested in their consumption (Senyolo et al., 2014; Voster et al., 2007). Younger generations are therefore interested in the consumption of AGLVs or knowledge of their preparation, which is an issue that should be looked at as knowledge of traditional food is becoming lost (Voster et al., 2007).

African green leafy vegetables have made a significant positive impact on the total nutrient intake of African communities for many years (Faber et al., 2007) and have been found to significantly contribute to the daily intake of calcium, iron, zinc, magnesium, folic acid, riboflavin, vitamin C, vitamin A and copper (Faber et al., 2007; Smith and Eyzaguirre, 2007; Agte et al., 2000). Very little has been done on the exploitation of these AGLVs. They are a viable market as they are nutritious and provide a competitive edge (Smith and Eyzaguirre, 2007).

"Innovation is defined as the creation of something new which has value to the customer" (Hu, 2010:3). This is needed in today's growing food culture in order to stay ahead in a competitive industry (Nebel et al., 2006). In new product development there has been an increasing awareness of the importance of indigenous products, although this remains relatively unexplored in South Africa.

Consumers of AGLVs are typically African individuals residing in rural areas who have access to the plants. In addition, many of these individuals do not have enough money to purchase vegetables sold in the marketplace (Jansen van Rensburg et al., 2007). Very little research has been done on the exploitation of green leafy vegetables in Africa, which are underexploited and underutilised. This makes them a viable market for the urban consumer and they would have a competitive edge in the research if an innovative food product were to be developed; in addition, the development of traditional foods has gained interest worldwide (Van Wyk, 2011; Smith and Eyzaguirre, 2007).

In order to begin the process of product development, the following aspects were taken into consideration:

- Each of the four students had to develop an innovative culinary product using AGLVs (particularly of the species Aysestasia gangetica – creeping foxglove)
- Target market: The products were aimed at the average South African urban dweller
- The products had to fall into the category of convenience food (ready-to-eat or ready-to-cook) to address issues of accessibility, convenience and urbanisation
- The products had to be nutritious or have nutritional benefits in order to address issues of health
- The products needed to take into account the current trends (locally as well as globally) of healthy convenience food, indigenous foods, etc.
- The products could have African flavours and ingredients

5.3.2 Product possibilities

The product for which the participants indicated as having a strong preference, based on the results from Phase 1 was morogo pasta (see Section 5.2). To run the processes simultaneously and be ready for the sensory evaluation, all four products which were identified were initially developed so as to be ready to proceed with the next phase of the study. The development of the three other products is shown in Addendum C. The development of the four products was assisted by four final-year hospitality management students under the subject Recipe Development (VDS 413). The four product options identified are shown in Table 5.8 in terms of definition trends, and recipe possibilities. From this point on, only the product that the participants were interested in and used in the sensory evaluation in Phase 3 (morogo pasta) is discussed.

TABLE 5.8: PRODUCT POSSIBILITIES

ASPECT OF INTEREST	PASTA	SOUP	BREAD	GRANOLA
Definition	An unleavened dough made from wheat flour, water and eggs that is cut or extruded into a variety of different shapes and sizes. It can be fresh or dried and is boiled prior to consuming. The dough can be flavoured and coloured with a variety of different ingredients (Labensky et al., 2011:1135)	A liquid food made with meat, fish or vegetable stock as a base and often containing pieces of solid food or is smooth. Some common types of soup include broths, consommés, cream soups, puree soups, bisques, chowders and cold soups (Labensky et al., 2011:234)	A basic mixture of flour, water, salt and leavening which is baked. Different ingredients may be added to produce a variety of breads. Two main categories include quick breads (using chemical leaveners or steam) and yeast breads (using yeast) (Labensky et al., 2011:924)	A toasted blend of whole grains, nuts and dried fruit, usually eaten with milk or yoghurt (Labensky et al., 2011:550)
Trends	• Natural coloured pasta • Healthy pasta dishes • Leafy greens • Vegetable-based pasta • Different flavours, ingredients, sauces • Local foods • Healthy eating	• Zero waste • Healthy convenience foods • Soup flavours, ingredients and toppings • Natural ingredients • Plant-based dishes • Natural ingredients	• Healthy breads • Artisan bread • Whole grains • Gluten-free bread • Flavoured breads	• Healthy breakfast items • Vegetables in every meal • Superfoods • Raw food • Global flavours
The gap in the market	• Underutilised ingredients • Few products with morogo • Healthy convenience food options • Making traditional foods accessible • Innovative traditional foods			
Recipe possibilities according to the level of convenience (ready-to-eat or ready-to-cook)	A morogo pasta to be made available either as a cooked meal or in a ready-to-cook dried format	A healthy vegetable-based soup to be made available as a ready-to-eat product or in an instant form to which boiling water is added	A healthy quick bread flavoured with morogo and African flavours – available either as a baked product or in a dried baking kit form	A nutritious granola made with morogo and African ingredients to be available as granola or to be adapted in a bar format

5.3.3 Recipe and information search

To begin the process of recipe development, various aspects needed to be investigated to determine what the morogo pasta should consist of. A recipe and information search was done, which involved research on various topics, as illustrated in Table 5.9.

TABLE 5.9: RECIPE AND INFORMATION SEARCH

Knowledge needed	Purpose	Source
Types of flour	To determine which flour would benefit the pasta in terms of quality	• Recipe books • Academic culinary books • Literature search
Pasta shapes	To determine which shape would be best for the addition of morogo	• Recipe books • Academic culinary books • Literature search
Current trends	To identify any gaps in the market and be able to position the pasta competitively	• Literature search • Internet – trend-forecasting platforms
Role of different ingredients	To understand the structure of the recipe and how to adapt it to an innovative product	• Recipe books • Academic culinary books • Literature search
Pasta recipes	To obtain a baseline recipe to which adaptations and alterations were made	• Recipe books • Academic culinary books

5.3.4 Implementation of the morogo pasta

To formulate the morogo pasta, various factors had to be taken into account so that a baseline recipe could be established. The factors in question are the performance criteria for the morogo pasta, the sensory characteristics desired, the structure of the recipe and the preparation techniques. The formulation of the morogo pasta discussed in more detail in Table 5.10.

TABLE 5.10: FORMULATION OF THE MOROGO PASTA

<table>
<tr><td>Performance criteria for morogo pasta
(Labensky et al., 2011:645)</td><td colspan="2">Appearance:
Must be green in colour
The pasta was firm when cooked and had little to no water retention
Should have morogo in the dough of the pasta
The surface was slightly pitted or dull
Dried pasta must be hard and break with a snap
Flavour:
The pasta should taste earthy and have a morogo flavour
Should be flavourful
Must be appetising
Texture:
Uniform texture and appearance
Should have a bite (al dente) when eating
Convenience in preparation:
Must take the form of ready-to-cook (dried product)
Must be convenient and easy for consumers to prepare</td></tr>
<tr><td>Sensory characteristics desired according to Phase 1 (culinary innovation formulation)</td><td colspan="2">Al dente
Seasoned
Morogo smell
Green colour</td></tr>
<tr><td>Role of ingredients
(Labensky et al., 2011:645)</td><td colspan="2">Eggs:
For binding of the dough and to create richness and strength
Flour:
For gluten development of the pasta so that it can stretch and for texture creation
Morogo:
For a characteristic flavour as well as for the addition of vitamins and minerals</td></tr>
<tr><td rowspan="2">T-structure
(Du Rand, 2015)</td><td>Ingredients determining character</td><td>Ingredients contributing to the support</td></tr>
<tr><td>Major flavour: Morogo
Body: Egg
Texture: Flour</td><td>Seasoning: Salt</td></tr>
<tr><td>Preparation techniques
(Labensky et al., 2011:649)</td><td colspan="2">Morogo:
Blanching

Pasta (traditional method):
Flour is sifted on a clean, dry workbench. A well is made in the centre, and the eggs are cracked into the well. The flour must then be folded into the egg from the outside inwards and incorporated. The dough must then be kneaded to assist in the gluten development

Pasta (desired manner):
Pulsing ingredients in food processor
Rolling and cutting out pasta with Kenwood mixer
Dry pasta on drying rack</td></tr>
</table>

5.3.5 Adaptations of ingredients and method of making morogo pasta

A baseline recipe was chosen to which changes and adaptations needed to be made to create the final prototype. The adaptation was evaluated every week by the researcher, two subject experts and the four final-year students who assisted in the development of the products. The four students were trained in the use of the sample. They were briefed and closely involved throughout the practical sessions with the researcher and subject specialists. The adaptations are shown in Table 5.11.

TABLE 5.11: ADAPTATIONS OF INGREDIENTS AND METHOD FOR MOROGO PASTA

Original	Adaption 1	Adaption 2	Adaption 3
Ingredients			
50 g egg (1 unit) 15 ml water 500 ml spinach, fresh 250 ml basil, fresh 315 ml flour, cake	For the first adaption, fresh and dried morogo leaves were used **First trial:** 400 g flour, cake 250 g egg, large (5 units) 150 g morogo leaves, fresh **Second trial:** 400 g flour, cake 250 g egg, large (5 units) 150 g morogo leaves, dried	400 g flour, cake 250 g egg, large (5 units) 160 g morogo leaves, fresh	400 g flour, cake 250 g egg, large (5 units) 180 g morogo leaves, fresh
Method			
1. Place egg, water, spinach and basil in food processor. Pulse until smooth 2. Add flour and pulse until the dough comes together into a ball 3. Turn the dough out onto a floured surface and form into a ball 4. Roll out into a thin layer using a rolling pin and cut into strips 5. Rest for 20 minutes 6. Add pasta to a pot of boiling salted water and boil for 5-7 minutes	1. In a food processor, pulse the morogo leaves 2. Add flour and pulse until it resembles breadcrumbs 3. Turn the dough onto a floured surface and form into a ball 4. Knead and work the dough to develop the gluten in the flour 5. Rest for 20 minutes 6. Add pasta to a pot of boiling salted water and boil for 5-7 minutes	Blanch the morogo leaves and strain off the water In a food processor, pulse the morogo leaves Add flour and pulse until it resembles breadcrumbs Turn the dough onto a floured surface and form into a ball Knead and work the dough to develop the gluten in the flour Rest for 20 minutes Feed dough through a pasta machine to the desired thickness and shape. Add pasta to a pot of boiling salted water and boil for 5-7 minutes	1. Blanch the morogo leaves and strain off the water 2. In a food processor, pulse the morogo leaves 3. Add flour and pulse until it resembles breadcrumbs 4. Turn the dough onto a floured surface and form into a ball 5. Knead and work the dough to develop the gluten in the flour 6. Rest for 20 minutes 7. Feed dough through a pasta machine to desired thickness and shape 8. Add pasta to the pot of boiling salted water and boil for 5-7 minutes

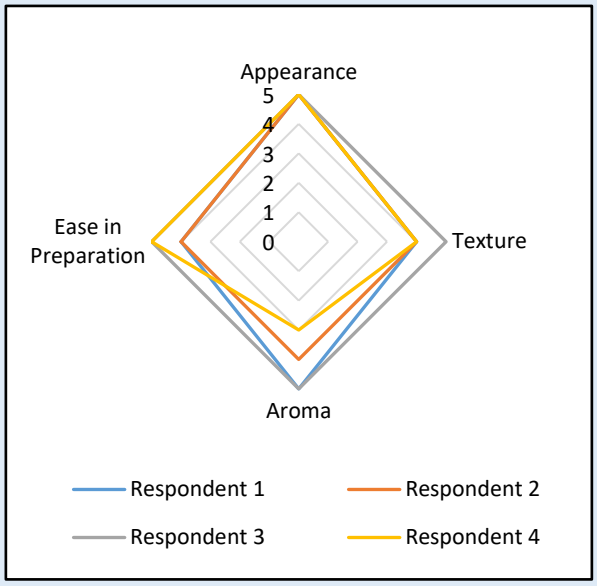
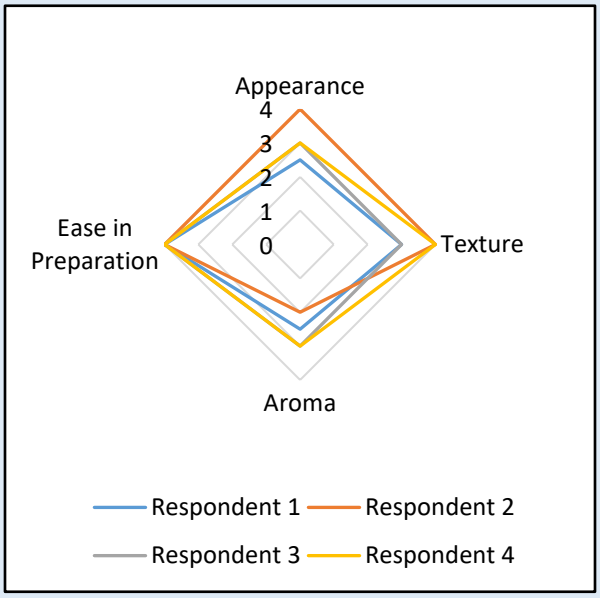
5.3.6 Evaluation by subject experts

After each adaptation, the product was evaluated by the researcher, two subject experts, and the four final-year students who assisted in the development of the products. The four students were trained in the use of the sample and were briefed and closely involved throughout the practical sessions with the researcher and the subject experts. The following characteristics were evaluated: appearance, texture, aroma and ease of preparation. For each characteristic, the following aspects had to be taken into account by the evaluators:

- Appearance:
    - Green in colour
    - The pasta was firm and had little water retention
- Texture:
    - Al dente
    - Smooth mouthfeel
- Aroma:
    - Smells like morogo
- Ease of preparation:
    - Easy steps to follow in cooking
    - Remains al dente when cold

The participants had to evaluate each aspect on a 5-point Likert liking scale (1 = dislike a great deal to 5 = like a great deal) and then give an overall mark out of five for the flavour of the product. The results of the evaluation are shown in Table 5.12 for each adaptation.

TABLE 5.12: EVALUATION OF MOROGO PASTA

Adaptation	Explanation
First adaptation: Fresh Morogo  **FIGURE 5.16: FIRST ADAPTATION (FRESH MOROGO)**	As seen in Figures 5.16 and 5.17, the first adaptation involved a change in ingredients and method. After the first adaptation, it was found that the fresh morogo worked better than the dried morogo, but the ratio of the leaves needed to improve for a better consistency and appearance. A recommendation by the subject experts was to blanch the morogo and increase the quantity to increase the green colour and morogo flavour.
First adaptation: Dried Morogo  **FIGURE 5.17: FIRST ADAPTATION (DRIED MOROGO)**	

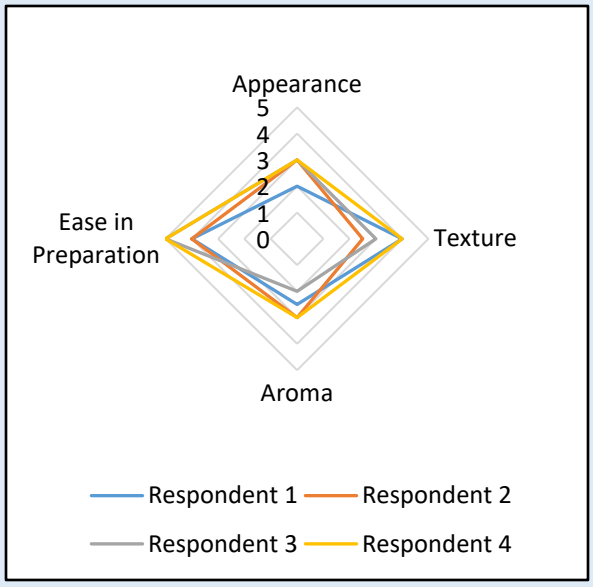


FIGURE 5.18: SECOND ADAPTATION

The second adaptation as seen in Figure 5.18 included adjusting the ratio of the morogo and blanching the morogo. The blanched morogo worked well as it retained its green colour and aroma, but it was found that the appearance was still not correct for the pasta, which could be a result of either too few leaves being added or because the leaves were not processed enough before adding the flour.

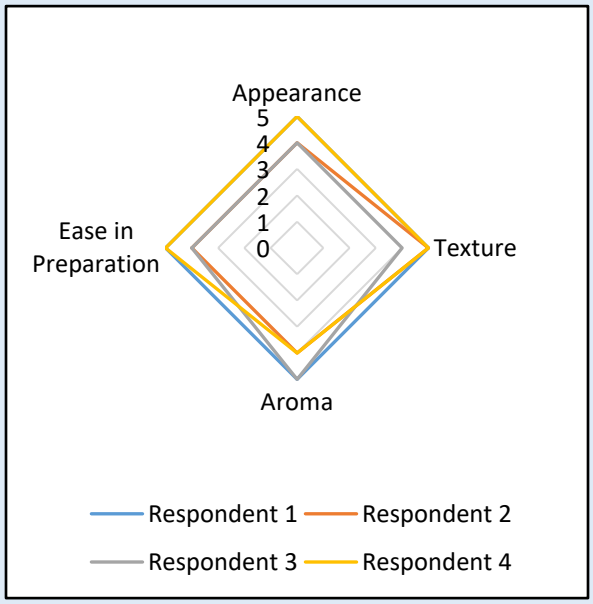


FIGURE 5.19: THIRD ADAPTATION

The third adaption revealed that the morogo pasta had an optimal colour as the appearance score is high, as shown in Figure 5.19. The results show that the correct amount of morogo leaves for this specific recipe would be 180 g.

5.3.7 Yield tests

In order to confirm that the developed product was accurate and reliable, a triple test was performed whereby the recipe was repeated three times to determine any difference in mass, taste and appearance. The results can be seen in Table 5.13, which confirm that the recipe was accurate and would reproduce the same result each time the product was made.

TABLE 5.13: TRIPLE TEST OF MOROGO PASTA

YIELD FACTOR	TRIPLE TEST 1	TRIPLE TEST 2	TRIPLE TEST 3
Total raw mass	880 g	879 g	880 g
Total cooked mass	1 126 g	1 125 g	1 126 g
Yield factor	0.78	0.78	0.78
Yield factor %	78%	78%	78%
Handling loss	246 g	246 g	246 g

5.3.8 Prototype

Details of the prototype developed are given in Table 5.14 below, which will be used as the product for sensory testing in Phase 3.

TABLE 5.14: STANDARDISED RECIPE

Date	**Dish**		**MOROGO PASTA**		**Source**
15-06-2017	Description		A bright green-coloured pasta made from a flavourful indigenous AGLV.		Bupo, A.D
	Serving suggestion		Serve with olive oil and season with salt		
	Portion size		115 g		
	No. of portions		4		
	Preparation time		49 minutes		
AMOUNT	**g/ml**	**INGREDIENTS**	**METHOD**	**TIME/TEMP**	**EQUIPMENT**
PRE-PREPARATION (Mise en place)					
180	g	Leaves, morogo, raw	Bring a pot of water to the boil. Prepare an ice bath by placing ice and water in a medium-sized bowl. Blanch leaves for 1 minute and remove with a slotted spoon.	5 minutes	Stock pot Medium-sized bowl Slotted spoon
PREPARATION					
237	g	Leaves, morogo, blanched	In the chopper attachment of a food processor pulse the morogo leaves. Add the flour and pulse until it resembles breadcrumbs.	1 minute	Kenwood Chopper (Quad blade mini chopper-CH580) Kenwood Food Processor (FP120) Wooden spoon
400	g	Flour, cake			
243	g	Eggs, chicken, large			
880	g	Pasta dough	Tip the mixture onto the work surface and bring the dough together into one lump using your hands. Knead and work the dough with your hands to develop the gluten in the flour.	1 minute	
880	g	Pasta dough	Wrap the pasta dough in cling wrap and allow to rest at room temperature	20 minutes	Cling wrap
ROLLING AND CUTTING					
880	g	Pasta dough	Feed the pasta dough through a pasta machine starting at the widest setting and working to number 5 (3 mm). Cut the pasta with the cutting attachment in linguine size and shape. Allow to dry overnight or use immediately.	20 minutes (rolling) Overnight (drying)	Kenwood Pasta Roller Attachment (KAX980ME) Pasta drying rack Cooling rack

5.3.9 Benchmarking

Various retail establishments were investigated to identify possible competing products for the morogo pasta. Three major South African supermarkets were used, namely, Checkers, Pick n Pay and Woolworths. As seen in Table 5.15, there is quite a limited range of flavoured/healthy/vegetable-based pastas (only seven products were identified that could compete with the morogo pasta). The morogo used in the developed product added flavour, colour and nutrients which many of the pastas on the market lack. The developed morogo pasta produced a quantity of 460 g for a cost of R8.45, which is cost-effective compared to the healthy or coloured kinds of pasta on the market, which provides a competitive edge.

TABLE 5.15: BENCHMARKING OF MOROGO PASTA

ITEM	QUANTITY	PRICE	IMAGE	CONVENIENCE	HEALTH
CHECKERS					
Moringa Noodles	200 g	R39.99	 **FIGURE 5.20: MORINGA NOODLES**	Pasta is in ready-to-cook form, and has added indigenous vegetables, but is very expensive	Energy: 620 kJ Protein: 4.3 g Carbohydrate: 31 g Dietary fibre: 3.6 g Inclusion of vegetable: Yes

ITEM	QUANTITY	PRICE	IMAGE	CONVENIENCE	HEALTH
PICK N PAY					
Fatti's & Moni's High Fibre Spaghetti	500 g	R19.99	 **FIGURE 5.21: HIGH FIBRE SPAGHETTI**	Pasta is in ready-to-cook form but takes longer to cook due to the nature of the high fibre pasta. The pasta takes 13-15 minutes to boil whereas the morogo pasta only takes 7 minutes	Energy: 1 294 kJ Protein: 13.2 g Carbohydrate: 62 g Dietary Fibre: 7.2 g Inclusion of vegetable: No
Serena Spinach Lasagne	250 g	R26.99	 **FIGURE 5.22: SERENA SPINACH LASAGNE**	Pasta is in ready-to-cook form but takes longer to cook due to the nature of the pasta being in lasagne sheets. The pasta takes 30 minutes to bake in lasagne form, and 15 minutes to rest, whereas the morogo pasta only takes 7 minutes	Energy: 1 483 kJ Protein: 12.0 g Carbohydrate: 71 g Dietary fibre: 4.0 g Inclusion of vegetable: Yes

ITEM	QUANTITY	PRICE	IMAGE	CONVENIENCE	HEALTH
WOOLWORTHS					
Al Nero di Sepia Spaghetti (Cuttlefish Ink)	500 g	R76.99	 **FIGURE 5.23: CUTTLEFISH INK PASTA**	Pasta is in ready-to-cook form, and takes 10-12 minutes to cook, whereas the morogo pasta only takes 7 minutes. The aspect of interest is the colouring of the pasta, as the morogo pasta will also be coloured naturally	Energy: 1 488 kJ Protein: 12.6 g Carbohydrate: 71 g Dietary fibre: 3.6 g Inclusion of vegetable: No
Carb Clever Spinach and Cauliflower Noodles	250 g	R44.99	 **FIGURE 5.24: CARB CLEVER SPINACH AND CAULIFLOWER NOODLES**	Pasta is in ready-to-eat form and only needs to be reheated. Although it is quick to prepare, it is expensive for only two servings	Energy: 182 kJ Protein: 1,2 g Carbohydrate: 6,0 g Dietary Fibre: 3,0 g Inclusion of vegetable: Yes

ITEM	QUANTITY	PRICE	IMAGE	CONVENIENCE	HEALTH
Gluten-Free Spaghetti	250 g	R50.99	 **FIGURE 5.25: GLUTEN FREE SPAGHETTI**	Pasta is in ready-to-cook form but takes longer to cook due to the nature of the gluten-free pasta. The pasta takes 11-15 minutes to boil whereas the morogo pasta only takes 7 minutes	Energy: 1 518 kJ Protein: 7.2 g Carbohydrate: 78 g Dietary Fibre: 2.3 g Inclusion of vegetable: No
Organic Whole Wheat Linguini	500 g	R44.99	 **FIGURE 5.26: ORGANIC WHOLEWHEAT LINGUINI**	Pasta is in ready- to-cook form but takes longer to cook due to the nature of wholewheat. The pasta takes 13-15 minutes to boil whereas the morogo pasta only takes 7 minutes	Energy: 1 430 kJ Protein: 11.9 g Carbohydrate: 63 g Dietary Fibre: 8.8 g Inclusion of vegetable: No

5.3.10 Upscale

The original recipe yielded 460 g of pasta which would be for four servings of 110 g (taking moisture loss from drying into account). For the participants to be able to taste and evaluate the developed morogo pasta, it needed to be made in a large-scale production facility. The desired amount for large-scale production was 3 680 g of morogo pasta. The calculations for the upscaling is shown below in Table 5.16, which made use of the percentage method.

TABLE 5.16: UPSCALING OF MOROGO PASTA USING THE PERCENTAGE METHOD

Recipe Name	**MOROGO PASTA**							**Date**
Recipe Yield (ml/g)	460g	**New no. of portions**	8	**Size per portion** (N)	460g			15/06/2017
		Desired Amount		3680g		**1.804347826**		6640
Ingredients	**Recipe Amount**	**Converted Amount**	**% of Total Recipe**	**Edible Portion**	**Yield %**	**Yield needed to AP**	**As Purchased**	**Amount in original metric**
	(ml/g)	(ml/g)	%	(ml/g)	(Format not in % e.g. 80)		(ml/g)	(ml/g)
Morogo, creeping foxglove, raw	180g	180g	21.69%	1 440.00g	130	-332.3076923	1 108g	1 108g
Flour, cake	400g	400g	48.19%	3 200.00g	100	0	3 200g	3 200g
Eggs, large	250g	250g	30.12%	2 000.00g	100	0	2 000g	2 000g
Total Converted Amount (C)	830g	100%	6 640g					

5.4 PHASE 3: EVALUATION AND CONTROL

Evaluation and control is the third stage in the product development process, where the one selected culinary product is evaluated, which was developed in Phase 2. This phase consisted of a sensory tasting of the one selected product from Phase 2, which was specified in Phase 1.

The sensory evaluation took place at the University of Pretoria in the Eat@UP dining room. Convenience sampling was used to recruit the participants who indicated in Phase 1 (of their own free will) that they would be willing to participate in the sensory tasting of the developed product. The survey questionnaire took the form of a self-administered, online electronic questionnaire (shown in Addendum D) which was developed on Qualtrics (an online research survey tool). This questionnaire was used to determine and

evaluate the sensory and hedonistic characterisation of the one selected culinary product developed (morogo pasta). Seventy-two participants responded to the questionnaire in this phase.

The participants were presented with iPads on which they answered the questionnaire. It took approximately 15 minutes to complete. The questionnaire allowed the collection of the following information: demographic information, descriptive characteristics of sensory characteristics (CATA), hedonic ratings of the product characteristics and intention to make future purchases (as shown in Addendum D).

5.4.1 Demographic characteristics of the sample

The profile of the participants shown in Table 5.17, was compiled by asking demographic questions in Section A of the questionnaire (Addendum D). The demographic variables of gender, age, ethnicity, level of education and household income were applied in the questionnaire. The demographic information obtained was not used in the analysis but was used to describe the sample. The participants were asked beforehand to state if they lived in Gauteng and were over the age of 18. If they did not meet these criteria, they were not permitted to continue with the questionnaire. In total, 72 participants were usable for further analysis.

TABLE 5.17: DEMOGRAPHIC PROFILE OF PARTICIPANTS (N=72)

Gender		**Male**	**Female**				
	n	24	48				
	%	33.33	66.67				
Age		**18-20**	**21-30**	**31-40**	**41-50**	**51-60**	**61-70**
	n	3	54	4	3	7	1
	%	4.17	75.00	5.56	4.17	9.72	1.39
Ethnicity		**Asian**	**Black**	**Coloured**	**White**	**Other**	
	n	2	17	1	52	0	
	%	2.78	23.61	1.39	72.22	0.00	
			Non-Caucasian		**Caucasian**		
		n	20		52		
		%	27.78		72.22		
Level of Education		**Lower than Grade 12**	**Grade 12**	**Undergraduate degree or diploma**	**Post-graduate degree or diploma**		
	n	0	21	24	27		
	%	0.00	29.17	33.33	37.50		
Household total monthly income		**Less than R5 000**	**R5 000- R9 999**	**R10 000 - R14 999**	**R15 000- R19 999**	**R20 000- R24 999**	**R25 000 or more**
	n	7	14	5	4	11	31
	%	9.72	19.44	6.94	5.56	15.28	43.06

5.4.1.1 Gender

The majority of the participants who took part in the study were female (66.67%) as seen in Table 5.17. The participants who participated in the sensory tasting did so of their own free will, which may indicate that female consumers are more interested in an AGLV product than their male counterparts. This could also be due to the fact that women tend to be more health conscious (Bidmon and Terlutter, 2015). Even though the majority of the participants were women, there were a few male participants (33.33%) who participated, which may indicate that there is some interest in an AGLV product by male consumers.

5.4.1.2 Age

The age profile of the participants is available below in Table 5.18. The participants who participated in the study had to be over the age of 18 in order to take part in the study. This is because they are legally allowed to participate in a study without the consent of their parents (ethical reasons) and also because they are more responsible for purchasing decisions as they are considered to be of "working age" by the City of Tshwane Municipality. The youngest respondent was 18 years of age, whereas the oldest respondent was 61 years of age, which therefore gave an age range of 43 years. The average age of the participants was 28.75 years of age. The age group with the largest participation was the 21-30 year group which comprised 75% of the total participants. This could be an indication that this age group was more willing to participate in the study and was more interested in the development of indigenous food products. It could also be due to the fact that the age group of 20-29 comprises of 23.5% of the total population of Gauteng, which is the largest age group (StatsSA, 2011).

TABLE 5.18: AGE PROFILE OF PARTICIPANTS (N=72)

Age profile of participants						
Age groups	**18-20**	**21-30**	**31-40**	**41-50**	**51-60**	**61-70**
Frequency of age group	3	54	4	3	7	1
Percentage of age group	4.17	75.00	5.56	4.17	9.72	1.39
Youngest respondent	18					
Oldest respondent	61					
Range	43					
Mean age	28.75					

If one had to break the age profile of the participants further into the generational cohorts in Table 5.19, the largest group would be Generation Y, comprising of 81.94% of the participants. The fact that Generation Y has the largest frequency could link to the fact that they are active on social media on which the questionnaire was distributed as seen in Phase 1 (Bolton et al., 2013).

TABLE 5.19: GENERATIONAL COHORTS OF PARTICIPANTS (N=72)

Generational Cohort	Baby Boomer	Generation X	Generation Y
Age bracket	**54 +**	**38-53**	**37 -**
Frequency	6	7	59
Percentage	8.33	9.72	81.94

5.4.1.3 Ethnicity

As seen in the demographic profile in Table 5.17, participants in this questionnaire indicated which ethnic group they belonged to according to the South African Population Equity Act. The group with the most participants was the white group, making up 72.22% of the total participants. This is significant as the consumption of AGLVs is usually associated with the black population. This may therefore indicate that there is an interest in an AGLV product by a population group which is not traditionally associated with its consumption (Cernansky, 2015; Feagan, 2007).

5.4.1.4 Level of education

There were no participants in this phase who had a level of education less than Grade 12 (0%) as seen in Table 5.17. 29.17% of the participants had a Grade 12 level of education, and 33.33% had an undergraduate degree or diploma. The majority of the participants in this study had a post-graduate degree or diploma, making up 37.5% of the total participants, as seen in Table 5.17. This higher level of education may have been due to the fact that the study was done in an academic environment and that participants with higher education levels were more interested in new studies or were more willing to participate in an academic study.

5.4.1.5 Household income

Household income influences consumers' ability to spend money on food purchases. Five different categories were used according to monthly income (Business-Tech, 2016):

1. Low income: Less than R5 000
2. Low emerging middle income: R5 000-R9 999
3. Emerging middle income: R10 000–R14 999, R15 000–R19 999
4. Lower middle: R20 000–R24 999
5. Upper middle to affluent groups: R25 000 or more

The group that comprised the highest percentage was the R25 000 or more (43.06%) income group, which is a high-middle to affluent group, followed by the R5 000–R9 999 (low emerging middle income) group comprising 19.44% of the participants. The majority of the participants had a high income level. This was interesting because consumers of AGLVs are usually individuals living in rural areas, and AGLVs are often associated with poverty foods (Cernansky, 2015; Jansen van Rensburg et al., 2007; Labadarios and Steyn, 2001). This interest could be due to the fact that consumers are beginning to see the importance of eating locally produced foods and are more willing to pay for because they can afford them (Cernansky, 2015; Adams and Adams, 2011; Jansen van Rensburg et al., 2007).

5.4.2 Characteristics of the developed product

Section B of the questionnaire (see Addendum D) aimed to determine the sensory characteristics of the selected developed product (morogo pasta) as well as its acceptance and purchase intentions of the participants. This section consisted of the CATA technique used in Phase 1 (see Section 5.2). The CATA section of the questionnaire consisted of 12 statements from which the participants had to select those that they thought applicable or represented their opinion of the product tested (morogo pasta). The participants were allowed to select as many terms as they liked, which they viewed as characterising the sensory and hedonistic attributes of the developed product. Opposing statements were given for all the attributes in order to produce reliable results (Ares and Jaeger, 2013). The statements that were marked with their opposites were discarded.

5.4.2.1 Statistical analysis of CATA questions

To determine the characteristics of the developed morogo pasta, the CATA technique (see Addendum D) was used. It consisted of 12 statements which the participants had to select from which they thought applied to or represented their opinion about the one selected developed convenience food product made from morogo. The participants were instructed to select as many statements they thought were

applicable. These statements were based on an original CATA questionnaire developed by Belusso et al. (2016) (as discussed in Chapter 4).

Each statement also had an opposing statement in order to produce reliable results (Ares and Jaeger, 2013). The statements consisted of terms relating to the sensory characteristics of the developed product. The classification of the CATA terms is shown in Table 5.20. The statements that were marked with their opposites were discarded. The data was analysed on XLSTAT 2017, version 19.4.1.46344, a statistical software and data analysis add-on for Microsoft Excel.

Table 5.20 shows the number of times each statement was selected (frequency) as well as the significance between each pair of terms with a 5% significant difference level (α=0.05). The statements that had the highest frequency were 11 (Good), 1 (Al dente), 4 (Weak vegetable smell), 8 (Dull green), and 5 (Seasoned). The Z-tests performed in this phase were carried out to assess the differences between the opposite sensory attributes. The results of this CATA test indicated the sensory and hedonistic characterisation of the morogo pasta.

TABLE 5.20 RESULTS OF CATA QUESTIONNAIRE FOR MOROGO PASTA (N=72)

Term Number	Sensory Attributes	Classification of Sensory Characteristic	Frequency	Z-Test
1	Al dente (still firm)	Texture	**63**	22.293*
2	Overcooked		0	
3	Strong vegetable smell	Aroma	19	3.368
4	Weak vegetable smell		**44**	
5	Seasoned	Flavour	**34**	4.825*
6	Strong morogo flavour		7	
7	Vivid green	Appearance	28	1.581
8	Dull green		**41**	
9	Sticky	Texture/Mouthfeel	9	2.164
10	Dry		2	
11	Good	Liking	**69**	28.093*
12	Bad		1	

*Presented a significant difference α=0.05 Z_{α}=1.96

In this sensory test, the participants were more inclined to select the terms “Good”, “Al dente”, “Weak vegetable smell”, “Dull green” and “Seasoned” due to the high frequency of these terms. This links to Phase 1 of the results obtained (Section 5.2) as the participants indicated that they wanted the morogo pasta product to be developed. The product had to take the form of ready-to-cook (which would be state in which the participants would purchase it), it had to be seasoned, could have a morogo smell and could have a green colour.

No clear preference was recorded in Phase 1 (Section 5.2) with regard to the appearance/colour of the product as the participants did not mind if it was green, and neither was it important whether the developed product was expected to be green. In the sensory test, the participants indicated that the pasta had the characteristic of a dull green colour due to a high frequency of the term. Although the term dull green had a high frequency, it was not statistically significant.

With regard to smell, the participants recorded in Phase 1 (Section 5.2) that they did not mind the smell of morogo, which indicated that the product could have a morogo smell as it would not bother the participants. In the sensory test, the participants indicated that the pasta had a weak vegetable smell due to the high-frequency.

In Phase 1 the participants indicated that it was important for the morogo pasta to be seasoned and not have a strong morogo flavour – the results showed a significant difference from the opposing statement ($p \geq 0.05$). This was confirmed in the sensory test as the participants characterised the morogo pasta as being seasoned, which showed a high preference as the results indicated a significant difference.

Another sensory aspect which typically relates to pasta is al dente (firm) or being overcooked (Martinez, Ribotta, Leóon et al., 2007). In the sensory test the participants indicated that the morogo pasta was al dente due to the high frequency of the term as well as the significant difference in the Z-tests. None of the participants selected the term “overcooked”.

The last aspects which the participants indicated as having a high preference for were the hedonic terms “Good” or “Bad” to categorise the product. The term “Good” had the highest frequency and preference in the sensory test and it also indicated that there was a significant difference.

5.4.3 Hedonic reaction to the developed product

Section C of the questionnaire aimed to determine the participants' liking of the morogo pasta. This was achieved by using a 9-point hedonic liking scale on which the participants rated the product. This question is seen in Addendum D. The data was then analysed on XLSTAT 2017, version 19.4.1.46344, a statistical software and data analysis add-on for Microsoft Excel.

In order to characterise the morogo pasta, a CATA questionnaire was used which contained sensory and hedonistic attributes related to the morogo pasta (see Section 5.4.2). A 9-point hedonic liking scale was then used to evaluate the acceptance of the morogo pasta (Addendum D). The scale ranged from "dislike extremely" to "like extremely". After this, the acceptance index (A) of the morogo pasta was calculated from the averages of the results, with the maximum value of the scale (9) representing 100%. The results of the hedonic scores are shown in Table 5.21. As can be seen, the term with the highest frequency was "Like very much" which is an indication that the participants were positive towards the developed morogo pasta.

TABLE 5.21: RESULTS OF THE HEDONIC PERCEPTION OF THE MOROGO PASTA (N=72)

Hedonic Perception	Frequency
1 = Dislike extremely	0
2 = Dislike very much	0
3 = Dislike moderately	1
4 = Dislike slightly	2
5 = Neither like nor dislike	0
6 = Like slightly	2
7 = Like moderately	**16**
8 = Like very much	**42**
9 = Like extremely	**9**

In order to understand the relationship between the CATA terms and the hedonic points better, a correspondence analysis was then conducted (Beh et al., 2011; Guerrero et al., 2010; Lawless and Heyman, 2010). Correspondence analysis is a multivariate statistical technique which uses non-metric data (such as the CATA results) to create percentage maps which will include all the varying categories (Hair et al., 2009).

Figure 5.27 illustrates the results of the correspondence analysis which was carried out with the CATA terms (Section 5.4.2) and the hedonic points on the scale. The first two planes (F1 and F2) explain 96.41% of the association between the CATA statements and the points on the hedonic scale. The "liking" indicator shows the sum of the relative contributions and is explained by both axes. The closer the characteristic is to 1, the better the representation of the product (González et al., 2011). The terms closest to the label "hedonic rating" indicate the qualities that the participants found the most desirable/optimal, whereas further terms indicate properties that the participants found less desirable (Belusso et al., 2016). This is illustrated in Figure 5.27 and is circled in red. The terms closest to the hedonic rating which the participants selected were "seasoned", "weak vegetable smell", "al dente", and "good". The analysis helps the understanding of the perception of the developed morogo pasta by the participants.

This links to Phase 1 of the results obtained (Section 5.2) as the participants indicated that they wanted morogo pasta to be developed. It had to take the form of ready-to-cook (which would be the state in which the participants would purchase it), it had to bet be seasoned, could have a morogo smell and could have a green colour.

With regard to the appearance/colour of the product, the participants did not mind if the product developed was green, and neither was it important whether the product was expected to be green. In the sensory test, the participants indicated that the pasta had the characteristic of having a dull green colour.

With regard to smell, the participants recorded in Phase 1 (Section 5.2) that they did not mind the smell of morogo, which indicated that the product could have a morogo smell and it would not bother the participants as it was not statistically significant. In the sensory test, the participants indicated that the pasta had a weak vegetable smell due to the high frequency. This was also seen as being a positive characteristic, as indicated in the correspondence analysis in Figure 5.27.

In Phase 1 (Section 5.2) the participants indicated that it was important for the morogo pasta to be seasoned and not have a strong morogo flavour as the results presented a significant difference with the opposing statement ($p \geq 0.05$). This was confirmed in the sensory test as the participants characterised the morogo pasta as being seasoned, which showed a high preference as the results indicated a significant difference. This was also seen as being a positive characteristic as indicated in the correspondence analysis in Figure 5.27.

Another sensory aspect that typically relates to pasta is al dente (firm) or being overcooked (Martinez et al., 2007). In the sensory test the participants indicated that the morogo pasta was al dente due to the high frequency as well as the significant difference in the Z-tests.

The last aspect that the participants indicated as having a high preference for was the hedonic terms "Good" or "Bad" to categorise the product. The term "Good" had the highest frequency and preference in the sensory test and also indicated that there was a significant difference. This was also seen as being a positive characteristic, as indicated in the correspondence analysis in Figure 5.27.

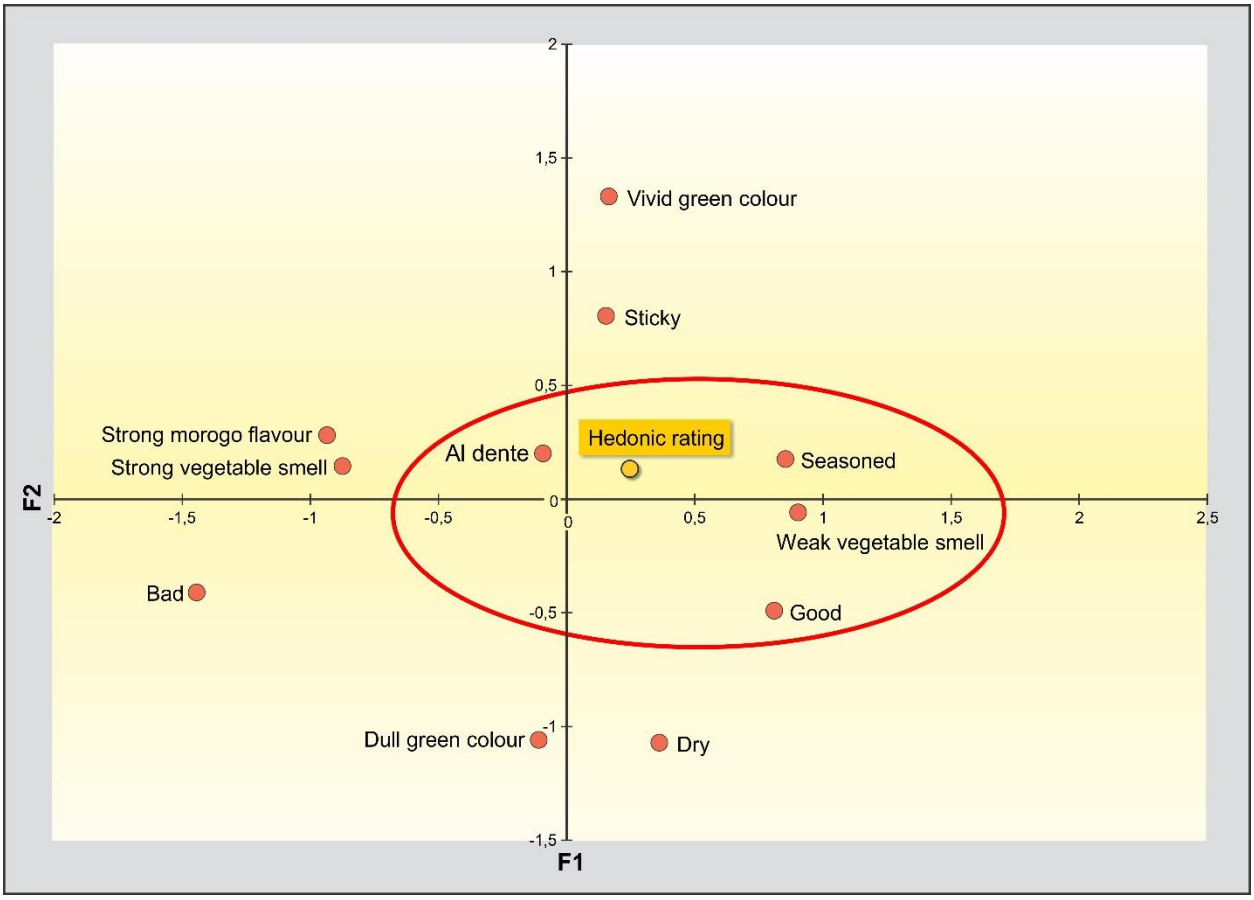


FIGURE 5.27: CORRESPONDENCE ANALYSIS BETWEEN CATA SENTENCES AND POINTS ON THE HEDONIC SCALE

5.4.4 Purchase intention of the developed product

Section D of the questionnaire aimed to determine the participants' purchase intention of the developed morogo pasta. This was achieved by using a 9-point purchase intention scale which the participants used to rate the morogo pasta after tasting it. This question is seen in Addendum D. The data was then analysed on XLSTAT 2017, version 19.4.1.46344, a statistical software and data analysis add-on for Microsoft Excel.

To determine the purchase intention of the morogo pasta, participants used of a 9-point purchase intention scale which ranged from “I would never buy this product” to “I would buy this product every time I could”. This question is seen in Addendum D (Question 4). The frequencies were recorded as shown in Table 5.22. The statement with the highest frequency was statement 7 (I would buy this product occasionally), which is an indication that the participants were positive towards the developed morogo pasta. This statement included 54.17% of the participants (as seen in Figure 5.28), which is more than half of them. Twenty-six point three nine percent of the participants selected statement 8 (I would buy this product as often as I could). Thus, one could say that after tasting the morogo pasta, 80.56% of the participants had a positive attitude towards it and were willing to purchase it if it were made commercially available.

TABLE 5.22: RESULTS OF PURCHASING INTENTION OF MOROGO PASTA (N=72)

Likelihood of purchase	Frequency	Percentage
1 = I would never buy this product	0	0.00%
2 = I would not buy this product	0	0.00%
3 = I would not consider buying this product	1	1.39%
4 = I would consider buying this product	6	8.33%
5 = I would buy this product	2	2.78%
6 = I would buy this product seldom	0	0.00%
7 = I would buy this product occasionally	39	54.17%
8 = I would buy this product as often as I could	19	26.39%
9 = I would buy this product every time I could	5	6.94%

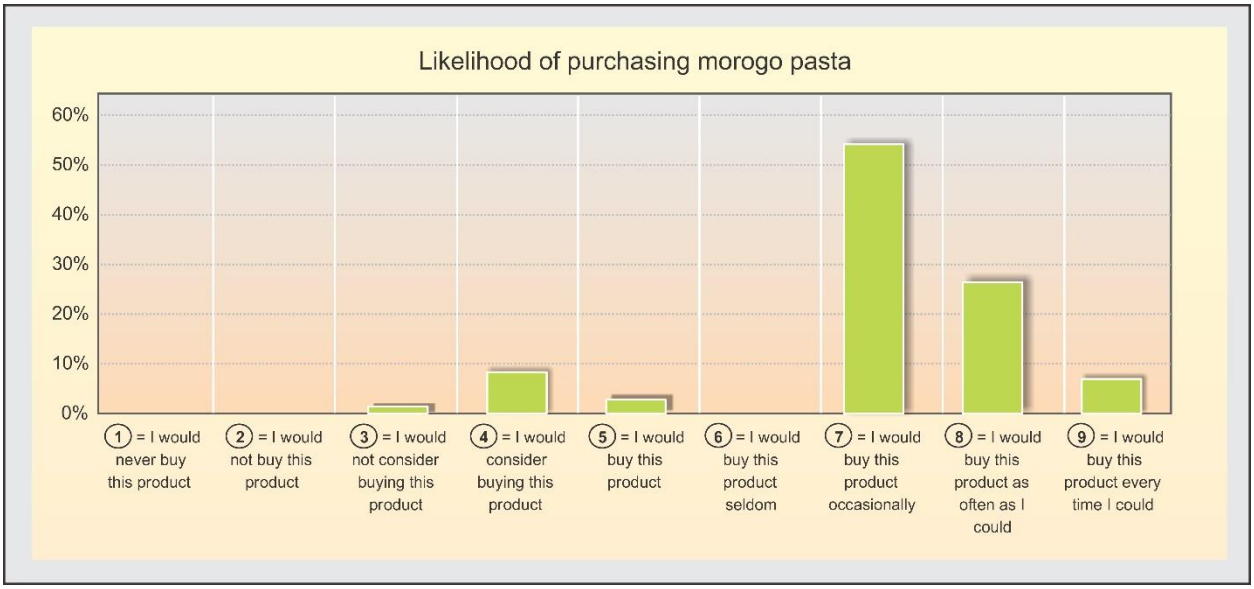


FIGURE 5.28: LIKELIHOOD OF PURCHASING OF MOROGO PASTA

5.5 CONCLUSION

In this chapter the data was collected, analysed and discussed. The focus of the chapter was the process of innovative product development as seen in the development of the morogo pasta. Descriptive and inferential statistics were used to describe and summarise the data. The researcher then analysed the data according to the objectives of the study with the aim of addressing the research problem by creating a product which would address the aim of the study and in turn address issues of urbanisation, accessibility, convenience and health. The results of the study were presented according to the objectives set out for this research, and with regard to the phases in which the data was gathered.

The next chapter (Chapter 6) discusses the conclusions of the study.

CHAPTER 6: CONCLUSION

This chapter presents the conclusions to the objectives which were set for this study as well as the limitations of the research and recommendations for future research proposed by the researcher.

6.1 INTRODUCTION

This chapter presents a reassessment of the entire research process to draw conclusions on the findings of the study that were obtained, and how the objectives were met. The research process was also reviewed to validate that the correct research procedures had been followed and that all the objectives had been met according to accepted ethical standards. The limitations of the study and recommendations for further research are also discussed in the subsequent sections of the chapter.

6.2 THE FINDINGS OF THE STUDY

The study aimed to explore, describe and develop a culinary product produced from AGLVs for the urban consumer in Gauteng to address issues of urbanisation, accessibility, convenience and health in accordance with the sample selection and the type of product developed. The purpose of this research was to contribute to the body of knowledge regarding the process of innovative product development using AGLVs.

6.2.1 To investigate and determine what type of African green leafy vegetable culinary product is desired (Objective 1)

The first objective of this investigation was to determine what type of product was desired by consumers residing in Gauteng. In order to accomplish this, market research and survey questionnaires were compiled. Market research was done in the form of a desktop review to identify possible trends and four product options which participants could choose from in the survey questionnaire. In the survey questionnaire, participants were asked to indicate why they did not consume AGLVs. The CATA technique was used to determine what type of product should be developed as well as what characteristics it should have.

6.2.1.1 To establish market trends of African green leafy vegetables in order to identify four possible product options (Objective 1.1)

The findings identified various trends and products on the market, which help to find four possible product options which consumers could choose from in the survey questionnaire. The market research assisted in identifying possible gaps in the market for a new product (Harrington, 2004a). Trends were identified according to the trend mapping technique of the Centre for Culinary Development (2007). The basis of trend mapping is that all major food trends go through five stages to become a mainstream product (Centre for Culinary Development, 2007). Areas that were investigated included AGLVs and products/dishes, indigenous foods and flavours, foods with perceived health benefits, plant-based eating and convenience foods. This search was done as a desktop review and presented as a report of the different stages of trends.

In Stage 1, the ingredient/dish started to appear at an upscale, fine dining or ethnic restaurant. The findings were obtained using a popular online South African restaurant directory called Eat Out (Eat Out, 2018). Thirty upscale eating establishments were identified which had begun to incorporate indigenous food or food with an African influence in their menu options. Health aspects were not really present yet at fine dining establishments, but there did seem to be an increase in vegetable-based dishes, which could indicate that there is a potential for morogo to be introduced to promote awareness. This confirms that very little has been done on the exploitation of AGLVs in Africa, which makes them a viable market as they are highly nutritious and provide a competitive edge (Opabode, 2017; Smith and Eyzaguirre, 2007).

In Stage 2, the item started to feature in speciality TV food channels and magazines. Various South African-based magazines were looked at to identify aspects of health, African influences, convenience foods and plant-based eating. The findings indicated that there was an increase in plant-based options, which could be a reason for consumers wishing for more healthy options to be available. With regard to specialty magazines, 42 magazine entries were deemed applicable, which could be an indication that consumers wished to see more local and traditional foods on the market as they are perceived as being of higher quality, being more sustainable and having high nutritional content (Hempel and Hamm, 2016; Risku-Norja et al., 2008; Asebo et al., 2007; Chambers et al., 2007; Fandos and Flavian, 2006). Various trends were prominent, the appearance of which had been increasing since 2015, such as: healthy breakfast options; products with health benefits and properties; innovative forms of pasta; increasing presence of leafy greens and use of vegetables; modernising of traditional foods; eating local foods; healthy

convenience foods; plant-based foods and proteins (as well as vegan and vegetarian options); and lastly meal kits. With regard to speciality TV food channels, five South African television programmes were identified which were aired on DStv that had a focus of indigenous food as well as African flavours and influences which could increase awareness of AGLVs. By increasing their availability and accessibility, the consumption of these plants is encouraged, which could also be applied to the case of morogo.

In Stage 3, the item started to appear in mainstream restaurants. The findings were obtained by using the Eat Out restaurant directory once again and was used to focus on mainstream restaurants. Seventy-five mainstream eating establishments were identified which had begun to include indigenous foods or foods with an African influence in their menu options. There were also a greater number of vegetable-based dishes as well as an increase in health-based eating establishments and eating options. This could be due to the fact that consumers wish for more healthy eating options and to eat more local foods (Grunert, 2017; Trichopoulou et al., 2007).

In Stage 4 the item starts to feature in popular magazines and publications. Various South African-based magazines were examined to identify aspects of health, African influences, convenience foods and plant-based eating. In total, 23 magazine entries were deemed applicable, which could be an indication there is an increase in local and traditional foods. The trends that were identified included the following: the increasing availability of vegan and vegetarian alternatives, traditional South African dishes being seen in a more modern and healthy way, an increase in African products and flavours in the market, and eating locally produced foods.

In Stage 5, the item reached quick-service restaurants and grocery stores. Once again, the Eat Out restaurant directory was used as in Stage 1 and 3, but with a focus on quick-service restaurants. Very few quick-service eating establishments were found to serve indigenous foods or have an African influence. In total, only six establishments were identified (some were retail chains). There is a minimal presence of healthy or plant-based eating options or establishments. This is an area that could be looked at as consumers wish to have more healthy eating options and to eat more local foods (Grunert, 2017; Trichopoulou et al., 2007). It could also be that indigenous foods are prepared more in informal establishments or rural areas, so they are not available and accessible in urban areas (Cernansky, 2015; Faber et al., 2010). There are very few healthy or plant-based quick-service restaurants available, which could be a gap in the market for a potential product. With regard to products in grocery stores, products were identified that related to traditional foods and African flavours, and health and plant-based eating

were identified and reported on. Twenty-one products were identified. The categories which showed some development regarding flavours, ingredients and toppings included healthy breakfast items; developments in pasta with regard to ingredients, flavours and health; healthy baked products; and soups.

After compiling the market research, four possible product options were identified which would be used in the survey questionnaire forming part of Objective 1. The product options had to be health orientated and vegetable-based, use indigenous ingredients, have African flavours and take the form of a convenience product. Thus, the findings identified four possible product options to be used as the input to the survey questionnaire: pasta; granola; bread; and soup.

6.2.1.2 To investigate why consumers do not consume African green leafy vegetables (Objective 1.2)

In the survey questionnaire, the participants were asked to indicate why they did not consume AGLVs. The findings indicated three possible aspects regarding why AGLVs were not consumed. These were issues related to knowledge, access and perception. This question was asked to gain some knowledge and to discover possible areas which could indicate how to help increase or promote the consumption of AGLVs.

With regard to the aspect of knowledge, results indicated that the participants strongly agreed that they did not consume AGLVs as they did not know how to obtain them by picking (49% of the participants), they were unfamiliar with the product (42% of the participants) and they did not know how to prepare them (39% of the participants). The findings also indicated that the participants strongly disagreed that they had never heard of AGLVs (56% of the participants).

Regarding the aspect of access, the findings showed that the participants strongly agreed that AGLVs are not commercially available (40% of the participants), they are not available in the local supermarket (45%) and that they did not live in an area where AGLVs can be picked (52% of the participants).

With regard to the aspect of perception, the findings indicated that the participants strongly disagreed that they viewed AGLVs as a poverty food (57% of the participants) and that it is seen as old fashioned (52% of the participants).

Nearly 78% of the participants were white, which could thus also influence the results obtained. A more in-depth analysis of non-consumption of AGLVs could be done in the future, but this was not the main aim of the study.

6.2.1.3 To determine the characteristics desired in an African green leafy vegetable product (Objective 1.3)

The findings obtained from the survey questionnaire were used to determine the products' concept and specifications as well as the sensory characteristics that urban consumers were interested in with regard to a new product containing AGLVs. Data were obtained from 183 willing participants.

The findings indicated that the general demographic profile of the participants were mostly female consumers (83.61% of the participants) in the Generation Y cohort (84.7% of the participants were 37 years of age or younger) living in Gauteng, South Africa. These consumers were mostly white (77.6% of the participants) with an undergraduate degree or diploma (50.27% of the participants) and were mostly in the higher income bracket (44.44% of the participants earned a household income of R25 000 or more per month). This was significant as it may indicate that there is an interest in an AGLV product by a population group which is not traditionally associated with its consumption (Cernansky, 2015; Feagan, 2007). It was also evident that the female participants were generally more interested in an AGLV product. This could be due to the fact that women tend to be more health-conscious (Bidmon and Terlutter, 2015). The fact that Generation Y has the largest frequency could also indicate that the participants in this cohort are more active on social media where the questionnaire was distributed (Bolton et al., 2013), or it could also be due to the fact that it is the largest age group in Gauteng (StatsSA, 2011).

With regard to the characteristics desired in an AGLV product, the CATA method was used to determine the products' specifications by allowing the participants to select as many terms as they wished relating to product choice, level of convenience and sensory aspects of morogo, which would determine the type of product to be developed as well as its characteristics.

With regard to product choice, the findings indicated that the participants were more inclined to select morogo bread, morogo pasta and morogo granola as the Z-tests and high frequencies indicated a preference for these products. Although all three of these products were more inclined to be chosen by the participant, only one product could be taken further, which is why pasta was chosen as the product to be evaluated by the participants as it had the highest consumption potential of the three products which the participants had shown an interest in. Apart from the type of product chosen by the participants for evaluation, it was evident that the morogo pasta should be seasoned (to mask the strong vegetable taste), could have a green colour (as it was not indicated that it should or should not have a green colour) and could have a morogo or vegetable smell.

Regarding the level of convenience, no clear preference was observed in the findings obtained. This suggested the possibility of the developed product either being ready-to-cook or a ready-to-eat. Even though the product could be either ready-to-cook or ready-to-eat, ready-to-cook had a higher consumption potential, which is why it was chosen as the level of convenience for the product which was developed.

After the CATA data was obtained, the participants were asked to indicate how likely they would be to consume and purchase each product option. The results indicated that there seemed to be a high likelihood of consumption of morogo pasta, as 84.62% of the participants indicated that they had a positive attitude towards the consumption of the pasta. With regard to the likelihood of purchase of the morogo pasta, the results indicated that 78.58% of the participants had a positive attitude. This could indicate that the positive attitude towards consumption and purchasing emphasises the interest in the development of the pasta which was to be evaluated in Phase 3.

6.2.2 To develop the four innovative culinary products using African green leafy vegetables (Objective 2)

The second objective of this investigation was to develop the four innovative culinary products which were identified in Phase 1. In order to accomplish this, the procedure of recipe development was followed, which was assisted by four final-year hospitality management students at the University of Pretoria under the subject VDS 413 (Recipe Development). The students were managed by the researcher and assisted by subject experts throughout the development. A design brief was given to the assisting students so that they could begin the product development process. The brief consisted of a background to AGLVs, leading to why innovative, convenient products were necessary, and aspects that needed to be taken into consideration before they began to search for recipes.

To run the processes simultaneously and be ready for the sensory evaluation, all four products which were identified (pasta, granola, soup, and bread) were initially developed so as to be ready to proceed with the next phase of the study. The four product options were identified with regard to definition, trends and recipe possibilities. From this point only morogo pasta will be discussed as it was the product selected by the participants to evaluate. The development of the three other products is shown in Addendum C.

A recipe and information search was then conducted to determine what the morogo pasta should consist of regarding types of flour, shape, role of ingredients, pasta recipes and the addition of an AGLV. A

baseline recipe was then established after various factors were taken into account, such as the characteristics of the pasta, the sensory characteristics desired, the structure of the recipe, and the preparation techniques. A baseline recipe was chosen to which changes and adaptations needed to be made to create the final prototype. Every week the adaptation was evaluated by two subject experts and the four final-year students who assisted in the development of the products. The four students were trained in the use of the sample and briefed. They were closely involved throughout the practical sessions with the researcher and the subject experts. Three adaptations were made to obtain the final prototype, which was used for the sensory evaluation of the product. The adaptations involved changes in ingredients, amounts, method and equipment used.

In order to confirm that the developed product was accurate and reliable, a triple test was performed whereby the recipe was repeated three further times. The recipe was also standardised and benchmarked against competing products available on the market. Finally, the recipe was upscaled using the percentage method for large volume use so that the participants could evaluate it in the sensory evaluation.

6.2.3 To evaluate the one selected culinary product produced (Objective 3)

The third objective of this study was to evaluate the one selected culinary product which was produced in Phase 2 (as shown in Objective 2) by means of sensory evaluation. To accomplish this a sensory questionnaire was completed by the participants which consisted of demographic information, sensory descriptive characteristics using the CATA technique, liking and purchase intention.

6.2.3.1 To describe the one selected developed product produced by means of sensory evaluation (Objective 3.1)

The findings obtained from the sensory evaluation questionnaire were used to determine the sensory evaluation of, and hedonic reaction to, the developed culinary product which was specified in Phase 1 (Objective 1) containing AGLVs. Data was obtained from 72 participants who indicated in Phase 1 that they would be willing to participate in the sensory tasting of the selected AGLV product. The sensory evaluation was held at the University of Pretoria in the Eat@UP dining room.

The findings indicated that the general demographic profile of the participants were mostly female consumers (66.67% of the participants) in the Generation Y cohort (81.94% of the participants were 37 years of age or younger) living in Gauteng, South Africa. These participants were mostly white (72.22% of

the participants) with a post-graduate degree or diploma (37.5% of the participants) or an undergraduate degree or diploma (33.34% of the participants) and were mostly in the higher-income bracket (43.06% of the participants earned a household income of R25 000 or more per month). This was significant as it may indicate that there is an interest in an AGLV product by a population group which is not traditionally associated with its consumption (Cernansky, 2015; Feagan, 2007). It was also evident that the female participants were generally more interested in an AGLV product than their male counterparts. This could be due to the fact that women tend to be more health-conscious (Bidmon and Terlutter, 2015). The fact that Generation Y had the largest frequency could also indicate that the participants in this cohort are more active on social media where the questionnaire was distributed (Bolton et al., 2013) or that it is the largest population group in Gauteng (StatsSA, 2011). The higher level of education could also indicate that the participants with higher education levels are more interested in new studies or are more willing to participate in an academic study as it took place in an academic institution. The demographic variables were not used in the analysis but merely described the sample.

The sensory characteristics of the morogo pasta were determined with the use of CATA technique when the participants were tasting the product. Once again, the participants were presented with a list of sensory terms applicable to the morogo pasta which they could select from in order to confirm that they met the specifications set out in Phase 1. The participants had to select those which they thought were applicable or represented their opinion about the pasta product tested.

With regard to the sensory terms selected, the findings indicated that the participants were more inclined to select the terms “good”, “al dente”, “weak vegetable smell”, “dull green” and seasoned” due to the high frequencies observed. This linked to the results obtained in Phase 1 as the participants indicated that they would like morogo pasta to be developed. It had to be in a ready-to-cook form (which would be the state in which consumers would purchase it), it must be seasoned, could have a morogo smell and could have a green colour. Of these frequencies, the terms that presented as significant in the Z-tests included “al dente” (texture), “seasoned” (taste/flavour) and good (hedonic viewpoint).

6.2.3.2 To determine consumers’ liking and purchase intention of the one selected developed product (Objective 3.2)

After the CATA data had been obtained, the participants were asked to indicate how much they liked the developed morogo pasta and how likely they would be to purchase it. The participants indicated on a 9-

point scale how much they liked the product as well as how often they would purchase it if it were commercially available.

The results indicated that the participants seemed to like the product as the term with the highest frequency was “like very much”, which is an indication that they were positively inclined towards the developed morogo pasta. The acceptance index was then calculated from the averages of the results. A correspondence analysis was then carried out with the sensory terms used in the CATA section and the hedonic points on the scale The results indicated that the terms closest to the label “hedonic rating” indicated the qualities that the participants found the most desirable/optimal, whereas further terms indicated the properties that the participants found less desirable (Belusso et al., 2016). The terms that were closest to the hedonic rating which the participants selected were “seasoned”, “weak vegetable smell”, “al dente” and “good”.

With regard to purchase intention, after consuming the morogo pasta the participants indicated how likely they would be to purchase the product. The results indicated that the majority of the participants “would buy the product occasionally”, which is an indication that they were had a positive attitude towards the morogo pasta. This statement was made by 54.17% of the participants. 26.39% of the participants selected the term “I would buy this product as often as I could”. Thus one could say that after tasting the morogo pasta, the results indicated that the participants had a positive attitude towards it and were willing to purchase it if it were available commercially.

6.3 THE RESEARCH IN RETROSPECT

After completion of a study, it is important to ensure that the research objectives set for the study have been met and that the data and results obtained are reliable and accurate, and were captured in an ethical and honest manner. The quality of the research data was evaluated in terms of validity and reliability. Throughout the research study, emphasis was placed on accuracy, reliability and validity as explained in Chapter 4.

6.3.1 Validity

Validity is the ability of a measuring instrument to measure what it intends to measure in order to prove that it is logical, effective and represents the concept that has to be measured. Various steps were taken to ensure that the measuring instrument was able to accurately measure what was intended to measure.

6.3.1.1 Theoretical validity

Theoretical validity is the extent to which a score accurately represents the concept being measured (Zikmund and Babin, 2007:2250). Theoretical validity was obtained by an extensive literature review, which presented clear and objective definitions on the important constructs of the research. The researcher compiled an extensive literature review of relevant and reliable literature, as shown in Chapters 2 and 3. Thereafter a conceptual framework was designed in order to define and direct the research process, as well as to indicate relationships among the constructs which were based on the relevant literature, theoretical perspectives and objectives of the study (see Chapter 3). Very little information was found pertaining to innovative culinary products using indigenous leafy green vegetables in South Africa. Figure 6.1 presents the revised framework which the researcher followed. All the objectives of the study were met, as it was possible to draw appropriate conclusions for all the objectives.

6.3.1.2 Measurement validity

Validity is a measure of the accuracy of the data obtained – it can be obtained in three ways: face validity, construct validity and content validity.

Face validity is what the measuring instrument appears to measure and appears relevant to whom it is administered for completion (Bryman, 2012:171), as well as the subjective impression the instrument leaves on the participants. The questionnaires used in this study were based on the design of one which had already been used as seen in the CATA study done by Belusso (2016). The University of Pretoria branding appeared on the online questionnaire for data collection to emphasise the researcher's affiliation with the University. It also gave the questionnaire a professional look to boost the participants' confidence in the study and ensure that the study was trustworthy as it was associated with an academic institution.

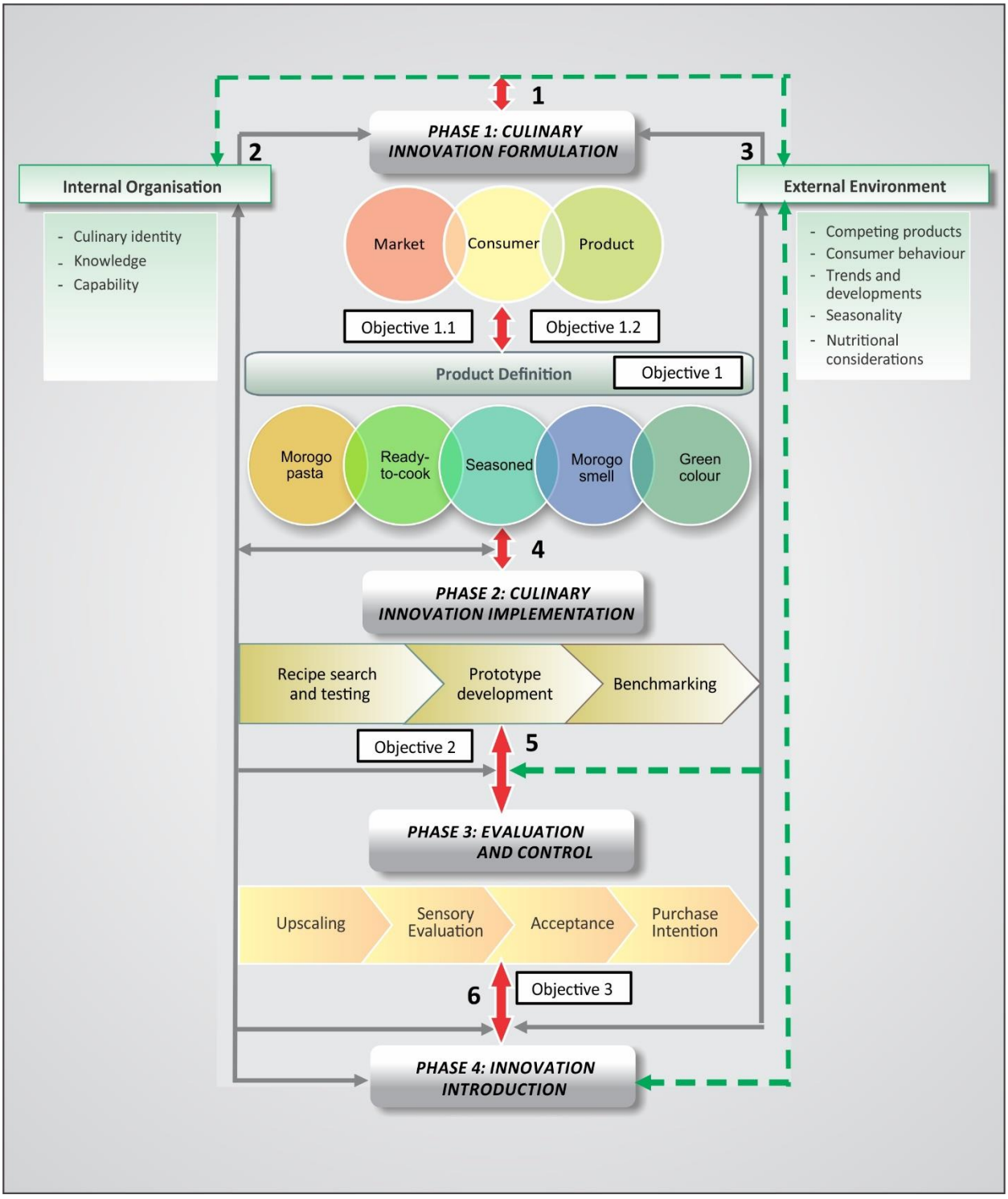


FIGURE 6.1: ADAPTED CONCEPTUAL FRAMEWORK

Construct validity refers to the extent or degree to which a scale measures the relevant concepts and is concerned with the meaning of the instrument, what it measures and how and why it operates as it does (Mouton, 2012:127; Babbie and Mouton, 2001:123). Construct validity was established by defining and

confirming the constructs by means of a thorough and relevant literature review. This is where the theory relevant to the concepts investigated guided the research and adapted it to apply to the study (as seen in the culinary innovation framework and the CATA technique) (Bryman, 2012:173).

Content validity refers to the sampling adequacy or representativeness of the content of the study as an instrument, and therefore how representative a test is from the area of study (Salkind, 2012:124). Content validity was achieved by checking and making sure that the measurements logically reflected the concepts being measured (Mouton, 2012:112). Existing measuring scales were also used and validated. The concepts, along with their dimensions and indicators, were carefully verified with regard to agreement with the literature to make sure that they were represented in the measuring instruments of the three phases.

Inferential validity refers to the logical interpretations drawn during the study, particularly during the writing of the results and conclusions. The assistance of a statistician ensured that through the process of data analysis the inferential validity of the data and internal consistency of the factors were attended to.

Overall, measurement validity was guaranteed using conversational language in the questionnaire to avoid complexity, and this was ensured by pre-testing the questionnaire.

6.3.2 Reliability

Reliability is the extent to which a measurement procedure is consistent and will give similar results under the same or similar conditions (De Vos et al., 2011). This is important for the successful outcome of a research project. Reliability does not deal with what is being measured but rather how well something is being measured while being free from errors (De Vos et al., 2011). This is when a measuring instrument is consistent and dependable with regard to obtaining results and the ability to be used again in the future (Salkind, 2012:115).

In order to reduce possible sources of error during data collection, the following precautions were taken:

- The concepts that were covered in the study were able to be supported by relevant literature and the measuring instrument used was pre-tested to identify and address any uncertainties and also to make sure that it was reliable and captured accurate responses.
- The measuring instruments were checked with subject experts to ensure that they were relevant, accurate and easy to understand, and that clear instructions were given beforehand. The

measuring instruments were also based on tried and tested instruments. The questions in the CATA sections of the questionnaires were also randomised in order to confirm their validity (Belusso et al., 2016).

- A pre-test was conducted prior to distribution of the questionnaires to ensure that the participants would understand and be able to self-administer the questionnaire, and also to ensure that all minor problems were addressed prior to data collection.
- The recipe development process followed an experimental procedure in which accurate and documented changes were made.
- The recipes used on a small and large-scale basis were standardised recipes which would eliminate the possibility of error and allow the same standard of product to be produced again and again.
- Triple testing of the product ensured that the product was accurate and could be repeated. This eliminated the probability of errors occurring.
- Sensory evaluation is a science of measurement and deals with aspects of precision, accuracy, sensitivity and avoiding false-positive results (Lawless and Heyman, 2010:4). Before each sensory session instructions were given in writing as well as verbally to prevent the participants from becoming confused.
- The sample that the participants tested in the sensory evaluation was controlled in terms of preparation and presentation in order to achieve standardisation (Lawless and Heyman, 2010:3). The testing environment of the sensory evaluation was comfortable and non-threatening with minimal distractions, free from any noise or intrusions, and no odours could be detected on the tasting side which could influence the panel's perception (Meilgaard et al., 2007:33).

6.3.3 Ethics

Approval to commence with this study was obtained from the Ethics Committee of the Faculty of Natural and Agricultural Science's, who approved the research proposal before data collection started (see in Addendum G). The data was then collected in three phases in Gauteng, South Africa. The following ethical requirements were ensured throughout the study:

Voluntary participation: The participants participated willingly, and were informed of this in the covering letter of the questionnaires and in the recruitment process. The participants were informed of the aim of the study and were also informed that they could withdraw from participation at any point of the study.

Anonymity and confidentiality: All the participants participated willingly, and all their responses were treated with confidentiality as was mentioned beforehand to them in the cover lettering of the questionnaires. The researcher had no access to any personal information which could not be shared. This ensured that the participants' opinions and personal information remained anonymous. The information obtained would be used solely for academic purposes.

Plagiarism: The researcher aimed to prevent any plagiarism and ensured that all thoughts and ideas from other sources were properly referenced and cited.

Data and interpretation of data: The researcher guarded against fraud and misinterpretation through the guidance of statisticians and subject experts. This ensured that the data was accurately interpreted and analysed, and that no attempt was made to manipulate the data. The results obtained and discussions were compiled objectively and written up according to the requirements of the University of Pretoria and the Department of Consumer and Food Sciences.

6.4 IMPLICATIONS OF THE RESEARCH

The justification of this research was based on the ability to develop an innovative culinary product made from AGLVs for urban consumers residing in Gauteng. The findings of the study can contribute towards the academic body of knowledge as well as the food industry. Food establishments, whether they be the service or retail sector, may find the information in this study useful as it could assist them in the process of developing new and innovative culinary products – a product could be made more successful by using consumers as part of the development. As the body of knowledge of the product development of AGLVs is lacking, this research will also allow a similar procedure to be followed, and the research to be used as a reference point for further investigation when developing new and innovative products.

Use of AGLVs as an ingredient in a new product encourages the growth of the local ecosystem and consumption of the products developed. These vegetables have the potential to be developed in terms of availability and commercialisation, but this has not been done as most AGLV consumers harvest the plants directly in the wild. The results also indicate that consumers do not consume AGLVs for various reasons such as perception, knowledge and access. Development of a convenient AGLV product would address these reasons as well as issues of convenience and health by making the vegetables available to consumers commercially (if the product were to be introduced into the marketplace). The CATA technique

will also assist food establishments to gather much information regarding new product development without the need for trained panellists and extensive questionnaire development.

The development of innovative food products using AGLVs could also increase and encourage consumption among urban consumers nationally and internationally, and it could also be used to encourage the production of innovative products from other traditional foods.

6.5 LIMITATIONS OF THE STUDY

Although care was taken to behave ethically and to acquire accurate data in a reliable manner, a few limitations were inevitable as the research was exploratory. These limitations, which are discussed below, can be used for guidance and opportunities for future research.

Due to financial and time constraints, the sampling of the study in Phase 1 was restricted to snowball sampling by means of media platforms. In snowball sampling, there is no way of checking if the sample is representative of the subset of the population, so the results can only be applied to this sample. A larger sample group using non-random sampling would assist in obtaining sufficient data to represent the population of Gauteng, South Africa, so as to have a more accurately developed product using consumer input. Nevertheless, the sample size (N=183 for Phase 1 and N=72 for Phase 3) was acceptable and useful conclusions could be drawn.

Secondly, with regard to the AGLV used (*Asystasia gangetica*), certain limitations regarding consistency can occur as the quality of green leafy vegetables is dependent on season, climate and cultivation.

Thirdly, a limitation of the CATA technique used is term generation as there is no way to determine the appropriateness of the terms selected – it assumed that consumers and trained assessors perceive the product in the same way.

6.6 RECOMMENDATIONS FOR FUTURE RESEARCH

During the course of this study, possible future opportunities were identified by the researcher.

With regard to the theoretical model used, Phase 4 (Innovation introduction) was omitted as it was only mentioned for theoretical purposes. This phase could be addressed in future research projects by introducing the developed product into the marketplace.

It might be beneficial to increase the sample size by using non-probability sampling to obtain a more representative group of participants if one intended to introduce the developed product commercially to obtain a more accurate product for urban consumers residing in Gauteng, South Africa.

Based on the findings of the study, ways were suggested to increase the consumption of AGLVs, encourage healthy eating and preserve the knowledge of AGLVs, including making them accessible, convenient and available to consumers. This could be enforced by implementing the final stage of the culinary innovation framework: Innovation Introduction. One recommendation is to use this research as a point of departure and to use it to increase the number indigenous innovative food products in the market.

With regard to the CATA technique used, in future research one could possibly generate a list of appropriate terms for the product using a focus group to precede and improve upon the questionnaire and conceptual framework to ensure that consumers and trained assessors perceive the product in the same way. This may allow more in-depth data to be collected. Another recommendation may be to use the same individuals who were involved in Phase 1 and Phase 3 also to generate the terms in order to understand the process and terms better. Further studies could also be carried out to evaluate the applicability of this technique to more complex food products and to investigate how the terms in the CATA question affect consumer responses.

6.7 CONCLUSION

This study provides information about innovative product development using AGLVs. The food industry can benefit from these results and their documentation, as a similar process could be applied when developing new innovative culinary products using indigenous foods. By developing a culinary product using AGLVs, the consumption of local foods could be encouraged in an innovative way. This will prevent the knowledge of traditional foods being lost and will address issues of accessibility, availability, convenience and health.

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ADDENDUM A: PHASE 1: MARKET RESEARCH

TABLE A1: PHASE 1: THE INGREDIENT/DISH BEGINS TO APPEAR AT UPSCALE, FINE DINING RESTAURANTS

Name of Restaurant (Accessed from Eat Out Restaurant Directory)	Aspect of Interest				URL
	Health	African Influence	Indigenous Food	Plant Based Eating	
4Roomed eKhasi Culture		X	X		http://www.eatout.co.za/venue/4roomed-ekasi-culture-2/
Asanka Restaurant		X	X		http://www.eatout.co.za/venue/asanka-restaurant/
Aubergine Restaurant	X		X	X	http://www.eatout.co.za/venue/aubergine-restaurant-cape-town/
Azure Restaurant		X			http://www.eatout.co.za/venue/azure/
Babel at Babylonstoren		X	X		http://www.eatout.co.za/venue/babel-at-babylonstoren/
Baobab		X	X		http://www.eatout.co.za/venue/baobab-cafe-and-grill/
Bertus Basson at Spice Route		X	X		http://www.eatout.co.za/venue/spice-route-restaurant/
Camphors at Vergelegen		X	X		http://www.eatout.co.za/venue/camphors-at-vergelegen/
Delaire Graaf Restaurant			X		http://www.eatout.co.za/venue/delaire-graff-restaurant/
De Kloof		X	X		http://www.eatout.co.za/venue/de-kloof-restaurant/
DW Eleven-13			X		http://www.eatout.co.za/venue/dw-eleven-13/
Eight Restaurant			X		http://www.eatout.co.za/venue/eight-restaurant/
Epicure by Chef Coco		X	X		http://www.eatout.co.za/venue/epicure-restaurant-chef-coco/
Fermier			X		http://www.eatout.co.za/venue/fermier-restaurant/
Foliage			X	X	http://www.eatout.co.za/venue/foliage/
Fyndraai Restaurant		X	X	X	http://www.eatout.co.za/venue/fyndraai-restaurant/
Gold Restaurant		X	X		http://www.eatout.co.za/venue/gold-restaurant/
Green & Vegan's	X			X	http://www.eatout.co.za/article/new-plant-based-pop-cape-town-promises-oasis-vegans/
Greenhouse		X	X	X	http://www.eatout.co.za/venue/greenhouse-constantia/
Imibala		X	X		http://www.eatout.co.za/venue/imibala/
Jordan Restaurant		X	X		http://www.eatout.co.za/venue/jordan-restaurant/
Marble			X		http://www.eatout.co.za/venue/marble-david-higgs/
Mash Braai House		X	X		http://www.eatout.co.za/venue/mash-braai-house/
Moyo		X	X		http://www.eatout.co.za/venue/moyo-melrose-arch/
Pierneef à La Motte		X	X		http://www.eatout.co.za/venue/pierneef-%C3%A0-la-motte/
The Tasting Room at Le Quartier Français		X	X		http://www.eatout.co.za/article/best-restaurants-winelands-eat-2017/
The Test Kitchen			X		http://www.eatout.co.za/venue/the-test-kitchen-by-luke-dale-roberts/
The VegTable Private Dining Room	X		X	X	http://www.eatout.co.za/venue/the-veg-table-private-dining-room/
Urbanologi			X		http://www.eatout.co.za/article/review-urbanologi-heart-joburg/
Wolfgat		X	X	X	http://www.eatout.co.za/venue/wolfgat/

TABLE A2: PHASE 2: THE ITEM STARTS TO FEATURE IN SPECIALITY FOOD CHANNELS

Name	Aspect of Interest				URL
	Health	African Influence	Indigenous Food	Plant Based Eating	
Developments					
Dik Delta Culinary Gardens	X	X	X	X	https://www.solms-delta.co.za/dik-delta-culinary-garden/
Specialist Food Programs					
Master Chef South Africa	X	X	X	X	http://www.eatout.co.za/article/sofa-chefs-top-12-cooking-shows/
Neill Anthony Private Chef			X	X	https://www.neillanthony.com/
Sarah Graham's Food Safari	X	X	X	X	https://sarahgraham.co.za/tv/
Siba's Table		X	X	X	http://www.eatout.co.za/article/sofa-chefs-top-12-cooking-shows/
Ultimate Braai Master		X	X		http://www.eatout.co.za/article/sofa-chefs-top-12-cooking-shows/

TABLE A3: PHASE 2: ITEM STARTS TO FEATURE IN SPECIALITY MAGAZINES

	Magazines								Aspect of Interest				
	Magazine	Year	Month	Vol-ume	Issue	Page	Title of Article	Author	Health	African Influence	Indige-nous Food	Plant Based Eating	Conve-nience
1	**South African Food Review: Journal for Food and Beverage Manufacturers**	**2015**	**March**	**42**	**3**	**14-15**	**Multiple Benefits of Grain and Malt**	**Food Review**	**X**				**X**
	Reports in the Business Monitor state that key drivers for growth in the breakfast cereal market include the healthy image of cereal products. This article also states that over the past year most new product releases had a healthy position, which is the result of a growing interest in products which feature health or multi-benefit positioning												
2	**South African Food Review: Journal for Food and Beverage Manufacturers**	**2015**	**April**	**42**	**4**	**24**	**Spotlight on Science and Natural Origins**	**Maryke Foulds**	**X**				
	In this article, it states that products with specific health benefits and health properties are becoming more popular due to the fact that consumers are looking for beneficial and functional foods which provide solutions to overall health and wellness												
3	**Woolworths Taste**	**2015**	**August**	**N/A**	**N/A**	**52**	**Where the Wild Things Are**	**Caro de Waal**			**X**	**X**	
	This article is about Caro de Waal and the ways she has encountered, experienced and used edible indigenous plants in her life and cooking. She uses them for infusions, roasts or even salads. She explains the Cape fynbos as being medicinal but also floral in dishes which is why she incorporates them into her cooking												

Magazines									Aspect of Interest				
	Magazine	Year	Month	Vol-ume	Issue	Page	Title of Article	Author	Health	African Influence	Indige-nous Food	Plant Based Eating	Conve-nience
4	Gourmet South Africa	2015	Summer 2015/ 2016	9	N/A	25-26	Pesto, Change-O	Amiel Stanek		X	X		
	This article is about pesto and ways chefs are replacing its traditional ingredients of basil, olive oil, pine nuts and parmesan cheese. It mentions using African staples like morogo and using peanuts instead of pecan nuts to give a more African flavour. It also gives ideas of different leaves such as kale, kohlrabi, parsley etc. as well as different cheeses and nuts/seeds. A recipe for kale pesto is also included in which the leaves are blanched in order to soften them												
5	Gourmet South Africa	2015	Summer 2015/ 2016	9	N/A	50-57	The New Rules of Pasta	Andrew Knowlton & Dawn Perry	X				
	This article is about Pasta and the way it has changed its look into different innovative forms, ingredients and cuisine. The techniques are rooted in Italian methods, but the flavours and presentation are taking a more modern turn. Some of the trends regarding pasta include gluten-free pasta, increasing nutty and lemony flavours, pastas made with different grains such as buckwheat, coloured pastas (such as squid ink)												
6	Woolworths Taste	2016	January/ February	N/A	N/A	23	First Taste: What to eat, drink, do and buy now	Annette Klinger	X			X	
	Content: This article is about leafy super greens and how high-end chefs are using and cooking them. Some of the ideas given was to eat it raw in a salad, sautéed with garlic, blended into a pesto, roasted into chips or juiced and made into a healthy smoothie												
7	Woolworths Taste	2016	April	N/A	N/A	34-35	Jan Hendrik van der Westhuizen	Annette Klinger		X	X		
	This interview was with Jan Hendrik van der Westhuizen after he received his first Michelin Star. He is a South African chef with his own restaurant in France. Most of his dishes are traditional South African dishes with a modern twist or adapted to suit the French palate. One of the first dishes on the menu was bobotie with yellow rice and malva pudding with popcorn and brandy ice cream. The wine list is also 60% South African which is uncommon in France												
8	Woolworths Taste	2016	April	N/A	N/A	66-73	Bokkoms, Buchu and Beans	Sven Alberding, Kobus van der Merwe & Tudor Caradoc-Davies		X	X	X	X
	This article is about forager chef Kobus van der Merwe, whose restaurant "Oep ve Koep" is on the route to Paternoster in the Western Cape. He specialises in local foods, using indigenous plants and animals in his cuisine. His aim is to value South Africa's culinary heritage. He forages through the Karoo like the San people used to, looking for edible plants. He received a lot of help from expert botanists who have helped him to identify edible plants. His menu changes according to season and according to what is available to harvest directly from the wild. He uses many local ingredients such as 'soutslaai", dune spinach, dune celery, sea lettuce, sea kelp, "heerenboontjie", "kapokbos", buchu, and "bokkoms"												
9	Woolworths Taste	2016	April	N/A	N/A	103-109	First Draught	Khanya Mzongwana		X	X		X

Magazines									Aspect of Interest				
	Magazine	Year	Month	Vol-ume	Issue	Page	Title of Article	Author	Health	African Influence	Indige-nous Food	Plant Based Eating	Conve-nience
	This article is by Khanya Mzongwana, who is a Pretoria based food stylist and chef on a mission to change the perception of African food. She serves some of her dishes at the African Beer Emporium. Her food plays modern twists on African food such as the "Mamelodi Half-Loaf", "Pineapple Atchar", “Goat Ribs with Sesame Treacle Barbeque Basting ”,” Kale and Sweet Potato Mfino and the African Beer Emporium Burger with Chakalaka, Kale Pesto, Pickled Red Onion, Sunday Lunch Beetroot and Rocket". The kale pesto is made by blanching the kale for 1 minute and then placing it in an ice bath, then blending it with garlic, Cajun spice, olive oil, salt, Danish feta and macadamia nuts. It is also mentioned that morogo can be used in its place												
10	**South African Food Review: Journal for Food and Beverage Manufacturers**	**2016**	**June**	**43**	**6**	**9**	**Loan Demand Hints at Growing Drought Distress**	**Food Review**				**X**	
	This short article is about the drought, which is causing many farmers to obtain loans to cover losses as a result. The drought is said to be record-breaking, which is having a disastrous effect on crops. Five out of nine provinces are said to be disaster areas as there is too little water to maintain crops. Morogo is thus a good possibility of crop as it survives on little water												
11	**South African Food Review: Journal for Food and Beverage Manufacturers**	**2016**	**June**	**43**	**6**	**10**	**Product Finalists Revealed**	**Food Review**	**X**		**X**		**X**
	At the Sial Paris World Tour, a panel of judges from around the world looked at the latest trends, and new food product launches internationally. This occasion aimed to highlight major retail and consumption trends around the world. Three main areas were identified: health; smart shopping and convenience; channel blurring, and changing consumption. With regard to health, it was said that obesity in children is increasing globally, which has increased the number of healthy products on the market. Another area which is showing growth is the consumption of local produce. Consumers are becoming more interested in what they eat and where it comes from while looking for more natural options (e.g. like organic, no additives, less sugar, no fat, the inclusion of superfoods etc.). With regard to convenience and smart shopping, consumers are still interested in products which can save them time and effort as well as being healthy, tastes good, and is rightly priced												
12	**South African Food Review: Journal for Food and Beverage Manufacturers**	**2016**	**August**	**43**	**8**	**8-9**	**Innovation in the Spotlight**	**Food Review**	**X**			**X**	**X**
	This article focused on new food products developed which were entered into the Food Review/Symrise New Product Competition. Among these entrants the following stood out in terms of convenience and healthy eating. Some products which were entered included healthy options from NuMe (a range of healthy products, including savoury baking product mixes and a low carb cereal), and Cold Off The Press Range from Woolworths (which is a range of cold-pressed juices made from local fruits and vegetables)												
13	**Woolworths Taste**	**2016**	**October**	**N/A**	**N/A**	**27-28**	**It is All a Bit Matcha**	**Annette Klinger**					
	Matcha is powdered green tea which has become very popular. People are becoming more used to the idea of green coloured items and using it in different forms such as in a latté or sprinkled over popcorn or in baking in sweet dishes												
14	**Woolworths Taste**	**2016**	**October**	**N/A**	**N/A**	**48**	**A Rosy Disposition**	**Hannah Lewry & Annette Klinger**			**X**		
	This promotion is about pink coloured alcohols. Gin is a strong feature, with all three of them flavoured with Rooibos tea/Honeybush which is indigenous to South Africa												

Magazines									Aspect of Interest				
	Magazine	Year	Month	Vol-ume	Issue	Page	Title of Article	Author	Health	African Influence	Indige-nous Food	Plant Based Eating	Conve-nience
15	**Woolworths Taste**	**2016**	**October**	**N/A**	**N/A**	**58**	**Tastes Like Summer**	**Abigail Donnelly**	**X**				**X**
	This recipe section is about berries which are in season. One of the recipes is oven-dried strawberries, which are like chips. They recommend to use it with home-made granola as a health-conscious snack												
16	**South African Food Review: Journal for Food and Beverage Manufacturers**	**2016**	**Nov/ Dec**	**43**	**11**	**20-22**	**Healthy, Indulgent and Fun**	**Michael Green**	**X**				**X**
	This article is about snacks which have become more popular as sales and products are increasing in growth rate. The majority of the population of South Africa is under the age of 30, which is something snack manufacturers are looking at as younger consumers are interested in different trends such as: 1. Fun and enjoyment (bold and spicy flavours, unusual shapes and textures as well as eye-catching packaging), 2. Luxury tastes (For many South African consumers, indulgence is a key motivator when snacking and are opting more for high-quality snacks) and 3. Health (consumers are interested in healthy products with aspects such as lower fat, reduced salt, lower calories, less sugar, and prepared from healthy ingredients)												
17	**South African Food Review: Journal for Food and Beverage Manufacturers**	**2017**	**January**	**44**	**1**	**12-13**	**On the Shelf**	**Food Review**	**X**				
	South Africa is seeing a growth in public health awareness campaigns as a result of the increasing amounts of diabetes in consumers. Three and a half million (about 6% of the population) are affected by diabetes. This has led to the demand for healthier alternatives in order for consumers to make smarter food choices. This has become a global trend as well as a way to embrace a balanced lifestyle												
18	**Woolworths Taste**	**2017**	**January/ February**	**N/A**	**N/A**	**12**	**Use Your Noodle**	**Jacqueline Burgess**	**X**			**X**	**X**
	This promotion was about the new range of vegetable noodles available at Woolworths, which allows one to still indulge without the kilojoules. The noodles are ready-made and only require heating as they are already cooked. The flavours available include wheat, gluten and egg-free cauliflower, or spinach and cauliflower noodles. The noodles are advertised as a ready to cook stir fry meal which entails 3 steps: picking a noodle base, deciding which vegetable mix to use, and choosing a sauce to stir fry												
19	**Woolworths Taste**	**2017**	**January/ February**	**N/A**	**N/A**	**26-29**	**Trends with Benefits**	**Woolworths Taste**	**X**				**X**
	According to Martin Raymond (a food trend forecaster), food and beverage industries are becoming more socially and environmentally aware. One of the trends which stood out the most was "Healthy Food for All". This is where establishments are making it their mission to make healthy food accessible to everybody. There is a restaurant in Los Angeles called Everytable which has implemented this by creating affordable healthy and seasonal meals for people on the go												
20	**Woolworths Taste**	**2017**	**January/ February**	**N/A**	**N/A**	**60-68**	**Healthy in a Hurry**	**Abigail Donnelly**	**X**				
	This article is about healthy eating and how one can eat healthy without spending a lot of time and money. Various recipes and cost per recipes were provided which included recipes such as Asian broths, stocks, soups and stews, rice dishes, salads, rice bowls, spreads, and sauces												

Magazines									Aspect of Interest				
	Magazine	Year	Month	Vol-ume	Issue	Page	Title of Article	Author	Health	African Influence	Indige-nous Food	Plant Based Eating	Conve-nience
21	**South African Food Review: Journal for Food and Beverage Manufacturers**	**2017**	**February**	**44**	**2**	**7**	**Rooibos Aperitif Turns Heads in Local Market**	**Food Review**			**X**		
	A new product on the market which has been released is The Spirit of Rooibos Aperitif. This was created as a heritage product and is made from natural ingredients												
22	**South African Food Review: Journal for Food and Beverage Manufacturers**	**2017**	**February**	**44**	**2**	**20-22**	**2017's Biggest Trends**	**Maryke Foulds**	**X**		**X**	**X**	
	Some of the biggest global food trends for 2017 were explained in this article and consisted of the following: adding extra heat (the additional of chillies to various dishes), "the green light for vegetables" (increasing the use of vegetables in juices, smoothies and even dairy and sweets) and ethnic products. Innova Market Insights reports that the number of new products with an ethnic positioning has nearly doubled in the last four years as more people are travelling abroad and are interested in authentic products												
23	**Woolworths Taste**	**2017**	**May**	**N/A**	**N/A**	**16-17**	**Master Mixes**	**Abigail Donnelly**	**X**			**X**	**X**
	This article is a promotion on the new range of soup packs in Woolworths. These soup packs are fresh, peeled and cut mixtures of vegetables, and it aims to make one feel that they had an input in making the soup as they still have to cook it. The flavours available include minestrone, butternut and split pea, green vegetables (including kale, broccoli, leeks and baby marrow), sweet potato, beetroot, and pumpkin. They also include serving suggestions for the soups to make it more interesting												
24	**Woolworths Taste**	**2017**	**May**	**N/A**	**N/A**	**31**	**Grab a Spoon**	**FoodLoose Productions**	**X**				**X**
	This is a promotion on new breakfast and snack ideas called "breakfast bowls" where yoghurt is topped with fresh fruits and granola. This is a good on the go nutritious meal, and different granola options are available in Woolworths such as spiced almond and toasted coconut, as well as strawberry flavoured granola												
25	**Woolworths Taste**	**2017**	**May**	**N/A**	**N/A**	**78-82**	**Food for a Beloved Country**	**Hope Malau & Anna Carolina Alberts**		**X**	**X**		
	This article features Hope Malau, who has just released a new recipe book called Johanne 14. This book is about using food to mend a broken heart, and he pays tribute to the tradition of food preparation in South African communities throughout his stories and recipes. Most of the recipes in this new book are aimed to be presented in family gatherings as a means to come together and continue the traditions of food preparation. Some of the recipes include corn soup, fried chicken, cremora tart and morogo. Malau describes how he ate morogo when we were feeling homesick (ox liver or mince, with morogo and pap). He describes this as being the traditional Sotho food that he grew up eating in the township of Jouberton in the North West Province. In this recipe, he prepares the morogo by frying onion and green pepper with curry powder, then adding diced potato, morogo and water and lets it cook for 10 minutes. It is also indicated that this recipe is carb-conscious, fat conscious, health-conscious and meat-free												
26	**Woolworths Taste**	**2017**	**June**	**N/A**	**N/A**	**20-29**	**7 New Ways to Worship Pasta**	**Abigail Donnelly & Jacqueline Burgess**					**X**
	This section on pasta is about different ways to make, prepare and serve pasta. There are also various new techniques and ingredients which one can use to make a classic dish more modern. Some of these ingredients/techniques include charcoal pasta, seaweed butter, cured egg yolk, cuttlefish ink spaghetti and deep-fried pasta												

Magazines									Aspect of Interest				
	Magazine	Year	Month	Vol-ume	Issue	Page	Title of Article	Author	Health	African Influence	Indige-nous Food	Plant Based Eating	Conve-nience
27	**Woolworths Taste**	**2017**	**June**	**N/A**	**N/A**	**42**	**Hello Africa, Tell Me How You're Doing…**	**Woolworths Taste**		**X**	**X**		
	This section is about trending ingredients in Africa, which are becoming more popular. Some of these ingredients include sorghum (especially because it is gluten-free and has also been increasing its appearance in breakfast grain cereals), teff, plantains, baobab and the Ethiopian spice blend "Berbere"												
28	**South African Food Review: Journal for Food and Beverage Manufacturers**	**2017**	**July**	**44**	**7**	**10-11**	**New Product Competition**	**South African Food Review**	**X**			**X**	**X**
	This article is about the Food Review/Symrise New Product Competition. Some of the products entered included the following: Thrive (a high protein multigrain breakfast cereal with added pea protein), Woolworths Roasted Seaweed Snacks (vegan high fibre snacks), Denny Mushroom Burgers (a vegetarian burger patty alternative developed by Montagu Foods) and Woolworths Cold Pressed Fruit and Vegetable Juice Shots (a high pressured processing of the pressed juices without adding heat or preservatives)												
29	**South African Food Review: Journal for Food and Beverage Manufacturers**	**2017**	**July**	**44**	**7**	**21**	**Ripe for South Africa's Food Manufacturers**	**South African Food Review**		**X**	**X**		
	Baobab fruit is becoming more popular in the world as it is a good superfood (high in vitamin C, antioxidants, dietary fibre, calcium, magnesium, and potassium). The fruit also is indigenous to Africa and grows well in South Africa. It is becoming more and more popular to purchase the fruit in a powder format and can be added to anything from smoothies to yoghurt, teas etc.												
30	**Woolworths Taste**	**2017**	**July**	**N/A**	**N/A**	**36**	**5 minutes with Jan-Hendrik van der Westhuizen**	**Annette Klinger**		**X**	**X**		**X**
	This interview was with South African Michelin starred chef Jan-Hendrik van der Westhuizen. He was asked what is currently on his menu in his restaurant, and he mentioned a few South African dishes, favours and ingredients. Some of the items mentioned included: artichoke with mieliepap pap and sunflower seeds, an amuse-bouche consisting of bobotie (made from guinea fowl) inside an egg, an edible candle made of kaaiings and pork fat with mosbolletjies, and there is also a main option of Bresse chicken served with mustard and buchu jus												
31	**Woolworths Taste**	**2017**	**July**	**N/A**	**N/A**	**40-41**	**Ben Shewry**	**Ishay Govender-Ypma**			**X**		**X**
	This interview was with the head chef and owner of Attica (a restaurant in Melbourne, Australia). It is ranked as number 32 on the World's 50 Best Restaurants list. He incorporates Australian Aboriginal ingredients on his menu. He also rents a space where he grows a garden with 100 different plants, some dating back to 50 000 years ago which were important sources of food for the Australian Aboriginal people												
32	**South African Food Review: Journal for Food and Beverage Manufacturers**	**2017**	**August**	**44**	**8**	**10**	**The Preferred Protein**	**South African Food Review**	**X**			**X**	

	Magazines								Aspect of Interest				
	Magazine	**Year**	**Month**	**Vol-ume**	**Issue**	**Page**	**Title of Article**	**Author**	**Health**	**African Influence**	**Indige-nous Food**	**Plant Based Eating**	**Conve-nience**
32 Cont.	This article is about Pea Protein, which has become popular in the last few years as consumers want more plant-based or plant-rich diets because of its perceived health benefits. It is also an alternative to animal-based protein; it is hypoallergenic and contains no gluten or dairy. It was also stated that in North America "one in three consumers states they prefer a vegetable-sourced protein to an animal-sourced protein"												
33	**Woolworths Taste**	**2017**	**August**	**N/A**	**N/A**	**23-25**	**A Whole Latte Loving Going On**	**Annette Klinger**	**X**			**X**	**X**
	This trend section is about the new trend with lattes around the world, including shots of vegetables/fruits along with their espresso and steamed milk. This is due to the fact that people want a boost but also want to be healthy. Some of the latte trends include adding purple potatoes, turmeric, hibiscus, matcha, charcoal, beetroot, apple, carrot, ginger, lemon, live E3 algae, brown rice malt and coconut. As a result of these ingredients being added, they often come in a variety of different bright colours which are "Instagram worthy"												
34	**Woolworths Taste**	**2017**	**October**	**N/A**	**N/A**	**8**	**Feel Free to Snack**	**Woolworths Taste**	**X**			**X**	**X**
	This promotional section is about Woolworths' guilt-free/healthy snack range such as kale chips, rice and multi-seed pop chips, gluten-free raw energy bites, vegetable flavoured yoghurts, roasted seaweed snacks, raw activated nibbles with kale and moringa, and raw activated date bites with kale												
35	**Woolworths Taste**	**2017**	**October**	**N/A**	**N/A**	**16-21**	**Goodness to Go**	**Abigail Donnelly**	**X**			**X**	
	This recipe section is about soups and stews which are suitable for spring in order to increase one's vegetable intake. There are many recipes included, but some which stand out include green asparagus broth (using spinach and cauliflower noodles as well as cauliflower, broccoli and kale rice) and turmeric and coconut broth (turmeric is used for its anti-inflammatory and antioxidant properties)												
36	**Woolworths Taste**	**2018**	**January/ February**	**N/A**	**N/A**	**28-29**	**Wok This Way**	**Woolworths Taste**	**X**			**X**	**X**
	This is an advertising promotion on Carb Clever (low carb) noodles which are pre-cooked and can be accompanied by a premade pack of cut vegetables and a ready-made sauce. All one needs to do is stir fry everything together. The noodles come in two flavours, cauliflower or spinach and cauliflower. It also shows different possible combinations of flavours one can make												
37	**Woolworths Taste**	**2018**	**January/ February**	**N/A**	**N/A**	**32-35**	**What's Cooking, 2018?**	**Woolworths Taste**	**X**			**X**	**X**
	This trend section illustrates various trends Taste indicates will be present in 2018. Some of the trends predicted included: Plant-based food (due to 90% increases in vegan recipe searches on google, as well as different food companies, vegetarian options in restaurants etc.), engineered animal protein (this is due to people becoming more aware of the sustainability of meat and therefore looking for vegetarian alternatives to meat which taste like meat), clicking and cooking (meal kits which can be ordered online and delivered to one's home with recipe cards so the buyer makes the food themselves-this is due to consumers wanting convenience but still want to feel that they made it themselves), and Ramen 2.0 (Ramen noodles prepared differently served without the broth with more western flavours and ingredients)												
38	**Woolworths Taste**	**2018**	**January/ February**	**N/A**	**N/A**	**42-43**	**Going Spiral**	**Woolworths Taste**	**X**			**X**	**X**
	This is an advertising promotion on spiralised vegetables which one can substitute as a carb-free pasta as well as a healthy alternative. There is a range of different vegetables such as pumpkin, baby marrow, beetroot, carrot and butternut												

Magazines									Aspect of Interest				
	Magazine	Year	Month	Vol-ume	Issue	Page	Title of Article	Author	Health	African Influence	Indige-nous Food	Plant Based Eating	Conve-nience
39	Woolworths Taste	2018	May	N/A	N/A	44	Leader of the Pack	Woolworths Taste	X			X	X
	This is an advertising promotion on ready-to-cook soup packs which includes a variety of different vegetables and a set of instructions. All the consumer needs to do is add water and simmer until cooked through. Their packs come in a range of flavours such as cauliflower, broccoli and kale												
40	Woolworths Taste	2018	May	N/A	N/A	100-105	Blogged in the USA	Woolworths Taste		X	X		
	This article is about South African food bloggers who live abroad and incorporate South African influences into their food. Marie Viljoen is based in the US and blogs her meals she makes. She also works with foraged wild edible plants of the area as well as South African owned businesses in the US such as Brooklyn Biltong and Ayoba-Yo. Marie also includes a recipe of Stinging nettle grits which combines her South African roots of the bitter taste of stinging nettles with grits which is a popular American mealie meal.												
41	Woolworths Taste	2018	June	N/A	N/A	119-124	What's for Dinner?	Woolworths Taste	X			X	X
	This article is about pasta and how to give it a "global makeover" with influences from different countries. The recipes include: baby marrow noodles with poached eggs and smoky roast pepper sauce (from Mexico); ravioli with crispy capers and olive breadcrumbs (from the Mediterranean); lasagne with parmesan, mushroom broth and pesto (from Italy); handmade beetroot tagliatelle with Cape Malay burnt butter (from South Africa); and gnocchi with creamy cheese-and-parsley sauce and peas (from Britain)												
42	Woolworths Taste	2018	July	N/A	N/A	54-84	Italy's Finest	Abigail Donnelly					X
	This magazine issue was all about Italian food and ingredients. The number one ingredient listed is pasta, and different recipes to prepare are also included such as squid ink pasta which is black in colour (which could be substituted with morogo in order to have green colouring)												

TABLE A4: PHASE 3: THE ITEM STARTS TO FEATURE IN MAINSTREAM RESTAURANTS

Name of Restaurant (Accessed from EatOut Restaurant Directory)	Aspect of Interest				URL
	Health	African Influence	Indigenous Food	Plant Based Eating	
Addis in Cape	X	X	X	X	http://www.eatout.co.za/venue/addis-in-cape-ethiopian-restaurant/
Afro Boer	X	X	X	X	http://www.eatout.co.za/venue/afro-boer/
Aliabie Restaurant		X	X	X	http://www.eatout.co.za/venue/aliabie-restaurant/
Amadoda Braai		X	X		http://www.eatout.co.za/venue/amadoda-braai/
Artizen Restaurant and Lounge		X	X		http://www.eatout.co.za/venue/artizen-restaurant-lounge/
At Kate's Kitchen			X		http://www.eatout.co.za/venue/at-kates-kitchen/
Bella Anima	X			X	http://www.eatout.co.za/venue/bella-anima/
Blos Café	X	X	X	X	http://www.eatout.co.za/venue/blos-cafe-and-venue/

Name of Restaurant (Accessed from EatOut Restaurant Directory)	Aspect of Interest				URL
	Health	African Influence	Indigenous Food	Plant Based Eating	
Bo-Kaap Kombuis		X	X		http://www.eatout.co.za/venue/bo-kaap-kombuis/
Café Ganesh		X	X	X	http://www.eatout.co.za/venue/cafe-ganesh-restaurant-bar/
Café Skyzer		X	X		http://www.eatout.co.za/venue/cafe-skyzer/
Carlton Café Delicious		X	X		http://www.eatout.co.za/venue/carlton-caf%C3%A9-delicious/
Chiliplum Bistro	X			X	http://www.eatout.co.za/venue/chilliplum-bistro/
City Bowl Health Kitchen	X				http://www.eatout.co.za/venue/city-bowl-health-kitchen/
Chaf-Pozi		X	X		http://www.eatout.co.za/venue/chaf-pozi/
Chickating Restaurant		X	X		http://www.eatout.co.za/article/african-restaurants/
Classique Braai Lounge		X	X		http://www.eatout.co.za/venue/classique-braai-lounge/
Conscious Café	X			X	http://www.eatout.co.za/venue/conscious-cafe/
Delish Sisters	X			X	http://www.eatout.co.za/venue/delish-sisters-2/
Earth Mother Organic	X			X	http://www.eatout.co.za/venue/earthmother-organic/
Free Food Deli & Takeaway	X			X	http://www.eatout.co.za/venue/free-food-deli-takeaway/
Fresh Earth Café	X			X	http://www.eatout.co.za/venue/fresh-earth-cafe-restaurant/
Fruits and Roots	X			X	http://www.eatout.co.za/venue/fruits-and-roots/
Govindas Pure Vegetarian Café	X		X	X	http://www.eatout.co.za/venue/govindas-natural-food-cafe/
Habesha Café		X	X		http://www.eatout.co.za/venue/habesha-cafe-2/
Harvest Café & Deli	X			X	http://www.eatout.co.za/venue/harvest-cafe-deli/
Hombaze African Cuisine		X	X		http://www.eatout.co.za/venue/hombaze-african-cuisine-2/
Home Town		X	X		http://www.eatout.co.za/venue/home-town/
Imbizo Shisanyama		X	X		http://www.eatout.co.za/venue/busy-corner-imbizo-shisanyama/
Kitchen Kafe	X				http://www.eatout.co.za/venue/kitchen-kafe/
La Coco C	X		X	X	http://www.eatout.co.za/venue/la-coco-c/
La Terasse Rooftop Café & Deli		X		X	http://www.eatout.co.za/venue/la-terrasse-rooftop-cafe-deli/
Leafy Greens Café	X		X	X	http://www.eatout.co.za/venue/leafy-greens-caf%C3%A9/
Lexi's Healthy Eatery	X			X	http://www.eatout.co.za/venue/lexis-healthy-eatery/
Licorish Bistro		X	X		http://www.eatout.co.za/venue/licorish-bistro/
Little Ethiopia		X	X		http://www.eatout.co.za/venue/little-ethiopia-restaurant/

Name of Restaurant (Accessed from EatOut Restaurant Directory)	Aspect of Interest				URL
	Health	African Influence	Indigenous Food	Plant Based Eating	
Lucky Bean	X	X	X	X	http://www.eatout.co.za/venue/lucky-bean/
Madam Taitou		X	X		http://www.eatout.co.za/venue/madam-taitou/
Maharaja Vegetarian		X		X	http://www.eatout.co.za/venue/maharajah-pure-vegetarian-foods/
Mama Africa		X	X		http://www.eatout.co.za/venue/mama-africa/
Maphindi's Braai Place		X	X		http://www.eatout.co.za/venue/maphindis/
Marco's African Place		X	X		http://www.eatout.co.za/venue/marcos-african-place/
Mashamplane's Lounge		X	X		http://www.eatout.co.za/venue/mashamplanes-lounge/
Max's Lifestyle Tavern		X	X		http://www.eatout.co.za/venue/maxs-lifestyle/
Mzoli's		X	X		http://www.eatout.co.za/venue/mzolis/
Ninho Pica Pau		X	X	X	http://www.eatout.co.za/venue/ninho-pica-pau-portugese-restaurant/
Nourish'd Café & Juicery	X			X	http://www.eatout.co.za/venue/nourishd-cafe-juicery/
Nouriti	X			X	http://www.eatout.co.za/venue/nouriti-umhlanga/
Nü Health Food Café	X			X	http://www.eatout.co.za/venue/nu-health-food-cafe-green-point/
Nwa 'n Kumi		X	X		http://www.eatout.co.za/article/african-restaurants/
Nyama Choma Restaurant		X	X		http://www.eatout.co.za/venue/nyama-choma/
Origins		X	X		http://www.eatout.co.za/venue/origins-restaurant/
Out to Lunch	X			X	http://www.eatout.co.za/venue/lunch/
Pata Pata		X	X		http://www.eatout.co.za/venue/pata-pata-restaurant/
Plant Café	X			X	http://www.eatout.co.za/venue/plant-buiten-loop-street/
Queen of Sheba Ethiopian Restaurant		X	X		http://www.eatout.co.za/venue/queen-sheba-ethiopian-restaurant/
Raw & Roxy	X		X	X	http://www.eatout.co.za/venue/raw-roxy/
Roving Bantu Kitchen		X	X		http://www.eatout.co.za/venue/roving-bantu-kitchen/
Savanna Restaurant		X	X	X	http://www.eatout.co.za/venue/savana-restaurant/
Sha'p Braai		X	X		http://www.eatout.co.za/venue/shap-braai/
Scheckter's Raw Gourmet	X			X	http://www.eatout.co.za/venue/scheckters-raw-2/
Skinny Legs Luxury Café	X			X	http://www.eatout.co.za/venue/skinny-legs-luxury-cafe/
Sweetbeat	X			X	http://www.eatout.co.za/venue/sweetbeet/

Name of Restaurant (Accessed from EatOut Restaurant Directory)	Aspect of Interest				URL
	Health	African Influence	Indigenous Food	Plant Based Eating	
Tajine Moroccan Restaurant		X	X	X	http://www.eatout.co.za/venue/tajine-moroccan-restaurant/
Tate's Kasi Grill		X	X		http://www.eatout.co.za/venue/tates-kasi-grill/
The Greenside Café	X			X	http://www.eatout.co.za/venue/greenside-caf%C3%A9/
The Hill Café			X		http://www.eatout.co.za/venue/hill-cafe/
The Hungry Herbivore	X			X	http://www.eatout.co.za/venue/hungry-herbivore/
The Joint Jazz Café		X	X		http://www.eatout.co.za/venue/joint-jazz-cafe/
Timbuktu Café		X	X	X	http://www.eatout.co.za/venue/timbuktu-cafe/
Tree Natural Café	X			X	http://www.eatout.co.za/venue/tree-natural-cafe/
Vuyo's Restaurant		X	X		http://www.eatout.co.za/venue/vuyos-braai/
Wellness Café	X		X	X	http://www.eatout.co.za/venue/wellness-cafe-brooklyn/
Zemara		X	X		http://www.eatout.co.za/venue/zemara-catering/

TABLE A5: PHASE 4: ITEM FEATURES IN POPULAR MAGAZINES/PUBLICATIONS

Magazines									Aspect of Interest				
	Magazine	Year	Month	Volume	Issue	Page	Title of Article	Author	Health	African Influence	Indige-nous Food	Plant Based Eating	Conve-nience
1	Food & Home Entertaining	2015	July	N/A	N/A	40-45	All Hail Kale	Illanique van Aswegen	X			X	
	This article is about the promotion of Kale (a type of green leafy vegetable). It includes some facts about kale as well as recipes and methods of preparation. Kale is also seen as a superfood. The article also gives tips on how to eat it such as raw in a salad, blended into a smoothie, juiced, sautéed, baked etc. Some recipes were also included such as kale chips, colcannon (an Irish dish with mashed potato), shortbread biscuits and a pie recipe												
2	Food & Home Entertaining	2015	September	N/A	N/A	74-78	Braai Day, The Vegan Way	Claire Ferrandi & Nomvuselelo Mncube	X		X	X	
	This article is a compilation of vegan recipes which one can make on heritage day as a healthier alternative to meat dishes												
3	Food & Home Entertaining	2015	September	N/A	N/A	80-84	Let's Graze	Claire Ferrandi & Nomvuselelo Mncube			X		

Magazines									Aspect of Interest				
	Magazine	Year	Month	Volume	Issue	Page	Title of Article	Author	Health	African Influence	Indige-nous Food	Plant Based Eating	Conve-nience
	This article was about heritage day and included various recipes which are traditionally South African with a spin. The recipes include traditional South African dishes, ingredients as well as flavour combinations												
4	**Food & Home Entertaining**	**2015**	**September**	**N/A**	**N/A**	**90-95**	**A Gathering of the People**	**Chevaun Roux**		**X**	**X**	**X**	**X**
	This is an article about Imbizo Shishanyama, a South African eatery which draws its inspiration from local identity and traditions. Rita Zwane is the founder and managing director, and her inspiration for this eatery was born from the need of a truly African food experience in South Africa. She has also included some recipes which are made at her establishment. Some of the recipes include a South African impala potjie (which is cooked the traditional way in a cast iron pot), roasted lamb neck with potatoes and vegetables, African dombolo (which is a steamed carrot bread and traditionally eaten with stews and grilled meat), pap (stiff maize meal porridge) and sautéed morogo. Rita says that morogo is easily harvested and grown wildly across Southern Africa and that modern living has provided alternatives to the traditionally cooked morogo varieties that indigenous African ancestors enjoyed												
5	**Food & Home Entertaining**	**2015**	**October**	**N/A**	**N/A**	**13-14**	**Trending: Vegetable Yoghurts**	**Claire Ferrandi & Nomvuselelo Mncube**				**X**	**X**
	This trend section is about a growing trend seen in the USA: vegetable yoghurt. This is done by mixing a puree of cooked vegetables to yoghurt. This is being done due to the increase in health consciousness and also because people are realising how much sugar is in commercially produced flavoured yoghurts. These yoghurts are also starting to feature more as they are becoming more available as a ready-made product												
6	**Food & Home Entertaining**	**2016**	**March**	**N/A**	**N/A**	**26**	**The Unsung Heroes**	**Anna Trapido**		**X**	**X**		**X**
	This article is about Siphokazi and Frank Omoluwa who make a range of Southern and West African savoury sauces and cook in sauces under the brand name Mrs O. They use a combination of flavours and ingredients such as tomato, palm nuts, okra in order to get African flavours without the fuss as it is convenient												
7	**Food & Home Entertaining**	**2016**	**March**	**N/A**	**N/A**	**92-95**	**Vintage Vegetarian**	**Nancy Richards**	**X**			**X**	**X**
	This article is about the world's oldest vegetarian restaurant in Switzerland, opening in 1898. This restaurant only serves vegetarian foods. It is increasing in popularity due to the consumer environment becoming more health-conscious and aware of where one's food comes from												
8	**Food & Home Entertaining**	**2016**	**April**	**N/A**	**N/A**	**44-47**	**Just Beet It!**	**Nomvuselelo Mncube**	**X**			**X**	
	This recipe section is about beetroot and how to incorporate it into dishes. It has many vitamins and minerals, antioxidants and is low in fat. One of the recipes included is beetroot granola with whipped coconut cream. This recipe is interesting as it uses a vegetable in the granola to make it have more nutrients. It is made by drying the beetroot in the oven and then mixing it with the roasted seed and nut mix												

Magazines									Aspect of Interest				
	Magazine	Year	Month	Volume	Issue	Page	Title of Article	Author	Health	African Influence	Indige-nous Food	Plant Based Eating	Conve-nience
9	Food & Home Entertaining	2016	May	N/A	N/A	15-16	Trending: Seaweed	Claire Ferrandi	X			X	
	This article is about the new trend of seaweed. It has gained interest because of its high level of fibre, antioxidants and iodine. It is sustainable to harvest and is easy to fry or bake with, and has a salty taste. It is recommended for use in a snack or salad. Morogo is similar in this regard												
10	Food & Home Entertaining	2016	June	N/A	N/A	26	The Unsung Hero	Food & Home Entertaining		X	X		
	This is an article about Laurette Meiring and Phillip Meiring who own a seed shop (NW Saad & Gas) in Rustenburg. They sell lots of traditional seeds such as cowpeas, mung beans and sorghum and say that their customers buy the seeds because are also interested in the leaves from the plant which they can eat as a morogo side vegetable or in salads and soups. The seeds are mostly sold to farmers and home gardeners but are becoming popular with caterers and chefs as more people are becoming interested in heritage food and African cuisine. They also mention that more health professionals such as dieticians and doctors are visiting the shop because there seems to be a growing interest in traditional African foods												
11	Food & Home Entertaining	2016	June	N/A	N/A	26	Lighten Up!	Claire Ferrandi & Nomvuselelo Mncube	X				
	This recipe section is dedicated to making an indulgent dish/food item in a healthier way. This month the section is placing granola into focus as it is usually full of sugar and unhealthy fats, yet a very desirable breakfast item. The recipe featured is a cashew, coconut and rose granola which is made with different nuts and seeds, and coconut shavings which is gluten and wheat free												
12	Food & Home Entertaining	2016	July	N/A	N/A	26	The Unsung Hero	Anna Trapido		X	X		
	This article is about Felix Okoua, an Ivorian chef. He is a classically trained French chef. He is now working at Savannah Restaurant in Pretoria where he aims to reflect the food of Africa												
13	Food & Home Entertaining	2016	September	N/A	N/A	20	The Unsung Hero	Anna Trapido		X	X		
	This article is about Ntombifuthi Ngomane, who is the founder and executive director of Zen Africa Chef Academy of Food & Wine. She specialises in hospitality training and mentoring for youth from disadvantaged backgrounds. In this article, she mentions her Academy as well as upbringing and traditional food she ate as a child such as picking imifino (morogo) when she was a little girl and learning how to prepare and eat it. She also mentions that "as South Africans, we have a tendency to look down on our own cuisine". She teaches her students how to be internationally competent chefs but also to take pride in their own tradition and indigenous foods												
14	Food & Home Entertaining	2016	September	N/A	N/A	88-93	The Day Mother Earth and Mama Africa Collaborated	Anna Trapido & Mpho Tshukudu	X	X	X		

	Magazines								Aspect of Interest				
	Magazine	**Year**	**Month**	**Volume**	**Issue**	**Page**	**Title of Article**	**Author**	**Health**	**African Influence**	**Indige-nous Food**	**Plant Based Eating**	**Conve-nience**
14 cont.	This article is about the collaboration between Anna Trapido and Mpho Tshukudu in their book titled "Eat Ting-Lose Weight, Gain Health, Find Yourself". Meetings were held prior to the book release in order to discuss heritage food and the cultural factors impacting the rising levels of obesity in South Africa. Research involved the expertise of both Mpho and Anna, as well as South African elders who demonstrated cooking methods and different wild ingredients to Mpho and Anna. Once they knew what type of foragable foods to look for they realised that delicious and nutritious foods were available everywhere. According to Mpho, "they're not just in the rural areas-the magnificent wild leaves that the elderly call thepe (amaranth/morogo) are so prolific, they're literally growing out of the cracks on the pavement in most South African cities!" They then proceeded to test and taste traditional recipes and created some modern variations on these dishes. Mpho also mentions that the knowledge of the grandmothers/elders was a neglected resource in terms of traditional food. South Africans seem to spend a lot of time and effort into looking for the latest "exotic" ways on how to lose weight, but most of us fail to notice that South Africa's culinary heritage is delicious as well as healthy. The book aimed to combine ancient yet accessible and inexpensive ingredients into one's daily diet												
15	**Food & Home Entertaining**	**2016**	**November**	**N/A**	**NA**	**120**	**Food on Trees**	**Food & Home Entertaining**	**X**		**X**	**X**	
	This article is about Urban Harvest, a Social Enterprise which establishes aesthetic as well as productive organic food gardens in homes, businesses and community projects. Since 2006, Urban Harvest has installed 303 harvest gardens in and around Cape Town. This project teaches people how to grow their food and eat fresh organic food. A key offering of Urban Harvest is their Edu maintenance program which provides ongoing maintenance and support to clients. In the article, it is stated that there is a global movement towards edible gardens because people realise that small scale, intensive and localised systems are a more sustainable option for food production. People are also realising that food is becoming more expensive, so growing your own food at home has financial benefits. Society is also becoming more health-conscious and is realising the positive effects of organic food												
16	**Food & Home Entertaining**	**2017**	**April**	**N/A**	**NA**	**24**	**The Unsung Hero**	**Anna Trapido**	**X**		**X**	**X**	
	This article is about Loubie Rusch, an indigenous and foraged food activist. In this article, she mentions that South Africa is one of the most bio-diverse parts of the world, yet we almost do not eat anything off the landscape because our knowledge on indigenous foods has been lost. She aims to teach people about the local landscape, how to grow indigenous plants, look after them and eat/cook them. She feels strongly about exploring ways to bring locally well-adapted wild ingredients into cultivation because they do not need much water to grow and is more sustainable. She states that: "most people do not know how many local leafy greens, vegetables, berries and flowers there are-and how delicious they can be!"												
17	**Food & Home Entertaining**	**2017**	**May**	**N/A**	**NA**	**68-73**	**Smooth Operator**	**Katelyn Williams & Cassandra Upton**	**X**			**X**	
	This recipe section is about smoothie bowls, which have become very popular as breakfast dishes. Different ingredients are blanched, baked, blitzed or mixed together to create a dish which is served in a bowl. One of the recipes included is for "The Moringa" which as a vanilla labneh with burnt honey butter and moringa and mint syrup. The moringa is added in a powder form which is available at health shops. It has a vibrant green colour, which is an interesting combination with the creamy labneh. Another recipe which stood out is "The Beet and Berry" which has beetroot in. Vegetables are beginning to make an appearance in breakfast items												

Magazines									Aspect of Interest				
	Magazine	Year	Month	Volume	Issue	Page	Title of Article	Author	Health	African Influence	Indige-nous Food	Plant Based Eating	Conve-nience
18	Food & Home Entertaining	2017	June	N/A	NA	15-16	Food Bites Trending: Legume Pasta	Claire Ferrandi	X			X	X
	This section in the magazine is dedicated to different trends in the industry, and one trend mentioned is legume pasta. This pasta is seen as a healthier alternative to wheat pasta but is also low in GI. A popular choice of legume pasta includes lentil and chickpea pasta												
19	Food & Home Entertaining	2017	June	N/A	NA	81-85	Let the Sun Shine	Kate Liquorish, Jonathan Duiker & Chiara Viljoen	X			X	X
	This article is based on an Italian restaurant in Johannesburg called café del sol. There are various recipes provided which are served in the restaurant, one of them being homemade spinach pasta. This dish uses a process of cooking the spinach and pureeing it in order to combine it with the pasta dough												
20	Food & Home Entertaining	2017	July	N/A	NA	31-34	Dog Day Afternoon	Jenny Handley			X		
	This article is about Six Dogs Distillery, who is a gin distillery based in Worchester. They infuse their gins with botanical plants that grow in the Karoo. This is important as it brings the natural flavours which grow in this area into a commercial setting for many to experience												
21	Food & Home Entertaining	2017	July	N/A	NA	55-60	Fuss Free French	Food & Home Entertaining	X			X	
	In this section, easy French recipes are included, but the ones which stood out the most were the healthy breakfast options which included vegan banana oatmeal as well as smoothie flapjacks which included Swiss chard												
22	Food & Home Entertaining	2017	August	N/A	NA	42-48	A Splash of Colour	Claire Ferrandi & Nomvuselelo Mncube	X			X	
	This section is about soups which are vivid and vibrant in colour to cheer one up. The soups were also suitable for freezing. One of the recipes listed is a broccoli and kale soup												
23	Food & Home Entertaining	2018	June	N/A	NA	16	Muffin Mania	King Korn	X		X		X
	This is a promotion on Mabele Meal, which is a sorghum-based cereal. In the promotion, a recipe of mabele meal muffins has been included to provide one with ideas as to how to use the Mabele Meal. The muffins are aimed to be a quick on the go breakfast or snack												

TABLE A6: PHASE 5: ITEM REACHES QUICK SERVICE RESTAURANTS

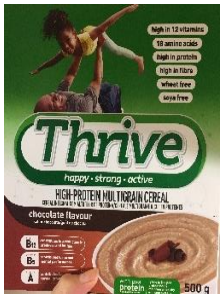
Name of Restaurant (Accessed from EatOut Restaurant Directory)	Aspect of Interest				URL
	Health	African Influence	Indigenous Food	Plant Based Eating	
Quick Service Restaurants					
Afro's Chicken		X			http://www.eatout.co.za/venue/afros-chicken-umhlanga-2/
Chesa Nyama		X	X		http://www.eatout.co.za/venue/chesa-nyama/
Kauai	X	X		X	http://www.eatout.co.za/venue/kauai-hatfield/
Lekker Vegan				X	http://www.eatout.co.za/venue/lekker-vegan/
Lele's African Food		X	X		http://www.eatout.co.za/article/get-mogodu-delivered-door-jozi/
Malome's Take Away		X	X		http://www.eatout.co.za/venue/malomes-take-aways/

TABLE A7: PHASE 5: ITEM REACHES GROCERY STORES

PRODUCTS AVAILABLE IN GROCERY STORES				ASPECT OF INTEREST			
ITEM	Quantity	Price	IMAGE OF ITEM	Health	African influence	Indigenous food	Plant-based eating
CHECKERS							
Fatti's and Moni's Instant Noodles Chakalaka Flavour	78 g	R4.99	 These instant noodles are spicy chakalaka flavour, which is a typical flavour seen in South African cuisine. The noodles also have finely chopped pieces of vegetables in it to increase consumption of vegetables		X		

FIGURE A1: FATTI'S AND MONI'S INSTANT NOODLES

PRODUCTS AVAILABLE IN GROCERY STORES				ASPECT OF INTEREST			
ITEM	**Quantity**	**Price**	**IMAGE OF ITEM**	**Health**	**African influence**	**Indigenous food**	**Plant-based eating**
Mageu Moringa Power	500 ml	R12.99	 This fermented milk product has been enriched with moringa powder as an added energy and nutrient boost **FIGURE A2: MAGEU MORINGA POWER**	X	X	X	
Moringa Leaf Powder	150 g	R79.99	 This dehydrated moringa leaf powder is aimed to increase one's daily intake of fruits and vegetables by adding it to items such as juice, yoghurt, smoothies, soups or stews **FIGURE A3: MORINGA LEAF POWDER**	X		X	X
Moringa Noodles	200 g	R39.99	 These noodles are made of moringa and are also labelled as a vegan product. This product is of interest as it adds nutrients and vegetables to a normal carbohydrate-rich food item **FIGURE A4: MORINGA NOODLES**	X		X	X

PRODUCTS AVAILABLE IN GROCERY STORES				ASPECT OF INTEREST			
ITEM	**Quantity**	**Price**	**IMAGE OF ITEM**	**Health**	**African influence**	**Indigenous food**	**Plant-based eating**
Thrive Energy Cereal	500 g	R29.99	 This high-protein multigrain cereal is made with added vegetable protein (pea protein) which has been added in a powder format **FIGURE A5: THRIVE ENERGY CEREAL**	X			X
PICK N PAY							
Knorr Packet Soup Curry Vegetable	50 g	R4.79	 This is a vegetable-based instant soup which one needs to only add boiling water to. The vegetables have all been dehydrated in order to preserve the shelf life. This could be a potential development for a morogo based product **FIGURE A6: KNORR PACKET SOUP CURRY VEGETABLE**				X
Maggi 2 Minute Noodles Boerewors Flavour	73 g	R4.99	 These 2-minute noodles are Boerewors flavoured which could be of interest when developing a new morogo product in order to include African flavours **FIGURE A7: MAGGI 2 MINUTE NOODLES BOEREWORS FLAVOUR**		X		

PRODUCTS AVAILABLE IN GROCERY STORES				ASPECT OF INTEREST			
ITEM	**Quantity**	**Price**	**IMAGE OF ITEM**	**Health**	**African influence**	**Indigenous food**	**Plant-based eating**
Mixed Herb and Garlic Bread Mix	450 g	R42.99	 This is a bread mix which only needs the addition of beer prior to cooking on the grill. The mixture has all of the dried ingredients mixed together which could similarly be applied to a morogo product **FIGURE A8: MIXED HERB AND GARLIC BREAD**		**X**		
Morvite Sorghum Cereal	1000 g	R20.99	 This is a cereal made of sorghum, which is an African ingredient. This could be a possible ingredient to combine with the morogo for a product **FIGURE A9: MORVITE SORGHUM CEREAL**		**X**	**X**	
Serena Spinach Lasagne	250 g	R26.99	 The pasta is a dried pasta made with spinach which gives the pasta a characteristic green colour as well as nutritional benefits **FIGURE A10: SERENA SPINACH LASAGNE**	**X**			**X**

PRODUCTS AVAILABLE IN GROCERY STORES				ASPECT OF INTEREST			
ITEM	**Quantity**	**Price**	**IMAGE OF ITEM**	**Health**	**African influence**	**Indigenous food**	**Plant-based eating**
WOOLWORTHS							
Baby Marrow Spaghetti	350 g	R32	 This is a vegetable alternative to pasta which is viable as consumers are interested in a product with nutritional benefits **FIGURE A11: BABY MARROW SPAGHETTI**	**X**			**X**
Carb Clever Spinach and Cauliflower Noodles	250 g	R44.99	 This is a wheat and gluten-free alternative to regular noodles which are made with cauliflower and spinach. This could be an interesting take if one had to substitute it with morogo **FIGURE A12: CARB CLEVER SPINACH AND CAULIFLOWER NOODLES**	**X**			**X**
Cold Pressed Meaner Greener Shot	100 ml	R16.99	 This juice shot is a mixture of fruits and vegetables and is aimed to increase one's daily intake of fruits and vegetables. This shot is made of cucumber, spinach, avocado and kale **FIGURE A13: COLD PRESSED MEANER GREENER SHOT**	**X**			**X**

PRODUCTS AVAILABLE IN GROCERY STORES				ASPECT OF INTEREST			
ITEM	**Quantity**	**Price**	**IMAGE OF ITEM**	**Health**	**African influence**	**Indigenous food**	**Plant-based eating**
Falafel and Beetroot Wrap	N/A	R44.99	 This wrap is made with beetroot in order to provide an added health benefit while still consuming a convenience food product **FIGURE A14: FALAFEL AND BEETROOT WRAP**	**X**			**X**
Green Smoothie Mix	350 g	R54.99	 This frozen smoothie mix ensures the convenience of fruits and vegetables on hand even when they are not in season. This mix includes a mixture of apple, cucumber, avocado, swiss chard and mint. **FIGURE A15: GREEN SMOOTHIE MIX**	**X**			**X**
Low Fat Blueberry and Moringa Drinking Yoghurt	100 ml	R9.99	 This drinking yoghurt has the added nutritional benefits of blueberry and moringa (which is an AGLV) **FIGURE A16: LOW FAT BLUEBERRY AND MORINGA DRINKING YOGHURT**	**X**		**X**	**X**

PRODUCTS AVAILABLE IN GROCERY STORES				ASPECT OF INTEREST			
ITEM	**Quantity**	**Price**	**IMAGE OF ITEM**	**Health**	**African influence**	**Indigenous food**	**Plant-based eating**
Low Fat Strawberry and Baobab Drinking Yoghurt	100 ml	R9.99	 This drinking yoghurt has the added nutritional benefits of baobab which is an indigenous ingredient **FIGURE A17: LOW FAT STRAWBERRY AND BAOBAB DRINKING YOGHURT**	**X**		**X**	**X**
Organic Sweet Chili Kale Chips	25 g	R21.99	 This product is a healthy alternative snack to chips. It is made by coating the kale with seasonings and dried slowly to maintain its crispness **FIGURE A18: ORGANIC SWEET CHILI KALE CHIPS**	**X**			**X**
Raw Kale Activated Date Bites	45 g	R21.99	 These bites are made with kale and dates and has no added sugar **FIGURE A19: RAW KALE ACTIVATED DATE BITES**	**X**			**X**

PRODUCTS AVAILABLE IN GROCERY STORES				ASPECT OF INTEREST			
ITEM	**Quantity**	**Price**	**IMAGE OF ITEM**	**Health**	**African influence**	**Indigenous food**	**Plant-based eating**
Raw Kale, Moringa and Coconut Granola	250 g	R55.99	 This granola is made by dehydrating the vegetables and has no added sugar or preservatives. This could be an interesting approach to take with a morogo product **FIGURE A20: RAW KALE, MORINGA AND COCONUT GRANOLA**	X		X	X
Spinach and Cheese Muffins	4 units	R36.99	 These savoury muffins have spinach in them which could be an interesting approach to take when developing a new morogo product **FIGURE A21: SPINACH AND CHEESE MUFFINS**				X

ADDENDUM B: PHASE 1: QUESTIONNAIRE

African Green Leafy Vegetables: Phase 1

Dear Respondent,

The purpose of this study is to gain insight into developing a new innovative culinary product using African green leafy vegetables. This questionnaire will be used as an input in order to find out what products are needed and desired in the market, which will include African green leafy vegetables (aka morogo) as an added health benefit. Participants will be asked to answer a number of questions which will take more or less 10 minutes to complete. The findings of this study will form part of a dissertation for a Master's degree in consumer science from the University of Pretoria. Participation is not compulsory, and all information will be treated as highly confidential and will only be used for research purposes. Thus, the participants' responses and information will remain anonymous. The answering of questions will indicate that the respondent is willing to participate but should he/she decide to withdraw from the study; he/she will not be penalised in any way. Please read the instructions carefully and give your honest opinion throughout. Thank you for your time and participation! Yours sincerely Ana Dinorah Bupo M Consumer Science: Food Management Student

Should you have any questions, please do not hesitate to contact me or my supervisor: Student: A.D. Bupo l 072 270 8534 l ana.bupo@up.ac.za Supervisor: Professor GE du Rand l 012 420 3547 l gerrie.durand@up.ac.za

Please would you be so kind as to indicate whether you give your consent to participate further in the study

- ○ I agree (1)
- ○ I disagree (2)

Do you live in the province of Gauteng?
Please do not continue if you do not live in Gauteng

- ○ Yes (1)
- ○ No (2)

Skip To: End of Survey If = No (2)

Morogo and other African wild spinach varieties African green leafy vegetables (aka morogo) are known as wild vegetables. These vegetables are high in nutrients and are often higher in nutrients than other commonly eaten vegetables. There is a gap of knowledge in the area of development and innovation in these vegetables which have the potential to be developed in terms of availability and commercialisation. This has hardly been achieved due to the fact that most of its consumers harvest the plants directly from the wild or view them as inferior products. By using African green leafy vegetables as an ingredient to a new product, one encourages the growth and consumption of the local ecosystem, which is recognised internationally and is becoming novel in the food industry. Local and traditional food has a structure of resistance to conventional globalising food systems which need to be overcome in order for consumers to accept it as part of their food culture and not as old fashioned.

Please tell us more about ourself by answering all of the questions:

Please note that all of your responses will remain anonymous and will only be used for academic purposes

Q1.1 What is your gender?

- Male (1)
- Female (2)

Q1.2 What was your age at your last birthday?

Please do not continue if you are under the age of 18 years

Age in Years (1)	

Q1.3 What is your highest level of education?

- Lower than grade 12 (1)
- Grade 12 (2)
- Degree/Diploma (3)
- Postgraduate qualification (4)

Q1.4 To which population group do you belong to according to the SA population Act?

- Asian (1)
- Black (2)
- Coloured (3)
- White (4)
- Other (5)

Q1.5 What is your approximate household total monthly income?

- Less than R5000 (1)
- R5000 - R9999 (2)
- R10 000 - R14 999 (3)
- R15 000 - R19 999 (4)
- R20 000 - R24 999 (5)
- R25 000 or more (6)

Please indicate your agreement with the following statements regarding morogo

Q2 **Morogo is not consumed by me because:**

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I am not familiar with it (Q2_1)	○	○	○	○	○
I do not know how to prepare it (Q2_2)	○	○	○	○	○
I do not know how to source it in terms of picking (Q2_3)	○	○	○	○	○
I have never heard of it (Q2_4)	○	○	○	○	○
It is not available in the local supermarket (Q2_5)	○	○	○	○	○
I live in an area where I do not have access to pick it (Q2_6)	○	○	○	○	○
It is not commercially available (Q2_7)	○	○	○	○	○
It is not a convenient product (Q2_8)	○	○	○	○	○
I dislike it (Q2_9)	○	○	○	○	○
I view it as a poverty food (Q2_10)	○	○	○	○	○
I think it is old fashioned (Q2_11)	○	○	○	○	○
I think it is difficult to prepare (Q2_12)	○	○	○	○	○

Q3 Please **select the statements which represent your opinion about an innovative culinary convenience food product made with morogo**

You may select as MANY as you think applicable*If answering on a mobile device, please click on those statements that you agree with (i.e. click on the block you agree with and leave those that you do not blank)

Select ALL That Apply (1)

If offered at the supermarket, I would consume morogo bread (1)	
When I think of a morogo product, I **do not** mind if the product is green (2)	
Even if offered in the supermarket, I **would not** consume morogo pasta (3)	
I feel uneasy when I smell morogo (4)	
A ready to cook convenient morogo product **does not** appeal to me (5)	
I prefer a well-seasoned morogo product (6)	
When I think of a morogo product, I expect the product to be green (7)	
Even if offered at the supermarket, I **would not** consume morogo instant soup (e.g. Cup a Soup) (8)	
I **would not** consume a ready to eat convenient morogo product (9)	
Even if offered at the supermarket, I **would not** consume morogo granola (e.g. Kellogg's granola) (10)	
I would only consume a ready to eat convenient morogo product (11)	
I would consume a ready to cook convenient morogo product (12)	
I prefer to consume a morogo-based product that has a characteristic morogo flavour (13)	
Even if offered at the supermarket, I **would not** consume morogo bread (14)	
If offered at the supermarket, I would consume morogo pasta (15)	
I would consume a ready to eat convenient morogo product (16)	
I would only consume a ready to cook convenient morogo product (17)	
I **do not** mind the smell of morogo (18)	
If offered at the supermarket, I would consume morogo granola (e.g. Kellogg's granola) (19)	
If offered at the supermarket, I would consume morogo instant soup (e.g. Cup a Soup) (20)	

What are your thoughts about an innovative culinary food product made with morogo?

Please look at the following images and indicate your likelihood of purchase:

Morogo pasta

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
How likely are you to consume this product? (_1)	○	○	○	○	○
How likely are you to purchase this product? (_2)	○	○	○	○	○

Morogo instant soup

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
How likely are you to consume this product? (_1)	○	○	○	○	○
How likely are you to purchase this product? (_2)	○	○	○	○	○

Morogo bread

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
How likely are you to consume this product? (_1)	○	○	○	○	○
How likely are you to purchase this product? (_2)	○	○	○	○	○

Morogo granola

	Extremely unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Extremely likely (5)
How likely are you to consume this product? (1)	○	○	○	○	○
How likely are you to purchase this product? (2)	○	○	○	○	○

Please indicate if you would like to participate in the tasting of the product which will be developed

○ Yes (1)

○ No (2)

Please would you be so kind as to provide your contact details for us to contact you if you would like to taste the developed product (email/cell phone)

_____

_____

Skip To: End of Survey If = No (2)

ADDENDUM C: PHASE 2: RECIPE DEVELOPMENT

1. Product possibilities

As seen in Section 5.3.2, and from the results in Chapter 1 (See Section 5.2), the product options which consumers could choose from which would be developed included pasta, soup, bread, and granola as indicated in Table C1. Pasta was the desired product chosen, as seen in section 5.2. Due to time limitations, all four product options were developed with the assistance of four final year hospitality management students under the subject Recipe Development (VDS 413). From this point, only the products soup, bread, and granola will be reported on as the product development of morogo pasta is seen in Section 5.3.

TABLE C1: PRODUCT POSSIBILITIES

ASPECT OF INTEREST	PASTA	SOUP	BREAD	GRANOLA
Definition	An unleavened dough made from wheat flour, water and eggs that is cut or extruded into a variety of different shapes and sizes. It can be fresh or dried and is boiled prior to consuming. The dough can be flavoured and coloured with a variety of different ingredients (Labensky et al., 2011:1135)	A liquid food made with meat, fish or vegetable stock as a base and often containing pieces of solid food or is smooth. Some common types of soups include broths, consommés, cream soups, puree soups, bisques, chowders and cold soups (Labensky et al., 2011:234)	A basic mixture of flour, water, salt and leavening which is baked. Different ingredients may be added to produce a variety of different breads. Two main categories include quick breads (using chemical leaveners or steam) and yeast breads (using yeast) (Labensky et al., 2011:924)	A toasted blend of whole grains, nuts and dried fruit, usually eaten with milk or yoghurt (Labensky et al., 2011:550)
Trends	Natural coloured pasta Leafy greens Vegetable-based pasta Local foods Healthy eating	Zero waste Healthy convenient foods Natural ingredients Plant-based dishes Natural ingredients	Healthy breads Artisan bread Whole grains Gluten-free Flavoured breads	Healthy breakfast items Vegetables in every meal Superfoods Raw food Global flavours
The gap in the market	Underutilised ingredients Few products with morogo Healthy convenient food options Making traditional foods accessible			
Recipe possibilities according to the level of convenience (ready to eat or ready to cook)	A morogo pasta to be made available either as a cooked meal or in a ready-to-cook dried format	A healthy vegetable-based soup to be made available as a ready to eat product or in an instant format where one would add boiling water	A healthy quick bread flavoured with morogo and African flavours available either as a baked product or in a dried baking kit format	A nutritious granola made with morogo and African ingredients to be available as a granola or to be adapted into a bar format

2. Recipe and information search

In order to begin the process of recipe development, various aspects needed to be investigated in order to determine what the optimum morogo bread, soup, and granola should consist of. A recipe and information search was done, which involved research on various topics, as illustrated in Table C2.

TABLE C2: RECIPE AND INFORMATION SEARCH

Morogo bread			Morogo soup			Morogo granola		
Knowledge needed	**Purpose**	**Source**	**Knowledge needed**	**Purpose**	**Source**	**Knowledge needed**	**Purpose**	**Source**
Types of breads	In order to determine which bread will be suitable as a convenience food	Recipe books Academic culinary books Literature search	**Types of vegetable soups and stocks**	In order to determine which type of soup and stock will be suitable as a convenience food	Recipe books Academic culinary books Literature search	**Types of granola**	In order to determine which type of granola will be suitable	Recipe books Academic culinary books Literature search
Types of flour	In order to determine which flour will be best for the addition of the morogo	Recipe books Academic culinary books Literature search	**Ingredients of soups**	In order to determine which will be best for the addition of the morogo	Recipe books Academic culinary books Literature search	**Ingredients of granola**	In order to determine which will be best for the addition of the morogo	Recipe books Academic culinary books Literature search
Current trends	In order to identify any gaps in the market and be able to position the bread competitively	Literature search Internet-trend forecasting platforms	**Current trends**	In order to identify any gaps in the market and be able to position the bread competitively	Literature search Internet-trend forecasting platforms	**Current trends**	In order to identify any gaps in the market and be able to position the bread competitively	Literature search Internet-trend forecasting platforms
Role of different ingredients and leavening agents	In order to understand the structure of the recipe and how to adapt it to an innovative product	Recipe books Academic culinary books Literature search	**Role of different ingredients**	In order to understand the structure of the recipe and how to adapt it to an innovative product	Recipe books Academic culinary books Literature search	**Role of different ingredients**	In order to understand the structure of the recipe and how to adapt it to an innovative product	Recipe books Academic culinary books Literature search
Bread recipes	In order to obtain a baseline recipe upon which adaptions and alterations will be made	Recipe books Academic culinary books	**Soup recipes**	In order to obtain a baseline recipe upon which adaptions and alterations will be made	Recipe books Academic culinary books	**Granola recipes**	In order to obtain a baseline recipe upon which adaptions and alterations will be made	Recipe books Academic culinary books

3. Implementation of the morogo product

In order to formulate the morogo bread, soup, and granola, various factors had to be taken into account in order to be able to establish a baseline recipe. The factors in question are the characteristics, the sensory characteristics desired, the structure of the recipe and the preparation techniques which will be discussed further in Table C3.

TABLE C3: FORMULATION OF THE MOROGO BREAD, SOUP, AND GRANOLA

	Morogo bread	Morogo soup	Morogo granola
Criteria for the morogo product	Characteristics of a good bread: Appearance: Even golden brown colour, no lip at the upper edge of the loaf Rounded top May have a centre crack Evenly browned top and bottom crust Uniform crumb colour Well distributed vegetables (with the addition of the morogo) Tenderness Crisp, tender crust Firm, but delicate crumb Texture Relatively fine crumb Uniform grain No tunnelling Moist Flavour Pleasant flavour Characteristic flavour of the variety of the bread Convenience in Preparation To be in the form of a quick bread by making use of chemical leaveners To be used as a bread premix where one would add oil and egg to the dry ingredient mixture	Characteristics of a good soup: Good quality stock-a good quality stock gives good flavour to a soup. The type of soup will determine the type of stock Good consistency-the type of soup will determine what consistency is needed, e.g. a consommé would have a much lighter and thinner consistency than a creamy butternut soup which is thicker and creamier in consistency Well-seasoned Good texture-texture is dependent on the type of soup, e.g. vegetables should be al dente, and meat should be tender Convenience in preparation: To be used as an instant soup sachet which consumers would simply pour into a bowl/cup and add hot water to, e.g. Cup of Soup Ingredients are pre-portioned Ingredients are dried for extended shelf life	Characteristics of a good granola: • Golden brown colour • Good crunchy texture • Well-seasoned granolas typically have a sweet flavour which can range from anything from cinnamon to chocolate • Long shelf life • Health aspects: lower in sugar and fat • Inclusion of fruit or nuts or both • Ability to be eaten with milk or as a topping to yoghurt • Pleasing flavour Convenience in preparation: To be used as an instant breakfast cereal to be eaten with milk, yoghurt or amasi or as a topping Ingredients are dried for extended shelf life

	Morogo bread	Morogo soup	Morogo granola
Sensory characteristics desired	<u>Appearance:</u> Even golden brown colour, no lip at the upper edge of the loaf Rounded top May have a centre crack Evenly browned top and bottom crust Uniform crumb colour Well distributed morogo, herbs and spices <u>Tenderness</u> Crisp, tender crust Firm, but delicate crumb <u>Texture</u> Relatively fine crumb Uniform grain No tunnelling Moist <u>Flavour</u> Balanced flavour Balanced spices Characteristic flavour of the variety of the bread Sourness from Amasi	<u>Concentrated stock paste:</u> Appearance: Deep brown colour Texture: Paste-like, smooth Flavour: Umami, salty Consistency: Paste-like, not too runny Aroma: Roasted vegetable <u>Smash (dehydrated potato):</u> Appearance: White to beige in colour Texture: Grainy, not lumpy Flavour: Must taste like a roast potato Consistency: Powder-like Aroma: Roasted potato <u>Instant soup:</u> Appearance: Green in colour Texture: Smooth, with vegetable pieces in-between Flavour: Dominant morogo flavour Consistency: consommé like, not too runny Aroma: Roasted vegetables with a predominant morogo aroma	<u>Flavour:</u> The granola should have a prominent cinnamon flavour <u>Colour:</u> The granola should be golden brown in colour with green flakes in between from the morogo <u>Texture:</u> The granola should have a crunchy taste and be able to keep its structure fairly well when in contact with liquids (e.g. milk) for a brief period before it softens <u>Taste</u> The granola should have a sweet and nutty caramelised taste <u>Smell</u> The granola should have a warm caramelised and nutty smell
Role of ingredients	<u>Flour:</u> Flour is the structure and bulk giving ingredient. It absorbs moisture in order to provide the structure and body in baked goods <u>Baking powder:</u> Baking powder is a chemical leavener that was the rising agent used in the morogo bread. Its role is to provide volume in baked goods <u>Amasi:</u> Amasi is a fermented milk product that has acidity and makes baked goods more tender and keeps them moist by breaking down gluten <u>Vegetable oil:</u>	<u>Morogo:</u> Main flavour component. It gives the product its authenticity <u>Potato:</u> The potato is converted into a powder. This contributes to the soups' body and consistency <u>Onion:</u> The onion gives the soup a sweet flavour and also contributes to the texture as the onion is served in pieces <u>Cumin:</u> When the cumin is roasted, it contributes to a nutty flavour <u>Coriander:</u>	<u>Honey, cinnamon and shredded coconut:</u> These flavours will be the predominant flavours in the granola <u>Puffed sorghum and dried fruits:</u> These ingredients will contribute to the granolas body substance and volume <u>Nuts and seeds:</u> Nuts and seeds will contribute to the granolas crunchy texture <u>Coconut oil:</u> The coconut oil will act as a supporting character in order to moisten the granola and not make it so dry <u>Salt:</u>

	Morogo bread	Morogo soup	Morogo granola
Role of ingredients Cont.	Adds flavour, moisture, and colour to baked goods. It tenderises a product as well as adding richness and assists in extending the products shelf life <u>Eggs:</u> Eggs add protein to the dough as well as provides structure and strength to the baked product <u>Liquid ingredients (eggs, amasi, and oil)</u> Provides necessary moisture in a mixture to gelatinise the starch and assist with gluten development <u>Morogo:</u> Used to add nutritional aspects as well as its characteristic flavour to the bread <u>Spices:</u> Spices will add to the depth of flavour of the bread	Contributes to a zesty flavour <u>Lemon juice:</u> The lemon juice gives acidity to the soup in order to balance its flavour <u>Salt:</u> Enhances the flavours of the soup <u>Pepper:</u> Adds depth of flavour <u>Vegetable stock:</u> The key ingredient to a vegetable soup	The salt will enhance the flavour of the granola and balance all the flavours together
T-structure (Du Rand, 2015)	<u>Ingredients Determining Character:</u> Morogo-Flavour, Colour Amasi-Body, Texture Oil, flour, baking powder, bicarbonate of soda-Body, Consistency <u>Ingredients Contributing to the Support:</u> Morogo, onion, garlic, oregano-Flavour builders Allspice, coriander, cumin, paprika, cayenne pepper-Flavourers Salt and pepper-Seasonings	<u>Ingredients Determining Character:</u> Morogo-Flavour, Colour Potato-Body, Texture Vegetable Stock-Body, Consistency <u>Ingredients Contributing to the Support:</u> Onion-Flavour Vegetable Stock-Flavour Cumin-Flavour Coriander-Flavour Salt-Seasoning Pepper-Seasoning Lemon Juice-Acidity	<u>Ingredients Determining Character:</u> Morogo- Flavour, Colour Sorghum- Structure Dates, shredded coconut, dried apricots, peanuts, sunflower seeds- Texture and flavour variety <u>Ingredients Contributing to the Support:</u> Honey- Flavour builders Butter- Moisture Cinnamon- Flavour Salt –Seasoning

	Morogo bread	Morogo soup	Morogo granola
Preparation techniques	Morogo: Dehydrating Muffin mixing method By mixing liquids and dry ingredients separately and then combining them at the end allows for a more soft, tender and cake-like crumb Baking of bread: Baking of bread at 180˚C	Morogo: Dehydrating Dehydration: This allows for the product to have an extended shelf life Can be done by making use of a dehydrator, microwave (on high heat for a short period), or oven (low heat for a longer period) Boiling (reduction): In order to reduce the stock to a concentrated paste Boiling the potatoes to soften them Soup (desired manner): Cooking method: Boiling Dehydrating Rehydrating: when consumers add boiling water	Morogo: Dehydrating Dehydration: Dehydration is a method of food processing whereby the moisture is extracted and thus preserved for longer as the growth of microorganisms is inhibited Roasting: In order to create a caramelised flavour Popping: Popping and puffing can be accomplished using dry heat methods

4. Adaptations of ingredients and method for morogo products

A baseline recipe was chosen upon which changes and adaptions needed to be made to create the final prototype. Each week the adaptation was evaluated by subject experts as well as internal consumers. This can be seen in Table C4.

TABLE C4: ADAPTATIONS OF INGREDIENTS AND METHOD FOR DEVELOPEDMOROGO PRODUCTS

Original	Adaption 1	Adaption 2	Adaption 3
MOROGO BREAD			
Ingredients			
Quick bread: Yield: 1 loaf 100 g bacon, cooked and coarsely chopped 200 g flour, whole-wheat 140 g flour, cake 5 ml bicarbonate of soda 2 ml salt, fine 5 ml mustard, powder 1 ml cayenne pepper 100 ml parmesan cheese, grated 500 ml buttermilk 1 egg 15 ml Worcestershire sauce 2 g butter, salted	Morogo bread: Yield: 1 loaf 200 g flour, whole-wheat 140 g flour, cake 1.5 ml bicarbonate of soda 7.5 ml baking powder 5 ml salt, fine 25 g feta cheese, chopped 100 ml (15 g) morogo, dried 2.5 ml pepper, black, ground 2.5 ml cumin 2.5 ml allspice 2.5 ml coriander, ground 2.5 ml garlic, dried 25 g onion, dried 370 ml Amasi 1 egg 100 ml oil, vegetable 2 g butter, salted	Morogo bread: Yield: 1 loaf 140 g flour, whole-wheat 200 g flour, cake 5 ml bicarbonate of soda 10 ml baking powder 5 ml salt, fine 25 g feta cheese, chopped 100 ml (15 g) morogo, dried 3 ml pepper, black, ground 3 ml cumin 5 ml allspice 2.5 ml coriander, ground 2 ml paprika 2 ml cayenne pepper 7.5 ml oregano, dried 2.5 ml garlic, dried 25 g onion, dried 500 ml Amasi 1 egg 100 ml oil, vegetable 2 g butter, salted	Morogo bread: Yield: 1 loaf 140 g flour, whole-wheat 200 g flour, cake 5 ml bicarbonate of soda 10 ml baking powder 5 ml salt, fine 25 g feta cheese, chopped 100 ml (15 g) morogo, dried 3 ml pepper, black, ground 3 ml cumin 5 ml allspice 2.5 ml coriander, ground 0.5 ml paprika 0.5 ml cayenne pepper 7.5 ml oregano, dried 2.5 ml garlic, dried 25 g onion, dried 500 ml Amasi 1 egg 100 ml oil, vegetable 2 g butter, salted

Original	Adaption 1	Adaption 2	Adaption 3
Method			
1. Combine dry ingredients in a mixing bowl 2. Add egg, buttermilk, and Worcestershire sauce and mix until evenly blended 3. Grease a medium-sized loaf tin well with butter and spoon the batter into the tin. Smooth the top 4. Bake at 160C for about an hour until browned on top. **5.** Turn out and allow to cool.	1. Combine dry ingredients in a mixing bowl 2. Add egg, Amasi, vegetable oil and mix until evenly blended 3. Grease a medium-sized loaf tin well with butter, and spoon the batter into the tin. Smooth the top 4. Bake at 160˚C for about one hour until browned on top 5. Turn out and allow to cool	1. Combine dry ingredients in a mixing bowl 2. Add egg, Amasi, vegetable oil and mix until evenly blended 3. Grease a medium-sized loaf tin well with butter, and spoon the batter into the tin. Smooth the top 4. Bake at 160˚C for about one hour until browned on top 5. Turn out and allow to cool	1. Preheat oven to 160˚C 2. Mince garlic and dry in oven for 30 minutes 3. Slice onion thinly and dry in oven for 30 minutes 4. Combine dry ingredients in a mixing bowl 5. Add egg, Amasi, vegetable oil and mix until evenly blended 6. Grease a medium-sized loaf tin (29cm x 9cm x 9cm) well with butter, and spoon the batter into the tin. Smooth the top 7. Bake at 160˚C for about one hour until browned on top 8. Turn out and allow to cool
MOROGO SOUP			
Ingredients			
<u>Basic spinach soup:</u> Yield: 2200 g 50 g butter, salted 85 g celery 120 g leeks 90 g onion, spring 2.5 g pepper, black, coarse 2.5 g salt, fine 200 g potatoes 500 g spinach 1000 ml stock, vegetable 150 ml cream	<u>Fresh morogo soup:</u> Yield for 4 servings: 663 g soup ingredients 1000 g stock 1000 ml stock, vegetable (as made in baseline practical) 200 g potatoes 85 g celery 90 g spring onion 280 morogo leaves, fresh 4 g cumin, ground 4 g coriander, ground	<u>Fresh morogo soup:</u> Yield for 4 servings: 613 g soup ingredients 2000 g stock 2000 ml stock, vegetable 200 g potatoes 90 g brown onion 5 g salt, fine 280 g morogo leaves, fresh 30 ml juice, lemon 4 g cumin, ground 4 g coriander, ground	<u>Fresh morogo soup:</u> Yield for 4 servings: 225 g soup ingredients 1333 g stock 1333 ml stock, vegetable 85 g potatoes 90 g brown onion 4 g salt, fine 4 g pepper, black, ground 56 g morogo leaves, fresh 30 ml juice, lemon 4 g cumin, ground 4 g coriander, ground

Original	Adaption 1	Adaption 2	Adaption 3
Vegetable stock: Yield: 1371 g 13,5 ml oil, vegetable 112,5 g onion, small dice 56,25 g carrots, small dice 56,25 g celery, small dice 7 g garlic 30 g fennel, small dice 15 g turnip, diced 15 g tomatoes, diced 62,5 g wine, white 1000 ml water 1 g bay leaf, dried 1 g thyme, dried 1 g peppercorns, crushed 2.5 g parsley, fresh	Dry morogo soup: Yield for 4 servings: 126 g dried ingredients 120 g concentrated stock 120 g stock, concentrated 45 g potato, powder 30 g celery, dried 28 g spring onion, dried 45 g morogo leaves, dried 4 g cumin, ground 4 g coriander, ground	Dry morogo soup: Yield for 4 servings: 152 g dried ingredients 240 g concentrated stock 240 g stock, concentrated 42 g potato, powder 17 g onion, brown 5 g salt, fine 45 g morogo leaves, dried 30 ml juice, lemon 4 g cumin, ground 4 g coriander, ground	Dry morogo soup: Yield for 4 servings: 60 g dried ingredients 40 g concentrated stock 40 g stock, concentrated 10 g potato, powder 16 g onion, brown 4 g salt, fine 4 g pepper, black, ground 10 g morogo leaves, dried 8 ml juice, lemon 4 g cumin, ground 4 g coriander, ground
Method			
Basic spinach soup: 1. Heat the butter in a large saucepan. 2. Add the spring onion, leek, celery and potato. Stir and cover. Sweat for 10 minutes, stirring a couple of times 3. Pour in the stock and cook for 10-15 minutes until the potato is soft 4. Add the spinach and cook for a couple of minutes until wilted. Use a hand blender to blitz to a smooth soup 5. Stir in the cream. Reheat and serve Vegetable stock: 1. Heat the oil. Add the vegetables and sweat for 10 minutes 2. Add the wine, water, herbs, and spices	1. Preheat the oven to 70˚C 2. Place vegetable stock in a pot and allow to reduce 3. Peel and cut potatoes. Boil potatoes for 30 minutes and drain the water. Mash the potatoes. Place the mashed potatoes on a baking sheet and allow to dry in the oven 4. Finely chop spring onion and celery. Sprinkle spring onions with salt and place on a baking sheet and allow to dry in the oven 5. Place morogo leaves in the microwave on high for 4 minutes 6. Toast spices in a pan over medium heat	1. Preheat the oven to 120˚C 2. Place vegetable stock in a pot and allow to reduce 3. Peel and cut potatoes. Boil potatoes for 30 minutes and drain the water. Mash the potatoes. Place the mashed potatoes on a baking sheet and allow to dry in the oven 4. Peel and chop onion. Sprinkle onions with salt. Place on a baking sheet and place in the oven at 120˚C 5. Place morogo leaves in the microwave on high for 4 minutes 6. Toast spices in a pan over medium heat	1. Preheat the oven to 120˚C 2. Place vegetable stock in a pot and allow to reduce 3. Peel and cut potatoes. Boil potatoes for 30 minutes and drain the water. Mash the potatoes. Place the mashed potatoes on a baking sheet and allow to dry in the oven 4. Peel and chop onion. Sprinkle onions with salt. Place on a baking sheet and place in the oven at 120˚C 5. Place morogo leaves in the microwave on high for 4 minutes

Original	Adaption 1	Adaption 2	Adaption 3
3. Bring the mixture to a boil, reduce to a simmer and cook for 45 minutes 4. Strain, cool, and refrigerate	7. Place dried potatoes in a spice grinder to make a powder 8. Combine dried ingredients and wet ingredients separately	7. Place dried potatoes in a spice grinder to make a powder 8. Juice lemons and add to concentrated stock 9. Combine dried ingredients and wet ingredients separately	6. Toast spices (excluding salt and pepper) in a pan over medium heat 7. Place dried potatoes in a spice grinder to make a powder 8. Juice lemons and add to concentrated stock 9. Combine dried ingredients and wet ingredients separately <u>Components of morogo soup:</u> Concentrated vegetable stock Dried morogo Potato powder Salted dried onion flakes Toasted cumin and coriander spice Pepper
MOROGO GRANOLA			
Ingredients			
Yield: 500 g 200 g oats, rolled 50 g coconut, flakes 50 g dates, pitted 25 g apricots, dried 50 g almonds 50 g sunflower seeds 50 g honey 20 g butter 5 g cinnamon, ground	Yield: 500 g 150 g sorghum, puffed 50 g morogo, dried 50 g coconut, flakes 50 g dates, pitted 25 g apricots, dried 50 g peanuts 50 g sunflower seeds 50 g honey 20 g butter 5 g cinnamon, ground	Yield: 500 g 150 g sorghum, puffed 100 g morogo, dried 25 g coconut, flakes 50 g dates, pitted 25 g apricots, dried 50 g peanuts 50 g sunflower seeds 25 g honey 20 g butter 5 g cinnamon, ground	N/A
Method			
1.Measure ingredients 2.Cut apricots and dates into 5mm pieces	1. Preheat oven to 125˚C 2.Measure ingredients 3. Cut apricots into 5mm pieces	1. Puffing the sorghum: Heat a medium-size pot on high heat for 5 minutes. To test if the pot is ready, add a drop of	N/A

Original	Adaption 1	Adaption 2	Adaption 3
3.Combine all ingredients 4.Roast in a 180˚C oven for 10 mins	4. Place the sorghum into a preheated pot and cover with the lid. Cook the grains, shaking the pot like you would make popcorn, until the grains begin to pop. When the popping has slowed to 7-8 seconds between pops, remove the pan from the heat. 5.Dry the morogo in the microwave and lightly crush by hand 6. Toast the peanuts in the preheated oven for 8 minutes 7.Combine all ingredients 8.Roast in a 180˚C oven for 10-15 mins until golden brown, stirring often to ensure all sides are baked	water, if it evaporates the pot is hot enough. Add 75 g of the sorghum grains to the pot and put the lid on. Gently shake the pot, the grains will start puffing when there is a 6-second pause between grains popping, remove the pot from the stove and repeat with the other 75 g. 2. To dehydrate the morogo leaves: Wash the leaves and pat dry. Place in a microwave-safe bowl. Put in the microwave for 3 minutes on high, remove and stir every 30 seconds, when done flake the leaves with your hands. 3. Cut the dates and apricots in 5 mm x 5 mm blocks. 4. Melt the honey, butter and cinnamon together in the microwave for 1 minute on high. 5. Add all the ingredients in a mixing bowl and combine. 6. Place on a baking paper-lined baking sheet and bake at 180 C for 15 minutes. 7. Remove, let cool and store in an airtight container	

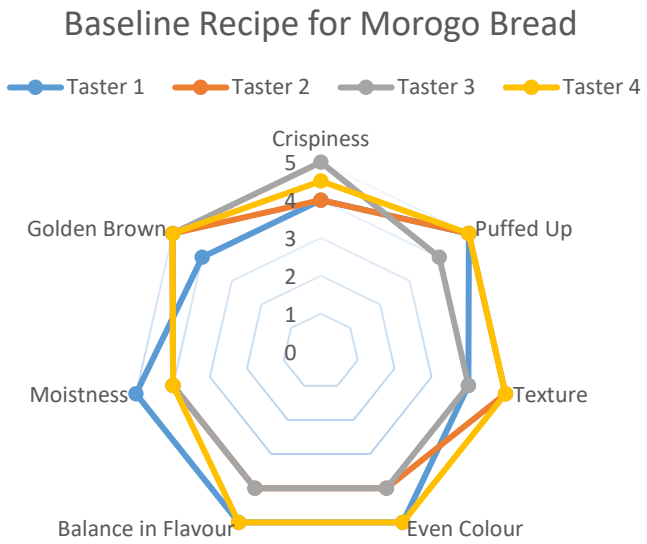
5. Evaluation by subject experts

After each adaptation, the product was evaluated by an internal panel of four participants (McWilliams, 2012:60). The following characteristics were evaluated: appearance, texture, aroma, and ease in preparation. For each characteristic, the following aspects had to be taken into account by the panel, which can be seen in Table C5. The participants had to evaluate each aspect on a 5 point Likert-type liking scale (1=dislike a great deal to 5=like a great deal) and then give an overall mark out of five for the flavour of the product. The results of the evaluation can be seen below in Table C6-8 for each adaptation.

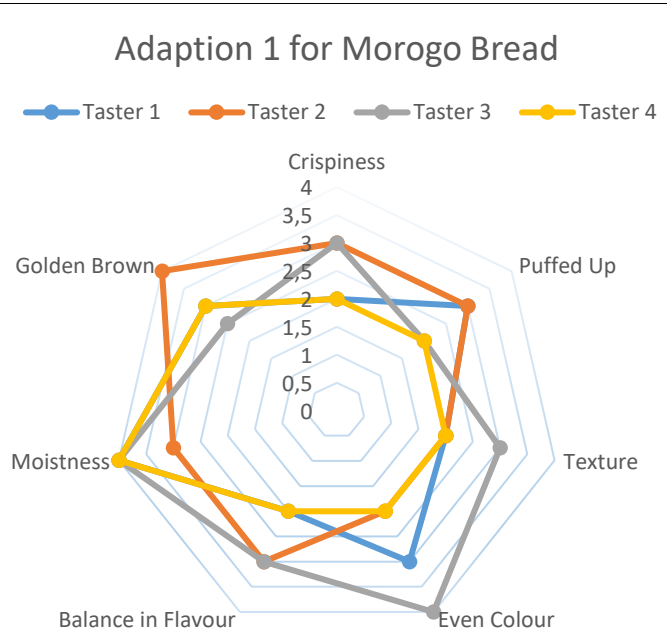
TABLE C5: SENSORY CHARACTERISTICS FOR EVALUATION

Morogo Product	Appearance	Flavour/Taste/Smell	Texture/Consistency	Practicality
Morogo Bread	Even golden brown colour, no lip at the upper edge of the loaf Rounded top May have a centre crack Evenly browned top and bottom crust Uniform crumb colour Well distributed morogo, herbs and spices	Balanced flavour Balanced spices Characteristic flavour of the variety of the bread Sourness from Amasi	Relatively fine crumb Uniform grain No tunnelling Moist <u>Tenderness</u> Crisp, tender crust Firm, but delicate crumb	Easy to eat Ease in preparation Will you try it again? Will you buy it for yourself?
Morogo Soup	Broth-like colour Morogo still green in colour Overall appearance	Morogo taste Broth taste Overall balance of flavours	Smooth texture Body from potatoes Free from lumps Leaves not too coarse (easily consumable)	Easy to eat Ease in preparation Will you try it again? Will you buy it for yourself?
Morogo Granola	Golden brown colour with bright green flakes in between	Nutty and earthy taste and smell Prominent cinnamon flavour Sweet, caramelised taste and smell	Crunchy	Easy to eat Ease in preparation Will you try it again? Will you buy it for yourself?

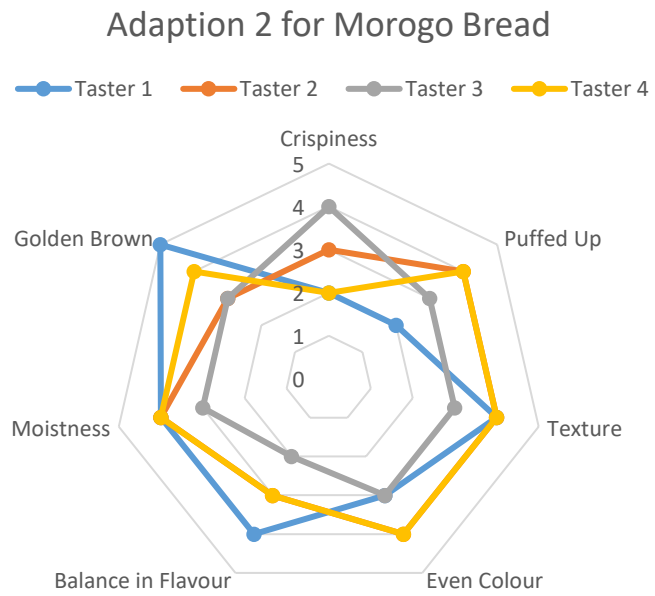
TABLE C6: EVALUATION OF MOROGO BREAD

Adaptation of recipe	Feedback of consumer panel
Baseline recipe	

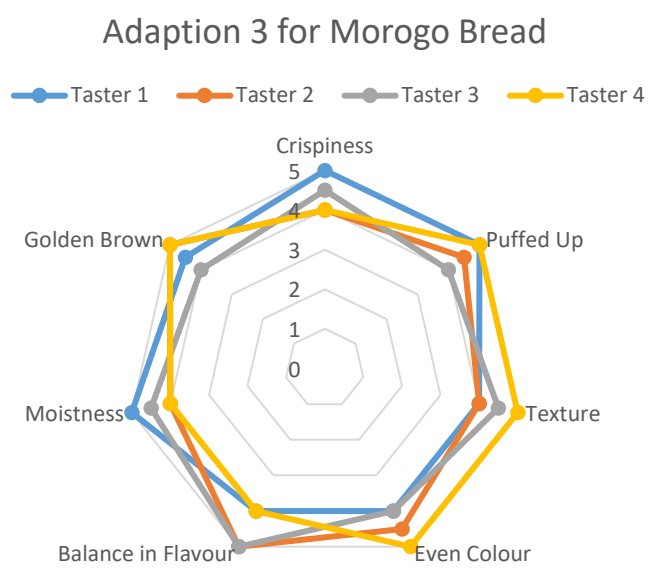
- An instant bread recipe was used as the baseline recipe
- The result was pleasing and was deemed acceptable for further adaptations
- Alterations to be made for first adaptation:
    - Amasi will be used instead of buttermilk
    - The morogo will be added in a dried form
    - Addition of spices for a more African flavour

Adaption 1	

- The focus of this adaption was to address the cracking of the bread, as well as its dense crumb which is not palatable
- In the following adaptation, the following should be addressed:
    - The seasonings must be adjusted to have a more balanced flavour
    - The colouring of the bread
    - The bread is too dense and thus needs to be lightened more-a possible reason could be due to overmixing
    - Decrease amount of flour used

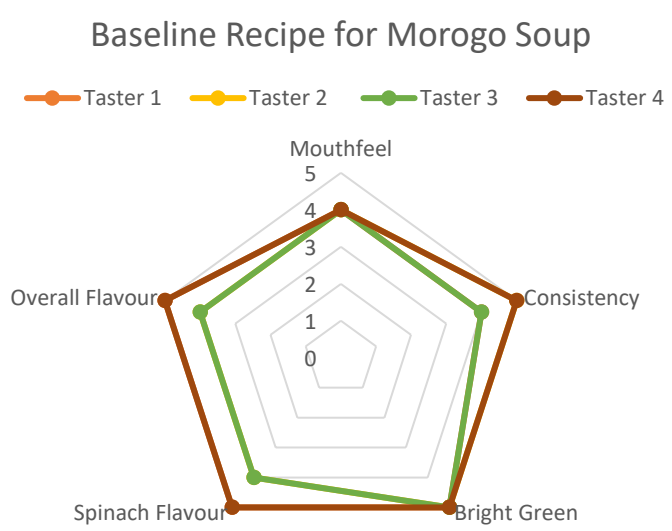
Adaption 2	

- The focus of this adaption was to address the seasoning which was not enough, resolve the moistness of the bread as it was quite soggy, resolve the tunnelling of the bread, and the colouring of the bread
- Outcomes of the second adaption:
    - Colour significantly improved but still quite green. A solution would be to dry the morogo or reduce the amount used
    - The bread was too heavy and still had tunnelling
    - There was too much paprika which overpowered the other flavours

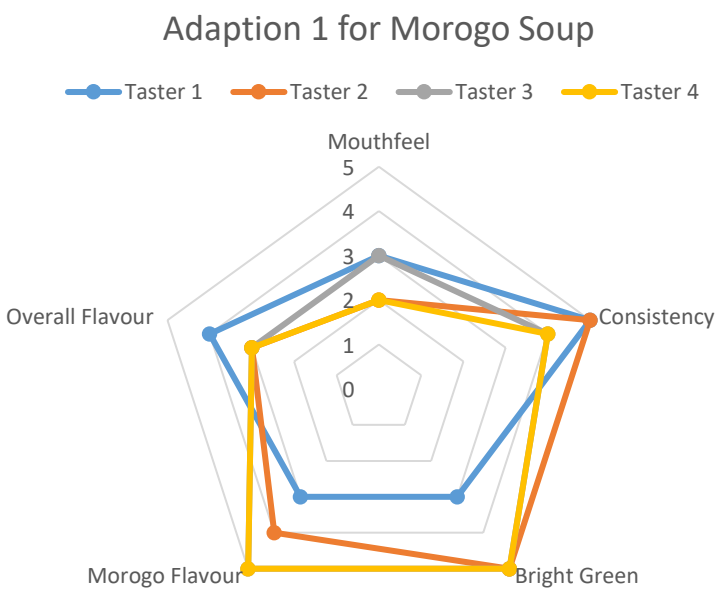
Adaption 3	

- In adaption 3, the following was implemented:
  - The spices and seasoning were adjusted
  - Improvement of shape and colour of bread
- The outcome of adaption 3:
  - The flavour and seasoning ratio is correct
  - The consistency was correct
  - The ratio of the ingredients was correct
  - The product has been approved for triple testing

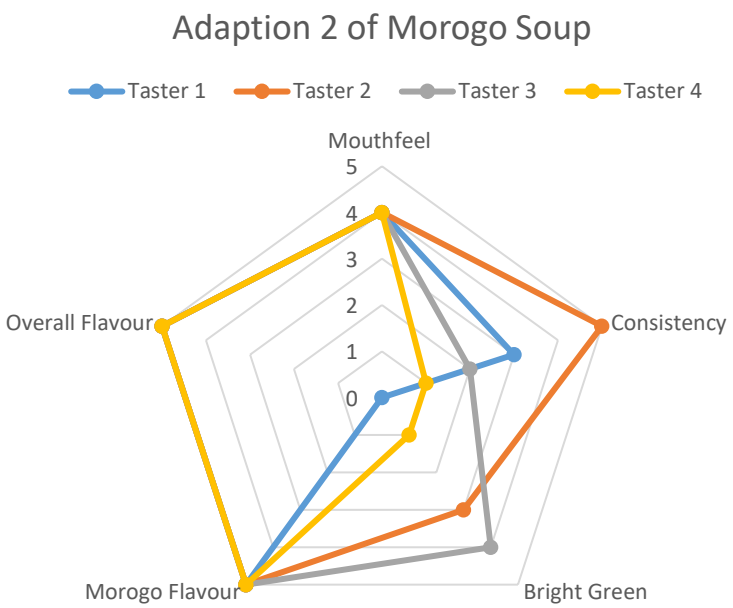
TABLE C7: EVALUATION OF MOROGO SOUP

Adaptation of recipe	Feedback of consumer panel
Baseline recipe	

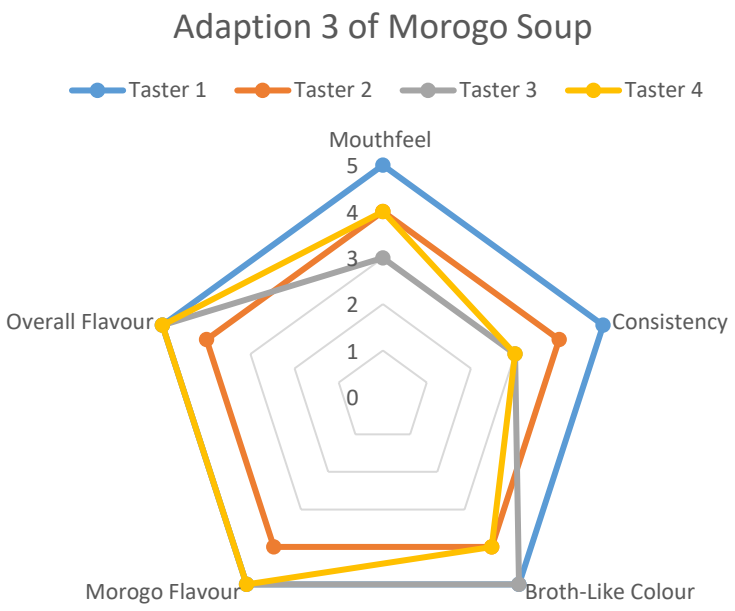
- The recipe worked well and was easy to prepare
- Good consistency of soup
- The recipe lacked seasoning
- The baseline recipe makes use of fresh ingredients, which is not possible for a product that requires a longer shelf life; thus further investigation is needed
- Alterations to be made for first adaptation:
    - The baseline recipe will be adjusted and used for further development
    - The aim for the final product will be to produce a concentrated stock, dehydrated crushed morogo leaves as well as dehydrated soup ingredients

Adaption 1	

- The focus of this adaption was to dehydrate all the ingredients and make a sachet
- To identify how the ingredients will differ from fresh to dry
- To identify where the recipe needs improvements/adjustments to better the product
- Outcomes of the first adaptation:
    - Initially, dried ingredients were divided into four equal parts
    - All ingredients were then added together with 250 ml of boiling water
    - The soup was very bitter and unpleasant
    - Research indicated that all the ingredients added had a bitter nature. Substitutes must be made along with changes in ingredient amounts
    - The soup was very grainy
- In the following adaptation, the following should be addressed:
    - The leaves will not be powdered but crushed for better mouthfeel
    - Seasonings must also be added (salt and pepper)

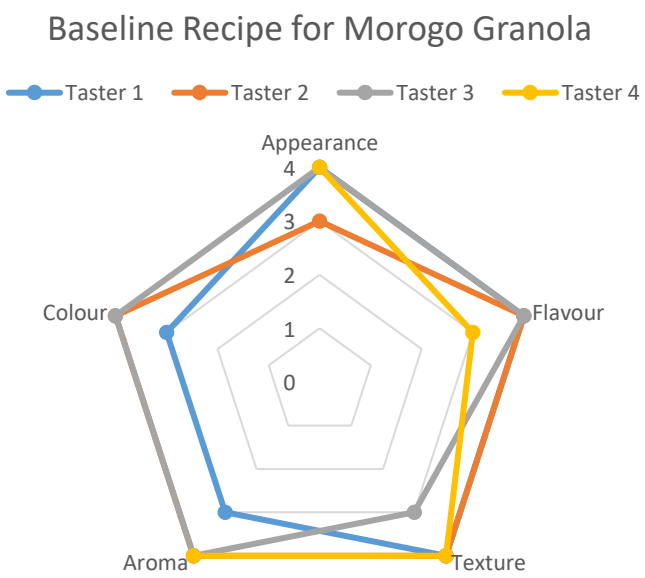
Adaption 2	

- The focus of this adaption was to reduce the bitterness of the soup by changing the ingredients as well as the amounts, using crushed morogo leaves instead of powdered leaves, replacing celery and spring onion with brown onion, and adding more lemon juice
- Outcomes of the second adaption:
    - Taste significantly improved
    - Leaves are too large with stems still intact (stems must be removed)
    - Very broth-like (brown in colour)

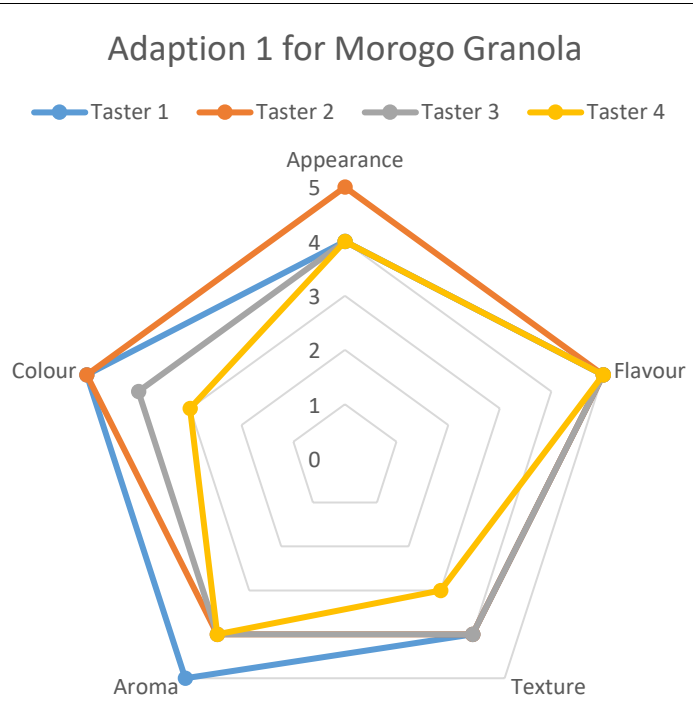
Adaption 3	

- In adaption 3, the following was implemented:
  - The paste amount was increased
  - The potato powder, as well as the crushed dried morogo, was decreased
  - Lemon juice has been added to the paste mixture
  - The portion size has been adjusted to 25 g per portion
- The outcome of adaption 3:
  - The flavour improved
  - The consistency was correct
  - The ratio of the ingredients was correct
  - The product has been approved for triple testing

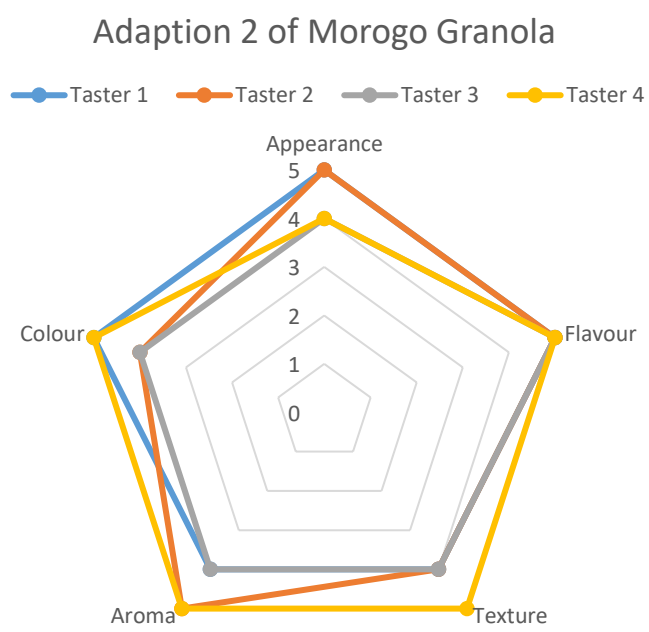
TABLE C8: EVALUATION OF MOROGO GRANOLA

Adaptation of recipe	Feedback of consumer panel
Baseline recipe	

- The recipe worked well and was easy to prepare
- The granola looked good and had a pleasant golden brown colour
- The granola was balanced in flavour and had a good crunchy texture
- **Baseline recipe deemed acceptable for further adaptations**

Adaption 1	

- The focus of this adaption was to include morogo and sorghum into the granola for a more African flavour
- The morogo was dried in the microwave, and the sorghum was popped in a hot pot
- The granola tasted good; however, the morogo was not prominent enough
- Granola was crunchy and appealing
- Granola was a good golden brown colour

Adaption 2	

- The focus of this adaption was to increase the amount of morogo, decrease the amount of coconut, and decrease the amount of honey used
- The granola tasted good, and the flavours were balanced
- The granola was crunchy and appetising
- The golden colour of the granola was attractive
- **The product was deemed acceptable for triple testing**

6. **Yield tests of developed products**

In order to confirm that the developed product is accurate and reliable, a triple test was performed whereby the recipe was repeated three further times in order to observe a difference in mass, taste, and appearance. The results can be seen in Table C9, which confirm that the products are is accurate and will reproduce the same result each time it is made. During triple testing, no further adjustments are made, which ensures consistent results.

TABLE C9: TRIPLE TESTING OF MOROGO PRODUCTS

YIELD FACTOR	TRIPLE TEST 1	TRIPLE TEST 2	TRIPLE TEST 3
Morogo Bread			
Total raw mass	1000 g	1000 g	1000 g
Total cooked mass	800 g	800 g	800 g
Yield factor	0.8	0.8	0.8
Yield factor %	80%	80%	80%
Handling loss	20%	20%	20%
Morogo Soup			
Total raw mass	1558 g	1582 g	1588 g
Concentrated/Dehydrated mass	25 g	25 g	25 g
Yield factor	0.984	0.984	0.984
Yield factor %	2%	2%	2%
Handling loss	98%	98%	98%
Morogo Granola			
Total raw mass	510 g	509 g	510 g
Total cooked mass	500 g	500 g	501 g
Yield factor	0.98	0.98	0.98
Yield factor %	98%	98%	98%
Handling loss	2%	2%	2%

7. **Prototype**

The developed prototypes can be seen in Table C10-12 below, which were used as the standardised recipes.

TABLE C10: STANDARDISED RECIPE FOR MOROGO BREAD

DATE	DISH		MOROGO BREAD	SOURCE	
15/06/2017	DESCRIPTION		Morogo bread with African flavours	Bupo, A.D.	
	SERVING SUGGESTION		Slice and top with butter		
	PORTION SIZE		50 g (1 slice)		
	NUMBER OF PORTIONS		12-15 portions (1 loaf)		
	PREPARATION TIME		120 minutes		
AMOUNT	**G/ML**	**INGREDIENT**	**METHOD**	**TIME/TEMP**	**EQUIPMENT**
PRE-PREPARATION					
			Preheat oven	160˚C	Oven
1000	ml	Morogo	Dry	4 mins	Microwave
25	g	Onion, brown	Slice into thin slices and dry	30 mins	Oven
2.5	ml	Garlic	Mince and dry	30 mins	Oven
PREPARATION					
200	g	Flour, cake	Sieve and combine dry ingredients and mix in oregano and dried	10 mins	Measuring cups
140	g	Flour, whole wheat	morogo, onion, and garlic		Measuring spoons
5	ml	Bicarbonate of soda			Scale
10	ml	Baking powder			Mixing bowl
5	ml	Salt, fine			
3	ml	Pepper, black, ground			
5	ml	Allspice			
3	ml	Cumin, fine			
7.5	ml	Oregano, dried			
2.5	ml	Coriander, ground			
0.5	ml	Paprika			
0.5	ml	Pepper, cayenne			
15	g	Morogo, dried			

500 100 1	ml ml unit	Amasi Oil, vegetable Egg, chicken, large	Whisk and combine wet ingredients	5 mins	Whisk Measuring cups Measuring spoons
25	g	Cheese, feta	Add liquid mixture to dry mixture and mix until just combined (do not overmix). Stir in feta cheese	5 mins	Mixing bowl Wooden spoon
2	ml	Butter, salted	Spoon mixture into the buttered bread tin and bake	160˚C 60 mins	Bread tin (29 cm x 9cm x 9cm) Oven
PLATING AND GARNISHING					
1000	g	Morogo bread	Slice and serve with desired toppings	5 mins	Bread knife

TABLE C11: STANDARDISED RECIPE FOR MOROGO SOUP

DATE	**DISH**		**MOROGO SOUP**	**SOURCE**	
15/06/2017	DESCRIPTION		Instant morogo soup	Bupo, A.D.	
	SERVING SUGGESTION		Add rapidly boiling water		
	PORTION SIZE		25 g		
	NUMBER OF PORTIONS		4		
	PREPARATION TIME		275 minutes (Dehydration takes place simultaneously, reducing cooking time)		
AMOUNT	**G/ML**	**INGREDIENT**	**METHOD**	**TIME/TEMP**	**EQUIPMENT**
PRE-PREPARATION					
			Preheat oven	120˚C	Oven
85	g	Potatoes	Peel and medium dice	5 min	Chopping board
90	g	Onions	Peel and chop	1 min	Chef's knife
30	ml	Lemon	Juice	2 min	Juicer
PREPARATION (next page)					

PREPARATION					
1350	ml	Stock, vegetable	Place stock in pot and allow to reduce	180 min	Stove, Pot
80	g	Potatoes, diced	Boil potatoes and drain water	30 min	Stove, Pot, Slotted spoon
			Mash potatoes	10 min	Masher
			Place potatoes on baking sheet and allow to dry in oven	180 min	Baking sheet
70	g	Onions, chopped	Sprinkle onions with salt, place on baking sheet and allow to dry in oven	180 min	Baking sheet, Oven
4	g	Salt, fine			
56	g	Morogo, leaves	Place morogo leaves in the microwave on high in batches of 2	4 min	Microwave
				4 min	Large bowl x2
10	g	Morogo, dried	Crush leaves	2 min	Large bowl
2	ml	Cumin, ground	Toast spices	2 min	Sauté pan
2	ml	Coriander, ground			Wooden spoon
15	g	Potato, dried	Place dried potatoes in a spice grinder to make a powder	10 min	Spice grinder, Sieve
PLATING AND GARNISHES					
		Vegetable stock,	Combine ingredients for 1 serving	10 min	Measuring spoons
10	g	concentrated			
5	g	Juice, lemon			Scale
2,5	g	Morogo, dried			Packaging cup
2,5	g	Potato, powder			
1	ml	Cumin, ground			
1	ml	Coriander, ground			
1	ml	Pepper, fine			
4	g	Onion, dried			

TABLE C12: STANDARDISED RECIPE FOR MOROGO GRANOLA

DATE	DISH		MOROGO GRANOLA	SOURCE	
15/06/2017	DESCRIPTION		Morogo granola with African flavours	Bupo, A.D.	
	SERVING SUGGESTION		Serve with milk, yoghurt or Amasi		
	PORTION SIZE		50 g		
	NUMBER OF PORTIONS		10 (500 g)		
	PREPARATION TIME		40 minutes		
AMOUNT	**G/ML**	**INGREDIENT**	**METHOD**	**TIME/TEMP**	**EQUIPMENT**
PRE-PREPARATION					
			Preheat oven	180˚C	Oven
150	g	Sorghum, grains	Heat pot, and add 75g of sorghum. Cover with lid and gently shake pot. Remove from heat when there is a 6-second pause between pops. Remove from heat and repeat with remaining grains	10 mins	Medium Pot
100	g	Morogo, Mondia whitei	Wash and pat dry. Microwave on high for 3 minutes and remove to stir every 30 seconds	3 mins	Microwave
			Flake leaves by hand	5 mins	
50	g	Dates, pitted	Cut into 5mm x 5mm blocks	7 mins	Chef knife
25	g	Apricots, dried			Chopping board
PREPARATION					
25 20 5	g g g	Honey Butter, salted Cinnamon, ground	Melt together and mix	1 min	Microwave
100 150 50 50 50 25 25 50	g g g g g g g g	Morogo, dried Sorghum, puffed Peanuts Sunflower seeds Dates, chopped Apricots, chopped Coconut, flaked Honey, butter and cinnamon mix	Combine ingredients	3 mins	Mixing bowl
500	g	Granola mixture	Bake	180˚C 15 mins	Oven Baking sheet
PLATING AND GARNISHING					
500	g	Morogo granola	Cool and store in an airtight container Serve with milk, yoghurt or Amasi		

8. Benchmarking

Various South African retail establishments were investigated in order to identify possible competing products for the morogo products. As seen in Table C13-15, there is quite a limited range of flavoured/healthy/vegetable-based product. The morogo used in the developed products added flavour, colour and nutrients which many of the products on the market do not. The developed morogo products were cost-effective in comparison and would provide a competitive edge due to its uniqueness.

TABLE C13: BENCHMARKING OF MOROGO BREAD

ITEM	QUANTITY	PRICE	IMAGE	COMMENTS	SHELF LIFE
PICK N PAY					
Albany Rooibos and Rye Bread	700 g	R17.50	 **FIGURE C1: ALBANY ROOIBOS AND RYE BREAD**	Use of local ingredient (Rooibos) as a flavouring and added health benefit	1 week
Sandwich Loaf from Bakery Babka	400 g	R16.99	 **FIGURE C2: SANDWICH LOAF**	Simple sandwich bread, as was used in the baseline recipe	1-2 days

ITEM	QUANTITY	PRICE	IMAGE	COMMENTS	SHELF LIFE
WOOLWORTHS					
Gluten-Free Bread Mix	500 g	R39.95	 **FIGURE C3: GLUTEN FREE BREAD MIX**	A convenient bread mix which has been pre-measured and only required the addition of liquids. The mix can make 2 loaves or 2 pizza bases	1 year
Multi-seed Bread	450 g	R36.99	 **FIGURE C4: MULTISEED BREAD**	Ready to eat brown bread loaf with health benefits (multi-seed). High in fibre. Very expensive	1 week
Sandwich Loaf (Gluten-Free Brown Bread)	450 g	R46.99	 **FIGURE C5: GLUTEN FREE BROWN BREAD LOAF**	Ready to eat brown bread loaf with health benefits (gluten-free). Very expensive	1 week

TABLE C14: BENCHMARKING OF MOROGO SOUP

ITEM	QUANTITY	PRICE	IMAGE	COMMENTS	SHELF LIFE
PICK N PAY					
Knorr Cup a Soup	4 x 20g= 80g	R15.99	 **FIGURE C6: KNORR CUP A SOUP**	Just add water. There are a variety of flavours; however there are no morogo-like flavours available	Various months
Pick n Pay Instant Soup	4 x 20g= 80g	R10.99	 **FIGURE C7: PICK N PAY INSTANT SOUP**	Just add water. There are a variety of flavours; however there are no morogo-like flavours available	Various months
WOOLWORTHS					
Fresh Spinach, Broccoli and Kale Soup	600 g	R29.99	 **FIGURE C8: FRESH SPINACH, BROCCOLI AND KALE SOUP**	A creamy vegetable soup packed with fresh kale, broccoli and spinach	Various days

TABLE C15: BENCHMARKING OF MOROGO GRANOLA

ITEM	QUANTITY	PRICE	IMAGE	COMMENTS	SHELF LIFE
PICK N PAY					
Jungle Muesli Mixed Berries Lite	400 g	R42.99	 **FIGURE C9: JUNGLE MUESLI MIXED BERRIES LITE**	A healthier granola option but it is quite an expensive option. There is an addition of fruit in this granola which is beneficial	12 months
Nature's Choice Granola	750 g	R54.99	 **FIGURE C10: NATURE'S CHOICE GRANOLA**	High in sugar and fat, but relatively affordable in price. There is no inclusion of fruits or vegetables	12 months
WOOLWORTHS					
Baked Crunchy Granola	1200 g	R57.99	 **FIGURE C11: BAKED CRUNCHY GRANOLA**	High in sugar and fat, but competitive in pricing in comparison to the other granolas found. There is no inclusion of fruits or vegetables	12 months

ITEM	QUANTITY	PRICE	IMAGE	COMMENTS	SHELF LIFE
Raw kale, moringa & Coconut Granola	250 g	R55.99	 **FIGURE C12: RAW KALE, MORINGA & COCONUT GRANOLA**	Inclusion of vegetable in granola as seen in the morogo granola, and is low in sugar. It is very expensive for its pack size and has a high amount of fat	2 months

9. Upscale

The original products were developed for 4-6 servings. In order to check for the accuracy and reliability of the product, the products were tested on a large scale volume. This can be seen in Tables C16-18.

TABLE C16: UPSCALING OF MOROGO BREAD

DATE	DISH		MOROGO BREAD	SOURCE	
15/06/2017	DESCRIPTION		Morogo bread with African flavours	Bupo, A.D.	
	SERVING SUGGESTION		Slice and top with butter		
	PORTION SIZE		50 g (1 slice)		
	NUMBER OF PORTIONS		24-30 portions (2 loaves)		
	PREPARATION TIME		120 minutes		
AMOUNT	**G/ML**	**INGREDIENT**	**METHOD**	**TIME/TEMP**	**EQUIPMENT**
PRE-PREPARATION					
			Preheat oven	160˚C	Oven
2000	ml	Morogo	Dry	10 mins	Microwave
50	g	Onion, brown	Slice into thin slices and dry	45 mins	Oven
5	ml	Garlic	Mince and dry	45 mins	Oven
PREPARATION					
400	g	Flour, cake	Sieve and combine dry ingredients and mix in oregano and dried morogo, onion, and garlic	10 mins	Measuring cups
280	g	Flour, whole wheat			Measuring spoons
10	ml	Bicarbonate of soda			Scale
20	ml	Baking powder			Mixing bowl
10	ml	Salt, fine			
6	ml	Pepper, black, ground			
10	ml	Allspice			
6	ml	Cumin, fine			
15	ml	Oregano, dried			
5	ml	Coriander, ground			
1	ml	Paprika			
1	ml	Pepper, cayenne			
30	g	Morogo, dried			
1000	ml	Amasi	Whisk and combine wet ingredients	5 mins	Whisk
200	ml	Oil, vegetable			Measuring cups
2	units	Egg, chicken, large			Measuring spoons

50	g	Cheese, feta	Add liquid mixture to dry mixture and mix until just combined (do not overmix). Stir in feta cheese	5 mins	Mixing bowl Wooden spoon
5	ml	Butter, salted	Spoon mixture into the buttered bread tin and bake	160˚C 60 mins	Bread tin (29 cm x 9cm x 9cm) Oven
PLATING AND GARNISHING					
2000	g	Morogo bread	Slice and serve with desired toppings	5 mins	Bread knife

TABLE C17: UPSCALING OF MOROGO SOUP

DATE	**DISH**		**MOROGO SOUP**	**SOURCE**	
15/06/2017	DESCRIPTION		Instant morogo soup	Bupo, A.D.	
	SERVING SUGGESTION		Add rapidly boiling water		
	PORTION SIZE		25 g		
	NUMBER OF PORTIONS		24		
	PREPARATION TIME		275 minutes (Dehydration takes place simultaneously, reducing cooking time)		
AMOUNT	**G/ML**	**INGREDIENT**	**METHOD**	**TIME/TEMP**	**EQUIPMENT**
PRE-PREPARATION					
			Preheat oven	120˚C	Oven
510	g	Potatoes	Peel and medium dice	30 min	Chopping board
540	g	Onions	Peel and chop	12 min	Chef's knife
180	ml	Lemon	Juice	18 min	Juicer
PREPARATION					
8100	ml	Stock, vegetable	Place stock in pot and allow to reduce	180 min	Stove, Pot
480	g	Potatoes, diced	Boil potatoes and drain water Mash potatoes Place potatoes on baking sheet and allow to dry in oven	60 min 15 min 180 min	Stove, Pot, Slotted spoon Masher Baking sheet
420 24	g g	Onions, chopped Salt, fine	Sprinkle onions with salt, place on baking sheet and allow to dry in oven	180 min	Baking sheet, Oven
336 60	g g	Morogo, leaves Morogo, dried	Place morogo leaves in the microwave on high in batches of 2 Crush leaves	24 min 24 min 12 min	Microwave Large bowl x2 Large bowl
12	ml	Cumin, ground	Toast spices	7 min	Sauté pan
12	ml	Coriander, ground			Wooden spoon
90	g	Potato, dried	Place dried potatoes in a spice grinder to make a powder	30 min	Spice grinder, Sieve

PLATING AND GARNISHES					
10	g	Vegetable stock, concentrated	Combine ingredients for 1 serving	30 min	Measuring spoons
5	g	Juice, lemon			Scale
2,5	g	Morogo, dried			Packaging cup
2,5	g	Potato, powder			
1	ml	Cumin, ground			
1	ml	Coriander, ground			
1	ml	Pepper, fine			
4	g	Onion, dried			

TABLE C18: UPSCALING OF MOROGO GRANOLA

DATE	DISH		MOROGO GRANOLA	SOURCE	
15/06/2017	DESCRIPTION		Morogo granola with African flavours	Bupo, A.D.	
	SERVING SUGGESTION		Serve with milk, yoghurt or Amasi		
	PORTION SIZE		50 g		
	NUMBER OF PORTIONS		30 (1500 g)		
	PREPARATION TIME		60 minutes		
AMOUNT	**G/ML**	**INGREDIENT**	**METHOD**	**TIME/TEMP**	**EQUIPMENT**
PRE-PREPARATION					
			Preheat oven	180˚C	Oven
450	g	Sorghum, grains	Heat pot, and add half of the sorghum. Cover with lid and gently shake pot. Remove from heat when there is a 6-second pause between pops. Remove from heat and repeat with remaining grains	20 mins	Large Pot
300	g	Morogo, Mondia whitei	Wash and pat dry. Microwave on high for 3 minutes and remove to stir every 30 seconds Flake leaves	10 mins 5 mins	Microwave Kenwood chopper
150	g	Dates, pitted			
75	g	Apricots, dried	Cut into small pieces	5 mins	Kenwood chopper
PREPARATION					
75	g	Honey			
60	g	Butter, salted			
15	g	Cinnamon, ground	Melt together and mix	1 min	Microwave
300	g	Morogo, dried			
450	g	Sorghum, puffed	Combine ingredients	3 mins	Mixing bowl

150	g	Peanuts			
150	g	Sunflower seeds			
150	g	Dates, chopped			
75	g	Apricots, chopped			
75	g	Coconut, flaked			
150	g	Honey, butter and cinnamon mix			
1500	g	Granola mixture	Bake	180˚C 15 mins	Oven Baking sheet
PLATING AND GARNISHING					
1500	g	Morogo granola	Cool and store in an airtight container Serve with milk, yoghurt or Amasi		

ADDENDUM D: PHASE 3: SENSORY QUESTIONNAIRE
African Green Leafy Vegetables: Phase 3

Start of Block: CONSENT AND BACKGROUND

Dear Respondent,

Thank you for participating in this study regarding new and innovative product development using indigenous African green leafy vegetables (morogo).The findings of this study will form part of a dissertation for a Master's degree in consumer science from the University of Pretoria. The objective of this sensory evaluation is to evaluate the sensory properties of the food product as well as to determine its acceptability. Participants will be asked to answer a number of questions which will take a maximum of 15 minutes to complete. This will also include the tasting of the developed product. Participation is not compulsory, and all information will be treated as highly confidential and will only be used for research purposes. Thus the participants' responses and information will remain anonymous. The answering of questions will indicate that the respondent is willing to participate but should he/she decide to withdraw from the study; he/she will not be penalised in any way. Please read the instructions carefully and give your honest opinion throughout. Thank you for your time and participation! Yours sincerely Ana Dinorah Bupo M Consumer Science: Food Management Student

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Should you have any questions, please do not hesitate to contact me or my supervisor: Student: A.D. Bupo l 072 270 8534 l ana.bupo@up.ac.za

Supervisor: Professor GE du Rand l 0124203547 l gerrie.durand@up.ac.za

Please would you be so kind as to indicate whether you give your consent to participate further in the study

- ○ I agree (1)
- ○ I disagree (2)

End of Block: CONSENT AND BACKGROUND

Start of Block: SECTION A: DEMOGRAPHICS

Morogo and other African wild spinach varieties African green leafy vegetables (aka morogo) are known as wild vegetables. These vegetables are high in nutrients and are often higher in nutrients than other commonly eaten vegetables. There is a gap of knowledge in the area of development and innovation in these vegetables which have the potential to be developed in terms of availability and commercialisation. This has hardly been achieved due to the fact that most of its consumers harvest the plants directly from the wild or view them as inferior products.

By using African green leafy vegetables as an ingredient to a new product, one encourages the growth and

consumption of the local ecosystem, which is recognised internationally and is becoming novel in the food industry. Local and traditional food has a structure of resistance to conventional globalising food systems which need to be overcome in order for consumers to accept it as part of their food culture and not as old fashioned.

Please tell us more about yourself by answering all of the questions:

Please note that all of your responses will remain anonymous and will only be used for academic purposes

Q1.1 What is your gender?

- ○ Male (1)
- ○ Female (2)

Q1.2 What was your age at your last birthday?

*Please do not continue if you are under the age of 18 years

Age in Years (1)	

Q1.3 What is your highest level of education?

- ○ Lower than grade 12 (1)
- ○ Grade 12 (2)
- ○ Degree/Diploma (3)
- ○ Post graduate qualification (4)

Q1.4 To which population group do you belong to according to the SA population Act?

- ○ Asian (1)
- ○ Black (2)
- ○ Coloured (3)
- ○ White (4)
- ○ Other (5)

Q1.5 What is your approximate household total monthly income?

- ○ Less than R5000 (1)
- ○ R5000 - R9999 (2)
- ○ R10 000 - R14 999 (3)
- ○ R15 000 - R19 999 (4)
- ○ R20 000 - R24 999 (5)
- ○ R25 000 or more (6)

End of Block: SECTION A: DEMOGRAPHICS

Start of Block: Block 5

Before continuing with the rest of the questions, please make sure to taste sample one

End of Block: Block 5

Start of Block: Block 6

Now that you have tasted Sample 1, please would you be so kind as to taste Sample 2 (morogo) and then answer the questions on the following page relating to Sample 2 (Sample 1 will not be evaluated)

When tasting the product, please take note of the following characteristics:

Appearance

Smell

Taste

Texture

End of Block: Block 6

Start of Block: SECTION B: CATA

Q2 **Please select the characteristics which represent your opinion about an innovative culinary convenience food product made with morogo**

You may select as MANY as you think applicable

	Select ALL That Apply (1)
Vivid green (Q2_7)	☐
Dull green (Q2_8)	☐
Strong vegetable smell (Q2_4)	☐
Weak vegetable smell (Q2_3)	☐
Seasoned (Q2_5)	☐
Strong morogo flavour (Q2_6)	☐
Al dente (still firm) (Q2_1)	☐
Overcooked (Q2_2)	☐
Sticky (Q2_9)	☐
Dry (Q2_10)	☐
Good (Q2_11)	☐
Bad (Q2_12)	☐

End of Block: SECTION B: CATA

Start of Block: SECTION C: LIKING SCALE

X→ X→

Q3 **After tasting this product how much do you like it?**

	Dislike extremely (1)	Dislike very much (2)	Dislike moderately (3)	Dislike slightly (4)	Neither like nor dislike (5)	Like slightly (6)	Like moderately (7)	Like very much (8)	Like extremely (9)
My opinion of the product tasted (Sample 2) (1)	○	○	○	○	○	○	○	○	○

End of Block: SECTION C: LIKING SCALE

Start of Block: SECTION D: PURCHASE INTENTION

Q4 **After tasting this product, how likely are you to purchase it?**

	I would never buy this product (1)	I would not buy this product (2)	I would not consider buying this product (3)	I would consider buying this product (4)	I would buy this product (5)	I would buy this product seldom (6)	I would buy this product occasionally (7)	I would buy this product as often as I could (8)	I would buy this product every time I could (9)
How likely are you to purchase this product? (1)	○	○	○	○	○	○	○	○	○

End of Block: SECTION D: PURCHASE INTENTION

ADDENDUM E: DEVELOPMENT OF OPTIMUM RECIPE

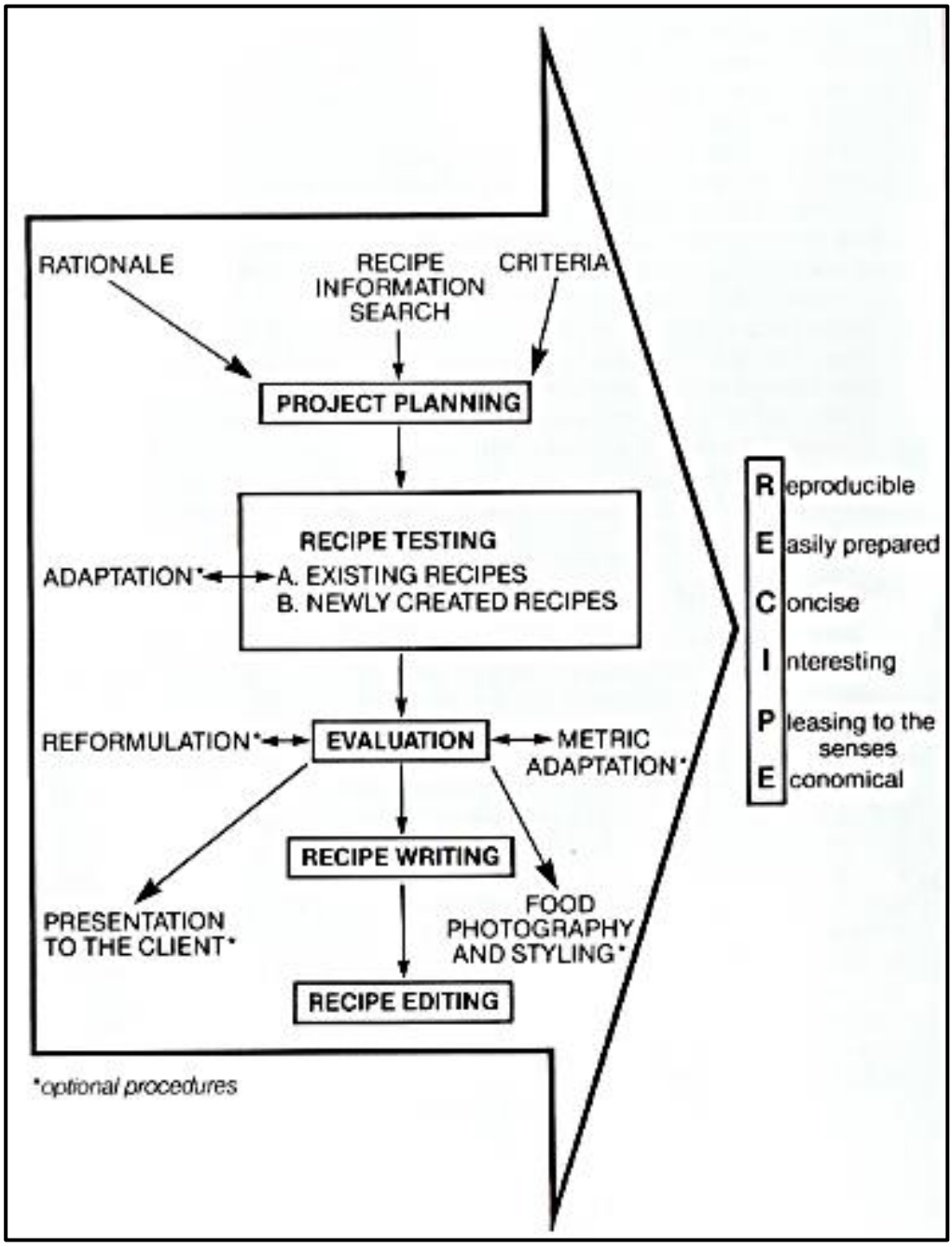


FIGURE E1: DEVELOPMENT OF OPTIMUM RECIPES (HULLAH, 1984: 3)

ADDENDUM F: PROJECT PLANNING PATTERN

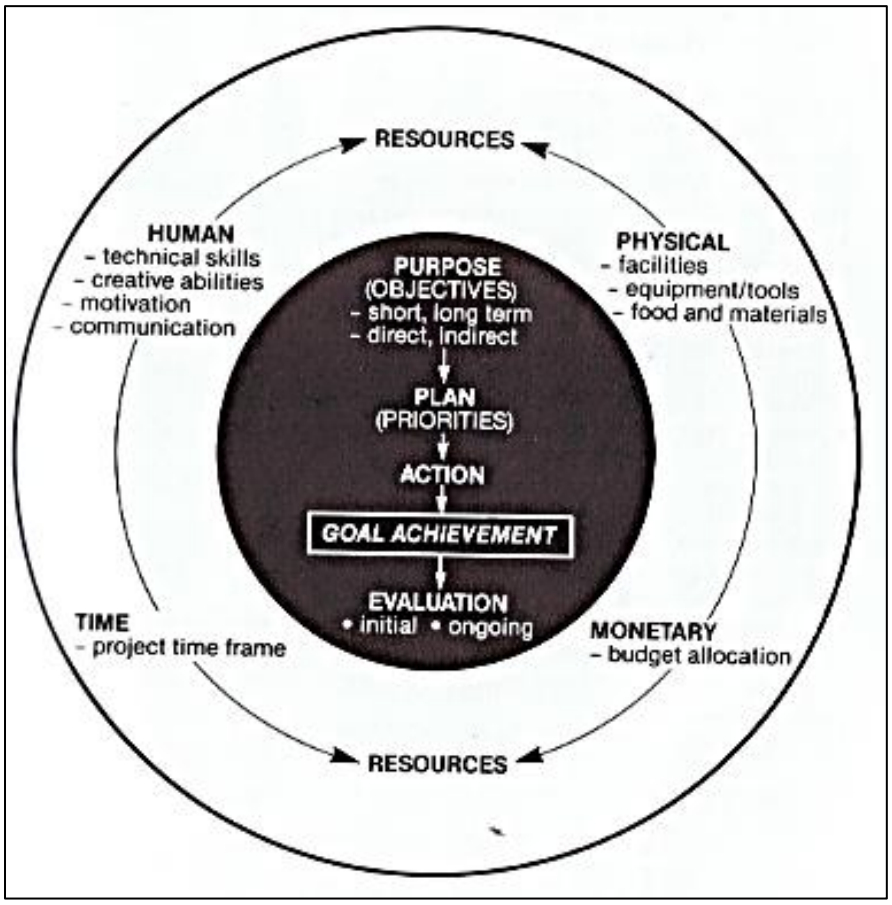
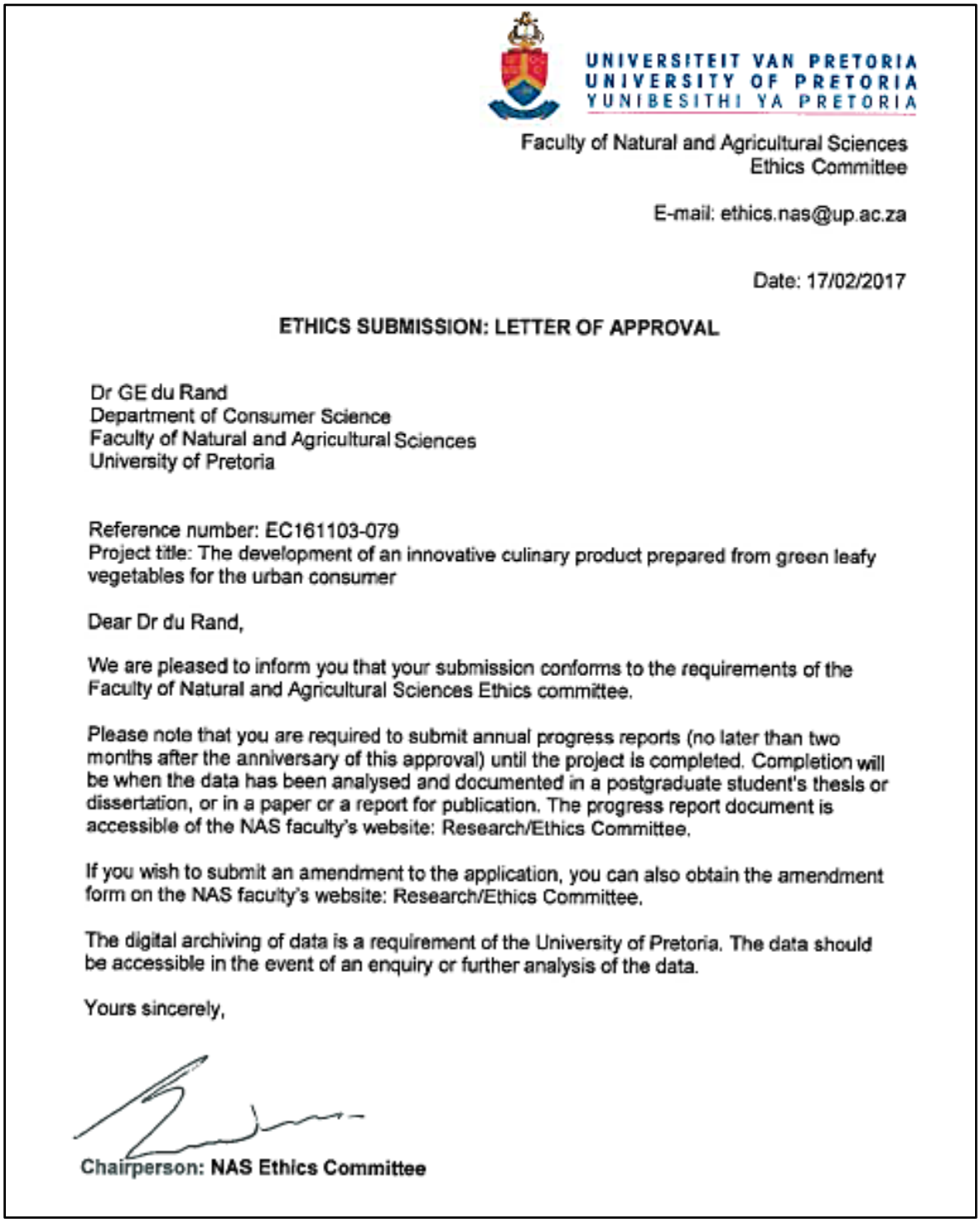


FIGURE F1: PROJECT PLANNING PATTERN (HULLAH, 1984: 8)

ADDENDUM G: ETHICAL CLEARANCE



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UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Natural and Agricultural Sciences
Ethics Committee

E-mail: ethics.nas@up.ac.za

Date: 17/02/2017

ETHICS SUBMISSION: LETTER OF APPROVAL

Dr GE du Rand
Department of Consumer Science
Faculty of Natural and Agricultural Sciences
University of Pretoria

Reference number: EC161103-079
Project title: The development of an innovative culinary product prepared from green leafy vegetables for the urban consumer

Dear Dr du Rand,

We are pleased to inform you that your submission conforms to the requirements of the Faculty of Natural and Agricultural Sciences Ethics committee.

Please note that you are required to submit annual progress reports (no later than two months after the anniversary of this approval) until the project is completed. Completion will be when the data has been analysed and documented in a postgraduate student's thesis or dissertation, or in a paper or a report for publication. The progress report document is accessible of the NAS faculty's website: Research/Ethics Committee.

If you wish to submit an amendment to the application, you can also obtain the amendment form on the NAS faculty's website: Research/Ethics Committee.

The digital archiving of data is a requirement of the University of Pretoria. The data should be accessible in the event of an enquiry or further analysis of the data.

Yours sincerely,

Chairperson: **NAS Ethics Committee**

FIGURE G1: ETHICAL CLEARANCE

ADDENDUM H: LANGUAGE EDITING

STYLUS

[Linton and Beverlie Davies (Partners) – T/A Stylus]
(Independent Contractors – Partnership – established 1993)

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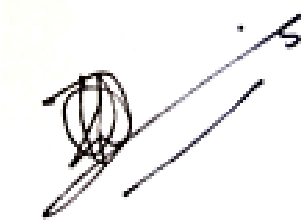
LANGUAGE EDITING

I, Linton Davies, Full Member of the Professional Editors' Guild of South Africa, hereby declare that I have edited the language in the Master's dissertation entitled *The development of an innovative culinary product prepared from African green leafy vegetables for the urban consumer* by Ana Dinorah Bupo.



Date: 29 October 2019

FIGURE H1: LANGUAGE EDITING

ADDENDUM I: LIST OF CONFERENCES ATTENDED

1. SAAFECS (South African Association of Family Ecology and Consumer Science), 2018

13th international SAAFECS

Venue: St George Hotel and Conference Centre, Irene, South Africa

Date of conference: 5-9 March 2018

Theme of conference: "Consumer science in pursuit of the future"

Date of oral presentation: 6 March 2018

Title: The development of an innovative culinary product prepared from green leafy vegetables for the urban consumer

Keywords:

African green leafy vegetables
Morogo
Recipe development,
Consumer-led product development
Sensory evaluation
Check all that apply

Abstract:

In most developed countries, indigenous leafy vegetables are regarded as weeds, but in Africa these vegetables are important to rural households. In South Africa these vegetables are referred to as morogo which mean edible green leafy vegetable. Indigenous or wild leafy vegetables are very nutritious foods which are underutilised. They have made a positive impact on the nutrient intake of local communities for many years due to their contribution of vitamins, minerals as well as phytochemicals and antioxidants. These vegetables were used traditionally as a relish or potherb (cooked in a pot) and served as an accompaniment to carbohydrate staples such as maize meal.

The increase in desire and need for convenience foods makes it imperative that healthy options are made available amongst other convenience food products as time is very valuable to the modern urban consumer. Using African green leafy vegetables helps traditional foods to not become lost in a westernised environment as well as to allow a healthier alternative product to be made available. In order to do this, consumers are vital to the process of product development as it is them who have the final say whether a product will be successful or not.

Methodology:

The aim of this study is to investigate and determine the characteristics and specifications desired in African green leafy vegetable products, to develop the culinary product using these vegetables and lastly to determine and evaluate the culinary product by means of sensory evaluation and consumer acceptance. This study will be conducted in three phases. During the first phase a quantitative research approach will be followed to collect demographic, background knowledge on these vegetables, product characteristics as well as consumption information of the participants to determine what type of convenience food product is needed in the food industry. A trend analysis will also be done in order to observe the trends in the industry regarding indigenous foods, health and convenience. This will be conducted in order to obtain a background knowledge on the subjects. During phase two the product will be developed which was indicated in phase one and will follow an experimental procedure. In the last phase, phase three, the product developed in phase two will be evaluated by means of sensory evaluation which ultimately aimed to describe and evaluate the final product.

The target population for this study is male and female consumers who are over the age of eighteen (to be able to make purchasing decisions) and reside in the province of Gauteng. The participants will also need to be able to read and understand English.

This study aims to contribute to the gap of knowledge in the development of innovative indigenous leafy vegetable products. The process used would enable one to follow it to develop another innovative culinary product. It also promotes the use of indigenous leafy vegetables which are sometimes seen as inferior but have the potential to be developed. This growth in the consumption of the local ecosystem is also recognized internationally and is becoming more novel. Value was also added to the study as a combination of culinary innovation and traditional recipe development was used in the development process.

2. Eurosense, 2018

8th European Conference on Sensory and Consumer Research

Venue: Centro Congressi VeronaFiere, Verona, Italy

Date of conference: 2-5 September 2018

Theme of conference: “A sense of taste”

Date of poster presentation: 4 September 2018

Title: Using Check All That Apply (CATA) to develop an innovative food product using African green leafy vegetables

Introduction:

Although *African green leafy vegetables* (AGLV) are still used throughout South Africa, consumption has decreased due to various reasons. These vegetables are perceived to be poverty foods or old fashioned yet little has been done in terms of investigating them. The aim of this study was to explore, describe and develop an innovative convenient food product using AGLV for the urban consumer in Gauteng in order to meet changing needs as a result of urbanisation, difficulty of access, changing food consumption patterns, convenience, health and wellbeing.

Methodology:

This study consisted of three phases. The culinary innovation model was followed in order to ensure that the product developed has competitive advantage and that value was created through product differentiation. Phase one of the study aimed to determine the products concept and specifications by making use of a *check all that apply* (CATA) questionnaire (n=183). CATA is an innovative sensory technique where consumers select as many terms as they like from a variety of options. The product was developed in phase two. Phase three made use of CATA (n=78) again in order to determine the sensory and hedonistic characterization and purchase intention of the developed product.

Results:

Results indicated that by using innovation and the CATA technique one could determine the type of African green leafy vegetable product to be developed as well as its desired features. Pasta was the desired product.

Discussion:

By making use of AGLV, growth and consumption of local foods will be encouraged. The information found contributes to the limited body of knowledge and can be used as a reference point for further investigation in traditional foods and new product development.