Value chain constraints analyses of selected medicinal and aromatic plants indigenous to South Africa

by

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ABSTRACT

The introduction of the New Growth Path (NGP) and the New Industrial Policy Framework (NIPF) have created an opportunity for the industrialisation of indigenous medicinal and aromatic plants (MAPs Amarula (Sclerocarya birrea), Buchu (Agathosma betulina), and *Pelargonium* (*Pelargonium* sidoides) for job creation and economic development in South Africa. The aim is to create a locally sustainable industry which creates jobs as well as improvement of the balance of payments. The National Growth Plan highlights some of the opportunities for industrialization as well as creation of decent jobs. There is increasing pressure on the harvesting of wild indigenous medicinal and aromatic plants (MAPS). The establishment of a local pharmaceutical and nutraceutical industry for processing MAPS remains a challenge in South Africa and many low income countries. The objective of this study was to assess the challenges and their impact looking at particular species, Amarula, Buchu and *Pelargonium* by using structured focus group interviews with users in communities and businesses in KwaZulu Natal Province, Eastern Cape and the Western Cape. More data/information was also collected from key stakeholder companies including desk-top reviews. Data/information was analysed using the SPSS computer programme and the Atlas software to summarize data and the results. Graphs and tables were used where necessary.

The qualitative research reported on some qualitative assessments and challenges facing the establishment of medicinal and aromatic plants in South Africa. Comparative findings from BRICS were also reported. The results of the study indicated that there is continuous exploitation of several medicinal plant species, for plant trade, from the wild and substantial loss of their habitat. The research identifies a number of challenges such as: poor standards for raw materials, lack of research and development linking industry driven revenues, demand exceeding supply, regulatory risk, community risk, lack of understanding of judicious agronomic practices, ethical challenges, liquidity risk as well as political instability fail to attract foreign direct investments. The research concludes that for the establishment of a viable local pharmaceutical industry,

beverage industry and nutraceutical industry with sustainable harvesting, there are serious hegemonic challenges which will require multi-stakeholder analysis. However, for the South African (SA) industry to be competitive, detailed feasibility studies need to be done comparing SA with other BRICS countries. There is also a need for the Research and Development to be strengthened. It must also be linked into industrial development in the industry. Furthermore there is a need to initiate the incentivizing of the pharmaceutical manufacturing to lower the cost of setting up the businesses in the industry and lessen the need to harvest from South African forests. Furthermore there is a need for programmes of production so that key species are given opportunity for cultivation and the attention they deserve to preserve these depleting resources.

Keywords: Sustainable harvesting, economic growth, job creation, plant trade, commercialisation

DECLARATION

Student number: 35500859

I declare that the “Value chain constraints analyses of selected medicinal and aromatic plants indigenous to South Africa” is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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SIGNATURE DATE

(Ms Unati Speirs)

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ACRONYMS AND ABBREVIATIONS

APAP	Agricultural Policy Action Plan
BRICS	Brazil, Russia, India, China and South
DAEARD	Department of Agriculture, Environmental Affairs and Rural Development
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DTI	Department of Trade and Industry
EC	Eastern Cape
FAO	Food and Agricultural Organisation
GDP	Gross Domestic Product
GDPR	Gross Domestic Product for Region
IPAP	Industrial Policy Action Plan
KZN	KwaZulu Natal
MAPs	Medicinal and Aromatic Plants
MCC	Medical Control Council
MDGs	Millennium Development Goals
MTP	Medium Term Plan
NDP	National Develop Plan
NGP	New Growth Path
NIPF	New Industrial Policy Framework
R&D	Research and Development
SA	South Africa
SADC	Southern African Development Community
SSA	Sub-Saharan Africa
Stats SA	Statistics South Africa
WC	Western Cape

CHAPTER 1

1.0 INTRODUCTION AND BACKGROUND OF STUDY

Medicinal and Aromatic Plants (MAPs), the lead crops which are the focus area of this study are *Pelargonium*, Buchu, Amarula in the Kwa-Zulu-Natal, Western Cape and Eastern Cape provinces. The MAPs (*Pelargonium*, Buchu, and Amarula) are botanical raw materials, also known as herbal drugs that are primarily used for therapeutic, aromatic and/or culinary purposes as components of cosmetics, medicinal products, health foods and other natural health products. They are also the starting materials for value-added processed natural ingredients such as essential oils, dry and liquid extracts and oleoresins. There is a clear industrial demand for MAPs (Amarula, *Pelargonium* and Buchu); because of the increased production of herbal health care formulations; herbal based cosmetic products and herbal nutritional supplements.

In addition, traditional health care practitioners, traditional healers and consumers at the household level have all contributed to the demand for herbal medicinal products. Finished products made from medicinal and aromatic plants are increasingly prescribed and bought over the counter. Medicinal and aromatic plants and extracts have become essential for the export of products in many developing countries. The preference by consumers to have natural products has grown over the years, and these increases have allowed medicinal aromatic plants to present a unique and niche market base that exporters are looking to increase in the developed economies. The potential uses of these herbs is very wide: colouring of food, tanning of leather, plant protection, making of poison arrows, for drugging fish for primitive means of catching them, as narcotics, aromatic substances, flavouring or seasoning, to production of gums and resins or as medicine (Vermeule, 1998).

Medicinal and Aromatic Plants-MAPs in this study are (i) Amarula (*Sclerocarya birrea*), (ii) Buchu (*Agathosma betulina)* and (iii) *Pelargonium* (*Pelargonium sidoides)* these three plants are defined as raw plant materials and are also

referred to as traditional medicines. Extracts from these plants are also used in cosmetic, health products, in food products and natural health products. They can also be used as materials for processed products as natural ingredients such as dry or liquid extracts and oils. There is a demand industrially for MAPs Amarula (*Sclerocarya birrea*), Buchu *(Agathosma betulina*), and *Pelargonium* (*Pelargonium sidoides* (Amarula, *Pelargonium* and Buchu) due to the new focus and increase in interest in both health based medicinal and cosmetic products, healthy and nutritious formulations. The consumer's awareness of traditional healers, herbalists and alternative health care systems has created a household level demand for traditional medicinal products. In recent times the final value added or processed products made from medicinal and aromatic plants are bought or prescribed over the counter in many pharmaceutical stores.

Traditional and plant medicines have been for many decades used and have always played and continue to be regarded as key role players in health care systems around the world. In many parts of the world indigenous methods of traditional treatments are part of the culture and have been the major method of therapy in those communities and have been known for effectiveness, which makes them socially accepted, economically viable and, often are the only source of therapy available. In civilised an uncivilised communities people mainly depend on subsistence agriculture and natural resources for their livelihoods. Medicinal and Aromatic Plants (Amarula Amarula (Sclerocarya birrea), Buchu (Agathosma betulina), and *Pelargonium* (*Pelargonium* sidoides) have always been the most important source of economic activity in rural livelihoods in South Africa. Health care facilities in these regions are non-existence because they collect medicinal plants from the wild which provide communities in the rural areas with self-employment opportunities.

Medicinal plants have healing properties and are therefore called medicinal plants and may also be referred to as healing herbs. In the plant kingdom they are divided into several similar groups, but the plant classification differs per plant species. Medicinal plants may be classified as annual, biennials, woody perennials, trees, climbers and shrubs. In this study, the focus is flowering

plants, trees and shrubs. Traditional healing is the medicinal practice of healing using plants. The western-modern medical systems treatment somewhat differ from traditional healing, but there are some similarities in the methods and partly treatments used. For example, the use of aloe vera to manufacture a gel application for treating sunburn and bruises and creating skin balms for skin care. The major difference in the two types of systems is that the western-morden medicine uses synthetic medicines that originate or are modelled on compounds obtained mainly from medicinal plants. Therefore, the use of the medicinal plants used as a whole, or partly thereof as synthetic modelled. Their discovery originated from the long term practice of the traditional medicine.

Livelihoods of populations in the modern society both urban and rural areas depend on a variety of wild plant products and from an even more different types of wild plant species which include species with aromatic and medicinal properties. The export trade value of medicinal and pharmaceutical plants globally is estimated at USD 2.2 billion annually with 45,000 – 70,000 species harvested from the wild. There are many important uses and trade of these plant-based pharmaceuticals plants (MAPs) Amarula Amarula (Sclerocarya *sirrea*), Buchu (*Agathosma setulina*), and *Pelargonium* (*Pelargonium sidoides*). They also feature in both traditional medicine practices and in western-modern health care systems. In addition to the known medicinal properties, these plants can be used in food as flavours and in drinks as colourants. They are also used in cosmetic and beauty products as perfume and give colour to beauty products. They are also used as incense in different religious practices. In many economies pharmaceutical trades provides a sustainable source of income to millions of households who are involved in the collection of wild medicinal plant material with women usually playing the major role in the wild plant collection. Trade happens when these plants are supplied for industrial production to both small and large manufactures of a large number of medicinal and household products. To date there is little or no accurate information available about this trade but the indication is that trade is increasing nonetheless. A great majority of medicinal and aromatic plants MAPs which are in use for traditional medicinal practices and for trade are collected in the wild. Raw materials have also been

provided by wild harvests which are used in the pharmaceutical production and traditional healing products. This practice has led to declining populations of wild plants around the world. It is estimated that one in five of the world medicinal plant species are threatened by extinction due to unsustainable wild harvest (http://www.traffic.org/medicinal-plants). There are implications here that are associated with loss of habitats, extinction of species and their possible biomedical uses. It is understood that indigenous inhabitants are as endangered as the forest in which they live (Kaufaman, 1999). There seems to be a slow or no recovery in species that have been selected for monitoring. The majority of people in rural areas in South Africa live in extreme poverty. With those in sub-Saharan Africa about 70% of the population survive by subsistence agriculture (Hellmuth, Moorhead, Thomson and Williams, 2007). Agriculture is a major contributor to the current economy of most African countries ranging from 10% to 70% of the gross domestic product (GDP) with the slowest record of productivity increase in the world. Medicinal Plant Trade figures from the province of KwaZulu-Natal in South African shows important hub for medicinal plant trade (Niekerk, 2005).

1.1 The problem statement

South Africa is rich in fauna and flora, as well as agricultural resources and therefore need to have viable MAPs. The good climatic conditions and plant material include indigenous plant species like *Pelargonium*. South Africa has a high percentage of unemployment and large number of the population residing in rural areas. South African Flora shows obvious signs of stress as a result of overexploitation (Niekerk, 2005).The MAPs (Amarula, *Pelargonium* and Buchu) industry has the opportunity to create a good and economic viable industry that could employ many people in the upstream and downstream of the value chain. Producers and investors in the MAPs industry require efficient methods of streamlining their production and processing methods. This study seeks to take an in-depth analysis of the value chain of selected MAPs namely (Amarula, *Pelargonium* and Buchu) and make recommendations on how to efficiently participate and grow the supply chain and the industry.

1.2 Objectives of the study

The objective of this study is to identify and analyse constraints in attempting to participate in the global supply chain by farmers/harvesters of three selected MAPs (Amarula, *Pelargonium* and Buchu) to improve business income and profitability. This study seeks to explain and create a deep understanding of the value chain and how it links up with reliable markets from production to markets in the high-value plants in medicinal and aromatic plants (MAPs). The lead crops which are the focus area of this study are *Pelargonium*, Buchu, Amarula in the Kwa-Zulu-Natal, Western Cape and Eastern Cape provinces. The specific objectives are to:

i) Analyse the value chain of the three selected species regarding the processes leading to the final processed products in South Africa

ii) Analyse the value chain constraints and challenges of the production and harvesting, processing, marketing, distribution and the final sections of the value chain of the three selected MAPs

iii) Analyse the constraints and challenges facing the selected MAPs and others in South Africa in respect of research, information/data, infrastructure, facilities/equipment, institutional and policy support

iv) Provide policy recommendations for sustainable development and participation of the producer's/harvesters of the selected MAPs to the global value chain

1.3 Research questions

Based on the aforementioned specific objectives, the following research questions were formulated:

i) Who does the production of MAPs (Amarula, *Pelargonium* and Buchu) based products in the value chain?

ii) What are the challenges and constraints affecting the MAPs (Amarula, *Pelargonium* and Buchu) value chain and how these challenges can be addressed in order to improve the MAPs (Amarula, *Pelargonium* and Buchu) value chain used by the industry?

iii) What are the constraints and challenges of the production and harvesting, processing, marketing, distribution and the final sections of the value chain of the three selected MAPs?

iv) What are the major value chain constraints and challenges militating against sustainable economic development potential of MAPs in South Africa in respect of: research, skilled human resources, patency, legislation, information and data, infrastructure, facilities and equipment, institutional and policy support?

1.4 Project justification

South Africa's development and employment needs depicts a cross benefit arising from agriculture according to the New Growth Path (NDP). There are areas in the industry that are considered as gaps and should be areas of focus which can be addressed in order for South Africa and its economy to leverage on the Indigenous Bio-Economy afforded by Medicinal and Aromatic Plants. South Africa has a high percentage of unemployment and large number of the population resides in rural areas. The MAPs (Amarula, *Pelargonium* and Buchu) industry has the opportunity to create a good economically viable industry that could employ many people in the upstream and downstream of the value chain. Furthermore, rural South Africa is characterized by high unemployment, limited skills, persistent poverty and a bleak economic outlook. Few rural jobs utilize financial or technological resources and are unproductive at low often below-minimum-wage. South Africa's mining and other industries are shedding jobs at a massive rate with many unemployed people returning to their rural homes where

there are little prospects of jobs. In the absence of alternative income sources, natural resources are rapidly being depleted; deforestation and erosion are widespread (Everpix, 2013).

The study identified the challenges in the MAPs value chain that government and industry can address in order to grow the sector in both urban and rural settings; increase investment and funding support for research, innovation, and technology transfer and product development. This includes the need to adopt a sustainable approach to Medicinal and Aromatic Plants with the potential to benefit end users as well as to create opportunities for advancing development of innovative products, increasing support of services, and promoting commercialisation in this sector. Africa has numerous ecosystems and vegetation zones that support an immense diversity of native and naturalised plant species, estimated to be at least 40,000 species (Shackleton, 2009).
The anticipated research project results and recommendations are as follows:

- Make recommendations to policy makers which will assist in some of their goals. The South African government has committed to the Millennium Development Goals (MDGs) which requires government to improve livelihood in rural areas using economic development
- Can be used by the industry and government organisations when planning according to their Medium Term Plan (MTP) and assist in Research and Development (R&D)
- May stimulate awareness and provide information and further research and promote bankable business for the communities
- Capture the indigenous knowledge and processes and the use of the three indigenous species used in the research area
- Document the unique information and innovation by the communities in the study area.

1.5 Scope and possible constraints of the study

This study seeks to take an in-depth analysis of value chain in the MAPs (Amarula, *Pelargonium* and Buchu) industry and make recommendations on how to efficiently participate and grow this industry. The study covers three provinces where the leading plants which are the focus area of this case study are Amarula Amarula (*Sclerocarya birrea*), Buchu (*Agathosma betulina*), and *Pelargonium* (*Pelargonium sidoides*) grow indigenously. There are other MAPs species that grow in various parts of South Africa but the study focuses only on these three specific species and the specific area where the industry operates. The research project is limited to assessing results from the area that is being assessed and does not reflect the total industry and it's potential. In order to accommodate the different nature of businesses and species in question there was variation in the questionnaires when presented to different respondents in the Amarula group interviews, due to language and content.

The focus group research interview required translation of the process and questions; the translation services were done professionally and were reliable; none the less the questionnaire was developed in English. The kind of focus on my topic requires a lot of explanation and narrative as some of the subjects were not literate but extremely knowledgeable. The average number in a group interview was 40 and consisted of mainly rural women of which some of them were illiterate. At times the focus of the study was situational and focused in detail in each part of the value chain.

Other parts focused on the financial viability of the business. As the primary researcher I recorded noticeable systematic difference when comparing the information provided by the companies interviewed and at times could not account for the variance; I had to be objective and look at the data as presented by the participants. Human resources were not enough to collect data readily even when it was available, due to cost and to the distance between each of the areas and the large number of people that were involved in the communities. There were challenges in getting things like financial statement or cost of setting up a business in the procurement of the plant material and the pharmaceutical plant due to confidentiality and the high risk of sharing specific information.

1.6 Outline of the thesis

The thesis is organized into seven main chapters; Chapter 1 presents the introduction and background to the study, problem statement, objectives of the study, research questions, project justification, scope and possible constraints of the study. Chapter 2 provides relevant literature review on the South Africa MAPs industry and its challenges. Chapter 3 provides the description of the study area. Chapter 4 presents the methodology, which discusses the methods of data collection and data sources, the sampling and analysis techniques and ethical consideration. Chapter 5 presents and discusses the results of the study. Chapter 6 presents and discussion of the analysis of the data and information of study; while Chapter 7 provides conclusions and policy recommendations from the research.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 Introduction

The objective of the paper is to establish the challenges and constraints on the value chain of South African Medicinal Aromatic Plants and highlight the importance of this sector both on the legislative front and economic development. According to Diederichs (2006) South Africa is estimated to have consumed 200, 000 tonnes of medicinal material annually. South Africa was unable to provide adequate employment, unemployment rates in fact increased. The New Growth Path (NGP) specifically calls for more inclusive growth, and "heightened efforts to strengthen partnership among all economic role-players, proceeding from the understanding that each sector has a critical role to play in addressing these challenges" (NDP, 2010). Agriculture, Forestry and Fisheries are widely recognized as sectors with significant job creation potential and with strategic links to beneficiation opportunities (IPAP 2013). However, between 1994 and 2012, the real contribution to GDP of Agricultural sector increased by only 29%. The OECD recognises South Africa's agriculture sector as among the least supported in the world: South Africa's Producer Support Estimate is currently 3.2%, versus 4.6% for Brazil, 7.1% for the US, and 18.6% for the OECD global value chains offer many market opportunities for the agriculture sector though at present most value added occurs outside of Africa. The development of medium term projections for agricultural markets has been the core work of the OECD's Committee (OECD, 2011). The agriculture sector employed 65% of Africa's labour force and accounted for 17% of growth in African GDP between 2001 and 2011 (World Bank, 2013).

Of particular concern is the lack of attention to Research and Development (R&D) (Muhammad & Awaisu, 2008) in the MAPs industry. According to the 2009/10 R&D survey conducted by Human Science Research Council on behalf of the Department of Science and Technology (the most recent survey for which the results are available on the website of HSRC), agriculture accounted for

only 6.9% of South Africa's total R&D expenditure. Moreover, of all government expenditure on the sector, only about 7% went to R&D. In the new policy by government called Bio-economy Strategy Medicinal and Aromatic Plants will play a significant in the economic turnaround of South Africa (DST, 2014). The strategy clearly defines the "Bio-economy" to encompass biotechnological activities and processes that translate into economic outputs, particularly those with industrial application. Within the South African context these may include, but are not limited to, technological and non-technological exploitation of natural resources such as animals, plant biodiversity, micro-organisms and minerals to improve human health, address food security and subsequently contribute to economic growth and improved quality of life (DST, 2014).

Government policy has recorded the agro-processing sector as the largest manufacturing sector in employment terms, with 183,502 employees (IPAP, 2011) and it contributes a significant 3.1% of manufacturing value added as percentage of GDP. Moreover the sector has been identified in the Industrial Policy Action Plan (IPAP, 2010) as one of the areas with potential to actualise Macroeconomic objectives as pronounced in the New Growth Path (NGP). A key characteristic of the agro-processing is its strong up- and downstream linkages. Upstream, the sector links to primary agriculture across a wide variety of farming models and products. Downstream, agro-processing outputs are both intermediate products to which further value is added and final goods that are marketed through wholesale and retail chains. They are further distributed to a diverse array of restaurants, pubs, shebeens and fast-food franchises making agro-processing critical for employment creation and poverty eradication.

According to Niekerk (2005) the increasing rarity and the continuous exploitation of several medicinal plant species from the wild and substantial loss of their habitats during past years have resulted in population decline. The author further notes that many high value medicinal plant species over the years have become extinct and will be depleted. Furthermore natural resources cannot meet current or foreseeable medicinal plant products (Niekerk, 2005). However the primary threats to medicinal plants are those that affect any kind of biodiversity used by

humans. According to the Population Connection report there are many other potential causes of rarity in medicinal plant species, such as habitat specificity, narrow range of distribution, land use disturbances, introduction of non-natives, habitat alteration, climatic changes, heavy livestock grazing, explosion of human population (Population Connection, 2006).

Ewens (2004) states that the fragmentation and degradation the indigenous species' population will result in genetic drift. Furthermore the population bottleneck according to Ewens (2004) will cause many species to lose their original habitat. Additionally, natural enemies (i.e., pathogens, herbivores, and seed predators) could substantially limit the abundance of rare medicinal plant species in any given area. Traditional medicine in terms of a culture-bound body of indigenous medical knowledge, belief and practices has provided the primarily plant-based foundation for many ethno medical systems which already existed long before the development of 'scientific' or cosmopolitan medicine.

The demand by majority of the people in developing countries for medicinal plants has been met by indiscriminate harvesting of spontaneous flora including those in forests (Niekerk, 2005). As a result, many plant species have become extinct and some are endangered and are on the Red List in KwaZulu Natal being the most affected (Niekerk, 2005). As Africa's population grows, demand for traditional medicines will increase, and pressure on medicinal plant resources will become greater than ever. While loss of habitat is the major factor contributing to the depletion of natural resources in Africa, collection of wild plants for traditional medicinal use is extremely detrimental to certain species.

However, active ingredients use in leaves, roots and bark may often vary in its use and therefore the demand for the different parts of the plant and its supply can be commercially grown of the active ingredient duplicated or substituted (van Wyk et al., 2012). According to the Food and Agriculture Organisation's case study in KwaZulu-Natal (1998) the indigenous medicine market is based on indigenous plants that are generally harvested from wild plant stocks in KwaZulu-Natal, neighbouring provinces and other countries. The plant stocks and their

harvesting are not managed and little cultivation takes place. The combination of high demand and the lack of any significant resource management and plant production have resulted in a decline in the supply of numerous indigenous medicinal plants (Mander, 1998).

Niekerk (2005) notes that there are some constraints associated with the processing of medicinal plants which may result in reducing their competitiveness in global markets and which have to be remedied. Some of the general constraints with regard to medicinal plants and traditional medicine include indiscriminate harvesting and poor post-harvest treatment practices (Niekerk, 2005). For the commercialization of this industry there need to be an improvement in conservation and cultivation practices. According to Diederichs (2006) an estimated 26 500 tonnes of raw MAPs material where exported to Europe and 50 000 tonnes of raw MAPs material outside South Africa and Africa (Diederichs, 2006).

He argues that the medicinal plant resources may be doomed to extinction by overexploitation resulting from excessive commercialization, habitat destruction and other natural and man-made destructive influences unless energetic conservation measures are taken to ensure their continued availability (Niekerk, 2005). This can be done through the establishment of medicinal plant gardens and farms for primary agriculture in support of commercial production in South Africa. According to the Indo Global Journal of Pharmaceutical Sciences (2012), a low number of medicinal plants currently being cultivated should be increased, in order to meet the demands of industry for continuous and uniform material supplies, and to take some of the pressure off medicinal plants originating from natural ecosystems. At present, commercial varieties have been developed for about 16 species, most of which are cultivated for export. Furthermore the journal states that much more needs to be done to select superior genotypes of many more species. However to achieve this initiative, it will be necessary to make extensive use of the network of nurseries and gardens in the country, in order to establish high quality plant supply systems. Wild-harvesting practices are presently highly sustainable and are likely to remain so (Mazid et al., 2012).

There has been capability building in India in recent years in the Research and Development sector of medicinal formulations involving plants and its compounds both in private sector (i.e. industry oriented) as well as government funded research. There are several private sector and government Research and Development institutions in OECD countries that have supported the successful commercialisation of MAPs and their products.

2.2 The MAPs and traditional medicine of South Africa in comparison to BRICS countries

The existence of traditional medicine depends on plant species diversity and the related knowledge of their use as herbal medicine. In addition both plant species and traditional knowledge are important to the herbal medicine trade and the pharmaceutical industry whereby plants provide raw materials and the traditional knowledge prerequisite information (Tabuti et al., 2003).

India has one of the richest plant medical traditions in the world. It is a tradition that is of remarkable contemporary relevance for ensuring health security to the teeming millions. There are estimated to be around 25,000 effective plant-based formulations, used in folk medicine and known to rural communities in India (ITPO, 2001). There are over 1.5 million practitioners of traditional medicinal system using medicinal plants in preventive, promotional and curative applications. It is estimated that there are over 7800 medicinal drug-manufacturing units in India, which consume about 2000 tonnes of herbs annually (Ramakrishnappa, etal 2002). The market for ayurvedic medicines is estimated to be expanding at 20% annually. Sales of medicinal plants have grown by nearly 25% in India over a period of ten years (1987-96), the highest rate of growth in the world (Masood, 1997).

The basic uses of plants in medicine will continue in future, as a source of therapeutic agents, and as raw material base for the extraction of semi-synthetic chemical compounds such as cosmetics, perfumes and food industries.

Popularity of healthcare plant-derived products has been traced to their increasing acceptance and use in the cosmetic industry as well as to increasing public costs in the daily maintenance of personal health and well-being. In the dual role as a source of healthcare and income, medicinal plants make an important contribution to the larger development process, and can reduce unemployment in South Africa (Bell, 1984). The study noted that the respondents' main income came from the sale of the products made from the harvested plants.

Though the efficacy of herbals requires development of quality consciousness in respect of the evaluation related evidences, supplying the demand for botanicals and herbals is a booming business (Mukherjee, 2002). Recently even developed countries, are using medicinal systems that involve the use of herbal drugs and remedies. Undoubtedly the demand for plant-derived products has increased worldwide. The demand is estimated to grow in the years to come fuelled by the growth of sales of herbal supplements and remedies according to several surveys. This means that scientists, doctors and pharmaceutical companies will be looking at countries like China, India, etc. for their requirements, as they have the most number of medicinal plant species and are the top exporters of medicinal plants (de Silva, 1997). However, South African farmers/harvesters can exploit this new industry in order to grow the sector, create jobs and economic development as well as balance of payment. The cost of setting up a full value chain industry for MAP's includes major investment in research and development in order for the country to best utilise its natural resource despite these hegemonic challenges discussed in research.

The study recommends the support for agricultural studies for commercial cultivation of indigenous species and the need for Research and Development for the conversation of extinct MAPs. Further research on this subject is needed to reap the benefits of this labour. In fact, agricultural studies on medicinal plants, by its very nature, demand an equally large investment and higher priority. Research in support of industrial development encompasses all activities ranging from the development of superior propagation materials, agro-

technology, low cost and efficient processing technologies to improve quality and yield, new formulations to new products and the marketing of finished products.

2.3 World market: Export opportunities of MAPs for developing countries

The value of medicinal plants as a source of foreign exchange for developing countries depends on the use of plants as raw materials in the pharmaceutical industry. It provides numerous opportunities for developing nations to advance rural well-being. The global trade in medicinal plants is of the order of US$ 800 million per year. Export statistics available between 1992 and 1995 indicate that India exported about 32,600 tonnes of crude drugs valued at $US 46 million (Dhar et al., 2002). China with exports of over 120,000 tons per annum (US$ 264.5 million) and India with over 32,000 tons per annum dominate the international market. The annual export of medicinal plants from India is valued at R1,2 billion (Ramakrishnappa. etal, 2002). All the major herbal-based pharmaceutical companies are showing a constant growth of about 15 per cent or more, next only to Information Technology industry (Kumar, 2000). The turnover of herbal medicines in India as over-the-counter products, ethical and classical formulations and home remedies of Ayurveda, Unani, and Siddha systems of medicine is about US$1 billion with a meagre export of about US$ 80 million (Kamboj, 2000).

According to an estimate of World Health Organization (2002-5), nearly 80% of the populations of developing countries rely on traditional medicine, mostly plant drugs for their primary health care needs. Traditional medicine has served as a source of alternative medicine, new pharmaceuticals, and healthcare products. Medicinal plants are important for pharmacological research and drug development, not only when plant constituents are used directly as therapeutic agents, but also as starting materials for the synthesis of drugs or as models for pharmacologically active compounds (Mukherjee, 2003). During the last two decades, India has made massive investments on pharmacological, clinical and chemical researches all over the world in an effort to discover still more potent plant drugs. About 250,000 living plant species contain a much greater diversity of bioactive compounds than any chemical library made by humans but only few

plants species have been systematically investigated for the presence of bioactive compounds. A few new drug plants have successfully passed the tests of commercial screening.

The support for agricultural studies for commercial cultivation is needed to reap the benefits of this labour, as medicinal plants are threatened by overuse (Bodeke et al., 1997). In fact, agricultural studies on medicinal plants, by its very nature, demand an equally large investment and higher priority. Research in support of industrial development encompasses all activities ranging from the development of superior propagation materials, agro-technology, low cost and efficient processing technologies to improve quality and yield, new formulations to new products and the marketing of finished products. There has been capability building in India in recent years in the Research and Development sector of medicinal formulations involving plants and their compounds both in private sector (i.e. industry oriented) as well as government funded research. There are several private sector and government Research and Development institutions in India of which a few have been mentioned.

2.4 Conserving MAPs for drug/health care development

The global craving for more herbal ingredients creates possibilities for the local cultivation of medicinal crops as well as for the regulated and sustainable harvest of wild. The expanding trade in medicinal plants has serious implications on the survival of several plants species, with many under serious threat to become extinct. Open access to medicinal plants in the wild is perhaps one of the main reasons for the current unsustainable levels of harvesting. As the prices paid to the gatherers tend to be very low, commercial plant gatherers often ‘mine’ the natural resources rather than manage them, as their main objective is to generate an income resulting in destructive harvesting (Bodeke et al., 1997).

Other factors contributing to unsustainability include lack of sufficient data on wild plant populations, marketing, and trading; inadequate regulations and legal protection (including intellectual property rights for local practitioners with local

knowledge); and poor access to appropriate technology for sound harvesting and plantation development. Suggested actions to be taken to remedy the situation include:

- Interaction between social, economic and ecological systems is most essential to conserve the medicinal plants making its sustainable use.
- A need-based research including screening of plants for biological activity and focus on environmental and bio-diversity conservation aspects of forests, which continue to be primary habitats of medicinal plants, is desirable.
- Training to the collectors and growers proves very useful in improving the quality of the material and plummeting the wastage (Bodeke et al., 1997). There is an urgency to have clearly defined policies to regulate medicinal plant conservation, cultivation quality control standards, processing and preservation, marketing and trade including domestic and export, and a well-coordinated information network effort (de Silva, 1997).

A major factor impeding the development of the medicinal plant based industries in developing countries has been the lack of information on the social and economic benefits that could be derived from the industrial utilization of medicinal plants. Except for the use of these plants for local health care needs, not much information has been available on their market potential and trading possibilities. As a result, the governments or entrepreneurs have not exploited the real potential of these plants (de Silva, 1997).

2.5 Conclusion

In this chapter I looked at the international opportunities in MAPs for exports in South Africa in comparison with BRICS countries. Although most of the market for MAPs in outside where it is harvested, some of the BRICS countries like India have made massive investments on pharmacological, clinical and chemical research. In order for South Africa to further promote commercializing of this industry and be able to grow the industry in particular in *Pelargonium*, Buchu, Amarula in the Kwa-Zulu-Natal, Eastern Cape and Western Cape similar programmes will be an advantage. Furthermore it is clear with the increase in the harvested MAPs export the protection and conservation of medicinal plants does not take high priority on the agenda for natural resources management in South

Africa and in BRICS countries. Government programmes give priority to agricultural and wildlife resources, this is mainly due to the identified potential of such resources in contributing positively to national development. On the other hand, it could be because there is more information about agricultural, forestry and wildlife resources as compared to medicinal plants. This status will change as the profile of Medicinal and Aromatic plants extracts have become essential part of exports in the developing countries.

The preference by consumers to have natural products has grown over the years, this increases annually and has allowed medicinal, aromatic plants to present a unique and niche market base for pharmaceuticals, cosmetics and other industries such as food & industrial use.

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CHAPTER 3

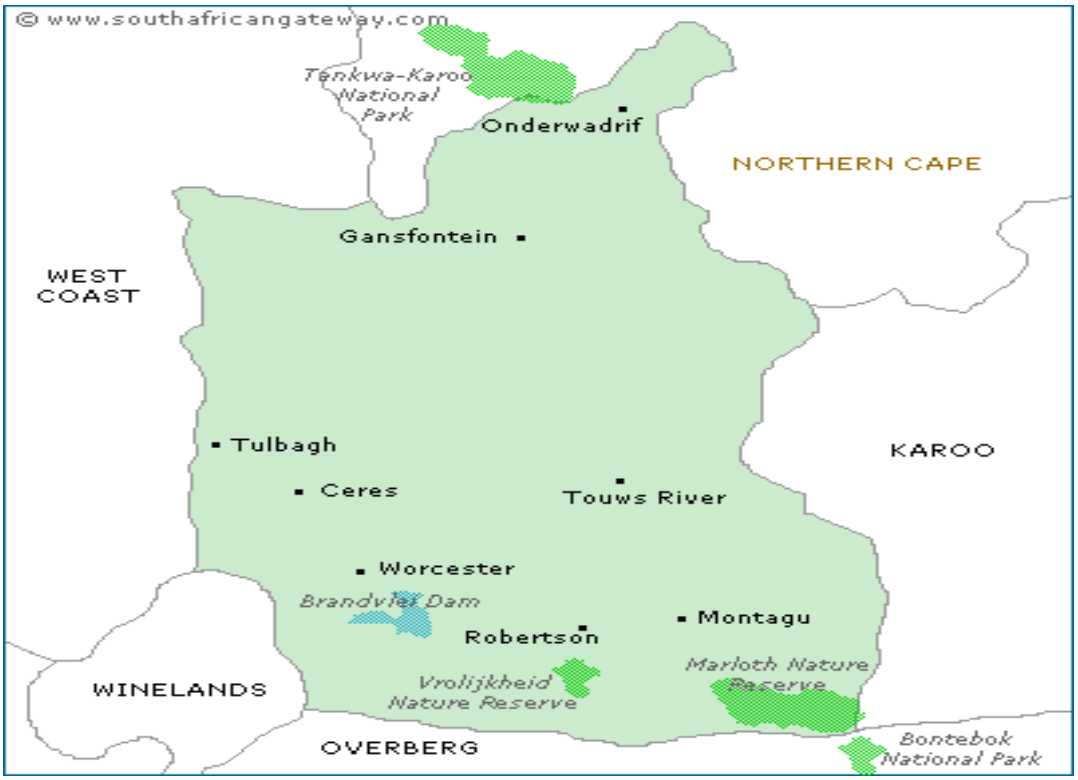
3.0 THE STUDY AREA

3.1 Introduction

This chapter focuses on the three study areas selected for the study; it is divided into eight sections and analyse each of the MAPs characteristics by describing its use and the benefits. Presented in the chapter are the description of the three provincial areas relating to their rainfall, soil, slopes, altitudes, vegetation, maps for the demarcated areas of the research and main economic activities using graphs, plates and tables.

3.2 Buchu Growing Area in the Western Cape Province

The company which is a respondent in the study, sources Buchu from the Western Cape. Buchu occurs on damp lower slopes of the mountains of south-western Cape from Tulbagh to Riversdale (Figure 1). In nature it prefers the middle slopes, particularly on saltier valley or shallow soils and often near water. Natural distribution is Mountain Fynbos. According to the 2011 census the municipality has a population of 52,642 people in 15,873 households. In South Africa Buchu is endemic to the mountains of the Western Cape. Buchu plants start to grow during August when the days start to become longer and temperatures increases after winter. It is also the time when rainfall starts to decrease. It is found in a small town called Clanwilliam in the north of the province, and in Stanford in the south, and east as far as the Outeniqua Mountains. This is called the Fynbos strip of the Cape; it is a Mediterranean type of climate which is dry in summer and rainy in winter. Buchu is in the citrus plant family *Rutaceae,* with its genus being *Agathosma*. Buchu plants grows naturally on steep slopes with altitudes that range between 737 m to 2 028 m above sea level. This is the historical Khoesan area before the introduction of the western culture this was know as Barosma. The soils are mostly nutrient poor sandy soils with low pH varying. In the fynbos areas rains comes from June until spring.



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Source: Demarcation Board (www.demarcation.org.za)

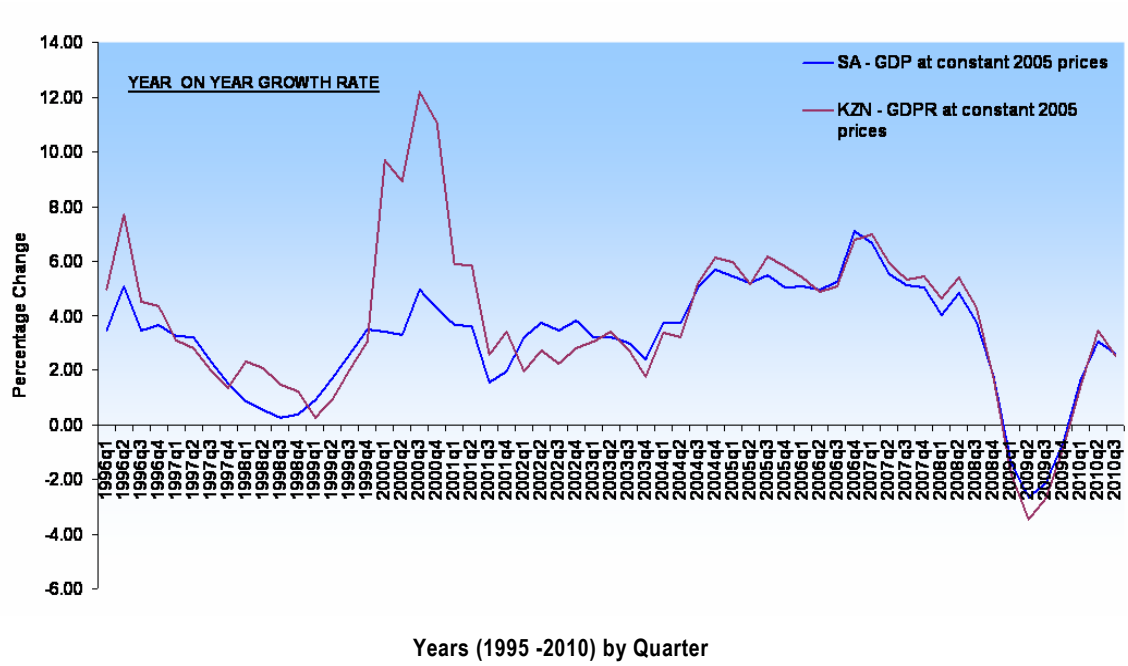
Figure 1: Map of the Western Cape area where Buchu grows

3.3 Amarula Growing Area in Kwa-Zulu-Natal

Mtikini, Uthungulu, Umkhanyakude, Zululand, Northern KZN are Amarula areas in the deep rural areas of KZN (Figure 4) and supply the Amarula Company with Amarula dry kernels from the fruit in order for the company to press the oil. The areas where Amarula currently grows wild includes Umkhanyakude, Uthungulu and parts of Zululand; this largely rural area spans 26,453sqkm, and exhibits unemployment rates exceeding 42%. Planting trees and building the rural processing industry has the potential to positively impact the livelihoods of 1.55 million people of 351 000 households, with poverty rates of, 62.5% in Uthungulu and 81.2% in rural Zululand adult income below R5057/annum (Census, 2010). African Conservation Trust (ACT) already planted 11,100 trees in Mphola village and rural schools, of which 7,000+ are Amarula and 4,000 Jackalberry (*Papea capensis*), another indigenous fruit bearing tree with oil-containing seed to share the same value addition paths. Expansion to additional rural communities and

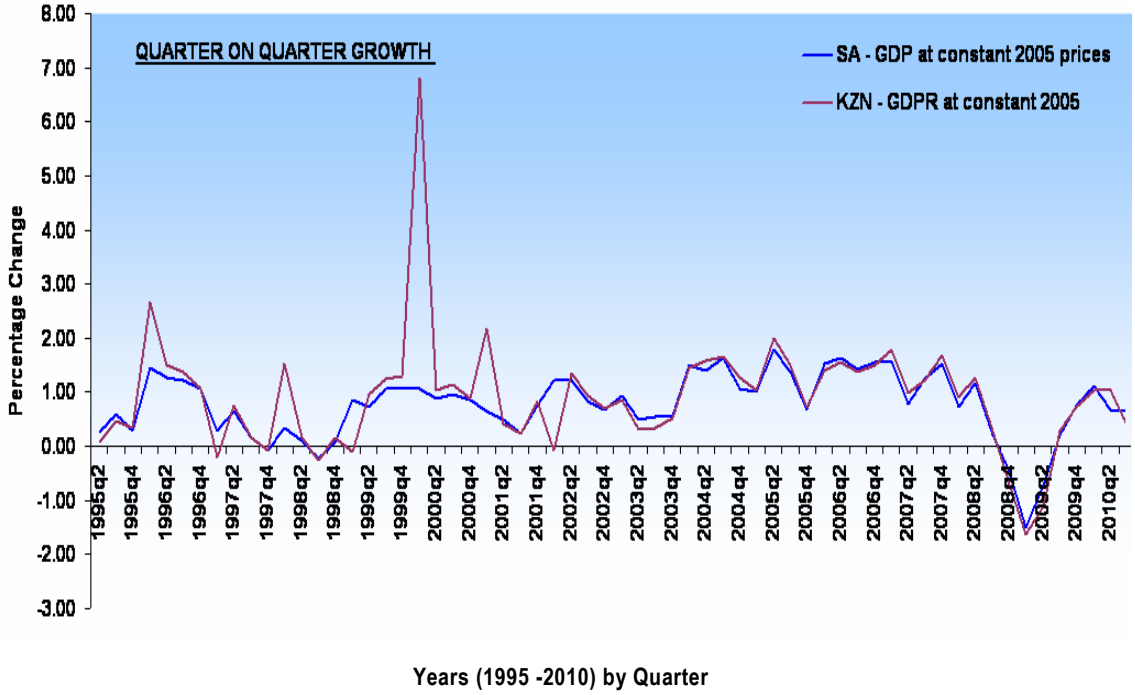
areas will be in line with growing market demand. The areas where the trees grow are close to the homesteads of the communities. During the time of the study the communities handpicked the fruit in the local indigenous forests and dried it under trees in their homes.

The transportation of the fruit is via large containers and wheelbarrows. The communities have developed a tool to pick the fruit and have methods of pressing and squeezing the fruit to get the most pulp out of the fruit without damaging the kernel which is dried and sold as a secondary income after beer is processed. The KwaZulu-Natal province, popularly known as KZN, is one of the nine provinces in South Africa. It has the second largest provincial economy and manufacturing sector in South Africa following after Gauteng, but it is the country's third-smallest province, taking up 7.7% of South Africa's land area. The KZN population has grown to approximately 10,645,400 people in 2010 from approximately 9,557,165 people in 2001 (Stats SA, 2010). The year-on-year and quarter-on-quarter growth rates for Gross Domestic Product (GDP) for South Africa and Gross Domestic Product for Region (GDPR) for KwaZulu-Natal are shown in Figure 2 and 3.



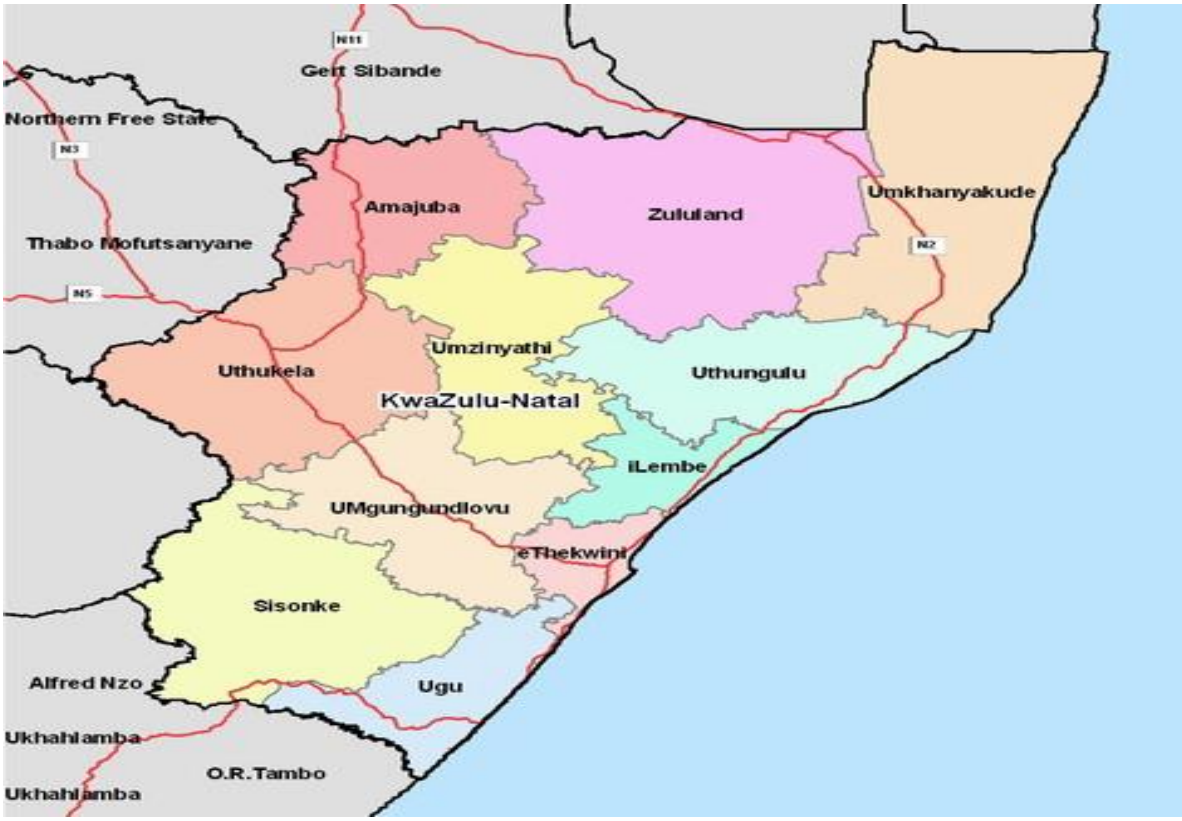
Source: Stats SA (2010)

Figure 2: Year-on-year growth rate for GDP in South Africa and GDPR in KZN



Source: Stats SA (2010)
Figure 3: Quarter-on-quarter seasonally adjusted growth rate for GDP in South Africa and GDPR in KZN

It is evident from Figure 2 and 3 that the South African economy as well as the KwaZulu-Natal economy are recovering from the global economic recession. Statistics South Africa (2010) states that "a comparison of the average real economic growth rate from 2002 to 2009 recorded by the provincial economies and the total economy" shows that the "South African economy recorded an average growth rate of 3.7 % which KwaZulu-Natal bettered at 3.8 percept. Therefore this provides the right climate for economic growth in the MAPs (SARB, 2010).



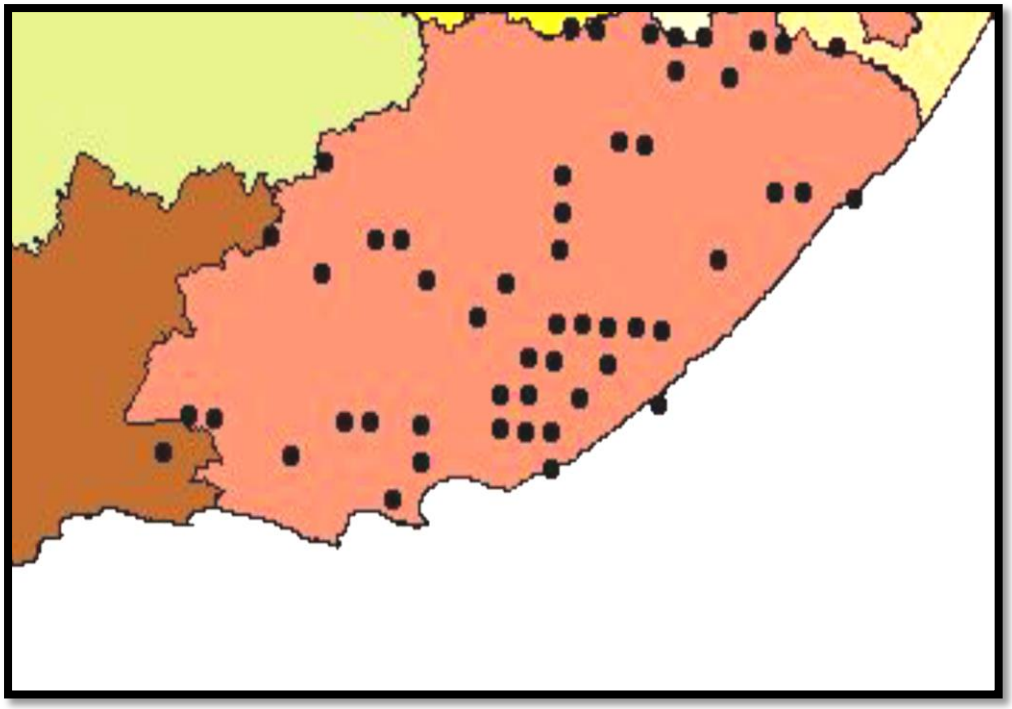
Source: Demarcation Board (www.demarcation.org.za)
Figure 4: KwaZulu-Natal Districts Map

3.4 *Pelargonium* Growing Area in the Eastern Cape

This *Pelargonium* species (Plate 1) is found in the southern regions of the Western and Eastern Cape (Figure 5). The distribution is the mountain ranges from the Swartberg Pass in the Oudtshoorn area eastwards to as far as Katberg in the Fort Beaufort area, a distance of more than 400 km. It prefers fairly moist habitats, and this explains its distribution pattern, as the mountainous regions experience higher rainfall than lower lying areas. Linctagon is a popular cough Syrup which is made from *Pelargonium* (Plate 2).

Source: University of Cape Town website (www.uct.ac.za)

Plate1: *Pelargonium* growing wild in the Eastern Cape



Source: University of Cape Town website (www.uct.ac.za)

Figure 5: Eastern Cape Map, the dots show where *Pelargonium* grows

LINCTAGON SYRUP

Linctagon Syrup contains *Pelargonium sidoides* to support the body to counter colds, flu and respiratory infections. The syrup can be administered to children of six months and older and contains the extract of *Pelargonium sidoides*. *Pelargonium* extract has been used as an herbal remedy in South Africa for many years and found its way to Europe in the early 1800's. Numerous studies have been conducted on the efficacy and safety of *Pelargonium* in supporting the body to counter colds, flu and respiratory infections. In broad terms *Pelargonium* assists the body to shorten the duration of infections and to reduce the severity of symptoms. It displays both anti-viral and anti-bacterial properties.

www.afliplex.co.za

Source: Afriplex website adverts of a *Pelargonium* products

Plate 2: Linctagon is a popular cough Syrup which is made from *Pelargonium*

3.5 Group Environment and Company Environment

The group interviews were conducted in a classroom style due to the number of the participants. The participants were mostly illiterate but very excited to participate in a study of this nature and were happy UNISA is doing the study. The company interviews where done in one on one meetings. Each interview was done in the language of comfort for the participants. The company interviews where done in a casual environment such as hotels.

The sample group of 88 constituted of women between the ages of 25 and 72 (Appendix 2). There were varying levels of economic activities but 92% of the

women were not formally employed. The socio-economic status of most of the women was the average rural living from hawking and seasonal trade in MAPs. The women relied on the MAPs for their livelihood. There were 54% of the women above the 55 year age group and 46% were between 25-55 years. The women noted that child bearing age women were faced with the challenge of child care which made it difficult for them to participate in the harvesting activities and making beer. There were no males in the group. Three of the women who participated in the study were traditional healers. The traditional healers were frequent harvesters of the plant material in the forest and therefore participated in the picking of the fruit during the season,

3.6 Value Chain Analysis

3.6.1 Introduction

This section of the chapter deals with the Value Chain analysis for sustainable economic development potential of South African aromatic, beverage and medicinal herbs in South African. Of the 68 vegetation types in South Africa, there are 22,000 species of vascular plants, of which 80% are endemic. Approximately 3,000 species are of medicinal value and are used by an estimated 200,000 indigenous TMPs. Most of the medicinal plant material is sourced from wild collection. Only a few medicinal plants are cultivated. The cultivated species include *Warburgia salutaris* (Bertol. f.) Chiov., *Siphonochilus aethiopicus* (Schweinf.) *Bl. Birtt*. and *Agathosma spp*. The practice of over-harvesting and habitat destruction has endangered the existence of many medicinal and aromatic plants of high commercial importance. The endangered plants are *Siphonochilus aethiopicus* (Schweinf.) *Bl. Birtt*., *Warburgia salutaris* (*Bertol. f.) Chiov., Ledobouria hypoxidoides*, *Mystacidium millaria*, *Ocotea bullata E. Mey*. and *Aloe ferox* (L.) *Burm*. f. *Siphonochilus aethiopicus* (Schweinf.) *Bl. Birtt.* is a slow growing plant with limited distribution and its demand exceeds supply. *Warburgia salutaris* (Bertol.f.) Chiov is the most valuable traditional medicine.

About 95% of the resource base of *Ocotea bullata E. Mey* has been depleted for its bark. *Aloe ferox (L.) Burm. f.* is a species of international importance in the cosmetic and personal care products industry. The unsustainable and intensive harvesting from wild stocks is a serious threat to the biodiversity of medicinal plants in South Africa and its neighbouring countries. There is a lack of significant resource base management, and plant production and economics of associated markets. The conditions at the markets are generally poor. The lack of storage facilities and trading infrastructures frequently results in spoiled raw material as well as wastage and deterioration of the products quality. There is no legislation regarding the registration and certification of traded products. The processing and development of products is extremely limited. Value addition to the products and efforts to ensure standardization are scarce. The entire industry uses simple technology.

The scarcity of popular plants has led to their undersupply, with considerable increase in product prices, imports and use of substitutive plants. Furthermore, there has been an increase in the use of destructive harvesting techniques, which aim to maximize the harvest from declining plant stocks in order to maintain income levels.

3.6.2 Value Chain of Amarula tree

The Amarula is a handsome, spreading tree of wooded savannah, and belongs to the mango *(Anacardiaceae*) family. It favours sandy soils in the warmer, eastern parts of the continent, where it may grow up to 15 metres in height. Few African trees are held in such high esteem by indigenous people; the Amarula has a multitude of uses in terms of diet and culture. The fruit is very high in vitamin C; it is the source of jelly and jam as well as the basis for potent liquor. These have been commercialized in recent times as 'Amarula Cream' - one of South Africa's most successful exports. The Amarula is a tree which belongs to the Mango (*Anacardiaceae*) family. Its scientific name is *Sclerocarya birrea*. It grows in sandy loam soils and in the warm eastern parts of South Africa. The tree grows up to 18m high. Leaves are compound, crowded near ends of branches, leaflets ovate to elliptic; fruit yellow 30-35 mm in diameter (Retief,

1997). Indigenous people hold this tree with high regards. It has a number of uses for indigenous people and forms part of their culture and diet.

The MAPs in the case of Amarula (*Sclerocarya birre*) source of the products is forest harvesting. The ripening of the fruit occurs in the South African Summer season (December – March). The harvesting is done early in the morning and late in the afternoon with 20kg buckets. There is a tradition from the past for harvesting Amarula from the forest. Production has not been developed because the demand and the supply are sufficient in this region. The harvesting is done daily until the season comes to an end. The fruit is picked from the ground and sometimes the harvester has to shake the tree to induce the fruit to fall. The fruit of the Amarula tree is very high in vitamin C and fibre. It is used to make jelly, jam and liquor by many households. There is successful export liquor products called Amarula Cream which is manufactured in South Africa using the Amarula tree fruit.

In South Africa Amarula has many uses in the household environment which includes beer making that has a formal commercial business interest in women. Some of the products made from Amarula include wine. The female trees produce pale green fruits in February and March which is the late summer months. The fruit is 35mm in diameter and is oval with greenish tinge. The fruits fall and ripen in to a perfect golden yellow colour with a sweet flavour and smell. This yellow fruit which is rich in vitamin C has the strength of 8 oranges with Vitamin C with a tatty-sweet flavour. The inside of the fruit contains small thick walled stone which have a nutty flavour and are sought after for their oily seed. The fruit stone is dried and used in the processing of essential oils. (http://en.wikipedia.org/wiki/*Sclerocarya_birrea*).

The Amarula fruit is collected in large quantities and is piled up in stashes for ripening. The fruit is used is used for making local beer and jam in the communities. The traditional beer is made by soaking fruit in water in an airtight container for a few days, and then squeeze out the fruit juice from the softened fruits. The juice is left in the airtight container for a further few days. After a few

days the beer or wine is ready and known to have a kick. It takes around 200 fruits to make a litre of the alcohol. The jam is made by boiling peeled and cleaned fruit with a little sugar as the ripe fruit naturally sweet, once cooked the fruit is shredded and remains in the juice which is brought to boil to further reduce the liquid. Once cooled the jam is left to set. Large quantities of fruit are collected when they are ripe by mainly rural women. These include making alcohol which is the common practice; other products include jam and juice. (http://www.wildwatch.com/living_library/plants-1/the-Amarula-tree).

A tree can produce 10 000 fruit pieces; beside the edible fruit Amarula is known for its oil rich nutty kernel seeds, which is sort after by humans and animals. The stone like kernel is difficult to work with. The oil is used to preserve meat; some people in Venda use it to message the body. The Amarula fruit has no global footprint but in Southern Africa it has socioeconomic significance and is used traditionally for food. The high protein fatty seed kernel is used for Amarula oil which is used in cosmetic products, in skin care oils and as a food in many households. This oil is known for its nutty flavour and contains antioxidants in its oleic acid. The tree's bark has been used as prophylaxis for Malaria. The inner bark is known to treat insect bites, snake bites and is applied in scorpion bites to relieve pain. The leaves assist with heartburn and other gastric ailments like indigestion and stomach ache, when the leaves are dried and made into tea (Mudau et al., 2014). The dried up kernels are used in art and craft to make ornamental beads and other craft ornaments.

The bark and gum of the tree has hue that when dried and processed is used as ink and a red-brown dye from the tannin rich bark is made for colouring craft and household made paint for paintings. In agriculture livestock farmers use an infusion of the fruit to combat tick infestations and as insecticide for crop farmers. The wood is used in floor panels, boat building, sledges, furniture and drums. The inner bark can make ropes, yokes and other string instruments. Due to its well-known alcoholic capacities, rumours abound as to the Amarula's intoxicating effects on wild animals. While elephants and baboons both relish the fruit, the former would need to consume prodigious amounts of already fermenting fruit for

it to have even the mildest impact, and since these huge animals drink up to 160 litres of water a day, there would anyway be a major diluting effect. Interestingly, examination of fresh elephant dung show that less than ten percent of Amarula fruits are actually 'processed' in any way - most fruit passes through the digestive tract intact.

Amarula juice is made in the factory by processing ripened fruit that has been handpicked. The fruit is made into fruit pulp. The fruit pulp and fresh fruit juice is expressed and is packed din bags and frozen ready for distribution. Markets for the juice are local and brands like Ceres have developed flavours with Amarula as one of their flavour range.

Amarula oil is made by cracking the nut using specialised technique and equipment. The machinery is labour intensive and uses the filter technique to extract the oil. The cracked nut results in a soft kennel which are collected and pressed to get the precious Amarula oil. The oil is cold pressed to preserve the active ingredients. The market for Amarula oil is mostly export and the local cosmetic and pharmaceutical industry. Amarula oil is edible and has been used in the culinary industry and speciality oil for cooking and baking.

The beer is usually micro-brewed using ripped fruit that has been washed and peeled to expose the fleshy fruit. The skin and fruit and pips are covered in water and put in an airtight container for 2-4 days after which the mixture is strained and further fermented for 2 to 4 days. The fermented mixture is further strained and packed in bottles and chilled.

In producing Amarula cream liquor, the fruit is pulped and fermented then it is slowly distilled to produce a concentrated flavourful Amarula spirit. The spirit is wooden matured in French oak barrels for 2 years after which fresh cream is added to finish the product.

To produce Amarula jam, the washed ripen fruit (Plate 3) is peeled and boiled with some pectin rich green fruits. The mixture is strained and sugar is added

with lemon juice. The mixture is further boiled and cooled bottled and labelled when cool.

Plate 3: Harvesters handling Amarula fruits in bags

3.6.3 Value chain of Buchu

The most commonly used species of Buchu for therapeutic purposes is known as *Agathosma betulina* formally called *Barosma betulina*. *Barosma crenulata* (also known as *Agathosma crenulata* (Ovate Buchu) *Barosma serratifolia* (Long Buchu). All species of Buchu belong to the Rue (Rutaceae) family - the same family as Citrus Fruits. Other Names: Boegoe (Afrikaans), Boochoo, Bookoo, Bucku, Bucco, Diosma, iBuchu (Xhosa), Short Buchu. It is a five foot shrub (Plate 4) with finely toothed opposite or alternate leaves 3,5cm long. The leaves have visible oil glands that release a strong aroma reminiscent of blackcurrant. It has white flowers with purple anthers which appear in spring, usually with 5 petals. Buchu is a low, white or pink-flowered shrub native to South Africa. This species is sometimes confused with *Agathosma crenulata* but in the latter the leaves are more than twice as long as they are broad.

Plate 4: Buchu plants in the Western Cape

Native to South Africa, the word Buchu is from the Hottentot word for the plant, bookoo. The leaves are mixed with oil and used as a perfume in Africa. Buchu is part of the cultural heritage of the San and Khoi people. Chemicals and Nutrients: Constituents include: Bioflavonoids: Hesperidin, Lipids: Limonene Terpenes: Terpineol. Volatile Oils, Barosma, Camphor, Diosphenol , isomenthone Menthol, Pulegone [compound considered to be toxic-found in crenulata]. Mucilage, Minerals and Nutrients. Aluminum, beta-Carotene,Calcium, Chromium, Iron, Magnesium, Manganese, Phosphorus, Potassium, Protein, Selenium, Silicon, Sodium, Vitamin C, Zinc. Sulphur (Partly) responsible for the characteristic blackcurrant smell and flavour of Buchu oil. Essential oils are generally used because of their antiseptic and diuretic properties.

Buchu has a restricted natural distribution area in the mountains of the Western Cape. Dosage Recommendations: Tinctures or infusions are used. A cup of boiling water is poured on 1g of the drug and allowed to stand for 10 minutes before straining. The infusion is taken three times a day. Buchu can be used as Antiseptic, Aromatic, Carminative, Diaphoretic, Digestive Tonic, Diuretic, Kidney Tonic, Stimulant, Tonic, Urinary Antiseptic, and Uterine Stimulant. Cold, Infusion, Tea, Tincture, Capsules. The leaves are steeped in brandy and the tincture

(commonly known as Buchu brandy or “boegoebrandewyn” was an everyday remedy for stomach problems.

Buchu products (Plate 5) can be used to treat Arthritis, Bed wetting, Bladder Stones, Bloating, Cystitis, Oedema, Flatulence, Gonorrhoea, Gout, Hypertension, Incontinence, Indigestion, Kidney Inflammation, Kidney Stones, Nephritis, Prostate gland disorders, Prostatitis, Pulmonary Oedema, Pyelitis, Pyelonephritis, Respiratory disorders, Urethritis, Urinary Infections. It helps incontinence associated with prostate problems. Buchu aids in the elimination of calculus debris, mucus, and uric acid from the kidneys. It soothes and strengthens the urinary system. Buchu can be used to influence the digestive system; it is used to treat minor digestive disturbances. In the excretory system, Buchu is reputedly helpful in the treatment of Kidney Stones. Buchu reputedly possesses diuretic properties that alleviate Urinary Tract Infections (UTIs). Buchu is employed by many herbalists in the treatment of Cystitis (the diuretic effects of Buchu are claimed to help to flush away the Detrimental Bacteria that cause bacterial Cystitis). Metabolism of Buchu helps to normalize Blood Sugar levels (primarily it helps to prevent rapid falls in Blood Sugar levels (Hypoglycaemia)) Musculoskeletal System Buchu reputedly alleviates Rheumatism.

Plate 5: Buchu derived beverage, nuetricitical and pharmaceutical products

The properties of Buchu are that it is a stimulant, strong diuretic, antiseptic, and cleansing herb that increases perspiration. The antiseptic and strong diuretic properties are evident due to the active ingredient in the herb: disosphenol or barosma camphor. The leaves contain an essential oil which contains limonene, isomenthone, diosphenol (Buchu camphor), terpinen-4-ol and minor sulphur containing compounds such as 8-mercpatco-p-methane-3-one. The *A. betulina* leaf is more active than that of *A. crenulata*, as it contains low amounts of disosphenol, yet a possibly high toxic level of pulegone. Other therapeutic uses: internally for the relief of urinary tract infections, especially in conjunction with prostate problems. Furthermore, it is also used in the symptomatic relief of rheumatism. It is also used for bloating while menstruating, reducing high blood pressure, and congestive heart failure. Buchu is also used to decrease water retention.

Buchu decreases inflammation of the colon, gums and mucous membranes and is specially used to treat bladder infection. External use: Steeped in vinegar it is used as a remedy for bruises and sprains. Aromatherapy and essential oil use: The oil extracted from Buchu should, (because of its high pulegone content) not be used in aromatherapy as it is considered toxic. Safety precautions and warnings: When using Buchu as a diuretic must be noted that it can deplete the body's store of potassium. When taking Buchu, you should increase your consumption of potassium rich food in suppliments, such as banana, various dark green vegetables, whole grain and fish. Women who are pregnant or nursing should not take therapeutic amounts of Buchu and the herb should also not be used on young children.

3.6.4 The value chain of *Pelargonium*

Pelargonium sidoides is a medicinal plant native to South Africa. Its common names include Umckaloabo and South African Geranium. Root extract of *Pelargonium sidoides* is used as cold and flu medicine under various brand names including Kaloba, Umcka and Zucol. For hundreds of years the Zulu, Basuto, Xhosa and Mfengu cultures have used *Pelargonium sidoides* as a

curative for coughs, upper respiratory tract irritations and gastrointestinal concerns. Today, with the advantages of modern science and clinical research, we are able to better understand what makes this traditional remedy work so effectively. *Pelargonium sidoides* has been successfully used for the treatment of Respiratory infections like bronchitis, sinusitis, and pneumonia, tonsillitis and rhinopharyngitis. It is often used as an alternative to antibiotics, acute and chronic ear, nose and throat infections. Rapid improvement in the symptoms associated with colds and flu, Analgesic (absence of pain) effects.

Pelargonium sidoides occurs throughout the Eastern Cape, Free State and southern and south-western Gauteng in the Republic of South Africa. *Pelargonium sidoides* is the name used by the Kalwerbossie or Rabassam in South Africa. However, the name Umckaloabo is the most commonly known and originates from the Zulu language "heavy cough". *Pelargonium suburbanum* subsp. *Pelargonium suburbanum* is a fast growing, showy, long flowering plant, an outstanding plant for rockeries, walls and steep slopes, an excellent ground cover in a sunny position in any garden, and is tolerant of coastal conditions. It is also suitable for hanging baskets, window boxes or tubs. It flowers from mid-winter until mid-summer (the end of June into January), with a peak during early summer (October to December).

The plants are not long lived and should be replanted after two years; when they tend to start dying off from the centre. However, they are very easy to propagate from cuttings and seed germinates readily. Stem cuttings may be taken in summer or autumn from a parent plant that is strong and healthy. The stem should be fairly firm but not woody, with at least 3 to 5 leaf nodes, and cut just below a node. The leaves and stipules should be removed leaving only a few leaves intact on the top. Large leaves may be trimmed to reduce moisture loss. The cuttings should be left to dry for a few hours before being placed in the soil. The cuttings should be rooted in trays or in cold frames, in well-drained medium e.g. coarse river sand.

They can also be planted directly into the ground, as long as they are given light shade and are watered regularly until they have rooted. The basal ends of the

cutting should be dipped in a rooting hormone to improve the rate of rooting and inserted in a prepared hole made by a dibber or a nail to avoid damaging the ends. The cuttings should be watered regularly but kept on the dry side, as over-watering will result in losses. After root formation has started, 4 to 8 weeks later, the cuttings should be fed with a seaweed-based fertilizer and potted up 1 or 2 weeks after this. Plants produced this way will flower in approximately 3 to 6 months.

The *Pelargonium*s seed demonstrates interesting mechanism it has a feathered tail-like structure, which is coiled into a spiral. In a corkscrew fashion the tail causes the seed to be twisted around so that it drills into the soil. It then secures itself firmly in the soil. The seed is viable for 7 years and germinate when sown fresh. The seed grows well in soil that is well-drained, with high sand content. Sowing depth is usually one and a half times the size of the seed. Germination usually takes place within 10 to 14 days in temperatures that are low, plants from seeds grow vigorous than those produced from cuttings; however, they take longer to flower, from 12 to 18 months after sowing, and there may be variation in the above from different geographical areas and climate.

3.7 Conclusion

This chapter I have been able to look at the three study areas selected for the research. This chapter gave each species a general description, the topography of the growing areas and later a description of their medicinal, food, beverage and other uses. The chapter also analysed the value chain of the selected MAPs and the present characteristics of the 3 provincial areas relating to their rainfall, soil, slopes, altitudes, vegetation, maps for the demarcated areas of the research and main economic activities. In order to analyse the information and describe the area maps are used for the demarcated areas. Furthermore using graphs, plates and tables the analysis is made easy to understand.

CHAPTER 4

4.0 RESEARCH METHODOLOGY

4.1 Introduction

This section describes the approaches and methods that this study employed. Sources of data, sampling procedure, data collection and data analysis techniques are briefly discussed. As a qualitative research study, it is presented in descriptive and narrative form rather than as a quantitative approach.

4.2 Data

The study used both secondary and primary information/data. The research made use of secondary data from review of literature through a desktop study of published and unpublished sources. Secondary information was also gathered from annual reports from the Afriplex office, non-governmental organizations, research institutions and academic work of individuals. The information gathered from the desk review was also used to inform the selection of the sites for conducting focus group discussions and mapping the various key informants to be interviewed. This also informed the research in terms of existing information gaps and the identification of areas for further investigation. Focus group

discussions were used to gather primary information/data from key stakeholders in the industry in South Africa. Primary data/information was also gathered through interviews with officials from other departments both at provincial and district levels.

4.3 Sampling method and sample size

The participants were purposefully selected because of their unique expertise in the MAPs industry. The researcher conducted the pilot study using a structured questionnaire and unstructured interviewing techniques; asking-open-ended questions of the participants about their unique expertise in their respective MAPs use. The selection criteria for inclusion of companies included the size of the companies and the MAPs species used by the company. Non-probability sampling procedure was employed to sample farmers/harvesters. According to (Bless and Higson, 1995), the idea of non-probability sampling refers to that case in which the probability of including each element of the population in a sample is unknown. Since most participants belonged to a group. In a focus group, questions were asked in an interactive group setting where participants were free to talk with other group members (Marshall and Rossman, 1999). Group discussions produce insights that would be less accessible without interaction found in a group setting because listening to others' verbalized experiences stimulates memories and ideas in the African tradition. When sampling, it is important to deal with an adequate sample size in order to collect accurate information about a group (Bless & Higson, 1995). A large sample is more representative but very costly; while a small sample is less accurate but more convenient. In all, three focus discussion groups were formed with sample sizes of 29, 22 and 40 per group.

4.4 Data Collection

The data was collected from smallholder farmers/harvesters and MAPs companies. This was done by means of an interview questionnaire as the data collection instrument. A structured questionnaire was also used so as to

interview respondents in order to standardize the order in which questions were posed to respondents, and to ensure that questions were answered within the same context. A protocol consisting of a written questionnaire, interpreted interviews focus group discussions and both e-mail and one on one interviews, was used to obtain the data. A focus group approach was used to interview the MAPs participants. In the group discussion the researcher used a non-directive style of interviewing using open-ended questions allowing the participants the freedom to control pacing and subject matter of the interview. Additionally, a more directive style of questioning was used as needed when the researcher required more clarification of information that the participants provided. The researcher recorded the information from the group to capture the key points and for hand-written notes. Reliability was assessed through test-retest reproducibility by asking some of the participants to complete the questionnaire on more than one occasion. A sample of interview questions is presented in Appendix A.

4.5 Data Analyses

All the data from focus group discussions, key informant interviews, secondary data and field visit observations was consolidated and analysed using the SPSS computer programme and the Atlas software to summarize the data. Information from the key informants' interviews was used to triangulate information gathered from the desktop review and focus group discussions. Tables and graphs were used to analyse and present data/results where necessary.

4.6 Ethical consideration

According to Leedy and Ormrod (2010), most ethical issues in research fall into one of four categories: protection from harm, informed consent, right to privacy, and honesty. The researcher did everything within her power to protect the participants' physical, social and psychological welfare and to honour their dignity and privacy. The researcher kept high standard of ethics when undertaking the study. The participants were presented with a written consent form to describe the nature of research project and their purpose of participation

thereof as suggested by Leedy and Ormrod (2010). The aims of the investigation were communicated as much as possible to participants. The participants were given their rights to remain anonymous. Questions asked were not insulting or embarrassing. The privacy and wishes of informants were respected at all times. All the materials used were acknowledged through referencing. The researcher has an obligation to respect the rights, needs, values, and desires of the participants and did so by taking the following safeguards. The following safeguards were used to protect the participant's rights:

1) Participants were advised about the UNISA research towards the qualification being voluntary in nature partcipants could withdraw from the study at any time without penalty. They were also advised that at any time during the process they could decline to answer any question.

2) The researcher's objectives were clearly explained before the interviews and group discussions.
3) A written consent form was given to each participant and signed, the group was requested to verbally consent also.
4) The participants were informed of all data collection methods and activities post the research and that the outcome will be shared with them.
5) Provisions will be made for monitoring the data collected to ensure the safety of the participants.
6) An interpreter was procured for collecting the data where English was not the first language.
7) The participant's rights, interests and wishes were considered first when choices were made regarding reporting the data.
8) The risk to the participants was considered none existent to minimal.

4.7 Procedural Rigor

Qualitative validity was determined through the use of strategies to check the accuracy of the findings. A triangulation from different data sources was used to build a coherent justification for the themes in the literature review.

4.8 Conclusion

This chapter examines the methodology used in collecting the data in the research and the qualitative technique used in collecting data. The primary and secondary data collected suggests that the final results will meet the objects of the study. The population size means that the data collected is significant to draw the secondary data and make conclusions that will assist in the variety of research questions in the study. The ethical consideration and procedural rigor were done in order to ensure that this research meets the requirement set out by the academic department and UNISA.

CHAPTER 5

5.0 RESULTS OF THE STUDY AND THE INTERPRETATION

5.1 Introduction

This chapter presents the results and discussion of the descriptive analysis. The data under analysis was collected from three MAPs producing provinces in Kwa-Zulu Natal, Western Cape and Eastern Cape with groups and individual companies in MAPs industry. The sections begin with brief presentation of the demographic characteristics of the participants of the study.

5.2 Demographic characteristics of sampled MAPs farmers/harvesters

In this section, aspects such as gender and age are discussed. This aspect of the chapter is important because the participants in value chain interviewed are the key focus in the commercialisation of MAPs for economic development in their provinces.

5.2.1 Gender distribution

In all the areas surveyed there were more females than males as shown in Table 1. The women have the tradition of harvesting MAPs as it is culturally observed as a woman's job. In some cases the women are not educated enough to get

better jobs in urban areas compared to their male counterparts, who can get work in mining in the cities. It is also a cultural phenomenon that traditional Amarula beer, Buchu remedies and *Pelargonium* remedies are made by women as the custodians of the technical knowledge and skill.

Overall, when combining the three areas that were surveyed it was evident that more females are involved in agricultural activities as opposed to males. In total, there were 89.25% females and only 10.75% males in the areas studied as depicted in Table 1.

Table 1: Gender of participants

Gender	Focus Group 1	Focus Group 2	Focus Group 3
Females	29	22	32
Males	1	1	8
Total	30	23	40

5.2.2 Age distribution of participants

Age distribution of the participants was fairly spread as indicated in Table 2 below. The large majority of up to 36% of the sample were between the ages of 50-64 years. The second largest age group was aged between 25 and 34 years. The lowest age group was the age group of younger than 24. The following were referred as the explanation for the low number of youth under the age of 24 years:

- Moving to cities by young people for better opportunities
- The younger generation pursuing their studies to better their lives
- Lack of interest in agriculture by young people
- Lack of interest in traditional practices
- Child bearing and lack of motivation due to grants from government

Table 2: Age distribution of respondents

Variable	**Number of MAPs**	**%**

	Groups	
>24	3	3.2
25-34	26	28.6
35-49	22	24.2
50-64	33	36.3
65+	7	7.7
Total	93	100.00

Source: Used data from this study

5.3 Results of Large International Company interviews – Western Cape; Cape Town Afriplex

5.3.1 Introduction

Afriplex harvest high-quality raw material from approved, sustainable resources and then transform these into a range of innovative, client-specific products and services. This is done through not only technologically advanced extraction, processing, purification and production methods, but also through constant research into consumer trends and keeping up to date with the ethno-botanic discoveries and applications. A variety of indigenous plant extracts are traded, although the main focus of the commercial plantings is Rooibos, Honeybush, *Hoodia gordonii*, Buchu and a selection of African Aloe species. The suppliers of their raw material have to adhere to a stringent set of quality standards and are approved only after a rigorous quality audit by their Quality Assurance Department. Figures 6, 7 and 8 are annotated value chain diagrams of the three selected MAPs of the study.

5.3.2 Production Process Section of the value chain

The company Afriplex employs two production methods of MAPs this includes wild harvesting for the *Pelargonium*, Aloe and Buchu. The company also engages in commercial production or propagation of *Pelargonium*, Rooibos and Buchu under tunnel production. The limitation with the raw material that is propagated and grown is that it has poor quality in chemical composition compared to the harvested material. Afriplex as commercial farming enterprise, which focus mainly on Rooibos, *Hoodia gordonii*, *Pelargonium sidoides*, Buchu *(Agathosma betulina)* and a selection of African Aloe species, allows its clients a secure supply of these raw materials for their products. In some instances their clients can even choose to co-own such enterprises, to ensure long-term assurance for the supply and availability of quality raw materials.

In the early 1970's all plant materials were harvested, but over time the company invested in commercial technical expertise to be able to have a sustainable

business model and grow the business with the demand. The biggest challenge has been the quality of the commercially grown material in relation to the harvested material. The harvested material has been superior in quality and chemical composition in comparison to the commercially grown material. Over the recent years the quality has been improved through research and development. Further work still needs to be done in order for the two systems to match and by far the harvested material gives best and unique chemical qualities.

Harvesting is done for a portion of the total required stock for Aloe and *Pelargonium* only, the rest of the supply is grown commercially under irrigation. The commercial growing method is costly but sustainable. The production is sustainable and environmentally sound due to crop production method used instead of the harvesting. The harvesting is being done, because most of the plant material has been there for many years.

5.3.3 Processing Section of the Value chain

The processing is done on site for all the South African patented products and some of the material is produced under licensing for international pharmaceutical companies. There are some materials that are sold to large international pharmaceutical who inturn manufacture products offshore but are sold in the domestic market. The final product is manufactured in Europe(EU) while the domestic products consist of the unique medicinal qualities of *Pelargonium* which is sourced from the Eastern and Western Cape provinces. The products are now gaining prominence in Asia especially the South African patented cough mixture products made from *Pelargonium*. For the cough mixture the final products are processed locally. The extraction for international patents are being licensed in the EU, but the products are made here. For the extraction for products manufactured oversees the crude active ingredients are sold in bulk and shipped to that market. For the other cosmetic products, the final goods are made in Europe especially for rooibos. The crude active ingredients are sent in 50kg drums to the EU.

5.3.4 Marketing Section of the Value chain

Afriplex is an enterprise which is targeting domestic and international markets, although for the cough syrup the market is largely domestic. The international markets are potential but only focus on the raw active ingredient material instead of the finished product. For the cosmetic market the international market is more dominant; this is due to the superior product development and technology that is available internationally. Large pharmaceutical companies that operate in the anti-aging cosmetic market make use of the anti-oxidant properties in rooibos, the healing and soothing properties of Aloe. Domestic market has a cough syrup market predominantly. The percentage of the sales that are domestic for *Pelargonium*, Rooibos and Aloe: 50:50 local and international, although most of the product development is under licence there is a growing demand for pharmaceutical and cosmetic ingredients in the domestic market

5.3.5 Distribution Section of the Value chain

The domestic distribution is done via a company subsidiary and or the local network; for international customers it is done via special intermediaries and shipping companies. They are specialists in the shipping and trading of these products between South Africa and Europe.

5.3.6 Final Product Section of the Value chain

Afriplex is a crude supplier of active ingredients. Over time and intense research the Company has been able to sell a value added product and produce its own products. The biggest challenge has been the capital cost and the laboratory costs for research as some research cannot be done in South Africa but is still being outsourced to international laboratories. The final product is made in the EU by large pharmaceutical companies

5.4 Results of Small Medium Amarula Company interviews – Durban

5.4.1 Introduction

Everpix has the potential to turn over R10 million, and has operations in three provinces where the harvesting of MAPs occurs. The company buys dried nuts from rural communities led by women and Co-operatives (Cops). The company employs specially trained 16 youth workers to run a 24/7 oil processing operations at Pietermaritzburg. Workers are youth from Imbali, Edendale, rural Eastern Cape and rural Bulwer (KZN). The team is able to run operations without additional direct supervision according to set schedules and with some basic troubleshooting in the absence of direct supervision. A special machine for crushing the nut has been developed by the company.

The Amarula Company; its rural community suppliers and workers thus set out to build a profitable industry reduce the vulnerability of South Africa's rural households. Currently the communities have the natural resources but are not utilising them with overexploited natural systems, the negative impacts of climate change these resources will no longer exist. It is important that we care for the several million drought tolerant indigenous trees. The Amarula Company with a portfolio of novel African products that improves nutrition, health and wellness of local and global consumers. This company intervention is sustainable and could be replicated to other communities in South Africa and sub-Sahara in future.

The objective of the company is creating a shared rural MAPs industry with Amarula. The nut inside the fruit, the waste from mechanical and manual fruit pulping, harbours one to four kernels which can be eaten and, contain a high value oil desired by the cosmetics industry; its nuts shells can find artisan, landscaping, industrial and fuel applications. Amarula Company (Pty) Ltd established a footprint in the Amarula value chain and a community supply network spanning 52-80 communities in Waterberg, Blouberg in Limpopo, Bushbuckridge, Mbombela and Nkomazi in Mpumalanga with expansion to Northern KZN. Amarula Company designed and commercially piloted proprietary high throughput mechanical nut to oil processing, doubled the income of 275

households for one month by purchasing Amarula nuts that are the waste of manual fruit pulping for beer brewing and are otherwise thrown away, sold Amarula nut oil overseas and attained sales forecasts for up to R10 Million in 2013. Amarula Company is ready to formalize, grow and replicate its rural nut supply, produce more oil, expand its operations by integrating up and down stream and diversifying to other NTFP in future to capture substantially more value and share the benefits with rural suppliers and factory workers, create rural jobs and income and, plant NTFP trees for future income and household food security. For its substantial community and environmental benefit the Amarula Company – African Conservation Trust - community partnership received the 2011 SEED Award from the UNDP, UNEP and IUCN SEED Initiative. SEED awards few global entrepreneurs annually which enterprises show large social and environmental benefit and exhibit the potential to replicate.

5.4.2 Production Process Section of the Value chain

There are two methods, harvesting for the Amarula fruit only, because there are no commercially grown trees currently. The company indicated that, in future it would grow the trees commercially. Harvesting is the only method of securing feedstock. The participants felt that this sourcing is sustainable environmentally, because they are of the opinion that most of the trees have been there for many years, but recently the unique softwood of the tree is being used for furniture and toys.

5.4.3 Processing Section of the Value chain

The MAPS are processed on site and elsewhere, the Amarula is processed partially on site for beer production and 300km away for the oil manufacturing. The final product is manufactured in Europe pharmaceutical and cosmetic companies. For the beer, the processing of the beer is done after the extraction of the pulp and it is consumed within 20km radius of production. For the oil and other cosmetic products, the final good is manufactured in Europe. Everpix sells the oil in crude form and are sent in 50kg drums to the EU.

5.4.4 Marketing Section of the Value chain

For the beer Amarula is a locally brewed and locally consumed beer. The market for the beer is traditionally opened for three months of the active harvesting and processing of the pulp and it is a domestic market. For the oil the market for Amarula oil is a high end cosmetic market in Europe. Recently the domestic market for the oil and its product has started to take off due to the uniqueness of the oil and its medicinal and aromatic properties. For Beer the market is 100% local and for Oil 95% international.

5.4.5 Distribution Section of the Value chain

The beer is sold directly to communities within 20km radius of the brewer; albeit it is an informal market the tradition is very strong and therefore sustainable due to the taste and seasonality of the beer. For the oil, the shipping of the oil is done via special cosmetic oil intermediaries and shipping companies. There are specialists in the shipping and trading of these products between South Africa and Europe.

5.4.6 Final Product Section of the Value chain

Beer is the final product for the local communities and they separate the kernel and dry it for collection and processing and in the oil it's an input to the final product. The final product is made in the EU by large pharmaceutical companies.

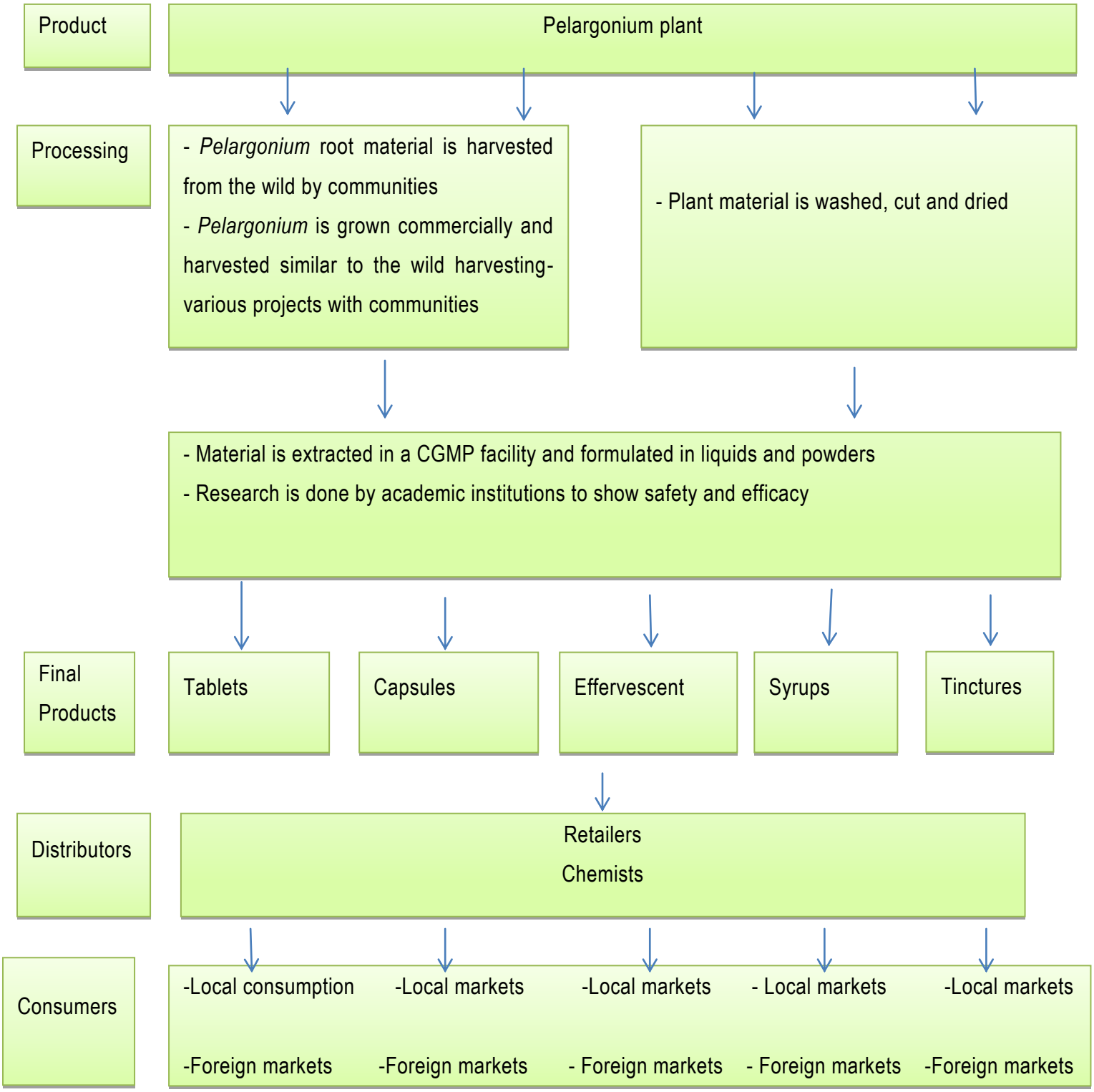


Figure 6: Value Chain Chart of the Pelargonium plant in the study.

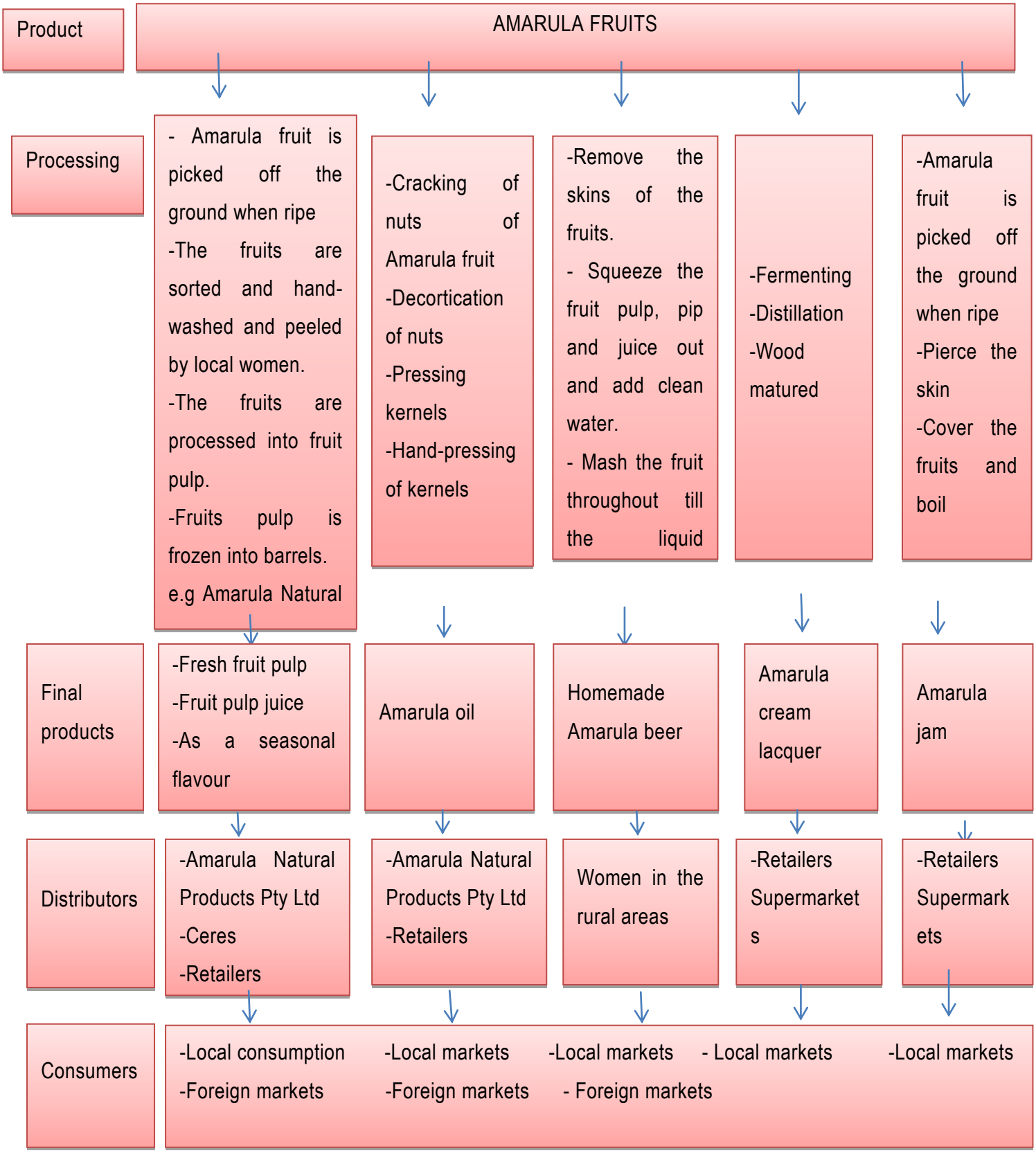


Figure 7: Value Chain of Amarula plant

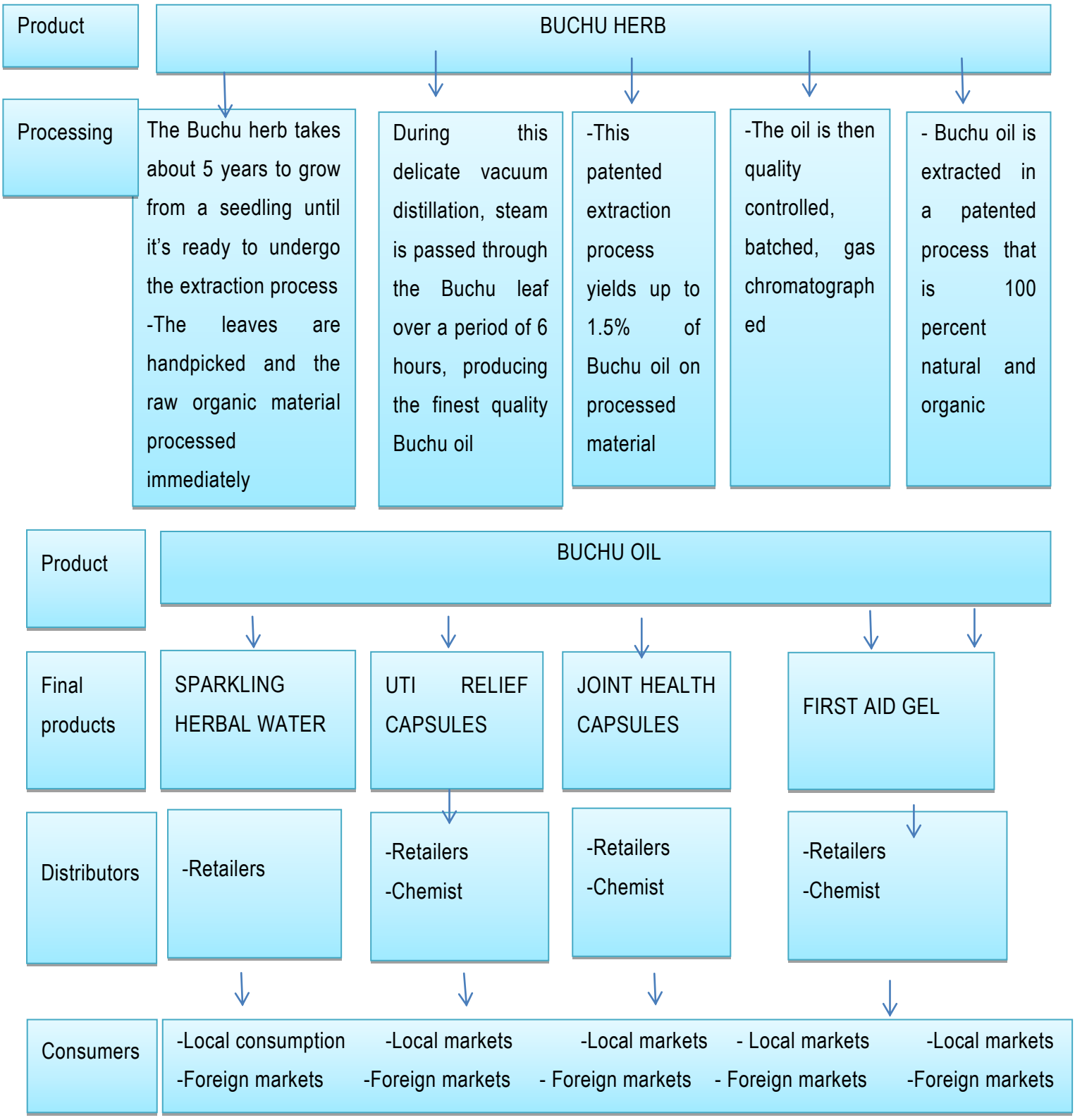


Figure 8: Value chain of buchu herb

CHAPTER 6

6.0 DISCUSSION OF RESULTS OF THE STUDY

6.1 Introduction

This chapter analyses and discusses the results of value chain challenges and constraints of the three selected South African medicinal and aromatic plants industry as supplied by participants and sources used by the study. The chapter focused on information and data benefited from comprehensive triangulation of information coming from different sources and conclusions were drawn from all existing evidence. There are suggested strategies provided by the sources that can be employed to mitigate the respective challenges and constraints.

6.2 Value chain Challenges and Constraints of the three selected South African MAPs industry

The value chain challenges and constraints facing the three selected South African MAPs industry as identified by the study in respect of the various sections of the chain are presented in Table 3.

Table 3: Results of consensus views of value chain challenges and constraints of the selected African MAPs by respondents and sources used by the study

Section of value chain	**Challenges and constraints of the African medicinal and aromatic plants**	**Suggested strategies that can be employed to mitigate the challenges and constraints**
1.0 Production section challenges & constraints	Poor quality and high costs of commercially grown materials	Continuous scientific research for quality propagation of materials and efficient commercial production method
	Absence of efficient and sustainable conservation and cultivation methods	Encourage cultivation of MAPs as field and horticultural crops in gardens and farms. Government departments concerned with conservation of water, vegetation/forest should prioritize MAPs

	Ecological threat due to use of haphazard harvesting and inefficient, ineffective post-harvest management practices	The protection and conservation of medicinal and aromatic plants should take high priority on the agenda for natural resources management. Segregation and key species cultivation
	Little or no research on the improvement of the low-yielding species and adaptation to farming production systems	Investment in Bio-technology for the development of sustainable cultivars
	Poor agriculture and propagation methods	Investment in Bio-technology for the development of sustainable cultivars. Promotion of good agro-ecological practices and good propagation methods
	Lack of commercially grown materials e.g. Amarula	The industrial production of plants and propagation for crop production is required
2.0 Procession section challenges & constraints	Lack of high-tech local industries for processing hence of the MAPs materials are sold to international companies	Promotion of high investment in establishing large pharmaceutical companies locally. Or product-line extension by local companies
	Inefficient processing techniques leading to low yields and poor quality products	Improvement of processing techniques leading to high yields and high quality
	Poor quality control procedures	Improved quality for control procedures with continued investment in research
	High-energy losses during processing	Efficient energy use during processing and packaging
	Lack of current good manufacturing practices	Use good manufacturing practices for efficiency
	Lack of R&D on product and process development	Improved R & D on product and process development
3.0 Marketing, distribution and final sections' challenges & constraints	Lack of local markets for some MAPs products, e.g. Amarula oil	Targeted marketing for the EU and other pharmaceutical companies with competitive prices
	Lack of superior technology to develop internationally competitive MAPs products	Improved R & D on product and process development
	Lack of access to latest technological and market information	and Streamline market access information

	South Africa and most developing countries do not provide institutional support and programmes for production supplies to promote MAPs production	Improved R & D on seeds production, product and process development and streamline market access information via efficient support programmes
	Difficulty in preserving extracts from MAPs for longer storage limiting marketability	Governments and private sectors should either develop or import reliable preservatives of medicinal extracts for extended shelf life
	Consumers of traditional medicinal plants pay very little prices to the producers/harvesters of MAPs. Very demotivating from profitability perspective	Promotion of value-adding and improved/efficient marketing system from production/harvesting to final consumers
4.0 Aspects of skilled human resources, technology, information, value adding, facilities, infrastructure, equipment, patenting and legislation challenges & constraints	Lack of MAPs oriented hi-tech for species breeding, pre and post harvesting processes of MAPs	Establish technology station to produce equipment
	Lack of trained personnel and equipment	Targeted skills and training programmes
	Lack of infrastructure, electricity, transport and water in rural areas to facilitate or improve value adding at rural areas	Government to accelerate the rural development programmes
	Lack of facilities to fabricate equipment locally	Import of new technology and equipment
	Lack of appropriate technology for post-harvest and pre-processing purposes adapted productively and effectively	Technology for post-harvest and pre-processing purposes adapted productively and effectively
	Most claims by many herbalists in South Africa and developing countries have not been verified scientifically	Government of South Africa and those of developing countries can establish links with international pharmaceutical companies to scientifically test these claims by herbalists
	Lack of or high cots or cumbersome patency and legislative procedures	Government to prioritize legislation and patency in order to develop the MAPs industry

Source: based on own information/data from the study (2014)

6.2.4 Absence of efficient, sustainable conservation and cultivation methods

Majority of the data/information sources pointed to the above challenge as one of the major ones and suggested the encouragement of cultivation of MAPs as field and horticultural crops in gardens and farms and that the government departments of developing countries concerned with conservation of water, vegetation/forest should prioritize MAPs. According to Kideghesho et al. (2006) the protection and conservation of medicinal and aromatic plants do not take high priority on the agenda for natural resources management and that government programmes give priority to agricultural and wildlife resources (www.blackherbals.com). By growing MAPs in the form of gardens and farms for primary agriculture will not only ensure proper farm management practices of the species but the prevention of threat of extinction of several MAPs species through use of haphazard harvesting and inefficient, ineffective post-harvest management practices. The primary production approach similar to production of staple crops may further lead to economic production levels of the MAPs to favour manufacturing; hence the prioritization of the protection and conservation of the MAPs by the concerned governments' departments cannot be overstated, especially in the area of research and information availability.

6.2.2 Challenges of low-yielding, poor quality outputs, poor adaptation to farming production systems and very little research and development

Some of the major challenges among the results of the study were very low-yielding species, poor quality outputs and poor processing methods. In addition, most of the MAPs do not adhere to modern agricultural propagation practices. Compounding the problems is that there is little or no research on the improvement of the low-yielding species and adaptation to farming production systems in most of the developing countries. Many of the data/information sources were of the view that the aforementioned challenges have not been given the desired priorities by the governments of South Africa and other Less Developed Countries (LDCs) in national investment, research and export development. South Africa and Least Developed Countries (LDCs) concentrate their research and development on staple crops such as maize, rice and wheat. The lack of attention from the various governments of the LDCs may be attributed to many reasons. Adotey et al. (2012) and Mohamed et al. (2013)

indicated the lack of scientific proof to the effect that the active elements in medicinal plants are valuable, not dangerous and effectual. This is very important for the medical field and the public to endorse the use of African medicinal plants as highly acceptable alternatives to western medications; and this will in turn induce more research and development investment from government and private sectors as well as international collaboration. However, methods to be used to evaluate the safety and effectiveness of traditional medicine are new challenges which have emerged in recent years. There is lack of research mainly in the improvement of high-yielding species and the adaptation of the species to gardening and farming cultivars for primary agriculture. In South Africa and many LDCs especially in Africa, there are very little local support for research and development of MAPs. Greater part of the little support available is usually obtained from external sources. The situation is often exacerbated by inadequate infrastructure/facilities such as water, electricity, transport and communication, as well as manpower, technical resources and financial capital for investment. Highly required are investment in biotechnology for the development of sustainable cultivars, more support for research and training activities for traditional medicine and the promotion of good agro-ecological practices and good propagation methods. The research and development recommendations suggested will be more attainable if supported with the proper policies.

6.2.3 Domination by manual practices with very little modern product manufacturing processes and lack of appropriate technology for post-harvest and pre-processing purposes

Most of the respondents of the study agreed that traditional herbal medicines and aromatic products are formed by the practitioner him/herself who identify and harvest the right plant species. Thus in most cases the practitioner is the only one who knows the right species, he does the harvesting himself, and do the preparation of the medicines himself; all the processes done manually. Since all the processes are done manually, there is no guarantee of the genuineness, concentration levels of the potential elements in the herbal medicines and quantity of plant material used in the preparations. There are so many

differences in traditional medicines so produced in respect of quality. Determining the right medicinal concentrations, dosage and removal of toxic contents require highly efficient modern technologies. These are critical challenges to the realization of the full potential of the MAPs as alternative to western medicines. Therefore the need for investment by South Africa and LDCs for efficient and effective techniques, manufacturing practices and appropriate technology for post-harvest and pre-processing purposes for African medicinal and aromatic plants cannot be over-emphasized.

6.2.4 Marketing of products challenges

Marketing involves the movement of goods and services from the producer to the final consumers. In every commercial production or service the market is the main determinant of sustainability. No matter how much bountiful production is, the market is the adjudicator. The market outlets can be for local use or export. Some of the marketing challenges of the selected MAPs identified by the study include:

- Inability of producers/harvesters to have contract agreements for supply due to lack of volume that can be produced by small industries
- Inability to access market information
- poor preservation of medicinal extracts for extended shelf life and
- low prices paid for traditional medicinal plants by herbal medicine traders and urban herbalists

According to Agricultural Marketing Resource Centre (2007) marketing is not just about selling but requires a clear and perfect understanding of what consumers want and the ability to deliver it to them through the most appropriate channels for a profit. The marketing functions comprise identifying the target market, product design, pricing, promotion, transportation (distribution), storage, and financing. Selling directly to retail outlets requires a routine sales route as well as an adequate volume of the product to meet market demand. Large volumes are required in wholesaling; they should be provided over a longer period of time in order to have consistency and guaranteed supply. These volumes will require grading and packaging facilities on site. There are further requirements for standards on quality, grade and size which are necessity in wholesale and retail

markets. Unforeseen risks may limit production and profitability of African medicinal and aromatic plants. Unstable markets, low product prices, changing tastes, poor infrastructure, droughts, inadequate government policies, longer food preparation time, as well as competition from non-African medicines and aromatic products are common risks faced by these plant-based industry markets. Government's support in the form of market information availability to the suppliers and buyers in this industry would go a long way in improving the marketing of the plant-based industry. Good preservation of African medicinal and aromatic extracts for extended shelf life will help reduce losses and also spread supply and maintain prices across seasons.

Regarding export market, usually medicinal plants are allowed without any tariff restrictions in many countries. According to Zhang (1998) the medicinal plants are mostly exempted from import duty in Canada, Japan, the European Union and the USA. However, tariff charges in China and South Africa vary between 10% and 20% of the value of goods, depending on product and origin, while Japan levies a 5% tax on imports of ginseng roots, peppy straw, sandalwood and some others (Zhang, 1998). Threats to the future development of medicinal plant exports from South Africa and LDCs depend on the structure of the major importing markets.

Efficient and effective marketing of MAPs especially in the high valued international markets requires strong marketing infrastructure and R&D facilities. Such capitals are usually not easily available in South Africa and most of the developing countries. The other challenge identified by most of the sources of the study is that herbal medicines are not sold as over-the-counter products in the developed countries hence the need for capital investment in R&D, post-harvest technology and quality products' processing, packaging and storage infrastructure.

Currently South Africa and most of the LDCs are not cultivating the MAPs. Most of the suppliers are actually harvesters of the MAPs from the wild. As indicated by some of the respondent companies, the quality of some of few commercially grown cultivars leaves much to be desired. Therefore the supply potential is thus

virtually unknown. Another major challenge as indicated by most of the sources of the study is the lack of high-tech know-how in processing technologies, lack of regular supplies of plant raw materials in adequate quantities on long-term basis, unavailability of sustainable production processes, lack of institutional capability to advice on quality requirements of standardized plant extracts, policy and regulatory mechanisms.

Regarding policy from the South African perspective, medicinal products are controlled by legislation in the medicines and Related Substances Control Act [No.101 of 1974], including the Pharmacy Act [No.53 of 1974] and their related regulations and Ethical Rules. The Medicinal Control Council (MCC) is the primary agency in South Africa responsible for control, regulation and registration of all medicine. The legislative approach for herbal medicines only makes accommodation of registration of medicines in two categories: orthodox and veterinary medicines (Parliamentary Act, 1998). Homeopathic medicine is dealt with under the orthodox category, but complementary medicines, which included African traditional medicine was not adequately covered. African traditional medicine has now been removed from this category and the MCC is reviewing the legislation. Section 14 of the medicines and Related Substance Control Act stipulates that no person shall sell any medicines that need to be registered, unless that medicine has already been registered (Parliamentary Act, 1998). The MCC has accepted the following understanding of herbal medicine for the purpose of registration.

Herbal medicines are finished, labelled medicinal products that contain an active ingredient aerial or underground parts of plants or other plant material or combination thereof, whether in the crude state or as plant preparation. A herbal medicine does not include medicines used exclusively in formalized Herbalism or in traditional indigenous herbalist practices. Any company manufacturing registered medicinal products is required to be a pharmaceutical company registered with the MCC, as well as with the South Africa Pharmacy Council. In 1994, the WHO Regional Office for the Eastern Mediterranean published Guidelines for Formulation of National Policy on Herbal Medicines (WHO, 2002-5). As the majority of the world population seeks treatment with traditional

medical practices, especially herbal medicine, and as herbal medicines are of particular value in gastrointestinal problems, upper respiratory tract ailments, urinary tract diseases and skin diseases, the need to formulate national policies on traditional medicines and to encourage co-operation between Member States in this regard is evident (Zhang, 1998).

In Africa the use of herbal medicine is based on the traditional knowledge and belief. However, knowledge about herbal medicines is very limited in most of the developed countries. This limits the usage, consumption and marketability of the plants. It is therefore important to employ a special deliberate systematic approach or strategy to link with end-users in the developed countries to study their use in herbal supplements and herbal remedies manufactured by them, explore the possibility of selling traditional herbal supplements and tonics and lastly, to examine the requirements for marketing traditional medicines.

Last but not the least of the marketing challenges is the lack of value adding to the African Medicinal and Aromatic Plants preparations. It is an established fact that value-adding improves income from the products, however majority of primary producers of herbal medicines in Africa have not as yet moved towards adding value to local natural products. Gurib-Fakim (2005) and Rukangira (2001) indicated that some plants originating from Africa have become sources of important drugs with examples extending to Neostigmine which is made from the Calabar bean being used in treating glaucoma and as an insecticide.

6.2.5 *The intellectual property challenge*

The study also found that intellectual property rights of traditional medicines continue to be one of the major concerns in South Africa and the Less Developed Countries. It is very difficult for them to be patented because the plants have been used by many people in many traditional medicines for many years from generation to generation; however, they can be registered as individual or regional trademarks, with unequivocal directions of source. The hindrance to patenting of the African traditional medicines in South Africa and LDCs are many and varied which include: nonexistence of legislative framework for official recognition of African herbal

medicines and their registration and property rights procedures; lack of knowledge about intellectual property rights; high cost of patenting to the African and their institutions; lack of patent experts to advise on requirements for patenting; and the fact that plant materials cannot be patented in their natural form. According to Wilder (2001) traditional healers associations have identified the high costs of filing patent applications as the biggest obstacle to the acquisition of patents by practitioners of traditional medicines. According to the report by the World Intellectual Property Organisation (2001), holders of indigenous knowledge systems pointed out that the transaction costs of the formal system are beyond the capacity of the majority of informal innovators, hindering their ability to file for patents. Although it is true that plant materials cannot be patented in their natural form, efforts should be made to protect the processes involved in the development of herbal medicine and aromatic products as well as the novel uses of the products.

6.2.9 Lack of access to information

The study also identified lack of access to information as one of the challenges limiting the development of the African herbal medicine industry. International databases and journals form the major sources of literature for many researchers and knowledge seekers of African herbal medicines and aromatic plants. However, due to lack of finance and other economic priorities they do not subscribe to these sources for data and information. It should be emphasized that critical information/data required for technologies and scientific processing of herbal medicines and aromatic plants are not available at the aforementioned sources; many of the sources that contain such important data and information are usually patented and require money to be granted access.

6.2.10 Human resource development challenge

More highly qualified specialists in chemical engineering and technology are required if appropriate and proper scientific research in African herbal and aromatic plants are to be undertaken. However, very few scientists in Africa specialize in this field; the services of the few specialists available are also required in other similar industrial sectors, making it a major limitation to the industry's development.

6.2.11 Pressure on the ecology

The majority of the focus groups and other respondents indicated that the major concern facing African medicinal and aromatic plants' continuous availability, development and use is its survival and reproducing ability for future supply needs. In most of the LDCs the herbal medicinal and aromatic plants usually grow in the wild and harvested without restrictions by traditional herbal medicine practitioners. The plants are harvested sometimes for commercial use; some of the harvesting procedures used are destructive especially where shoots and underground parts are removed incorrectly and become vulnerable to higher temperatures; this may disrupt or curtail the photosynthetic activities of the affected plants (Kala et al., 2006) (www.ethnobiomed.com). Lange (2004) reported severe decline in herbal medicinal plants in many parts of the world and attributed it to the demand in international trade and not to the supply needed by the indigenous population. The trade in botanicals is largely unmonitored (www.lib.teiep.gr). This over-exploitative practice without primary cultivation of the plants for regeneration coupled with other factors such as climate change, desertification, bush fires, drought and population growth will cause drastic decline of African medicinal plant resources' genetic diversity and livelihoods of people who depend on plants. Phondani (2011) indicated that demand for medicinal plant-based raw materials is growing and many African medicinal plant species are each used in curing more than one disease (www.lib.teiep.gr).

CHAPTER 7

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

This chapter summarizes the research findings and arrives at conclusions based on results of the study and puts forward some recommendations which are believed to be of benefit to the MAPs Amarula *(Sclerocarya birrea*), Buchu (*Agathosma betulina*), and *Pelargonium* (*Pelargonium sidoides* industry especially in the study area.

7.2 Conclusions

Medicinal and Aromatic plants extracts have become an essential part of exports in the developing countries. The preference by consumers to have natural products has grown over the years, this increases annually and has allowed medicinal, aromatic plants to present a unique and niche market base for pharmaceuticals, cosmetics and other industries (food & industrial use). South African farmers can exploit this new industry in order to grow the sector, create jobs and economic development as well as balance of payment. The cost of setting up a full value chain industry for MAP's includes major investment in research and development in order for the country to best utilise its natural resource despite these hegemonic challenges discussed. South African researchers, leaders and its government institutions need to focus on indigenous plant research projects in order to assist the country with job

creation. Support for a study like this should be promoted to preserve the traditions and commercialise these practices.

The objective of the study was to identify and analyse the value chain challenges and constraints militating against the economic development potential of three selected MAPs in South Africa. The study employed holistic and participatory approaches to comprehensively examine all aspects that relate the three selected MAPs industry in South Africa especially in the study areas. The study benefited from triangulation of qualitative data gathered from previous research and reports, interviews, focus group discussions and industry visits observations. Key government units relating to agricultural medicinal and aromatic industry were also consulted and reports used to verify findings from focus group discussions. Thus, the study used both secondary and primary information/data. The research made use of secondary data from review of literature through a desktop study of published and unpublished resources. Secondary information was also gathered from annual reports from the Agritex office, non-governmental organizations, research institutions and academic work of individuals. The information gathered from the desk review was also used to inform the selection of the sites for conducting focus group discussions and mapping the various key informants to be interviewed. This also informed the research in terms of existing information gaps and the identification of areas for further investigation.

Focus group discussions were used to gather primary information/data from key stakeholders in the industry in South Africa. The focus group discussions were held in three provinces *inter allia* Kwa-Zulu-Natal, Mpumalanga and the Western Cape using a semi-structured guide. All the data from focus group discussions, key informant interviews, secondary data and field visit observations was consolidated and analysed using the SPSS computer programme and Atlas software. Information from the key informants' interviews was used to triangulate information gathered from the desktop review and focus group discussions. The main value chain constraints and challenges identified and analysed by the study include:

- Poor quality and high costs of commercially grown materials

- Absence of efficient and sustainable conservation and cultivation methods
- Ecological threat due to use of haphazard harvesting and inefficient, ineffective post-harvest management practices
- Little or no research on the improvement of the low-yielding species and adaptation to farming production systems
- Poor agriculture and propagation methods
- Lack of commercially grown materials e.g. Amarula
- Lack of high-tech local industries for processing hence of the MAPs materials are sold to international companies
- Inefficient processing techniques leading to low yields and poor quality products.
- Poor quality control procedures.
- High-energy losses during processing.
- Lack of current good manufacturing practices.
- Lack of R&D on product and process development.
- Lack of local markets for some MAPs products, e.g. Amarula oil
- Lack of superior technology to develop internationally competitive MAPs products
- Lack of access to latest technological and market information
- South Africa and most developing countries do not provide institutional support and programmes for production supplies to promote MAPs production
- Difficulty in preserving extracts from MAPs for longer storage limiting marketability
- Consumers of traditional medicinal plants pay very little prices to the producers/harvesters of MAPs. Very demotivating from profitability perspective
- Lack of MAPs oriented hi-tech for species breeding, pre and post harvesting processes of MAPs
- Lack of trained personnel and equipment
- Lack of infrastructure, electricity, transport and water in rural areas to facilitate or improve value adding at rural areas
- Lack of facilities to fabricate equipment locally.

- Lack of appropriate technology for post-harvest and pre-processing purposes adapted productively and effectively
- Most claims by many herbalists in South Africa and developing countries have not been verified scientifically
- Lack of or high costs or cumbersome patency and legislative procedures

7.3 Recommendations

Important recommended strategies are that:

- Government should come out with clear agricultural policies to establish an information centre that acts as a source of information for producers and harvesters of MAPs

- Government should work on technical issues concerning African medicinal and aromatic plants such as; promoting the use of research and experts on issues regarding the marketing of the products.

- Initiatives from rural and peri-urban community towards African medicinal and aromatic plants should be supported by appropriate assistance from institutions by providing adequate extension services, improving grants, and access to credit inputs. This call for policy proposals that could help address the challenges faced by the marketing of the products from MAPs. The need for improvement in access to markets and market information with respect to African medicinal and aromatic plants should be one of the priorities of government.

- Government should assist in human resource development through mobilization, facilitation and integration of a comprehensive market strategy that will enable African medicinal and aromatic plants producers/harvesters to have greater access to national and international markets. One of the vital

necessities of a successful agricultural sector is the availability of reliable, readily available and understandable market information. This enhances producers' decision making and afford them a chance to exploit market opportunities. With the current deregulation of the various control boards, timely market information has become even more important as producers will now have to be more involved in marketing of their produce.

- The balance between marketing of inputs and production is vital to guard against the cost price-squeeze syndrome. Supply-side measures help reduce the costs price-squeeze syndrome and lead to sustainable growth of the manufacturing sector. Some of these measures are;
    - Support for technological development and diffusion:
    - Support for skill development of producers especially young aspiring producers
    - Competitive input prices;
    - Support programmes with respect to infrastructural development; and
    - Promotion of both internal and export marketing programs.
- For production to be effective, the current extension services should be enhanced and given an independent unit with the objective of;
    - Awareness on African medicinal and aromatic plants
    - Market coordination with respect to African medicinal and aromatic plants
    - Information centre and
    - Capacity building, especially for young producers
- The government is expected to facilitate the creation of new opportunities for the established and new entrant producers by developing support systems and infrastructure and by the provision of training, marketing information and other support services.

7.4 Implications for further research

Support for a study like this should be promoted and furthering of the study at doctoral level is advised. During the study the researcher in this study

necessitates the identification of personal values, assumptions and biases at the outset of the study. The primary researcher used her mother tongue Xhosa assisted in working with the key participants. Although every effort was made to ensure objectivity, the researcher's personal bias could shape the way she views and understands the development of further research for the dissertation. The primary researcher believes that these experiences enhance knowledge and sensitivity to the issues being addressed in this study and will assist South Africa in planning for the use of commercialising MAPs. She recognizes the need to be open to the thoughts and opinions of others and has set aside her experiences in order to understand those of the participants in the study.

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