

**Education for Sustainable Development of Medicinal  
Plant Sellers: challenges in relation to marketing, sales,  
storage and conservation**

**By**

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## DECLARATION

I Busisiwe Gugu Ndawonde declare that the thesis on **Education for Sustainable Development of Medicinal Plant Sellers: challenges in relation to marketing, sales, storage and conservation** submitted for Doctor of Education at the University of Zululand is my work and information contained in this study is my own work, all sources that I used have been indicated and acknowledged by means of complete references.

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## **ABSTRACT**

The purpose of this study was to introduce the concept of sustainability to medicinal plant sellers by a way of a non-formal environmental education programme. This was done for future generations to enjoy the benefits of medicinal plants whilst enhancing the livelihoods of medicinal plant sellers who depend on harvesting and selling these plants. Having realised that medicinal plant sellers were harvesting in an unsustainable manner, the researcher could not ignore this situation. There was a need to assist medicinal plant sellers to reflect on ways they conducted their businesses. The researcher deemed it necessary to alert the sellers to the necessity of harvesting plants wisely and consider future generations by taking preventive actions before many of the plants become extinct.

The design of this study was a mixture of qualitative and quantitative research approaches. On one hand, the quantitative approach involved a survey using a semi-structured questionnaire, which was administered through face-to-face interviews. On the other hand, the qualitative method is by way of a case study in which data were collected through open-ended questions, focus group discussions and a workshop. The questionnaires were semi-structured.

The research survey instrument served as the diagnostic tools to identify challenges that confronted the medicinal plant sellers. Information obtained through this instrument was explored in a workshop, which was designed to be an intervention programme. The programme engaged medicinal plant sellers and the researcher in discussions about sustainability of medicinal plants. The assessment of the intervention programme was carried out by means of site visit and open-ended interviews.

Data were coded and grouped according to themes. They were interpreted, analysed, presented according to the set perspectives such as tabulation, graphing and direct citations from the respondents.

The results showed that there were problems in the medicinal plant selling businesses, with regard to storing, marketing and conserving medicinal plants. Storage was problematic in the sense that some plants need to be dried out before being stored. During rainy seasons this was hard to be achieved since the drying out is done outdoors.

Marketing was also problematic due to price competition among medicinal plant sellers. There was no uniformity in pricing. Another problem was lack of record keeping. There were no records of revenue and expenditure that would help determine profit margins if any. After exploring these issues in the workshop, the results from the assessment of the intervention programme showed that the medicinal plant sellers had revisited prices for their medicinal plants.

Conservation was one of the areas that were explored as ways of sustaining medicinal plants. Among the conservation methods that were discussed in the study, cultivation of the medicinal plants was found to be a major challenge. The study revealed that in spite of the slow growth rates of medicinal plants, non-availability of land and irrigation problems posed as challenge of medicinal plant cultivation. The study intervened by engaging with medicinal plant sellers in discussions to start their own home gardens. The intervention programme had a way to supplying medicinal plant seedlings to the medicinal plant sellers. The sellers were also taught how to cultivate medicinal plants.

The assessment of the study intervention also revealed that some of the medicinal plant sellers were not yet accustomed to methods of record keeping. Nevertheless, the intervention programme introduced methods of recording sales such as banking of revenue and keeping deposit slips. When the second phase of assessment programme was conducted, the medicinal plant sellers reported that they had adopted banking of their revenue. Banking could however; banking could not show all records, particularly expenditures. Although medicinal plant sellers were shown how to record expenditures and sales of the medicinal plant material, they had not practiced those recording techniques during the assessment of the workshop. Banking money by the medicinal plant sellers was, however, seen as a step further towards Education for Sustainable Development (ESD) of medicinal plant sellers.

The study concludes by stating that issues of preservation and storage of medicinal plants by drying out in the sun, their packaging in plastic bags and reluctance to cultivate the plants by medicinal plants should be addressed by medicinal plant sellers.

While the South African government is taking action to empower medicinal plant sellers about sustainability issues studies are required to engage communities to reflect and be actively involved in conservation of biodiversity such as medicinal plants through action research as means to sustain livelihoods of communities including medicinal plant sellers. In conclusion, the capacity building programme took place in a short time scale; based on the research findings the study makes recommendations to guide the education and sustainability of medicinal plants.

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# **CHAPTER ONE**

## **BACKGROUND AND OVERVIEW OF THE STUDY**

### **1.1 INTRODUCTION**

Chapter one presents the background of this study which is Education for Sustainable Development (ESD) concerning medicinal plant sellers in northern KwaZulu-Natal (KZN). In this chapter the rationale behind this study and research problem are discussed. The overview of ESD with regard to medicinal plant sellers is also highlighted. Study objectives and research questions are explained in this chapter. This chapter also highlights the significance of the research and concludes with an explanation of the concepts used in the study.

### **1.2 BACKGROUND OF THE STUDY**

This study was triggered by the results of an earlier case study on medicinal plant sellers concerning the types, uses, quantities, prices charged and conservation status of medicinal plants (Ndawonde, 2007). The case study revealed, *inter alia*, that medicinal plants were harvested by the medicinal plant sellers without replenishment, thereby threatening the long-term survival of the selected plant species. The following species (Table 1.1) were found to be the priority species for conservation. These have also been identified in the literature as the species at high risk due to over-harvesting (Goldings, 2002; Nichols, 2005; van Wyk, & Gericke, 2009; Chungu, Muimba-Kankolongo, Roux & Malambo, 2007; Ndawonde, Zobolo, Dlamini & Siebert, 2007).

**Table 1.1:** Priority species for propagation

Family names	Scientific names	Zulu names	Conservation Status	Part Used
Apiaceae	1. <i>Alepidia amatymbica</i> Ackl. & Zeyh.	i-Khathazo	Vulnerable	Root
Orchidaceae	2. <i>Ansellia africana</i> Lindl.	i-Mfeyenkawu	Vulnerable	Whole tree
Fabaceae	3. <i>Bauhinia bowkeri</i> Harv.	u-Mdlandlovu	Rare	Bark
Hycinthaceae	4. <i>Boweia volubilis</i> Harv.ex Hook.f.	u-Gibisila	Endangered	Bulb/Tuber
	5. <i>Merwillia plumbea</i> (Lindl.) Speta	i-Nguduza	Vulnerable	Bulb
	6. <i>Eucomis autumnalis</i> (Mill.)Chitt.	u-Mathunga	Vulnerable	Tuber
Asphodelaceae	7. <i>Bulbine frutescens</i> (L.) Wild.	i-Bhucu	Endangered	Leaves
Zamiaceae	8. <i>Encephalartos natalensis</i> R. A. Dyer & I. Verd	i-Sigqiki somkhovu	Rare	Tuber
	9. <i>Encephalartos villosus</i> Lem.	i-Mfingo	Rare	Root
Apolynaceae	10. <i>Stapelia gigantean</i> N. E. Br.	i-Lilo	Vulnerable	Whole plant
Apocynaceae	11. <i>Mondia whitei</i> (Hoof.f.) Skeels.	u-Mondi	Vulnerable	Root
Hypoxidaceae	12. <i>Ocotea bullata</i> (Burch.) Bill.	u-Nukani	Vulnerable	Bark
Canellaceae	13. <i>Warbugia salutaris</i> (G.Bertol.) Chiov.	i-Sibhaha	Critical endangered	Bark, Stem, Roots and Leaves

(Adopted from Ndawonde *et al.*, 2007)

The conservation status of the medicinal plants listed in Table 1.1 was checked from the scientific published sources of Red Data Records (Goldings, 2002). It is teased that, over time, there is great danger that not all the thirteen species may survive. For instance, medicinal plant species such as *Bauhinia bowker*, *Ocotea bullata* and *Warbugia salutaris* where bark is harvested, take too long to mature, given the duration of the study.

Other issues that arose from the case study included business management skills of the medicinal plant sellers and the differences between indigenous knowledge and scientific practice.

### **1.3 RATIONALE BEHIND EDUCATION FOR SUSTAINABLE DEVELOPMENT**

Rukangina, (2001); Ndawonde *et al.*, (2007) have reported that many of the South Africans derive their income from collecting and trading medicinal plants at various medicinal plant markets. It is estimated that 4000 tons of medicinal plant material are used annually for medicinal plant purposes. In the process, the country is losing valuable medicinal plant species such as *Warburgia salutaris*. High unemployment rates resulted in the harvesting and selling of medicinal plants and a practice has become a popular alternative to sustain the livelihood of many communities.

Due to urbanisation and an increase in the commercialisation of medicinal plants, the trade is no longer just the domain of traditional healers, but has also become the domain of untrained commercial gatherers who supply main urban areas, thereby boosting the thriving informal trade, especially in towns and cities (Mander, 1998). As urban dwellers are mostly poverty stricken and without medical aid benefits, they tend to rely on traditional herbs for their medical problems. This, in turn, causes the demand for medicinal plants to exceed the supply from the wild. Thus in an attempt by the medicinal plant sellers to meet these high demands, they harvest the medicinal plants unsustainably. They can harvest the plants at any age, from the same area and take the whole tree in order to sell more. The incorrect methods of harvesting the medicinal plants have led to the decline in some species, while others are on the brink of extinction.



In order to conserve these species in the long term, the value of medicinal plants needs to be recognised by every South African citizen. Communities need to be encouraged to propagate priority species and use naturally occurring medicinal plant populations in a sustainable way. To achieve this, there is a need for government and non-government institutions to engage communities and empower them to ensure the sustainability of medicinal plants.

Besides the destruction of forestry resources through harvesting, medicinal plant sellers have been the victims of exploitation of their intellectual property rights. The knowledge of the medicinal plant sellers and healers has been exploited for a very long time (Rukangina, 2001). Many academics have interviewed traditional healers and published the results of such interviews without acknowledging them as the source of information (Obikeze, 2003, van Damme, 1999; WHO, 2003). Some of the modern medical scientists have also interviewed and observed traditional healers at work and then passed on their results and other findings to established pharmaceutical companies, yet, traditional healers do not receive any royalties for their knowledge.

This factor was the major constraint in the present study since some of the medicinal plant gatherers did not want to be interviewed. They indicated that they were concerned of being sued for selling indigenous medicinal plants. Others indicated that they believed that their knowledge would be exploited unfairly. Despite these constraints, trust eventually developed as the study progressed, particularly after the researcher bought some medicinal plant samples. All the traders were isiZulu speaking, as the researcher.

Having realised that medicinal plant sellers were harvesting in an unsustainable manner, the researcher decided not to walk away from the situation; there was a need to assist the sellers to reflect on their harvesting methods and the effect that these were having on the environment. It was deemed necessary to alert the sellers to the point that they should harvest plants wisely and consider future generations by taking corrective action before many of the plants become extinct. Thus, researcher introduced the concept of sustainability, which is simply described as a wise use of resources (medicinal plant species) such that future generations can utilise them as well (Ceschin, Vezzoli, & Zhang, 2010). Principles of sustainability include the recognition that the needs of future generations must not be sacrificed in order to meet present demands.

Fewer interventions of this nature have been conducted in KwaZulu-Natal. It was, therefore, hoped that this research project would contribute to the knowledge pool about sustainable development regarding medicinal plants *vis-à-vis* medicinal plant sellers. Furthermore, it was envisaged that this study would make a meaningful contribution to the reduction of knowledge gaps that might exist with regard to the propagation of certain scarce plant species. In the process, it was the hope of the researcher that this study would also fulfill one of the triple missions of higher education institutions that is, one of community development/engagement.

#### **1.4 THE CONTEXT OF EDUCATION FOR SUSTAINABLE DEVELOPMENT**

At the 1998 United Nations Educational, Scientific and Cultural Organisation (UNESCO) conference in Paris, delegates declared among other things, that education was a fundamental pillar of human rights, democracy, sustainable development and

peace. That concept of education is termed Education for Sustainable Development (ESD).

ESD entails a process which develops awareness, knowledge and understanding of the environment, positive and balanced attitude towards it, and skills that enable individuals to participate in assessing the state of the environment (Environmental Education Policy for Schools, 2001). ESD also prepares individuals for an ecologically sustainable future, as well as empowering them to restore the Earth's natural resources and foster support for the wellbeing of future generations by promoting sustainable life styles. ESD is based on **formal, informal and non-formal education**.

***Formal education*** is a structured, chronologically graded 'education system', running from primary school to university. In addition to general academic studies this system includes, a variety of specialised programmes and institutions for full-time technical and professional training (Hugo, 2004; Environmental Education Association of South Africa (EEASA) Monograph No. 3, 1999).

***Informal education*** is a lifelong process whereby individuals acquire attitudes, values, skills and knowledge from daily experiences and the educative influences and resources in his or her environment - from family and neighbours, work and play, the market place, the library and the mass media (Guidelines for Environmental Education Policy and Strategy Processes in the Southern African Development Community (SADC) States, 1999).

In the Guidelines for Environmental Education Policy and Strategy Processes in the SADC States (1999:5) it is stated that *non-formal education*

“is an organised educational activity outside the established formal system. It encourages the inclusion of environmental components in all relevant training and extension programmes including accredited vacation courses, on the job training, literacy and adult basic education, informal agricultural extension work, and community development programmes.”

Non-formal education is concerned with making government and private funding routes and processes more accessible to community-based agencies actively engaged in education for sustainability (Hoppers, 2006).

This study investigated the efficacy of non-formal education for medicinal plant sellers in order to promote the concept of sustainability of medicinal plants, and by implication the businesses which support their livelihoods. The researcher envisaged that by involving the medicinal plant sellers in the activities of conserving the plant species they harvested, they would come to learn about and appreciate indigenous plants and the value that the plants held with regard to the livelihoods of different communities.

## **1.5 STATEMENT OF THE PROBLEM**

The most important ‘ingredient’ required to achieve a truly sustainable form of resource, is information (Cunningham, 2001). In reality, medicinal plant sellers are confronted with a lack of adequate information about plants they use including their scarcity, the diversity of wild populations and the annual sustainable yields that can be

harvested without damaging the populations. As Schippmann, Leaman and Cunningham (2002) point out, excluding poverty and the break-down of traditional controls, the major challenges for sustainable wild collection of medicinal plants includes lack of knowledge on sustainable harvest rates and practices. Sustainable harvesting is increasingly seen to be the most important conservation strategy for most wild-harvested species and their habitats, given their current potential contributions to economies and their greater value to harvesters in the long term.

An earlier survey of the medicinal plant sales in northern KwaZulu-Natal was undertaken in 2006-2007 (Ndawonde, 2007). In the survey key role players in the medicinal plant selling business were identified as medicinal plant sellers and gatherers. Furthermore, the uses of the medicinal plants, priority species for conservation and the quantities of medicinal plant material traded at Mona Market (Nongoma), were identified. This was when it was noted that in spite of the numbers and the experience of the medicinal plant sellers, the medicinal plant selling business faced major challenges with regard to marketing, storage, and conservation of the medicinal plants. Those findings led to the present study.

This study sought to explore the existing knowledge and practices of medicinal plant sellers regarding marketing, conservation and storage of medicinal plants in addition, it sought to determine whether an intervention based on a non-formal education would significantly improve their knowledge and practices. More specifically, the study was underpinned by the following objectives:

## **1.6 THE RESEARCH OBJECTIVES**

- 1.6.1 To explore the most prevalent challenges faced by medicinal plant sellers with regard to marketing, storage and conservation of medicinal plants.
- 1.6.2 To investigate whether the medicinal plant selling business is environmentally supported to sustain the livelihoods of the medicinal plant sellers.
- 1.6.3 To determine whether or not a capacity building programme on knowledge related to marketing, storage and conservation of medicinal plants would enable the medicinal plants sellers' understanding to run their businesses more profitably and sustainable.

## **1.7 RESEARCH QUESTIONS**

- 1.7.1 What challenges are faced by medicinal plant sellers with respect to marketing, conservation and storage of medicinal plants?
- 1.7.2 How does the selling of medicinal plants impact on the sustainability of the environment and the livelihoods of the medicinal plant sellers?
- 1.7.3. Would a programme of intervention based on non-formal education enable the medicinal plant sellers to improve their understanding and practices regarding the storage, conservation and marketing of medicinal plants from the point of view of business profitability and environmental friendliness?

## **1.8 SIGNIFICANCE OF THE STUDY**

This study was deemed to be significant in two main ways, as explained below.

### **1.8.1 Scientific Contribution**

According to Schippmann *et al.*, (2002) a baseline element of the ecosystem approach is to recognise that humans, in their cultural diversity, are an integral component of ecosystems. This research was in part aimed at capacitating and empowering the local communities to better manage the natural resources (i.e. medicinal plants) found in

the ecosystem. Accordingly, this was a very important study and timely, if not overdue.

### **1.8.2 Social Relevance**

The study gave insight to local community members (i.e. medicinal plant sellers) into how to take care of medicinal plants. This was done in order to promote long-term socio-economic independence of the medicinal plant sellers, based on the principles and ethics of sustainable utilisation of medicinal plants within the context of the current concerns for the sustainability of the environment.

## **1.9 CONCEPTUALISATION OF KEY TERMS**

The following terms are the key concepts in this study:

### **1.9.1 Sustainability**

The term ‘sustainability’ means the utilisation of resources in a manner that they may be available for future generations. According to Guidelines for Environmental Education Policy and Strategy Processes in the SADC States (1999) the concept of sustainability refers to:

- The need for reconciliation between economic development and environmental conservation.
- The need to place the understanding of environmental concerns within a socio-economic and political context.
- The need to combine environment and development concerns.

### **1.9.2 Sustainable Development**

The United Nations’ Bruntland Report in *Our Common Future* (World Commission on Environment and Development, 1987; Ceschin *et al.*, 2010) define the concept of

Sustainable Development (SD) as development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Huckle and Sterling (1996) added that SD means improving the quality of life whilst living within the carrying capacity of the ecosystem. In concurrence, The Guidelines for Environmental Education Policy and Strategy Processes in the SADC States (1999) state that SD is increasingly being seen to have a vital role in transforming current life styles and practices into a sustainable mode of living.

The emphasis of the statement is that the practices of SD should be integrated and included into all the teaching and learning, practising of the formal education curriculum in order to foster a sense of responsibility for the state of the environment, and to teach learners how to protect and improve the environment. Hoppers, (2006) further states that adult education, on-job training, television and other less formal methods must be used to reach out to as wide a group of individuals as possible, as environmental issues and knowledge systems now change rapidly in the space of a life time.

In light of the above, ESD is being seen to have a vital role in transforming current life styles and practices into sustainable ways of doing things. In this study, this means that the medicinal plant sellers' practices in running their businesses should be informed by the principles of SD in a way that it enables the natural resources to be conserved so that the medicinal plant sellers and future generations may be able to trade these plants in the long term, thus sustaining their livelihoods.



### **1.9.3 Education for Sustainable Development**

The original focus of Environmental Education (EE) was on the nature, or the natural environment, including fauna, flora, soil and water. Its strategy was to develop an appreciation of nature and selected species of organisms. Its aim was preservation (keeping something unused for an unknown period of time with an aim of conserving it) of natural resources. The Commission on Sustainable Development appointed UNESCO to coordinate the activities of all stakeholders in education (<http://www.etd.lib.metu.edu.tr>). Included amongst these activities, was Chapter 36 of Agenda 21 (1992) on Education, Training and Public Awareness aiming to shape the focus of EE to ensure it adhered to the principles of sustainable development. Hence (ESD) refers to the education processes that deal with the environment and development education. Herremans and Reid (2000: 31) state that ESD is...

“a lifelong learning process that leads to an informed and involved citizenry having the creative problem solving skills, scientific and social literacy, and commitment to engage in responsible individual and cooperative actions. These actions help to ensure an environmental sound and economical prosperous future.”

This ESD addresses socio-economic, cultural and biophysical factors that affect the medicinal plant sellers, and, therefore, the medicinal plant selling business.

### **1.9.4 Medicinal Plant Sellers**

A medicinal plant seller is an individual who collects medicinal plants directly from the wild, or from medicinal plant gatherers, and sells them to clients such as pharmaceutical companies, medicinal plant customers and traditional healers. Thus, some medicinal plant sellers gather the medicinal plants, while others buy from the

gatherers. In the context of the environment within which the study was conducted, medicinal plant sellers were both harvesting and/or selling. In addition, the term medicinal plant seller was used for both types since the research participants were interviewed selling the medicinal plant species, irrespective of whether they were wholesalers (harvesting medicinal plants in bulk to sell to other medicinal plant sellers) or retailers (buying from other wholesalers to sell to customers).

### **1.9.5 Household**

The term household was used to refer to the residents visited during interviews. The term was also used synonymously with ‘homestead’ since it specifically referred to homes where interviews had taken place.

### **1.9.6 Livelihood**

Karki, Tiwari, Banoni and Battaria (2003) define livelihood as a process comprising of the capabilities, assets and activities that provide means to the human beings for living. In the context of this study the term livelihood has the same meaning as described by these authors.

## **1.10 STUDY PLAN**

### *CHAPTER ONE*

The first chapter provides an overview of the research problem and background of the study. Chapter one also includes research objectives and questions. It highlights the significance of the research project and conceptualises the terms used in this study.

### *CHAPTER TWO*

The second chapter of this document contains the theoretical framework and principles that underpin the study.

### *CHAPTER THREE*

Chapter three details a review of the relevant literature related to the study.

### *CHAPTER FOUR*

Chapter four contains the research methods of the study. More specifically, it indicates how the interviews were conducted as well as field observations with the medicinal plant sellers. This chapter also provides a detailed plan of the intervention and its assessment.

### *CHAPTER 5*

Chapter five deals with analysis and interpretation of the results.

### *CHAPTER 6*

Chapter six summarises the findings of the investigation. It concludes by making recommendations for further research.

## **1.11 SUMMARY**

This chapter briefly introduced the field of study, background of the study, rationale, research objectives and research questions and explanation of the operational concepts.

## **CHAPTER TWO**

### **THEORETICAL FRAMEWORK**

#### **2.1 INTRODUCTION**

This is a study about ESD among medicinal plant sellers in northern KwaZulu-Natal.

This chapter explores the theoretical framework and principles underpinning the study. Learning and teaching theories including the hierarchy of needs, meaningful learning, active learning, discovery learning, socialism, behaviourism, cognitive learning theory, constructivism and other teaching and learning theories are discussed, to better understand how the participants' mindsets could be changed considering that learning is a process where individuals make their own mental connections with their lived world.

Killen (2010:23) describes learning as 'a process that involves making connections, identifying patterns, and organising previously unrelated bits of knowledge, behaviour and actions into new patterned wholes'. Other authors define learning as 'a change in understanding and behaviour that results from encountering new experience' (Spady, 2001:18). In his unpublished notes, Imenda (2012) views learning as acquisition of new knowledge, skills, values and/ or attitudes as a result of instruction, study, experience or intuition – leading to modified understanding or action.

From these definitions it is emphasised that learning involves...

- a process that is based on a theory which leads to actions;
- changes, attitude, behaviour and understanding as a result of modified experiences which are sometimes based on the pre-existing experiences;

- redirecting thinking and actions based on the new experiences.

In most cases teaching involves a process of planning and implementing learning experience, as well as assessing learner achievement from the planned learning experiences.

As the basis for the study, the following theories are reviewed to show how the intervention of non-formal education holds promise for a changed world with regard to the medicinal plant sellers as part of ESD.

## **2.2 LEARNING AND TEACHING THEORIES**

"Learning Theory" is a discipline of psychology that attempts to explain how an organism learns. Thus, learning may be defined as the process leading to relatively permanent behavioural change or potential behavioural change (<http://www.unam.na>; Piaget, 1967). In other words, as we learn, we alter the way we perceive our environment, the way we interpret the incoming stimuli, and, therefore, the way we interact, or behave. The way in which ESD is done is in line with the work of protagonists who have researched different perspectives on learning. The teaching and learning theories discussed briefly below were reviewed because of their relevance to this study. However, there is no individual, specific theory that informed the research. The study was underpinned by different teaching and learning theories as well as social theories.

### **2.2.1 Hierarchy of Needs (Abraham Maslow)**

Psychologist, Abraham Maslow, first introduced the concept of a hierarchy of needs in his *Theory of Human Motivation* (1943) and his subsequent book *Motivation and Personality* (1970). This hierarchy identifies the following types of needs:

#### *2.2.1.1 Physiological needs*

This level includes the most basic needs that are vital for survival, such as the need for water, air, food, and sleep. Maslow believes that these needs are the most basic and primary to animals, particularly human beings, because all other needs become secondary until these physiological needs are met. Work by a number of authors reveals that medicinal plants are source of income sustaining medicinal plant sellers' livelihoods (Schippmann *et al.*, 2002; Cunningham, 2001; Ndawonde *et al.*, 2007; Botha, Witwoski & Shackleton, 2004a; Kepe, 2007; WHO, 2002). For the research participants, selling medicinal plants would mean immediate needs satisfaction. That is one of the reasons that their awareness of the sustainability of medicinal plants should be raised to sustain the natural resources they use in their businesses so that they are able to satisfy their primary needs for many years to come. Maslow (1970) states that the secondary need that has to be satisfied by human beings is one of security.

#### *2.2.1.2 Security needs*

These include the need for safety and security. Security needs are important for survival, but are not as demanding as the physiological needs. Examples of security needs include: a desire for steady employment, health insurance, safe neighbourhoods, and shelter from the environment. As street vendors who handle cash manually (for instance, not electronically), medicinal plant sellers need to be safe in their business while selling their medicines.

#### 2.2.1.3 *Social needs*

Social needs include those of love, affection and belonging. These are important needs for almost all animals. Maslow's social need is relevant to this study since 32% out of 56 participants who participated in the survey fell in an age category of 46-55 years. Human beings, particularly, of these ages do need love, affection and belonging since relationships and families are important and contribute to our well-being. Human beings need to share joys and sorrows with people who care. As people go through adult life differently, they move in and out of circles of family and friends.

#### 2.2.1.4 *Esteem needs*

After the first three needs have been satisfied, esteem needs become increasingly important (Maslow, 1986). These include the need for things that reflect on self-esteem, personal worth, social recognition, and accomplishment. There should be some recognition of the informal trade of the medicinal plant selling business and medicinal plant sellers.

#### 2.2.1.5 *Self-actualising needs*

This is the highest level of Maslow's hierarchy of needs. Self-actualising people are self-aware, concerned with personal growth, less concerned with the opinions of others, and are interested in fulfilling their potential (Woolfolk, 2010; <http://psychology.about.com/od/theoriesofpersonality/ss/maslows-needs-hierarchy-6.htm>). Self-actualisation need theory has a direct bearing in the study when an age factor of the participants is considered. Participants who took part in the survey were elderly people of 36 years of age and above. People of this age category are concerned with independence. This is supported by the research on influence of age on the level of self-actualisation by Reiss and Haverkamp (2005) as cited by Huit (2007) showed

that participants in the study of over 36 years showed higher levels of self-actualisation than participants under the age of 36 years. Ages of 36 years and above are responsibility age when human beings have children, families to support, ability to take care of themselves.

While some research showed some support for Maslow's theories, most research has not been able to substantiate the idea of a needs hierarchy. Wahba and Bridwell (1976) reported that there was little evidence for Maslow's ranking of these needs and even less evidence that these needs are in a hierarchical order. Other reasons for Maslow's theory criticism are based on the view that people may differ in their needs satisfaction, in that they may not always appear as the theory suggests (Woolfolk, 2010).

Other critics of Maslow's theory note that his definition of self-actualisation is difficult to test scientifically (Woolfolk, 2010). However, regardless of these criticisms, Maslow's hierarchy of needs represents part of an important shift in psychology and education.

Looking at Maslow's theory, which is based on a hierarchy of needs, I concur with him in the way he has described the needs. However, I disagree with his ranking of the need for security in a hierarchy order. I would think security is a priority need before anything else for the medicinal plant sellers. Medicinal plant sellers often handled cash in their businesses without making use of electronically facilities such as till machines, as it is in the case with western pharmacies when handling cash.



### 2.2.2 Behaviourism

The type of learning that is based on a stimulus model as well as some form of reinforcement is behavioural learning (Mwamwenda, 1995). Some behaviourist theories are discussed below:

Behaviourism is a world-view that operates on a principle of ‘stimulus response’ Behavioural Psychology is basically interested in how our behaviour results from stimuli, both in the environment and within ourselves. They study, often in minute detail, the behaviours we exhibit while controlling as many other variables as possible. Often a grueling process, but results have helped us learn a great deal about our behaviours, the effect our environment has on us, how we learn new behaviours, and what motivates us to change or remain the same (Imenda unpublished notes, 2012).

John Watson (1878-1958) in Watson and Rayner (1958) was the first to study how the process of learning affected behaviour, and he formed the school of thought known as *Behaviourism* (Woolfolk, 2010). The central idea behind behaviourism is that only observable behaviours are worthy of research since other abstraction such as a person’s mood or thoughts are too subjective.

#### 2.2.2.1 *Behaviourism: Classical conditioning/conditioning stimuli (Ivan Pavlov)*

The behaviourist’s view of learning was originated by Watson, and extended by Skinner. Behaviourists believe that learning has little to do with psychological changes, but instead learning is a behavioural change (Skinner, 1953). When something is learnt, the behaviour of the individual alters and this change can be measured or observed in some way.

One important type of learning, Classical Conditioning, was actually discovered accidentally by Ivan Pavlov (1849-1936) (Pavlov, 1994; Imenda unpublished notes, 2012).

A well-known experiment of Pavlov is that he *conditioned* dogs to initiate a salivary response to the sound of a bell. Pavlov began pairing a bell sound with meat powder and later found that even when the meat powder was not presented, the dog would begin to salivate upon hearing the bell. Since the meat powder naturally results in salivation, these two variables were called the **unconditioned stimulus** (US) and the **unconditioned response** (UR), respectively. The bell and salivation are not naturally occurring; the dog was conditioned to respond to the bell. Therefore, the bell was considered the **conditioned stimulus** (CS), and the salivation to the bell, the **conditioned response** (CR) (Mwamvenda, 1995).

The reactions of animals without training are called *primary* or *unconditioned stimuli* (US) ([www.hotroadbulldog.com](http://www.hotroadbulldog.com)). They include food, pain, and other "hardwired" or "instinctive" stimuli. For example, animals do not have to learn to react to an electric shock.

Pavlov's dogs did not need to learn about food. On the other hand, stimuli to which animals react only after learning about them, are called *secondary* or *conditioned stimuli* (CS). These are stimuli that have been associated with a primary stimulus. In Pavlov's experiment, the sound of the bell meant nothing to the dogs at first. After its

sound was associated with the presentation of food, it became a conditioned stimulus.

If a warning buzzer is associated with the shock, the animals will learn to fear it.

Many of our behaviour today are shaped by the pairing of stimuli, which basically implies that organisms are classically conditioned. Another type of learning, very similar to classical conditioning, is called *Operant Conditioning*.

#### 2.2.2.2 *Behaviourism: Radical behaviourism/ operant conditioning (Burrhus Frederic and Skinner)*

Perhaps the most well-known Behaviourist is Skinner. Skinner followed much of Watson's research and findings, but believed that internal states could influence behaviour just as external stimuli. He is considered to be a *Radical Behaviourist* because of this belief, although nowadays it is believed that both internal and external stimuli influence our behaviour. A key feature of Skinner's radical behaviourism is the theory of 'operant conditioning', which says that the reason we do something depends on the consequences of us doing that action in the past.

*Operant Conditioning* happens when an animal forms an association between a behaviour and a consequence whereas *Classical Conditioning* takes place when an animal forms an association between two stimuli. The term "operant" refers to how an organism operates in the environment, and hence, operant conditioning comes from how we respond to what is presented to us in our environment.

The classic study of *Operant Conditioning* involved a cat which was placed in a box with only one way out; a specific area of the box had to be pressed in order for the

door to open. The cat initially tried to get out of the box mainly due to the need to free itself from the box. In its attempt to escape, one area of the box was triggered and the door opens. Once placed in the box again, the cat would naturally try to remember what it did the previous time to escape and would once again find the area to press. The more the cat was placed back in the box, the quicker it would press that area for its freedom. It had learnt, through natural consequences, how to gain the reinforcing freedom.

We learn this way every day in our lives. Imagine the last time you made a mistake; you most likely remember that mistake and do things differently when the situation comes up again. In that sense, one would have learnt to act differently based on the natural consequences of one's previous actions. The same holds true for positive actions. If something one did results in a positive outcome, one is likely to do that same activity again.

The idea of operant conditioning has important implications for how behaviourists believe people learn (Imenda unpublished notes, 2012). However, according to behaviourism learning tends to emphasise rote and drill learning, where learning is repeated time and time again until the learners can do or remember something correctly. A typical example of an exercise promoting this idea of learning would be someone learning a foreign language by having to complete a text with gaps in it. When they have completed the task successfully, they have learnt what is needed and achieved the goals of the lesson. Completing passages by filling in missing words or phrases tends to depend on recall of information.

The method in which most of us were taught at school probably reflected behaviourism. If learners are praised when they do well and complete some tasks correctly, when they have to do the task again in the future, they would remember how to do the task and successfully complete it. It can be thought of as learning due to the natural consequences of our actions. For this reason, Operant Conditioning is also called *response-stimulus* (or RS), conditioning because it forms an association between the animal's response (behaviour) and the stimulus that follows the consequence. Hence, it may be said that although similar to classical conditioning, operant conditioning differs in that it is the process of reaching a desired behaviour or response through the use of consequences and rewards.

Pavlov's theory was based on behaviour that shaped peoples' mindsets. I concur with him in that our communities mimic the way we do things as professionals. That is my experience as an environmental education teacher. When we do coastal cleanups at local beaches, people appreciate and show a sense of responsibility in waste management of beaches which is enforced by law. If there can be a programme where communities engage themselves in environmental management projects, we could achieve more goals concerning nature conservation.

Pavlov also mentioned the two types of motivation discussed below: intrinsic and extrinsic motivation:

### **Intrinsic motivation**

Intrinsic motivation refers to motivation that is driven by an interest or enjoyment in the task itself, and exists within the individual rather than relying on any external

pressure (Richard & Edward, 2000; <http://www.psychology.wikie.com>). Learners are likely to be intrinsically motivated if they:

- attribute their educational results to factors under their own control, also known as autonomy,
- believe they have the skill that will allow them to be effective agents in reaching desired goals (i.e. the results are not determined by luck),
- are interested in mastering a topic, rather than just rote-learning to achieve good grades.

Intrinsic motivation is based on taking pleasure in an activity rather than working towards an external reward, as in the case of extrinsic motivation (Mwamwenda, 1995; Bandura, (1969).

### **Extrinsic motivation**

Extrinsic motivation comes from outside of the individual. Common extrinsic motivators are rewards such as money, grades, and threat of punishment. Competition is in general extrinsic because it encourages the performer to win and beat others, not simply to enjoy the intrinsic rewards of the activity. A crowd cheering on an individual and trophies are also extrinsic motivators. The concept of motivation can be instilled in children at a very young age, by promoting and evoking interest in a certain book or novel. The idea is to have a discussion pertaining to the book with young individuals, as well as to reward them.

A similar view could also be held by the medicinal plant sellers in that selling medicinal plants is only driven by money, which is not a good way of handling a business, bearing in mind SD. While making profit is a major motive in running a

business, other issues including sustainability of the stock should be taken into account. There should be a long term structured way of generating income so that the business survives for a long time. SD is an ongoing, comprehensive social process of change and design that makes it possible, both to provide for the current generation's quality of life and safeguard future generations' own life options. The intervention of ESD has been motivated by these reasons.

#### *2.2.2.3 Schedule of reinforcement*

Reinforcement may be defined as a stimulus which increases the probability of a response recurring (Woolfolk, 2010; Imenda unpublished notes, 2012). The process whereby behaviour is reinforced is referred to as a schedule of reinforcement. There are two forms of reinforcement, namely continuous and intermittent or partial reinforcement. Continuous reinforcement involves rewarding an organism every time it makes a correct response. Continuous reinforcement facilitates the mastery of behaviour very quickly. Intermittent reinforcement involves rewarding an organism after it has made more than one correct response and involves long term results of assessment. The schedule of reinforcement is in line with the assessment of the intervention of the study. The ESD of medicinal plants employed an assessment of the intervention after thirteen months following the intervention programme had taken place.

Thorndike's theory of connectionism was a contemporary of Pavlov's and Watson's classical methodology (Imenda unpublished notes, 2012). Thorndike introduced the concept of reinforcement, which Watson ignored. Thorndike's work frequently has not received the attention it deserves because so many aspects of his thinking became

associated with Skinner. Thorndike's work is often called connectionism, because of the idea that bonds between stimulus and response take the form of neural connections.

#### *2.2.2.4 Connectionism (Edward Thorndike)*

Thorndike rid his theories of the mentalism of earlier psychologists and paved the way for the behaviourism learning as a process of connecting information sources. Although evidence of classical conditioning was there, Thorndike did not believe that it was comprehensive because most behaviour in the natural environment was not simple enough to be explained by Pavlov's theory. He conducted an experiment where he put a cat in a cage with a latch on the door and a piece of salmon outside of the cage. After first attempting to reach through the cage and then scratching at the bars of the cage, the cat finally hit the latch on the door and the door opened. With the repetition of this experiment, the amount of time and effort spent on the futile activities of reaching and scratching by the cat became less and less, and the releasing of the latch occurred sooner.

Thorndike's analysis of this behaviour was that the action that produced the desired effect became dominant and, therefore, occurred faster in the next experiments. He argued that more complicated behaviour was influenced by anticipated results, not by a triggering stimulus as Pavlov had supposed. This idea became known as the law of effect, and it provided the basis for Skinner's operant conditioning analysis of behaviour (Schwartz & Lacey, 1982). Thorndike's theory of connectionism concurs with Skinner's (1953) reinforcement, and he also extends it to the fact that the behaviour which is being positively reinforced is likely to be repeated.



This theory is one of important theories with regard to this study. It is important because it requires the research participants, i.e. medicinal plant sellers, to connect their original ways of running their business to the new methods that would normally come out from the intervention programme.

In addition to behaviourism and hierarchy of needs theory, the following theories were regarded as giving this research project very important theoretical points of reference.

### **2.2.3 Developmental Theory (Jean Piaget)**

Jean Piaget (1896-1980) was a biologist who originally studied molluscs but moved into the study of the development of children's understanding, through observing them, talking and listening to them while they worked on exercises he set (Hassard & Dias, 2009). Piaget's research and publications were the driving forces behind the shift to a constructivist view of educational research and learning. Jean Piaget made a contribution to the understanding of children's thinking at different stages.

Although the talk of children might seem as illogical nonsense to adults, Piaget discovered that children simply think in a different way to adults. Children have their own logic and rules of thought. Piaget studied how children think and developed a theoretical framework for how a child's thought processes develop (Woolfolk, 2010; Hassard & Dias, 2009).

Piaget's theory led to the development of learning principles into categories. These categories, notwithstanding, the ages at which individual children reach each stage,

varies with respect to the ways in which they think and explore the physical and social world around them, namely:

The stage of learning that concerns adulthood is called formal operation stage. This is the stage of adulthood. This is the stage of cognitive learning where children are able of abstract thoughts.

In this regard, Piaget's work shows that children need to be actively involved in learning activities, and that such activities need to be matched with the stage the children are at.

Piaget's work provided the foundation for constructivist theory, which takes the view that learners build knowledge rather than receive it in its final and processed form. The target sample for a study of ESD was adults. The researcher planned organised and design activities for the workshop while taking into account of the cognitive level for the participants.

In this regard, Piaget's work shows that children need to be actively involved in learning activities, and that such activities need to be matched with the stage the children are at. Piaget's work provided the foundation for constructivist theory, which takes the view that learners build knowledge rather than receive it in its final and processed form.

Piaget argues that a person expects to understand each new experience in terms of what he or she already knows. When a person assimilates the new experience, his or her knowledge structure is adjusted or accommodated to it. To Piaget, learning is essentially an active process in which the learner constructs his or her knowledge

through interaction with the environment and the resolution of the cognitive conflict which may occur between expectations and observations. Piaget's work is based on a view that children's knowledge of a progressively more objective kind is constructed through interaction with the environment.

Similarly, non-formal education for medicinal plant sellers could be seen in the same light. Although some of them may be illiterate, their experience in the medicinal plant business has enriched them with knowledge and skills of handling the medicinal plant selling business. These skills need to be enhanced in order for the business to be more productive and sustained in the long run.

#### **2.2.4 Discovery Learning (John Dewey)**

John Dewey was an education philosopher whose belief was that learning was embedded in experiences in which learners interacted with the environment (Hassard & Dias, 2009). His belief was based on the notion that learning was natural and not process limited. This implies that learning is innate and is anywhere. There is a notion that nobody is a teacher, at the same time, all of us are learners till death. To Dewey, the learner is active, and within science education, learners should be experimenting with the environment using tools like hands-on experiences.

Dewey (1933) believed that non-schooling learning could be used to provide the kind of energy that learning in school would require to engage learners. He cited informal education and non-formal education through community work as 'learning that can be reflected in the qualities of non-schooling learning, greater emphasis would be placed on emotional and attitudinal aspects of learning' (Hassard & Dias, 2009:282). Thus,

Dewey observed that education outside the school setting could be significant to shed light on the shortcomings of formal learning. One specific example is project learning. Learners learn better if they are given a chance of self-discovery, assimilate knowledge and explore their knowledge through findings. With regard to this study a project that involved non-formal learning was designed to empower medicinal plant sellers with the skills of environmental conservation, marketing and storage of medicinal plants.

### **2.2.5 Active learning (Jerome Bruner)**

Bruner was one of the founding fathers of constructivist theory. Bruner's theoretical framework is based on the theme that learners construct new ideas or concepts based upon existing knowledge (Bruner, 1996). Jerome Bruner believes that knowing is a process rather than the accumulated wisdom of science as presented in the text books (Hassard & Dias, 2009). Providing opportunities to explore interesting phenomena motivates learners to find out things on their own. This simple notion provides the framework for creating discovery-learning activities. Bruner's developmental theory has four components: Curiosity and Uncertainty; Structure of Knowledge; Sequencing; and Motivation.

#### ***2.2.5.1 Curiosity and uncertainty***

With regard to curiosity and uncertainty, Bruner (1996) felt that experiences should be designed to help the learner to be willing and able to learn. He called this the predisposition towards learning. Bruner (1967) also believed that the desire to learn and to undertake problem solving could be activated by devising problem activities in which learners explored alternative solutions. Bruner (1967) further states that the goal of education should be intellectual development, and that the science curriculum

should foster the development of problem-solving skills through enquiry and discovery. In this study it was desired that empowering medicinal plant sellers with skills to run their businesses and to take care of the environment was enforced along the lines of curiosity to discover new knowledge and skills. This is when medicinal plant sellers were empowered with skills to run their businesses and to manage the environment so that the resources that they use are sustained.

#### *2.2.5.2 Structure of knowledge*

The second component of Jerome Bruner's theory refers to the structure of knowledge. Bruner (1996) contends that any domain of knowledge (physics, chemistry, biology, earth science) or problem or concept within that domain (law of gravitation, atomic structure, homeostasis, earthquake waves) can be represented in three modes: by a set of actions, by a set of images or graphics that stand for the concept and by a set of symbolic or logical statements.

#### *2.2.5.3 Sequencing*

Bruner's third principle of instructional principle deals with sequencing of knowledge. Bruner (1996) believed that instruction should lead the learner through the content in order to increase the learner's ability to grasp, transform and transfer' what is learned. According to Bruner (1996) sequencing should move from enactive (hands-on, concrete), to iconic (visual), to symbolic (description in words or mathematical symbols).

#### *2.2.5.4 Motivation*

With regards to motivation, the nature and pacing of rewards and punishments should be specified. Bruner (1996) further suggests that movement from extrinsic rewards,

such teacher's praise, towards intrinsic rewards inherent in solving problems or understanding the concepts, is desirable. Bruner believes that learning depends upon knowledge of results when it can be used for correction. Bruner also mentions that feedback to the learner is critical to the development of knowledge.

For the medicinal plant sellers, money received from medicinal plants may be the main motivation and incentive for engaging in this business. The main reason for this could be with the money collected, they are not only able to meet their physiological need of their families (e.g. food) but also are able to satisfy Maslow's higher order needs.

#### **2.2.6 Conditions of Learning (Robert Gagne`)**

Robert Gagne` (1977) developed ideas about conditions of learning and believed that effective instruction should go beyond traditional learning theories. In his model, Gagne` identified two factors for conditions of learning to make a real difference in instruction:

- a. Categories of human capabilities to be established for the attainment of learning.
- b. Events instruction: Gagne` describes instruction as events of learning external to the learner which are designed to promote learning (Gagne`, 1977).

In this study, these factors were taken into account during the intervention programme. The participants were informed about the objectives, content and assessment of the non-formal workshop prior to its commencement.

Gagné's theory of conditions of learning has several implications for instructional design, which include analysing requirements, selecting media and designing the

instructional events. The prerequisite lower level skills and knowledge required to achieve a given instructional objective should be identified, and new skills learned should build on previously acquired skills; positive reinforcement should be used continuously; instruction should be tested formatively and the effectiveness of the instruction should be evaluated summatively. The barriers and enhancers that effect the transfer of learning when developing different methods of instruction (such as application exercises, time to apply the learning, supportive climate for learning) should be kept in mind.

Central to Gagné's theory on conditions of learning is the notion that instruction must be designed specifically in the context of the learner's needs. Instruction should be designed to include a variety of instructional approaches in order to meet the needs of different learners (Killpatrick, 2001).

#### **2.2.7 Meaningful Learning (David Ausubel)**

Ausubel (1978) was among the first to describe the importance of the knowledge that learners held before coming to science classrooms (Wessel, 1999:1). Ausubel, like Piaget, Bruner, Gagne` and Dewey assumes that each individual organises and structures his/her own knowledge. Ausubel focuses on the structuring of content as a framework of specific concepts, thereby emphasising the role of verbal learning. Quite significantly, Ausubel distinguishes between rote and meaningful learning, where new knowledge is related by the learner to relevant existing concepts in that learner's structure. In agreement with Ausubel (1978), Novak (1998:11) summarises the relation between rote learning and meaningful learning as follows:

Either reception instruction or discovery approaches can be very rote or very meaningful learning experiences. The rote-meaningful learning continuum is distinct from the reception-discovery continuum for instruction. School learning needs to help learners move toward high levels of meaningful learning, especially in reception instruction that is the most common.

Ausubel's meaningful learning differs from Conditions of Learning theory in that it recognises learning as independent of the mode of instruction. As lessons are learnt from the presentation, regardless of whether it is by word of mouth, written or any other form, they are regarded as learning.

The meaningful learning theory influenced this study in that the participants were subjected to a non-formal learning session, with the hope of achieving a meaningful learning experience in conserving medicinal plants, among other objectives. According to Driver (1989) the results of Jean Piaget's work about intellectual development, is that knowledge is constructed through interaction with the environment. However, the importance of David Ausubel's contribution about the effect of preconceptions and familiarity with the context of a presented problem on the logical forms of thought, leading to meaningful learning, should not be ignored.

In the context of this study, one of the overarching theories behind conducting ESD involving the medicinal plant sellers is constructivism. Constructivism differs from the view that participants are passive role players in the researcher's total plan of gathering data, mostly for the researcher's own purposes. On the contrary,



constructivism acknowledges that participants can influence the course of the total process if given a chance to participate actively in a study. Thus, this study was guided principally by constructivism since the participants were actively involved in this project as will be described later in chapter 4.

### **2.2.8 Constructivism**

Geer and Rudge (2002) describe constructivism as a theory of learning which espouses the view that learners construct knowledge in the process of learning through social interaction and active participation with phenomena, as they develop shared-meanings of phenomena. Geer and Rudge (2002) further state that it is generally agreed that learners learn by making sense of phenomena as they experience them, evaluate their value and attempt to make sense of them within a socially acceptable context in light of prior knowledge. In this regard, it is held that the learners engage in learning tasks which wittingly or unwittingly make them aware of this construction with deference to prior knowledge structures.

Woolfolk (2010) postulates that constructivism is a broad term used by philosophers, curriculum designers, psychologists and others who agree with the idea that constructivism has two central ideas as follows:

1. Learners are active in constructing their own knowledge.
2. Social interactions are important in this knowledge construction.

One way to organise constructivism is in terms of the three forms of constructivism as described by Mintzes and Wandersee (1998:37).

- **Radical constructivism**-which rejects entirely the notion that scientific knowledge can be tested against an external reality.
- **Social constructivism**-which contends that reality itself, is simply a product of social negotiation.
- **Human constructivism**-which opines that human beings are meaning-makers and that the goal of education is to construct shared meanings facilitated through the active intervention of well-prepared teachers. Meaningful learning occurs through extended periods of interaction with objects, events and other people (Hassard & Dias, 2009).

Most constructivists contend that learning occurs when individuals assimilate new information into their existing mental models of the world, or construct new models that can accommodate both old and new insights gained from experience (Hassard & Dias, 2009).

De Vos *et al.*, (2011) maintain that constructivism enhances the reliability of the research project through the involvement of research participants throughout the project. However, there are problems associated with the attrition of the participants or when one or two participants try to dominate the process. Time limitation could also be a problem since having to consider the participants' views at every stage of the research could be time consuming. Another criticism of constructivism is the problem of misconceptions in that preconceived ideas might persist among participants. This study has attempted to mitigate these effects by using a large sample size (56 respondents out of the 63 participants targeted) and by increasing the number of sampling sites to three district municipalities.

There were other important theories that shaped the undertaking of this research project. These are briefly described below.

### **2.2.9 Social Theories**

Social theories were also used as a lens to analyse and understand the underlying social reality structures, as there are surface realities which tend to be unseen.

#### *2.2.9.1 Critical theory*

As opposed to traditional theory, which is orientated only to understanding the nature of the society, the orientation of critical theory is towards critiquing and changing society (Cohen, Manion & Morrison, 2007). Critical theory assumes that there is a 'reality' that is apprehendable. This is a reality created and shaped by social, political, cultural, economic, ethnic and gender-based forces that have been crystallised over time into social structures that are taken to be natural or real. On one hand, people, including researchers, function under the assumption that for all practical purposes these structures are real. On the other hand, critical theorists believe this assumption is inappropriate.

According to de Vos *et al.*, (2011) the critical theory approach to research emphasises the quest for attaining the highest potential for human beings and that by using reasoning it is possible to criticise and challenge the nature of existing societies. Thus, a critical framework focuses on how injustice and subjugation shape people's experiences and understanding of the world. It identifies a misconception that has brought an individual or social group to be regarded as powerless, or in power, and queries the legitimacy of this.

Cohen *et al.*, (2007) state that critical theory aims at transforming individuals to social democracy and has a political agenda which includes: How power is produced and reproduced through education; and whose interests are served and how legitimate these are, for instance, Whites, Africans, high class society, and middle class, poor.

#### 2.2.9.2 *Intersectional theory*

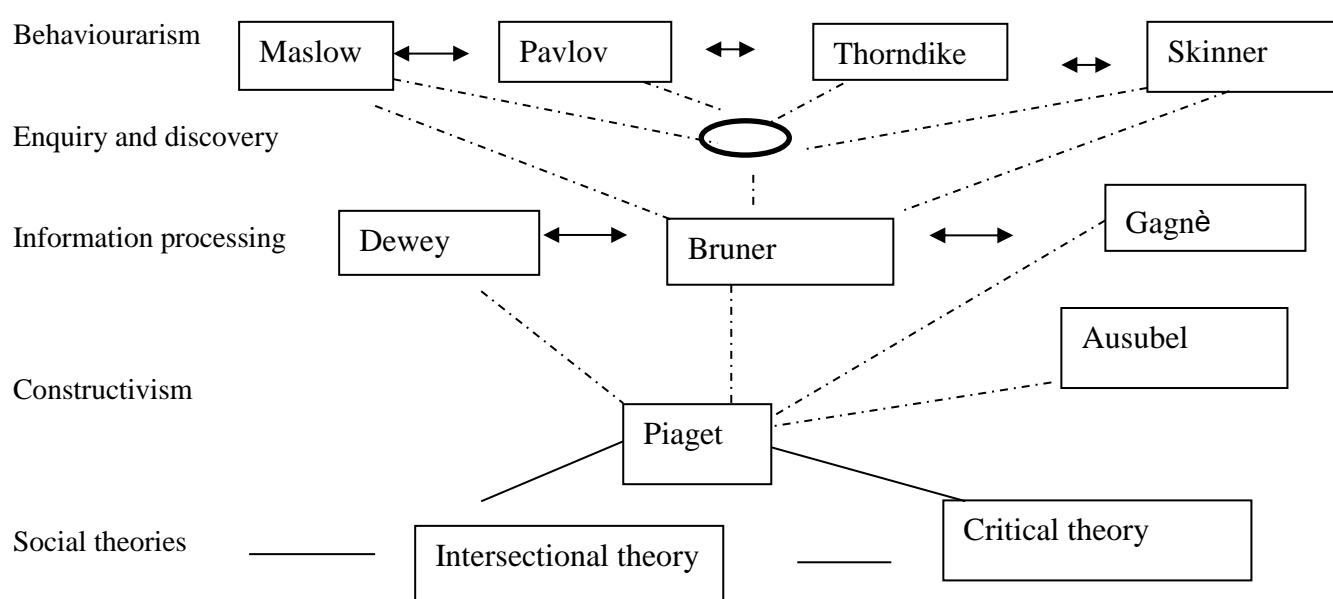
Intersectional theory looks at the oppressive factors within society, such as gender, class and religion, and how the resulting forms of oppression interrelate. For instance, studying that a woman lives in a sexist society is insufficient to describe her experience. On the other hand, studying her race, originality and her sexual orientation, social construction, age, class and other traits could give more clear background information. Glenn (1999) shows this complexity approach in her study of the historically specific intersections of labour and citizenship in the United States as institutions that are co-constructing class, race, and gender as systemic inequalities. In this study it is also argued that each dynamic force of inequality operates as an analytic concept that shares three main features namely, class, social structure and power. There is a view that instead of conducting research separately on race, gender, or class there should be a focus on social locations, created by the intersection of these three dimensions (Landry, 2007; Brewer, 1993; King, 1988).

Further, Glenn (1999) cautions against the use of differences, such as racial and gender categories, as mere descriptors. Her balanced combination of representational, social structure and power dimensions of these stratification processes undercuts the tendency to assign institutional primacy to one or another level stratification across the board, rather than in the particular patterns at different locations.

With regard to this study, an intersectional approach was used to understand the concepts of gender, age and localities of the participants as a lens to examine their awareness of appropriate marketing, storage and conservation methods.

## 2.3 INTERRELATIONSHIP OF LEARNING AND SOCIAL THEORIES TO ESD

The learning and social theories presented above are conceptually linked in the following diagram for the purpose of providing a theoretical framework for this study:



**Figure 2.1: Interconnections of learning and social theories applied to this study**

The above figure shows that teaching and learning theories are interrelated. For instance, Maslow's hierarchy of needs relates with this study in that medicinal plant sellers might need to satisfy their physiological and security needs before higher order needs come to their minds.

Maslow's theory is based on the hierarchy of human needs. Intersectional theory looks at the oppressive factors within society, such as gender, class and religion, and how the resulting forms of oppression interrelate. The issue of many plant sellers being

females could be an economic one. Men are able to access employment in town more easily than females. Females have to stay at home and look after children. Women therefore resort to selling medicinal plants, which brings an income.

Another area that the theories of teaching and learning had a direct bearing on the study was with regard to the reinforcement. As Mwamwenda, (1995: 38) opines ‘the most important of these is reinforcement, which serves as the motivation for people.’ One of the motives of the medicinal plant selling business is profit generation so that the livelihoods of medicinal plant sellers can be sustained.

John Dew and Bruner's theoretical frameworks are based on the theme that learners construct new ideas or concepts based upon existing knowledge/concepts, and discover new concepts. Discovery learning was viewed as a most powerful theory related to the study since the information that medicinal plant sellers were to discover for themselves, through cultivation of medicinal plants on their own in their home gardens, was thought to stand a higher probability of lasting longer as compared to information that would merely be passed on to them without being actively involved in the research.

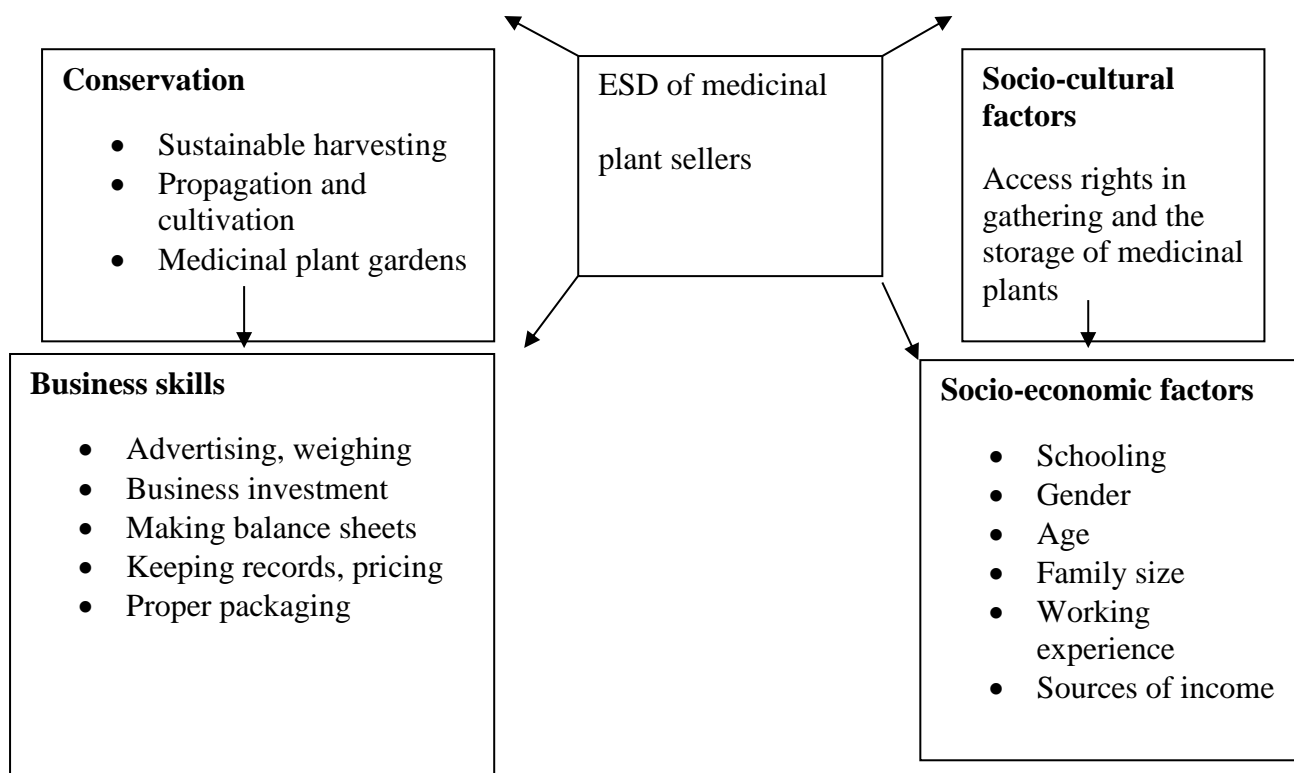
Ausubel's cognitive view of learning is based on meaningful learning, also known as sub-sumption theory or reception learning. The learning theory, emphasising meaning-making, influenced this study in that the participants were subjected to a non-formal learning activity, with the hope of achieving a meaningful learning experience in conserving medicinal plants, among other objectives.

## **2.4 FACTORS AFFECTING MEDICINAL PLANT SELLERS IN NORTHERN KWAZULU-NATAL WITH REGARDS TO ESD**

As indicated in chapter 1, this was a participatory community engagement project with a view to conserving the threatened medicinal plant species that the medicinal plant sellers depend on for their livelihoods. For ethical reasons and the promotion of SD of rural communities, the researcher continued to work with the medicinal plant sellers even after data collection of the study, in an effort to share information on the methods of propagation and cultivation of the medicinal plants in their own community medicinal plant gardens. One of the reasons for cultivating the medicinal plants in home gardens was to prevent exposing the women from collecting plants in dangerous places far from their homesteads.

Furthermore, this could protect medicinal plants from being harvested to extinction. Another benefit of involving the participants actively in a study of this nature was that they could be able to voice their opinions about the ways of doing things at the various stages of the study. Such input from the participants was regarded as being of great importance.

Likewise, one would like to look at the factors affecting medicinal plant sellers in rural communities of northern KwaZulu-Natal from a cross-sectional perspective, particularly, with regard to SD. Figure 2.2, illustrates such a perspective.



**Figure 2.2: Factors affecting Education for Sustainable Development of the medicinal plants**

The main focus in this study was community engagement in the conservation of medicinal plants. The study sought information on medicinal plant sellers' methods of conserving, marketing and storage of the medicinal plant material. Figure 2.2 shows how ESD could impact on the socio-economic and socio-cultural factors related to the sustenance of medicinal plants so that they will be available in future to support the livelihoods of the medicinal plant sellers.

## **2.5 PRINCIPLES UNDERLYING ESD FOR MEDICINAL PLANT SELLERS**

The major aim of the study was to investigate how ESD with respect of medicinal plant sellers could positively impact the livelihoods of the medicinal plant sellers while, at the same time, achieve sustainability of the plant species concerned through non-formal education.



### **2.5.1 Relevance of non-formal education in ESD**

As an ESD study, involving medicinal plant sellers, this study revolved around principles of non-formal education. As stated earlier, non-formal education differs from formal and informal education in that it involves planned educational activities that take place outside of the formally organised setting. However, some textbooks use these terms interchangeable. In this regard, Colley, Hodkinson and Malcolm (2002) state that the boundaries amongst the categories of education stem within a particular purpose and context in which they occur. As such, authors base the differences amongst formal, informal and non-formal education on the setting in which they are conducted. For instance, one may define formal education as taking place within a formal setting and non-formal education being conducted outside the formal setting.

That may be true when considering that in most cases informal education involves home education and can be picked up from sources including media and peers. Furthermore, in most cases informal education involves no assessment. On the other hand, formal education normally takes place within formalised settings and involves formative and summative assessment, especially in schools.

While formal and informal education may be seen as opposites of each other, non-formal education also takes place in either formal or informal settings. For instance, a workshop on environmental education can take place in a lecturer hall and assessed on the basis of its objectives. At the same time, a meeting by a local authority may take place under a tree but has a formal agenda. The issue of venue, mode of facilitation and assessment cannot give a clear distinction among the three categories.

Taking an example of Grade R teaching in early childhood education (South African education system), the teaching of Grade R takes place in a formal setting but it is not formally assessed. On the other hand, apprenticeship on home-based care may take place in any form of setting but it is assessed. It can be argued whether the education that is being given to grade R is formal, informal or non-formal when considering their curriculum. However, there is learning that takes place in Grade R, Early Childhood Development (ECD) band.

Colley *et al.*, (2002) shed light on an argument by Bourdieu and Passeron (1990) which elicits that formal education was dominated by the values of the middle class and that the prime purpose of formal education was to preserve and to reproduce those privileges. That is one of the reasons that policies of education in the United Kingdom are addressing those areas of inequalities by making changes to the funding regulations for adult education with a special focus on lifelong learning to identify, assess and certificate informal education (Bjornavold, 2001). This is similar to South African education where the government is also focusing on decreasing illiteracy through an adult-based education system and skills development in the informal business sectors and communities at large.

Against the above arguments, it may appear that the purpose of using each type of education depends on the intervention that is used to address a particular content. However, using a purpose as border lines amongst the types of education can widen the scope among the three categories.

I would argue that whether formal, non-formal or informal, the difference amongst the three is based on specific objectives. What is remarkable in the nature of these

categories is that their major objective is teaching and learning. Regardless of the category, as long as learning takes place that is education. Going by Ausubel's theory of meaningful learning, as long as a lesson achieves its objectives that is learning and is meaningful, no matter whether in school, home or in a workshop.

One of the ways to categorise formal, informal and non-formal education is by looking at their main features. Most typically, the term, or phrase, non-formal education is used to refer to adult literacy and continuing education for adults (Mfum-Mensah, 2003). According to Guidelines for Environmental Education Policy and Strategy Processes in the SADC States (1999) and Ndawonde (2007), the following are the fundamental features of non-formal education:

- Encouraging the inclusion of environmental components in all relevant training and extension programmes (including accredited vocational courses, on-the-job training, literacy, adult basic education, informal agricultural extension work, community development programmes, etc).
- Ensuring the availability of a range of specifically designed environmental and environmental education courses.
- Encouraging the formation of partnerships between organisations involved in non-formal education.
- Making government and other private funding routes and processes more accessible to community-based agencies actively engaged in education for sustainability.

The definition of non-formal education suggests community education, organised training and partnership formation.

Eraut (2000 as cited by Colley *et al.*, 2002) suggested the following characteristics of formal education:

- It includes a prescribed learning framework, an organised learning event or package;
- Has a designated teacher or trainer;
- Awards qualifications or credits;
- External features of outcomes;
- Cognition.

By implication any significant learning that is not this type should be regarded as informal education. Colley *et al.*, (2002: 3) unpacked informal education in defining it as:

“Lifelong process by which every person acquires and accumulates knowledge, skills, attitudes and insights from daily experiences and exposure to the environment.”

Although sharing the same purpose, which is meaningful learning, the category of each type of education has its own characteristics and objectives. For instance, non-formal education programmes are designed more especially for community extension programmes and mostly coupled with the research. Colley *et al.*, (2002:5) denote the term non-formal education as:

“A set of complementary programmes for the unreached or poorly served communities, and an approach to education leading to greater flexibility in organization and management of educational programmes with decentralized structure and less authorial management style. It promotes creative ways of mobilizing community participation in planning and management of resources through partnership programmes.”

From this quotation, two important characteristics of non-formal education emerge, namely, (a) flexibility in programme organisation and management, and (b) community/learner participation in planning and management of the attendant resources. Indeed, it is because of the close proximity of **learning** to **application** that non-formal education tends to present “flexible features as regards the initially established and adopted procedures, objectives and contents ... [and is] quicker to react in face of the changes that may affect the needs of learners and of the community” (Dib, 1988: 3).

Eaton (2010: 1) sees non-formal learning as a type of learning which “may or may not be intentional or arranged by an institution, but is usually organised in some way, even if it is loosely organized” and that in such learning, no formal credits are granted.

Contrasting **formal** against **non-formal** learning, Ainsworth and Eaton (2010: 14) opine that the former is ‘organised, guided by a formal curriculum, leads to a formally recognised credential such as a high school completion diploma or a degree, and is often guided and recognised by government at some level [and] teachers are usually trained as professionals in some way.’ However, although the latter may be organised, albeit loosely, it ‘may or may not be guided by a formal curriculum and may be led by a qualified teacher or by a leader with more experience’. However, Ainsworth and Eaton (2010: 14) hasten to add that although non-formal education ‘doesn’t result in a formal degree or diploma,’ it tends to be ‘highly enriching and builds an individual’s skills and capacities.’ They give ‘continuing education courses’ for adults, and ‘girl guides and boy scouts’ as examples of spaces where non-formal education takes place.

In addition, Dib (1988: 2) points out that non-formal education has ‘the constant presence of two features: (a) - centralisation of the process on the learner, as to his previously identified needs and possibilities; and, (b) - the immediate usefulness of the education for the learner’s personal and professional growth.’ Basically, this speaks to making the non-formal learner’s needs and aspirations the main concern of the non-formal education curriculum, and ensuring that the espoused outcomes of the instructional intervention have immediate application for the participants.

Non-formal education does not deal with the pursuance of learning outcomes which may only become relevant in the distant future. In concurrence, Ainsworth and Eaton (2010: 14) aver that non-formal education ‘is often considered more engaging, as the learner’s interest is a driving force behind their participation.’ Thus, in the present case, realisation was made that the participants would not have left their daily duties and responsibilities for the purpose of pursuing learning which had no immediate application, and only pertinent to a time in the distant future. So, in this study, cognisance was made to ensure that the topics covered in the intervention were of immediate concern and application for the participants. This is in contrast to what Dib (1987: 2) says about formal education, as a place where ‘for the most part teachers **pretend** to teach; learners **pretend** to learn; and, institutions **pretend** to be really catering to the interests of learners and of the society.’

In Australia, a study by Ferreira, Ryan and Tilbury (2007) revealed that higher education institutions had a daunting task of engaging communities in their research and on the issues of SD. This is also addressed by UNESCO (2005:11) in the

guidelines and recommendations for reorientating teacher education to address sustainability as follows:

“Institutions of teacher education fulfill vital roles in the global education community; they have the potential to bring changes within education systems that will shape the knowledge and skills of future generations. Often education is described as the great hope for creating a more sustainable future; teacher education institutions serve as key change agents in transforming education and society so that such a future is possible.”

Within the context of this study, non-formal education took the form of a community development programme on ESD, and also forming partnerships with the research participants to address the issue of environmental awareness, conservation, marketing, and storage of the medicinal plant species. Non-formal education was one of the study principles that were used, with a view of bringing about conceptual change in the mindsets of the medicinal plant sellers in addressing environmental issues that pertained to the medicinal plant selling business.

The other principle that underpinned this study was the very definition of EE, which is stated as follows:

“Environmental Education is the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and his biological surroundings. It is a life-long learning process that is graded at knowledge, understanding, skills and the fostering of values and attitudes towards the natural and man-made environment (IUCN, 1971: 21).”

The significance of this EE definition is the recognition of the interrelatedness among people, their culture and their physical environment. Certainly, when it comes to ESD, a people's culture, values and attitudes have to be integrated into any intervention more for adult learners than for young ones. International Union for the Conservation of Nature (IUCN; 1971); Irwin and Lotz-Sisitka (2000) also confirm that the definition refers to the fact that people hold values and attitudes which, *inter alia*, relate to the environment. That is why rural communities can be educated to develop positive attitudes toward their environment, and can be empowered to take a step further so as to use and manage natural resources responsibly. Irwin and Lotz-Sisitka (2000) also see EE as referring to the fact that people hold values and attitudes which, *inter alia*, relate to the environment.

Mulemwa (2006) states that good quality science and technology education should equip learners not only with knowledge but also with attitudes and skills for a healthy lifestyle, social-economic survival, self-reliance and self-sustenance. The ESD intervention programme sought to empower medicinal plant sellers to take a step further towards the conservation of the medicinal plants so as to use and manage medicinal plants responsibly.

Community engagement in conservation of resources was one of the principles that underpinned this study. In its ESD information Brief, UNESCO (2004:7) considers the roles and functions of a university in promoting SD as follows:

- Increasing the relevance of teaching and research for societal processes leading to more sustainable patterns of life and discouraging unsustainable patterns;



- Improving the quality and efficiency of teaching and research and;
- Bridging the gaps between science, technology, education and traditional knowledge.

Community engagement work is also an important dimension of ESD as engagement with communities often raises sustainability questions. This helps universities to substitute their contributions and provide forums for applied research, as well as opportunities for learners to engage in service learning programmes which provide them with real-life experiences.

Another pillar of this study was the indigenous knowledge in our society. This is a principle that highlights inclusivity and marks a major shift from the belief that only Western science contributes to a knowledge base that is credible. This is supported by Crabb (2004) who opines that learners in all education systems should be culturally empowered so that they can gain pride in their culture which, for so long, had been regarded inferior. On its part, the Department of Education (2003:13) adds its voice to the promotion of indigenous knowledge and states as follows:

“People should recognise the wide diversity of African renaissance, including the indigenous knowledge system through which they attach meaning to the world in which they live.”

This statement implies the significance of indigenous knowledge in our society thus, the importance of transferring, publicising and sharing of such knowledge so that the future generations have a heritage to talk about. It is important to recognise that many indigenous people have successfully managed the environment and encouraged

sustainable ways of dealing with it. Unfortunately, such ways of the indigenous people have been looked down upon instead of being acknowledged and developed to contribute to diverse ways of effectively managing our fragile planet (Cunningham, 1998).

## **2.6 SUMMARY**

Non-formal education was a main pillar of the study and it was sought to bring about conceptual change in the mindsets of the medicinal plant sellers in addressing environmental issues that pertained to the medicinal plant selling businesses since education and empowerment were viewed as powerful weapons to address SD the issues, especially concerning rural communities.

This chapter provided the theoretical background and framework that guided the study. Learning theories have been reviewed to show how the intervention of non-formal education held the promise for a changed world with regard to the medicinal plant sellers and the sustainability of threatened plant species. The literature on the specific research objectives of this study is discussed in the next chapter. Research methodology is discussed in chapter four.

## **CHAPTER THREE**

### **LITERATURE REVIEW**

#### **3.1 INTRODUCTION**

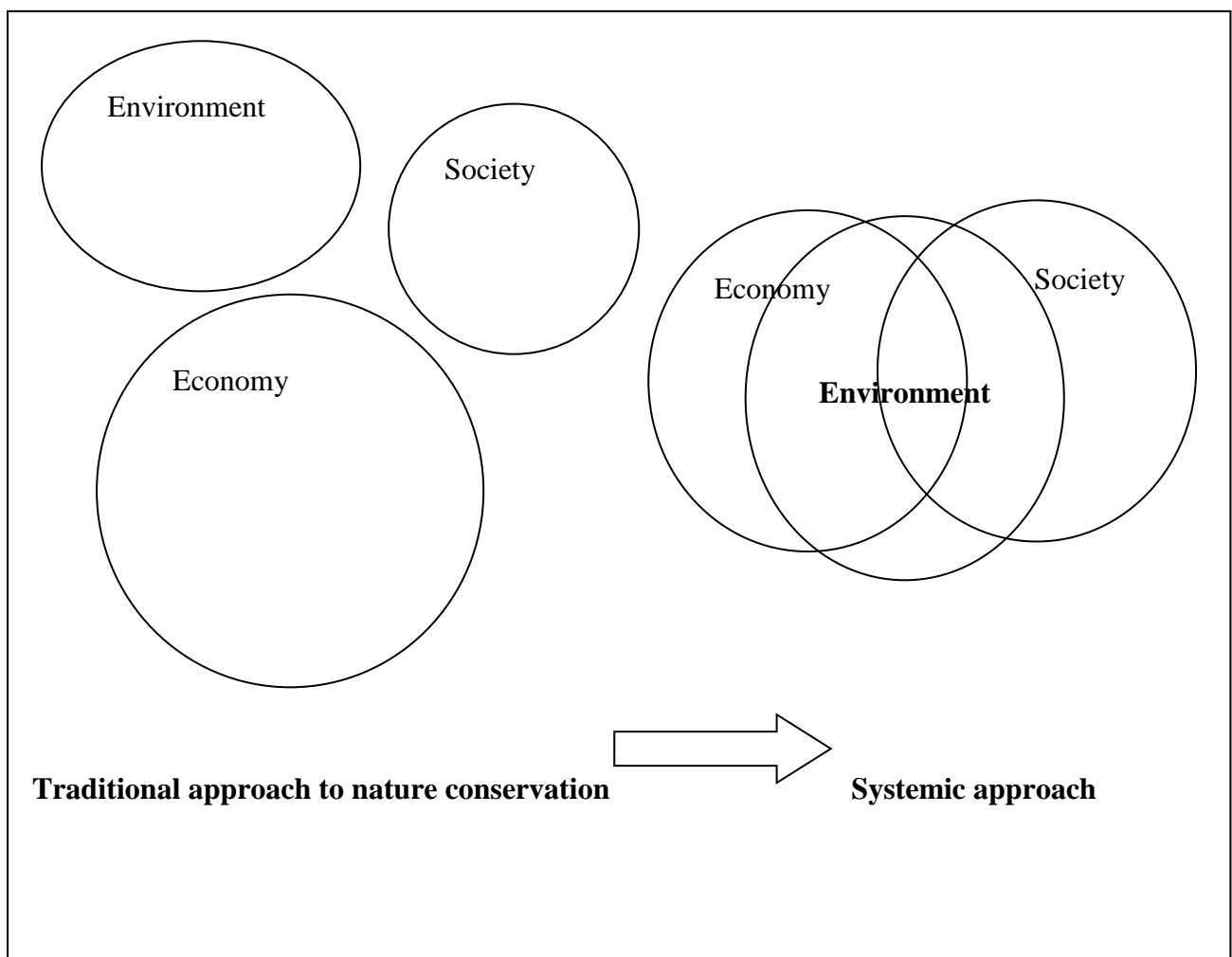
This chapter presents a review of the literature on ESD in the context of medicinal plant sellers. Issues that affect the medicinal plant business sector, such as marketing of medicinal plants, storage, conservation and capacity building of medicinal plant sellers will be discussed. Similarly, factors affecting the selling of medicinal plants and the impact thereof on the livelihoods of medicinal plant sellers are also highlighted.

#### **3.2 EDUCATION FOR SUSTAINABLE DEVELOPMENT AND MEDICINAL PLANT SELLERS**

The World Commission on Environment and Development (1987:13) defines the concept of SD as a kind of “development which meets needs of the present without compromising the ability of future generations to meet their own needs.” This is supported by Nederlanden (2000) who defines SD as a process of change in which the use of resources, the direction of investments, the orientation of technological, developmental and institutional change are in harmony and enhance both the current and future potential to meet human needs.

This definition implies that ESD focuses on the need to balance the use of natural resources according to what an environment can offer for human consumption. We are challenged to protect our environmental heritage, while simultaneously meeting the demands of local cultures and socio-economic development. However, the challenge is how to strike a balance between development and sustainability. In most

instances the term “development” simply refers to aspects of the country’s economy, while the issues of ecosystem conservation become a concern for some people. On the other hand, when environmental conservation is a concern, economic development is somehow compromised. The question is: what kind of development is sustainable? Figure 3.1 differentiates between the traditional approach to conservation and development, and that of SD.



**Figure 3.1: Dimensions of Development and Sustainable Development**

Historically, development and sustainability have been looked at as separate challenges. The reason could be that the traditional approach was on nature preservation without engaging communities to manage the environment. This is

emphasised by the National Environmental Conservation Act (1989) which states that no one has the authority to use natural resources in protected areas (Environmental Conservation Act of 1989). The National Conservation of Biodiversity Act (of 1999) supports this by stipulating that Natural Biodiversity can be protected from any human consumption. These regulations supported the traditional approach of development, one which was not sustainable since the economy, community and environment were looked upon separately. Communities were prohibited by laws of the then government erstwhile from using natural resources.

This was problematic because once people are prohibited from enjoying the gifts of nature; they tend to develop strategies to gain illegal access to the natural resources. For instance, medicinal plant gatherers were once caught in Karkloof (South Africa) using chain saws to remove *Ocotea bullata* trees to strip off their bark for the medicinal plant trade (Mander, 1998). Others also reported of medicinal plant gatherers being apprehended in the Karkloof area in possession of two vulnerable plant species; taxa-*Scilla natalensis* and *Ocotea bullata* (Kepe, 2007; Blignaut & Moolman, 2006; Mander, 1998; KwaZulu-Natal Wild Life Report, 2004). Both these species are protected. In addition to this, poachers were also apprehended in Ithala Game Reserve (KwaZulu-Natal Wild Life Report, 2004) for illegal harvesting of these species.

When people are given a chance to enjoy the resources, in most cases they focus on economic dimensions in such a way that the resources are exploited. In her case study of medicinal plant sales in northern KwaZulu-Natal (Ndawonde, 2007) it was revealed that the medicinal plant sellers and gatherers, harvested the medicinal plant

species in large volumes with the aim of making profit. It was the results of this that the current study aimed at bringing awareness to medicinal plant sellers, about the sustainability of medicinal plants and also encouraging them to take positive actions toward sustainability of the natural resources.

If communities are not given hands-on lessons in nature conservation, natural resources can be exploited in unsustainable ways. Historically, Australian education, just like in South Africa in the apartheid days, excluded indigenous pedagogy through colonisation and assimilation, leading to the cultural genocide of indigenous epistemologies (Walker, 2003). This is a powerful statement, however the world is beginning to realise the importance of recognising indigenous knowledge.

Governments are also beginning to see the importance of involving communities in development issues because it is believed that sustainable communities make efficient use of natural resources, while promoting sustainable production, consumption, protection and improvement of biodiversities.

The Ecosystem approach (Figure 3.1) focuses on development that is sustainable. Communities, the economy and the environment should be integrated. This is supported by the National Environmental Management Act (NEMA) of 1998 that commits the South African government to sustainable development, and emphasises the need for environmental education and capacity building in all sectors of South African society. The National Management of Biodiversity Act of 2004 stresses the use of indigenous biological resources in a sustainable manner, and the fair and equitable sharing among stakeholders of benefits arising from bioprospecting

involving indigenous biological resources. The act also emphasises the co-governance in biodiversity management. The challenge is to control the industry and to ensure that harvesting from natural areas is kept at sustainable levels.

The main purpose of including communities in issues related to the sustainability of the medicinal plants is to correct the past practices of exclusion of local communities in the process of collective decision making and general management of resources. There is a need to establish the principle of ownership of local resources by indigenous people so that the duty of preserving biodiversity does not become a duty of the government but a collaborative effort between government and local communities.

Training on sustainable harvesting of medicinal plants has been conducted in northern KwaZulu-Natal (Crouch & Hutchings, 1998). However, the training earmarked the traditional healers who do not harvest medicinal plants for selling purposes. As mentioned above, medicinal plant sellers harvest significant quantities of plant material in order to increase their sales. There is a need to engage medicinal plant sellers, who harvest large volumes of medicinal plant species, on projects and campaigns that focus on sustainability of the medicinal plants. Janse van Rensburg (1999), in writing on Southern Africa's dreams for development education and sustainability, argues that indigenous, traditional, ecological or local knowledge should be encouraged as it recognises marginalised ways of knowing, and has the potential to replace unsustainable ways of dealing with the environment.

The Department of Education (2003), argues for the recognition of other knowledge frameworks, including Indigenous Knowledge Systems (IKS), through which people attach the meaning of the world in which they live. ESD emphasises the integration of society, development and political decisions in managing the environment. In the present study, the communities, i.e. medicinal plant sellers, were given a chance to make contributions to the conservation of the medicinal plants they sell.

Some studies Barker (2004); Urmilla, Moodley, Traynor, Gausset and Chellan (2006) have acknowledge the relevance of local environmental knowledge passed on by local communities. This knowledge has been consistently used by these communities to successfully manage the environment.

It must be remembered that indigenous people have lived in harmony with the environment for many years. Aggrawal (1995) recommended an integration of IKS into the formal curriculum in order to fast track developmental efforts. In this context, IKS means the sum of all beliefs, skills theories, crafts, arts and architecture which are derived from African indigenous education and passed from one generation to the next. According to this author, integration of these aspects of knowing and knowledge constitutes direct experiences of people and the natural world. Crabb (2004) concurs with Aggrawal (1995) by referring to IKS as an intricate knowledge practice that is acquired over generations by communities as they interact with their environment.

There are many ways in which indigenous people interact with the environment. For instance, the Ndebele tribe, being mainly cattle rearing people, has limited knowledge of wild plants compared to the sedentary tribe of Tsonga. Similarly, women tend to



have more knowledge of leafy wild vegetables than men, due to the division of house chores. Men work in the field and can be more versed with knowledge of animals and wild fruits. IKS, is therefore, more than an ancient cultural practice, but is something that has enabled indigenous people throughout the world to adapt and survive (Onwu & Mogege, 2004). The major challenge is to reconcile IKS and modern science by respecting two sets of values without substituting one for another, while building on their respective strengths.

Prioritising environmental management issues is problematic when communities face imbalances related to social factors such as poverty; economic factors such as employment and political issues such as poor rendering of services. Communities may tend to make their livelihoods by utilising resources that are available to them. In some instances communities use more natural resources than what is supplied by the environment thus depleting the resources. This in turn perpetuates the poverty within communities. Some South African communities are facing poverty associated with race, gender, illiteracy and rurality (Kallaway, 1984). These problems are associated with poor delivery of services such as water and sanitation. In turn, this also adversely affects the education system.

### **3.2.1 Literacy Levels**

The survey of literacy among South Africans of age 15 and above was conducted by Aitchison and Harley (2004). The following table tabulates the results that were adapted from the survey. For better understanding by the researcher, the first column was reworded to further categorise the levels of education. The percentages were re-worked out from the total population surveyed in each year.

**Table 3.1:** Literacy and Basic Education level of South Africans aged 15 and above

<b>Level of education</b>	<b>1995 October Household Survey</b>	<b>1996 General Population Census</b>	<b>2001 General Population Census</b>
Full general education (Grade 9 and more)	14.3 million (38.86%)	13.1 million (33.59%)	15.8 million (35.35%)
Less than full general education (Grade 7 to less than Grade 9)	12.2 million (33.15%)	13.2 million (33.86%)	14.6 million (32.66%)
Less than full general education (Grade 1 to less than Grade 7)	7.4 million (20.11%)	8.5 million (21.79%)	9.6 million (21.48%)
No schooling	2.9 million (7.88%)	4.2 million (10.76%)	4.7 million (10.51%)
<b>Totals</b>	<b>36.8 million</b>	<b>39 million</b>	<b>44.7 million</b>

Adapted from Aitchison and Harley (2004:91).

Table 3.1 shows that literacy levels as per 2001 general census had not significantly changed from the figures obtained from the census of 1996. It is shown that the literacy level of 1996 was about 34% compared to 35% in 2001. This is not a significant improvement for the full general education band.

At the level of (Grade 7 to less than Grade 9), the levels of literacy were 34% and 33% for 1996 and 2001, respectively. Similarly, the literacy levels from grade 1 to less than grade 9 were 23% and 22% for 1996 and 2001, which does not show much difference. The levels of literacy for non-schooling population were about 11% in both 1996 and 2001.

From these results it is clear that in spite of government initiatives to build descent schools in order to improve the levels of literacy, there have not been major changes in the census results from 1996 to 2001.

Trevor Manuel said that some of these failures were not failures of the past-apartheid government. In his address in the government leadership summit in Pretoria, the Minister in the Presidency Trevor Manuel said on Wednesday, April 2013 that it is time for government to take responsibility for its actions, as the government they should no longer blame apartheid ([http://www. news24. com/South](http://www.news24.com/South) Africa). "We should get up every morning and recognise we have responsibility, Trevor Manuel explained. The Minister said that in 1994, 1995, and 1996, government could perhaps have said "we don't have the experience", but as the country approached two decades of democracy this was no longer an excuse.

Twenty years after the demise of apartheid, there is still no improvement with regard to the rates of illiterate. This could be as a result of lack of enforcement and monitoring of Adult Basic Education and Training (ABET) programmes. One of the reasons of the lack of success of ABET could be the shortage of resources, such as provision of proper text book for literacy and numeracy that can be used by adult people.

Low literacy is associated with poverty and a low level of entrepreneurship in both formal and informal sectors. This has resulted in large numbers of people plying their trades as street vendors without the necessary skills to run their businesses (McKay, 2008). This is one of the challenges faced by the medicinal plant sellers, whereby the business is dominated by elderly illiterate women (Ndawonde *et al.*, 2007). Acquiring literacy and numeracy skills goes a long way towards addressing the inequalities of the past, as adults learn not only to read and write, but to take control of their

everyday lives through activities like banking, filling in forms, reading work instructions and voting.

Based on its vision of providing a better life for all South Africans, the Reconstruction and Development Policy of 1994 placed great emphasis on community development, in which adult literacy and community development were linked. A lack of compulsory education, and the fact that the schools were sites for the liberation struggle, meant that many children did not attend school or had irregular attendance particularly between 1976 and 1994. This left many without education, and contributed to the massive need for ABET within the country.

### **3.2.2 Adult Basic Education in South Africa**

Efforts have been made by the government, the business sectors and non-governmental organisations to address the situation of illiteracy among South Africans by expanding the network of adult education ([http://SouthAfricaweb.co.za/page/adult education-South Africa](http://SouthAfricaweb.co.za/page/adult%20education-South%20Africa)). Adult Basic Education aims to provide South Africans with the basic foundation of lifelong learning and equip them with the skills and critical capacity to participate fully in society. ABET, is especially focused on women, particularly rural inhabitants, out-of-school youth, the unemployed, prisoners, ex-prisoners, and adults with disabilities. In 1995, the government established the South Africa Qualifications Authority (SAQA) which helped to develop the following:

- A national framework for learning achievements.
- Access to, as well as access mobility and progression within education, training, and career paths.

- Quality education and training.
- Readdress past discrimination in education, training, and employment opportunities.
- Full personal development of each learner and the social development of the nation at large.

The achievement of these activities was one of the efforts by the government to address issues of inequalities. There are recent developments with regard to skills training by the Sector Education and Training Authority (SETA). The SETA skills development programme was established by the Minister of Labour in 2000 to address the conditions of poverty, creation of work and the transfer of skills. However, the challenge is to achieve outcomes of the programme due to the lack of tangible results indicating that more people have acquired the minimum literacy skills (McKay, 2008). However, the intervention by SETA emphasised the skills training to address job opportunity issues and required that people should have minimum numeracy and literacy skills. This is a challenge considering that most South African adults are illiterate.

The lack of government intervention in these areas is one reason that the University of Zululand as the rural university in northern KwaZulu-Natal is involved in participatory action projects to address business challenges faced by the medicinal plant sellers. Universities have a daunting task to support the communities that surround them in terms of the issues related to, for instance, poverty and gender equity.

### **3.2.3 Poverty and Gender**

South Africa can be classified as a middle-income country, with one foot in the first world and the other in the developing world. However, poverty in rural areas is estimated by Mackay (2008: 29) to be as high as 67% (of the population of 44.7 million in 2001) due to socio-economic conditions such as high unemployment rates, and lack of basic infrastructure. Without infrastructure it is difficult for people to engage in entrepreneurial development activities. Most small-scale businesses require transportation for selling, electricity and other infrastructural requirements. These factors pose a challenge to micro businesses, including the medicinal plant selling business.

In general, South African women in rural areas are poorer than their male counterparts (Aliber, 2003). Women bear the burden of poverty because they are primarily responsible for managing the households and feeding the children. This has resulted in women trying to make their living through street vending. Southern African women have a tendency to practise as diviners, while men practise as herbalists (Cunningham, 1998). This tends to lead to a smaller number of males who are medicinal plant sellers in the markets since the herbalists are not supposed to be in the streets but rather perform their work in the homesteads.

In order to address these issues a framework has to be developed to unlock this knowledge, encourage consciousness and raise awareness through a process of joint learning to facilitate a more sustainable use of the environment. Learning should clearly link with the development of behaviour, attitudes and values, including the understanding of sustainable living, life styles and taking care of the planet. The ESD

venture in this study was devised in the form of a workshop to create awareness about the management of medicinal plants by medicinal plant sellers. It is generally accepted that knowledge is lacking among medicinal plant sellers and, any contribution in the form of education may assist by improving literacy levels in our communities, and hence the management of natural resources.

Thus, this study attempted to respond to the issues discussed above in light of recent developments in South Africa which support ESD in poverty stricken communities. The researcher formed partnerships with the medicinal plant sellers in order to embark on efforts to ensure the sustainability of the medicinal plant selling business. Participation of the medicinal plant sellers in ESD is important to make sure that they understand their responsibility in conserving the resources that form part of their livelihoods. As other businesses, the medicinal plant selling business has its own challenges that need to be addressed in order to make it a viable venture.

### **3.3 CHALLENGES FACING THE MEDICINAL PLANT SELLING BUSINESS**

Medicinal plants played a vital role in the livelihoods of communities for centuries, as they do today. According to the World Health Organisation (WHO) and the World Bank (2003), more than 80% of people depend on traditional medicine for their primary health care subsistence, and income. The situation is more prevalent in rural areas due to poverty, and as such, the sustainability of medicinal plants is of a great concern in these areas.

Despite the potential of the medicinal plant selling businesses to flourish due to the high dependence of people on traditional medicine, it is in fact facing hard times

(Street, Strik & van Staden, 2008). Over-exploitation, lack of business management skills, and lack of standard commercial processing of medicinal plants all pose a threat to this business sector (Dold & Cocks, 2002; Karki, Tiwari, Banoni & Battaria, 2003; Street *et al.*, 2008). It is for this reason that various issues such as livelihood and subsistence, storage, marketing, conservation of medicinal plants, financial management and capacity building of people using traditional medicine need to be explored.

### **3.3.1 Challenges in marketing medicinal plants**

The section below briefly reviews how medicinal plants are marketed and the challenges thereof.

#### *3.3.1.1 Commercialisation and Marketing*

Among plant sellers, the collection and selling of medicinal plants has become highly commercial (Crouch & Hutchings, 1998; Mander, 1998). This is more apparent when entering *umuthi* markets, where medicinal plant sellers trade large quantities of bulbs, bark, roots and mixtures of chopped plant material. Approximately 450 plant species are sold in markets in KwaZulu-Natal (KZN) (Mander, 1998). The amount of plant material traded in the KZN province alone is estimated to be 500 tons per year and most of this material is traded in informal street markets (Botha, Witkowski & Shackleton, 2004b). This, notwithstanding, the medicinal plant industry is underdeveloped and has limited opportunities for growth. The major contributing factor for this is that certain popular species are becoming less available as wild stocks diminish.



Little value is attributed to the medicinal plant industry since earnings from the sale of plants remain marginal (Kepe, 2007; Street *et al.*, 2008). Increasing competition within the industry makes it difficult for medicinal plant sellers to make a substantial profit. Poor or no marketing strategies for the medicinal plants could also be a contributing factor. Unlike western medicine, there is neither branding nor advertising of traditional medicines. Western medicines can become well known to consumers with regard to their use, shelf life, doses, subscriptions and prices through written records. The volumes of demand and supply are usually well documented. However, as with many informal markets, in the case of medicinal plants the volumes sold are difficult to quantify because of the lack of records.

Schippmann *et al.*, (2002) state that it is difficult to give accurate figures on medicinal plants that are commercially traded, either at a national or international level. However, it is reported that the international trend, for instance in the European countries, shows that approximately 94,300 tons of medicinal plants are commercially traded, with Germany ranking as the fourth largest importer and exporter of medicinal plants (Lange & Schippmann, 1997). Countries like China, Bangladesh, Japan and Spain are also actively involved in the medicinal plant trading industry with large quantities of medicinal plants traded annually (Schippmann *et al.*, 2002; Kala, 2005; Niaz & Rashid, 2006).

In KwaZulu-Natal most of the documentation on the trade of medicinal plants has been compiled and reported by Mander (1998); in Gauteng by Williams (1996); Williams, Witkowski and Balkwil (2007); in Mpumalanga province by Botha *et al.*, (2004b) and in Limpopo by Botha *et al.*, (2002). Dold and Cocks (2002) undertook

the research on the medicinal plant trade in the Eastern Cape. These studies reported on the quantities of medicinal plants traded in South Africa. Further, the researchers profiled the role played by the medicinal plant trade in the South African economy.

Botha *et al.*, (2004b) recorded 176 medicinal plant species being sold in Mpumalanga markets. There were 525 tons of medicinal plant materials recorded in Eastern Cape per annum (Dold & Cocks, 2002). The trade of medicinal plants in Witwatersrand (Gauteng) is approximately worth R27 million per annum (Williams, 1996). These studies show that the quantities of medicinal plant material traded in informal markets are quite high.

Cunningham (1998) noted that with 70-80% of the African population relying on traditional medicines, the importance of medicinal plants in the healthcare system is enormous. Medicinal plants are now given attention as is evidenced by a) the recommendation of the WHO, that traditional remedies be incorporated within national drug policies, and also b) by recent moves towards greater professionalism within African medicine (Cunningham, 1998).

There is also a preponderance of research on the conservation and sustainable use of medicinal plants, particularly in Africa. In 1990 Cunningham (1998) conducted surveys, correspondences and field visits to establish contact with Traditional Medicinal Practitioners (TMPs) and herbalists in Malawi, Mozambique, South Africa, Swaziland, Zambia and Zimbabwe. The main field of enquiry was whether or not plant species were threatened. Cunningham (1998) identified the following plant species as being in a 'danger zone' in South Africa.

**Extinct in the Wild:** *Siphonochilis natalensis*

**Endangered:** *Warburgia salutaris* and *Siphonochilus aethiopicus*

**Vulnerable and Declining**

*Dioscorea sylvatica*, *Bersama tysoniana*, *Ocotea bullata*, *Ocotea kenyensis*, *Curtisia dentate* *Pleurostyliia capensis*, *Faurea macnaughtonii*, *Loxostylis alata*, *Mystacidium millarii* and *Ledebouria hypoxidoides*. The most vulnerable species were those that are slow growing or slow to reproduce (Cunningham, 1998) and the following species (Table 3.2) have been identified as being scarce, but in high demand for medicinal usage.

**Table 3.2:** The top 15 medicinal plant species identified as becoming scarce by herb traders in South Africa (Cunningham, 1998:22)

Species	Zulu name	% (n=44)
<i>Warburgia salutaris</i>	Isibhaha	90
<i>Boweia volubilis</i>	Ugibisila	84
<i>Siphonochilus aethiopicus</i>	Indungulo	68
<i>Eucomis species</i>	Umathunga	64
<i>Ocotea bullta</i>	Unukani	61
<i>Haworthia limifolia</i>	Umathithibala	55
<i>Synaptolepis kirkii</i>	Uvuma-omhlophe	52
<i>Scilla natalensis</i>	Inguduza	36
<i>Eucomis species</i>	Imbola	34
<i>Erthrophleum lasianthum</i>	Umkhwangu	32
<i>Synaptolepi spp.</i>	uvuma obomvu	32
<i>Curtisia dentate</i>	Umlahleni	27
<i>Cyanotis speciosa</i>	Uphindemuva	27
<i>Asclepias cucullata</i>	Udelunina	27
<i>Cinnamomum camphora</i>	Uroselina	25
<i>Begoniam honymma</i>	Idlula	25

**Adapted from Cunningham, 1998:22**

The study by Mander (1998) conducted in a Durban market, showed that approximately 4,300 tons of medicinal plant species were consumed by 6 million medicinal plant consumers annually. It was also revealed that of the 20 000 - 30 000 people selling medicinal plants in street markets in KwaZulu-Natal the majority were women. Mander (1998) estimated the demand of medicinal plants in

Bushbuckridge (Mpumalanga province) to be between 2000 - 7000 tons per year. This level of demand is likely to increase as demand for medicinal plants increases as a result of population growth and an increase in the value of indigenous plants used to presumably treat Acquired Immune Deficiency Syndrome (AIDS) and associated ailments. A study by Ndawonde (2007) revealed that there was a high demand for *Hypoxis hemerocallidiae* due to the belief that it alleviates symptoms associated with Human Immune Virus (HIV) and AIDS.

**Table 3.3:** Estimates of the amount of priority species traded annually in KwaZulu-Natal (Mander, 1998:27)

Scientific name	Gram/annum	Prices charged/gram		
		Rural gatherer	Street vendor	Shops or healers
<i>Scilla natalensis</i>	95.5	R1.89	R6.50	R6.80
<i>Eucomis autumnalis</i>	73.17	?	R6.20	R10.6
<i>Boweia volubilis</i>	43.0	R11.7	R14.0	R27.8
<i>Alepidea amtymbica</i>	31.23	R11.7	R16,0	R17.8
<i>Ocotea bullata</i>	25.25	?	R6.67	R27.7
<i>Curtisia dentate</i>	23.9	R3.28	R7.61	R23.8
<i>Haworthia limifolia</i>	22.5	?	R30.7	R69.2
<i>Warburgia salutaris</i>	17.2	R8.52	R16.9	R31.0
<i>Siphonochilus aethiopicus</i>	1.9	?	R140	R450

**Adapted from Mander (1998:27)**

The medicinal plants listed in Table 3.3 are in high demand. As a result, some of them are restricted to plant collectors due to their vulnerability. Some medicinal plant species are no longer found at the street markets, for example; *Warburgia salutaris* and *Siphonochilus aethiopicus*. However, they are still in demand from medicinal plant buyers. Medicinal plant species such as *Boweia volubilis* and *Harworthia limifolia* were difficult to obtain at the Nongoma medicinal plant market

in northern KwaZulu-Natal. *Boweia volubilis* is rarely obtained from medicinal sellers in Newcastle. *Harworthia limifolia* only comes from Vryheid. Ndawonde *et al.*, (2007) have reported on selected medicinal plant species found in northern KwaZulu-Natal, the quantities sold as well as the prices charged (Table 3.4).

**Table 3.4:** The quantities of certain herbal medicines sold in Nongoma (Mona bulk sale) in northern KwaZulu-Natal region and income generated by traders in standard re-used 50kg bags (Ndawonde, 2007:74)

Scientific name	Part used	Sub-sample (g)	Price (R) charged/g	50kg and 25kg bags	Price (R)
<i>Acorus calamus</i>	Rhizomes	207.09	5.00	25	60.00
<i>Acridocarpus natalitus</i>	Leaves	694.62	5.00	50	120.00
<i>Aptenia cordifolia</i>	Bark	65.72	5.00	25	30.00
<i>Callilepis laureola</i>	Bark	295.27	5.00	50	100.00
<i>Calodendrum capense</i>	Bark	235.52	5.00	25	60.00
<i>Capparis tementosa</i>	Bark	127.79	5.00	25	40.00
<i>Chlorophytum modestum</i>	Roots	562.40	5.00	25	50.00
<i>Clivia minnata</i>	whole plant	194.49	5.00	50	70.00
<i>Conia capensis</i>	whole plant	146.21	5.00	50	100.00
<i>Drimia robusta</i>	Bulb	207.09	5.00	25	60.00
<i>Erythrophyleum lasianthum</i>	Roots	350.94	5.00	50	100.00
<i>Hypoxis hermellocalidae</i>	Bulb	694.62	5.00	50	120.00
<i>Mondia whitei</i>	bark/roots	14.10	5.00	50	140.00
<i>Ocotea bullata</i>	Bark	296.27	5.00	50	70.00
<i>Olinia radifolia</i>	Roots	146.11	5.00	50	80.00
<i>Sarcophyte sanguinea</i>	Roots	282.07	5.00	50	140.00
<i>Urginea sanguine</i>	Roots	138.08	5.00	50	70.00

It appears that the medicinal plant sellers harvested the plants for low returns. Some of the plants listed in Table 3.4 such as *Hypoxis hemerocallidae* and *Ocotea bullata* are in the Red Data List by Goldings (2002), but the prices charged for their sub-sample was R5.00. The most important consideration for the plant sellers seemed to be the satisfaction of their immediate needs – a situation that is clearly unsustainable.

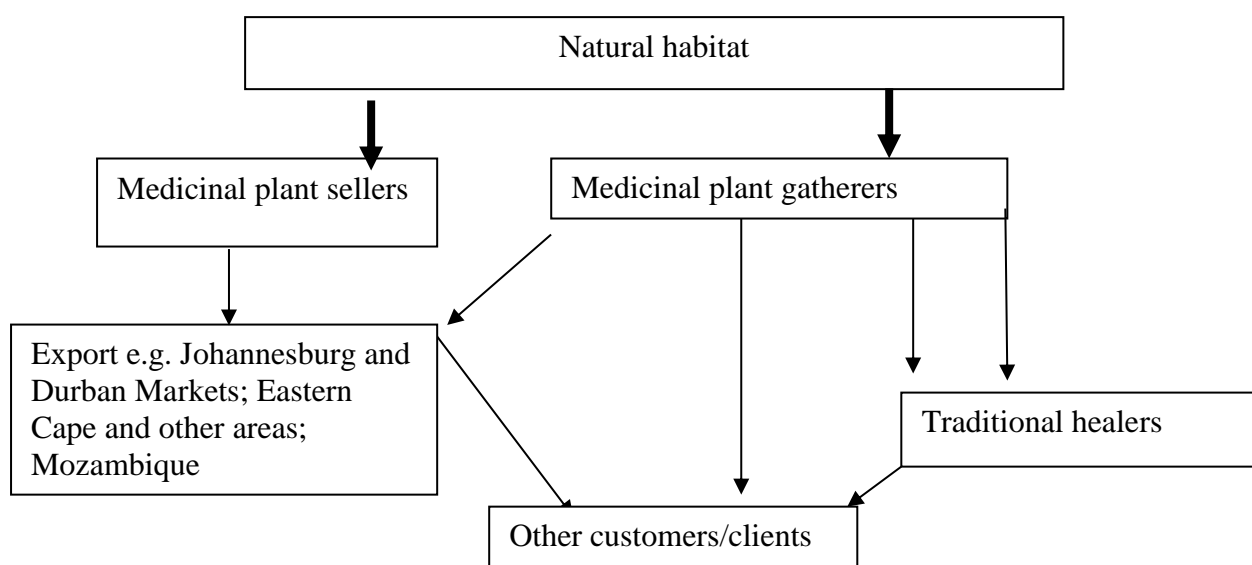
It was found that two-hands full of medicinal plant material cost R5.00. The hands of the sellers are not equal in size therefore they need a standard unit of measurement. One seller could therefore sell merchandise at a given price whereas another with bigger hands would sell more material at the same price. If the transportation fee, time, work effort (in chopping up the plant material) and the risk of collecting the plants in the field is considered, a maximum price of R140.00 per 50kg bags would not yield sufficient profit. Therefore, it is important to work together with the medicinal plant sellers on the management of the species they sell so that the species continue to be available in future.

Mander (1998) conducted a research in which it was reported that the supply of traditional medicines is based on medicinal plants which are generally harvested from the wild plant stock that unfortunately, is not well managed. Mander (1998) further highlights the following concerns on the supply of medicinal plants:

- A wide range of plant species is showing indications of unsustainable use with the size of the products decreasing and so many plants becoming unavailable at certain markets. Some popular plants have become extinct outside of the protected areas in the KZN.
- The scarcity of popular plants has led to their under-supply in the market; with considerable increases in the prices of imports into the province, and the use of substitute plants.
- In addition, there has been an increase in the application of destructive techniques, which aimed at increasing the harvest from the stock in order to maintain income levels in the short term.

KwaZulu-Natal Wild Life (2004) has reported that 22000 tons of medicinal plant material is sourced from the grasslands and savanna biomes daily. Numerous grassland medicinal plant species are declining as shown by the effort required by gatherers to find adequate stock. For example, the report revealed that plant gatherers use chain saws to remove *Ocotea bullata* to strip its bark for medicinal plant trade.

One issue that contributes to the poor marketing of medicinal plants is the complex market structure, with both national and international dimensions. It is difficult to predict the demand of medicinal plants by medicinal plant sellers since their target customers vary. Buyers of medicinal plants can be individuals, interested in certain medicinal herbs, or it could be traditional healers. Medicinal plant sellers also buy traditional medicines from other medicinal plant sellers. The following figure provides an overview of the marketing chain of the plants harvested in KwaZulu-Natal.



**Figure 3.2: Marketing chain for medicinal plants harvested in northern KwaZulu-Natal**

Figure 3.2 shows that the main role players in medicinal plant harvesting and selling are the medicinal plant gatherers and medicinal plant sellers. In some instances medicinal plants sellers also harvest from the field. They form the critical chain in the medicinal plant collection since they are concerned with making profit. In other words, medicinal plant sellers constitute a larger group in plant harvesting since they are concerned with the availability of medicinal plant stock in the medicinal plant industry. It is, therefore, important to make them aware of the negative impact of overharvesting medicinal plants on the environment.

#### *3.3.1.2 Pricing*

Pricing is also an issue in the selling and marketing of medicinal plants. Sometimes the retailer determines the price of medicinal plants regardless of the primary plant collector. This reduces the income of the medicinal plant sellers as they make little or no contribution in determining the price of their medicinal plants. Okello and Ssegawa (2007) state that the market chain of medicinal plants in Ghana involves a middle man. According to Niaz and Rashild (2006) medicinal plant price units are determined the same way in Bangladesh, and Himalaya.

The middle man may also require a commission from the selling of medicinal plants and this adversely affects the income, and thus the livelihoods, of medicinal plant sellers. In Uttarakhand District - India, pricing of medicinal plants is determined by the State. However, there are problems since traders are not legally required to provide trade-related information to State forest departments and communities.

The lack of transparent and accessible information hampers collectors in negotiating better prices (Karki & Rawat, 2004, as cited by Unasyuva, 2008). According to



Unasylva (2008), in other areas in India, such as Orissa, the village council has the power to set the minimum procurement pricing for medicinal plant species. This passive pricing process imposes pressure on medicinal plant sellers as the selling of the plants may not meet their needs.

A situation where medicinal plant sellers determine the price of medicinal plants may seem to be ideal for profit making. However, in South Africa, the determinants of prices are the medicinal plant sellers themselves. An individual, probably the experienced plant collector, determines the price of medicinal plants, which is eventually shared by all the medicinal plants sellers. This poses problems to the sellers where it is difficult to find the plant specimen since the price is determined by the medicinal plant seller (s), probably those who have experience in how to obtain the medicinal plants easily. Other medicinal plant sellers have to adhere to the price determined by the first sellers who probably easily access that particular plant material. The profit gained by medicinal plant sellers who face difficulties in accessing the medicinal plants may be low, thus undermining the business.

All sellers should be enlightened about these issues. Thus, there should be consensus on pricing so that all the medicinal plant sellers share the benefits of selling medicinal plants. There is a need to work with the medicinal plant sellers in order to make them reflect upon the pricing issue. Besides the problem of price determination, there are other challenges that face the medicinal plant selling business. These include packaging and storage, such as accuracy of measurement, weighing and prescriptions of medicinal plants, as discussed in the following sections.

### **3.3.2 Challenges facing medicinal plants sellers with regard to packaging and storage**

Lack of storage facilities and trading infrastructure in the informal traditional medicine selling business result in wastage of medicinal plant material. Medicinal plant sellers also harvest large quantities of medicinal plants to meet the high demands for traditional medicine. It could happen that one medicinal plant seller sits with 50 bags of the plant material at Mona market in northern KwaZulu-Natal. The question is what happens with the rest of the plant material if not all of it is bought on the first day or throughout the market session? The plant material may rot. The medicinal plant sellers may discard the material, resulting in a waste of natural resources and the money used to transport the material to the market. Time and energy spent in collecting the medicinal plant is also lost during this process.

South African medicinal plants are most commonly sold at outdoor informal street markets or indoor shops. The outdoor markets are customarily positioned in the hub of the city centre to allow easy access for customers. A rudimentary cover may keep direct sunlight or rain off the trader and his or her product, but most of the plants are displayed in the open (Street *et al.*, 2008). Therefore, plant material may come in contact with various kinds of urban pollutants, such as industrial and vehicular emissions. Furthermore, the plant material is exposed to microbial and insect attack (Street *et al.*, 2008).

Pests are a frequent problem for medicinal plant vendors and fumigation does take place in medicinal plant shops. Shop owners, however, do not seem to be concerned about the consequences of potentially toxic residues on the plant material being sold to their patients (Street *et al.*, 2008). This could have negative implications on the

intended customers - particularly considering that 80% of the people worldwide depend on traditional medicine for their health care. There should be ways in which medicinal plant sellers are made aware of the proper storage mechanisms for their medicinal plants, as well as the implications of poorly stored medicines.

The packaging used for medicinal plant products are newspapers and plastic bags (Street *et al.*, 2008). The plastic material used for packaging may form water vapour inside the bag which may develop mould, especially on the fresh plant material. Issues such as shelf life, packaging and proper dosages of traditional medicines need to be made available to them and clarified so that the quality of traditional medicine practice improves.

#### *3.3.2.1 Accuracy in measurement*

Medicinal plant sellers do not have standard scales for weighing their medicines and in some cases they use hand-full to estimate the quantities of material to be sold (Ndawonde, 2007). The dosage of the prescribed medicinal plant material is also an issue. In some instances, medicinal plant sellers use segments of a finger to estimate the dose of the medicine, especially for liquid medicines. This poses a problem as their fingers are unequal in size and length. The situation is even worse with prescriptions for children. Steenkamp, Stewart, Curowska and Zuckerman (2002) state that overdosing by traditional plant-based remedies in South Africa is common, particularly in children. Medicinal personnel tend not to ask about the use of traditional medicines administered to young children, especially babies.

A case study by van Wyk and Els (2008) reported that neonatal organo-phosphate-like poisoning, presumed to be caused by traditional medicine. An analysis of the

Johannesburg forensic database over a 5-year period (1991–1995) revealed that there were 206 cases in which a traditional remedy was either stated to be the cause of death or was found to be present in a case of poisoning with an unknown substance (Steenkamp *et al.*, 2002). These issues need to be addressed. Medicinal plant sellers and healers should have training on the handling of traditional remedies so that their medicines become part of a solution rather than a problem. Diederichs (2006) recommends the implementation of correct documentation and traceability of medicinal plants that enter into regional health systems since safety and quality assurance of medicinal plants are universal concerns with regard to the regulatory requirements and standards of traditional medicines.

### **3.3.3 Challenges in conservation of medicinal plants**

Conservation of medicinal plants can be effected through their protection by imposing harvesting restriction laws on certain species and the amount of material harvested, and also through the propagation, cultivation and sustainable harvesting (Hamilton, 2004). Conservation through protection of species have been implemented in the Kruger National Park (Blignaut & Moolman, 2006), Hluhluwe Game Reserve (Mander, 1998) and Mkhambathi Nature Reserve (Kepe, 2007). However, this was ineffectively implemented as it had drawbacks evidenced by some medicinal plant gatherers still being able to illegally harvest medicinal plants in those areas (Kepe, 2007; Blignaut & Moolman, 2006; Mander, 1998; Chungu, Muimba-Kankolongo, Roux & Mulambo, 2007).

Another method of conserving medicinal plants includes sustainable harvesting of medicinal plant parts such as sustainable removal of roots and barks where plants are harvested. Studies by Chungu *et al.*, (2007) showed that the barks of trees in Zambia

were able to regenerate after the harvesters had placed mud on the areas where the bark was removed. This method ensured the survival of the species in their own habitat. However, the implementation thereof was not easy, particularly when dealing with medicinal plant gatherers whose intention was to generate revenue from selling and gathering the plants. Cultivation ensures long term survival for a species. However, there are problems associated with the prolonged periods before the medicinal plants (Lewu Grierson & Afolayan, 2006). In addition to sustainable harvesting, cultivation and legal protection conservation practices.

Hanazaki, Peroni and Begossi (2006) outline a continuum model of managing medicinal and food plants by communities which start from the wild, where the plant could be taken care of by, for example, not cutting or stepping on it. That required no labour in managing the plant species. If the species is of more concern to people, weeding can take place while it is in the wild. Although this requires energy input, weeding a species enables management of the species in its own growing environment.

#### *3.3.3.1 Challenges with regard to cultivation of medicinal plants*

Only a very small number of species are cultivated in South Africa using *ex situ* methods, that is, the nursing and conservation of the plant species in their original habitat such as the biome where they are grown (Mander, 1998). Some medicinal plant species are slow growers; they can take three to eight years to mature (Lewu *et al.*, 2006). One explanation may be that cultivated plants are considered inferior to wild gathered specimens. In Botswana, traditional healers are of the opinion that cultivated material is unacceptable, as they do not have the same power as material

collected from the wild (Cunningham, 1998). Scientific studies partly support this (Schippmann *et al.*, 2002).

Medicinal properties in plants are mainly due to the presence of secondary metabolites which the plants need in their natural environments under conditions of stress and competition which perhaps would not be expressed under mono-culture conditions. Active ingredient levels are much lower in cultivated medicinal plants, whereas wild populations may be older due to slower growing rates. However, the activity of plants can be enhanced under controlled conditions (Schippmann *et al.*, 2002; Karki *et al.*, 2003), by subjecting them to stress whereupon they respond by converting their active metabolites into steroids (Schippmann *et al.*, 2002).

Unlike in India and China where more than 700 farmers were reported to be engaged in the cultivation of medicinal plants (Lambart, Srilastaca & Vietmayer, 1997), in South Africa very little has been done on the cultivation of medicinal plants (Jäger & van Staden, 2000). Buchu, rooibos tea, aloe and devil's claw had made it into overseas markets, and are under cultivation. Some medicinal plants such as *Haworthia limifolia*, *Encephalartos*, *Scilla natalensis*, *Warburgia salutaris* and *Ocotea bullata* were cultivated in Silver Glen nursery at Pietermaritzburg. Most of the species were not cultured by traditional medicine farmers but rather in nurseries by plant scientists (Nichols, 2005; Diederichs, 2006). Yet the people who require the cultivation skills are the medicinal plant sellers who still harvest medicinal plants from the wild. The interest in cultivating medicinal plants had been lacking due to uncertainties surrounding financial returns. Field trials on the most endangered species are needed to address the following:

- How to grow the plants (soil, water, fertilizer, planting density, shading, etc).

- The length of the planting and harvesting periods of the plant.
- The yield and expected financial returns.
- How to store plants after harvest.
- The length of the cultivated plants.

Until such basic information is available it is difficult to ask small scale farmers to venture into medicinal plant farming, unless support and guidance are provided to them. Universities and communities can start to make a difference by creating medicinal plant gardens while seedlings are still available, rather than waiting until nothing is left. According to Lambart *et al.*, (1997) the Chinese Academy of Sciences Institute has 186 farms that include medicinal plants or rare and endangered species. South Asian states are practising mixed farming systems that include herbal plants and cultivation of medicinal plants (Karki *et al.*, 2003). Aguilar-Støen and Moe (2007) have reported that only 3.3% of the 695 species are cultivated from countries such as Mexico, Nepal, Spain, Bulgaria, Philippines, Uganda and Ethiopia. This indicates that medicinal plant cultivation worldwide is occurring on a relatively small scale.

### 3.3.3.2 *The need for cultivation of medicinal plants*

From a conservation point of view, in South Africa there are medicinal plant species that are over-exploited and as a result are depleting. There may also be slow growing species with limited distribution that are endangered and in high demand, such as *Warburgia salutaris* (Cunningham, 2001). There should be means for the community to access the species in the long run. From a livelihood perspective, an understanding of the economic and health importance of traditional medicines at household and individual levels, is required in order to design appropriate health and medicinal plant

resource management policies (Krog, Falcão & Olsen, 2006). Medicinal plants cultivation is a potential economic venture in the region and a way of ensuring the long-term conservation of traditional herbs in the wild (Aguilar-Støen & Moe, 2007).

According to Silori and Badola (2000) in Himalaya, Nanda village communities cultivate medicinal plants in their home yards. The harvesting pattern is different from South African practices in that when roots are collected only fresh roots are picked for harvesting purposes. Old roots are left behind for propagation purposes. Propagation takes the form of roots, rhizomes, seeds and bulbs.

In South Africa, Maundu, Kariuki and Eyog-Matig (1999) suggested that *ex situ* and *in situ* conservation systems are necessary for the medicinal plant gatherers to collect medicinal plants in their home yards. There is scientific propagation of medicinal plants (Nichols, 2005; Kowalski & van Staden, 2000; Diederichs, 2006). This contributes to the sustainability of medicinal plants. However, there is a need for medicinal plant sellers to be aware of, and to be encouraged to participate in, conservatory actions of the medicinal plants that they harvest. Even if they are made aware of sustainable harvesting they may still continue to harvest the plants the same way unless they are given hands-on experience on the plant conservation.

#### 3.3.3.3 *Challenges in conservation of medicinal plants through protection*

Protection of medicinal plant species is working in some areas in northern KwaZulu-Natal. In Hluhluwe game reserve, endangered medicinal plant taxa are fenced off (KwaZulu-Natal Wild Life Report, 2004). It is hoped that in these areas the species will come under less threat from illegal harvesting by medicinal plant gatherers as



reported by Marstiliza and Barker (2001) where, in Grahamstown, there was less evidence of ring-barked medicinal plants in protected areas than in unprotected areas. Effort to stabilise or protect populations of medicinal plant species through national legislation have in most cases been ineffective as people invading protected areas cause significant harm to medicinal plants (KwaZulu-Natal Wild Life Report, 2004).

Adding to the government activities to mitigate the effects of threatened medicinal plants, are policies that restrict collection of medicinal plants resulting in some being depleted from the wild. In effect, these include protected areas, such as Hluhluwe game reserve, Ungoye Forest and Karkloof. However, much still needs to be done to ensure medicinal plant gatherers comply with the regulations preventing medicinal plants from being exploited to extinction. Although the Department of Agriculture had introduced permits as a control measure against the unsustainable harvesting of taxa *Pelargonium sidoides*, this had not stopped the illegal removal of the species from the wild (Lewu *et al.*, 2006).

The other threatened, protected taxa include *Ocotea bullata* and *Warburgia salutaris*, amongst others which were still being illegally removed from protected areas (Mander, 1998). Education could increase awareness regarding the need for methods that should be utilised to conserve medicinal plant species.

#### *3.3.3.4 Social perspectives in medicinal plants conservation through protection*

Traditionally, women have been key role players within medicinal plant-based activities and macro-enterprises primarily because the products and activities thereof fit easily within their average daily work schedules (Karki *et al.*, 2003). These

activities typically include the collection and transportation of medicinal plant raw materials to the market. These small businesses contribute to the preservation of traditional knowledge and provide enterprise opportunities for the unemployed youth and poor rural people. However, legal restrictions to enforce the protection of medicinal plants by governing the access and removal thereof should be in place (Kepe, 2007; Chungu *et al.*, 2007; Karki *et al.*, 2003), so as to achieve, a careful balance between restricting access to plants (which may encourage economic opportunity) and the conservation of biodiversity.

The importance of traditional plant knowledge is evident by the need for ‘biospectors’ which involves recruiting indigenous people to identify and describe the uses of local flora (Lambart *et al.*, 1997), hence the need to protect intellectual rights.

There are social beliefs that ‘facilitate’ medicinal plant conservation, for instance, some Christians are against the use of medicinal plants in northern KwaZulu-Natal because of the associated stigma of witchcraft. Many Christians do not use medicinal plants because they are afraid of the stigma. This reduces the demand for medicinal plants in one way or another.

A Study by Price (2006) in northern Thailand showed a decrease in the use of traditional food plants because their use was associated with poverty. Many households rely on commercial food to avoid the stigma of being classified as being poor by relying on traditional food plants.

### 3.3.3.5 *Challenges based on cultural practices in medicinal plant conservation*

The use of wild plants, including medicinal plants, is linked to cultural practices of all nations (Cunningham, 1993). Wild plants are an important source of edible fruits, leafy vegetables and traditional herbs, and are particularly important in ensuring food security and maintaining nutritional balance in people's diets (Price, 2006; Ndangalasi, Bitariho & Davie, 2007). During times of famine, wild plants are essential for human survival (Grivetti, 2006) and at other times they serve a dual function: preventing the need for cash expenditure and providing a source of income to cash-poor households. As the plant numbers diminish from their natural environment due to changes in land use for commercial crops, over-harvesting for marketing purposes and clearing of vegetation for industrial development, cultured practices associated with the plants may also fade.

Access to modern medicine and exposure to modern culture have also altered the distribution and extent of local knowledge and use of medicinal plants in our societies (Caniago & Siebert, 1998). Pieroni and Quavata (2006) have found that indigenous knowledge is declining in South Italy because of technology and modern commercial food. In Botswana, Grivette (2006) has brought credibility to the elders by documenting the identification and use of medicinal plants. The elders were concerned that the youth were losing the indigenous knowledge that could be utilised to cure diseases. Studies by Caniago and Siebert (1998); Kepe (2007); Schippman *et al.*, (2002); Karki, *et al.*, (2007) and Cunningham (1998) showed that rapid social change can also affect local knowledge of medicinal plants and interest in medicinal plant use.

Educational documentation of medicinal plants and their functions is required to promote conservation, livelihood security, healthcare and local culture. Indigenous knowledge has always been looked down upon and being secretive. For instance, if one had knowledge of a special herb that could cure a serious disease, one's grandfather might appear in a dream to tell one who should be given the privileged information about how the herb should be administered. Unlike indigenous medicinal practitioners, scientific endeavours are characterised by both cooperation and competition. Scientists subject one another's claims to careful scrutiny by repeating experiments and by verifying the results of others. This constitutes a system of quality assurance the same of which cannot be said of the indigenous practice.

#### *3.3.3.6 Challenges associated with ecological perspectives of medicinal plant conservation*

Medicinal plant availability is reduced by forest conversion and land degradation (Blignaut & Moolman, 2006; Schippmann *et al.*, 2002). For instance, turning natural forests into agricultural fields has reportedly caused timber plantations to have altered the number of medicinal plant species and distribution in Kalimantan, Indonesia (Caniago & Siebert, 1998).

Ndangalasi *et al.*, (2007) contend that inadequate information on ecological productivity, growth forms, life history and conservation of the various species complicates harvesting levels of medicinal plants by medicinal plant gatherers. However, ecology of the species can help a particular species to survive over-exploitation. For instance, there are medicinal plant species that become dormant in certain seasons, particularly winter, and become more readily available in rainy seasons such as summer and spring (Kepe, 2007). The medicinal plant gatherers can

perceive particular species as being scarce in the field. Only experienced medicinal plant gatherers who know the growth patterns of the species should collect them (Kepe, 2007).

Another ecological factor is the physical difficulty of collecting plants; even though they may be visibly present (Kepe, 2007). There are medicinal plant species such as *Cassipourea gerrardii* that can grow on very tall trees, making themselves inaccessible. In addition, some of the plants including forest trees, grow in gorges where the women collectors cannot easily reach them. In such situations collectors can label the species as scarce. Other plants are found in deep forest locations where women and children cannot go. This decreases their availability in the market and by implication may support the survival of the species.

Kepe (2007) and Cunningham (1993) are of the view that another factor that determines the medicinal plants' availability is ecological processes initiated by human beings, such as veld fires. Fires make it possible for medicinal plant gatherers to see plants that can be hidden by grass. However, there are also negative effects (Cunningham, 1993) such as in forest areas where the bark and leaves burn and become unusable. Anthropogenic factors that result in the decline of the indigenous medicinal plant species must be mitigated through the collaborative effort of all the stakeholders involved since medicinal plants play vital roles in society.

#### *3.3.3.7 Challenges faced by medicinal plant sellers with regard to conservation through harvesting of medicinal plants*

Africans rely heavily on traditional medicine. Factors including high rates of unemployment, urbanisation, clearing of vegetation for agriculture and land use

(Krog, Falcão, & Olsen, 2006; Blignaut & Moolman, 2006; Okello & Ssegawa, 2007; Aguilar & Moe, 2006; Silori & Badola, 2000; Caniago & Siebert, 1998) and low levels of formal education have resulted in the high demand for medicinal plants (Williams, Witkowski & Balkwill, 2007; Kalatwang & Duvel, 2002; Cunningham 2001; Kepe, 2007). Together, these factors have resulted in over-exploitation of medicinal plants, particularly by commercial gatherers to obtain an income (Mander, 1998; Williams *et al.*, 2007; Lewu *et al.*, 2006; Cocks & Dold, 2002; Kowalski & van Staden, 2000; Botha *et al.*, 2004a).

Incorrect methods of harvesting the medicinal plants have led to a decline in medicinal plant species, while others are on the brink of extinction (Krog *et al.*, 2006; Schippmann *et al.*, 2002; Kepe, 2007; Aguilar & Moe, 2006; Mander, 1998; Kowalski & van Staden, 2000; Chungu *et al.*, 2007). Trees are stripped of their bark and in some instances roots or bulbs are removed from some areas by unscrupulous gatherers (Mander, 1998; Kepe, 2007). The medicinal plants taxa such as *Warburgia salutaris* and *Ocotea bullata* are the victims of ring barking in South Africa (Geldenhuis, 2004; Kowalski & van Staden, 2001).

Many medicinal plants in KwaZulu-Natal are no longer found in the wild. The Wild Ginger (*Siphonochilus aethiopicus*) is one example. It is used to treat malaria, oral and vaginal thrush, fever, headaches, colds and respiratory infections. The plant has gained interest from the herbal and pharmaceutical industry, but is now locally extinct due to over-collection. The use of indigenous plants and animals for medicinal and magical purposes, known as *umuthi*, is a cultural practice that continues to thrive in South Africa.

The medicinal plant trade is recognised as an important local economic sector actively in Zambia, over harvesting, particularly of roots and seeds have reduced the likely regeneration of potential species (Chungu *et al.*, 2007). High unemployment rates, particularly among women, have ensured that the harvesting and selling of medicinal plants has become a popular alternative method for them to fend for their families. This in turn creates greater demand for medicinal plants, eventually exceeding that which can be supplied by the wild.

The bulk of medicinal plants on South African markets is harvested from wild populations which, when combined with increased pressures from human habitation, has resulted in numerous local extinctions (Cunningham, 2001).

The scarcity of popular medicinal plants has caused market prices to escalate (Unasylva, 2008). In addition to escalating prices, other problems such as the perishable nature of the plant materials, poor product stabilisation and inadequate trading conditions are experienced on an ongoing basis. This poses a serious problem and may threaten:

- the valuable health care service that is provided to those that use medicinal plants;
- the biodiversity of resources as a result of the high pressure for harvesting medicinal plants; and
- the livelihoods of people who depend on the trade.

Therefore, there is a need to address the issues that affect the sustainability of the medicinal plant business as the majority of the medicinal plant sellers depend on

selling the medicinal plants for their livelihoods. There is a need to intervene through programmes that enable the medicinal plant sellers to reflect on the issues that challenge their business.

### **3.4 INITIATIVES BY HIGHER EDUCATION INSTITUTIONS ON EDUCATION FOR SUSTAINABILITY OF NATURAL RESOURCES**

The United Nations Environmental Programme (UNEP), together with its partners, drawing on experience gained from the previous programmes of working with universities in Africa, and with universities worldwide, supported a partnership programme to mainstream environment and sustainability concerns into the teaching, research, community engagement and management of universities in Africa (UNEP, 2006). This included the following:

- An education for sustainable development innovations short course, developed and implemented by partners to strengthen the capacity to establish ESD innovations in universities;
- A biennial conference providing an opportunity for universities to report on ESD innovations associated with the universities triple mission of research, teaching and community engagement;
- Pilot programmes linking universities, communities, business and industry in sustainable development partnerships.

UNEP's environmental education, awareness and training programmes are central to the organisation's mandate of inspiring, informing and enabling nations and peoples to improve their quality of life without compromising future generations. According to Agenda 21, Chapter 36: 16) (<http://www.unep.org>).



“Education is critical for achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and for effective public participation in decision making.”

Sustainable development can only be achieved where people are well-informed of the challenges and have relevant knowledge, skills and motivation to address them. The universities are facing a daunting task of making sure that their surrounding communities are aware of the changes in the environment and the impact of our deeds on the environment, whether positive or negative. All human inhabitants of this planet should work together to find solutions to mitigate the negative impact of our actions on nature. It is our duty as university educators to make our local communities aware of this and engage them in actions to conserve environment.

The partnership by UNESCO, African Association of Universities (AAU), the Global Virtual University (GVU), the United Nations University (UNU) and Global Higher Education for Sustainable Partnership Project, together with sub-regional structures such as South African Development Community Regional Environmental Education (<http://www.unep.org>). This partnership promises to enhance the quality and relevance of higher education in Africa in the context of sustainable development.

The goals of the partnership by UNESCO, African Association of Universities (AAU) and the Global Virtual University (GVU), the United Nations University (UNU) and Global Higher Education for Sustainable Partnership Project is to:

“To provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations” (UNEP’s mission, 2006:14).

“The overall goal of the UN Decade of Education for Sustainable Development (DESD) is to integrate the values inherent in sustainable development into all aspects of learning to encourage changes in behavior that allow for a more sustainable and just society for all.” (UNESCO, 2005: 06).”

The objectives of African Association of Universities (AAU) (GVU) is to enhance the quality and policy relevance of university education in Africa in the context of sustainable development and the achievement of the Millennium Development Goals.; and also to offer unprecedented opportunities for collaborative projects between universities, civil society/communities and the private sector (<http://www.un.org/africa/osaa/reports/UN%2520folder2006-UNU.pdf>).

Already, some South African universities such as the University of KwaZulu-Natal and University of Zululand have attempted, in collaboration with traditional health practitioners, to develop courses covering, among others, anatomy and diagnosis for traditional health practitioners. However, universities alone have not been able to achieve this. There is a need for collaboration with other sectors and communities.

There are also some discussions underway with local institutions on medicinal plant nursery development as a way to conserve the medicinal plant species. The South

African government departments and private industries are embarking on projects addressing the sustainability of medicinal plants.

### **3.5 INITIATIVES BY PUBLIC AND PRIVATE SECTORS ON THE SUSTAINABILITY OF MEDICINAL PLANTS IN SOUTH AFRICA**

There is a substantial increase in the population and a concomitant increase in the demand for initiatives to ensure the survival of rare medicinal plants in their natural habitat. These projects include the transfer of conservation techniques to local communities, who are often the custodians of biodiversity in rural areas. The programme (the discovery of new and useful biological mechanisms, either with or without the help of indigenous knowledge, and with or without compensation) also establishes community-owned agro-processing businesses for the cultivation and processing of medicinal plants.

It is expected that significant conservation benefits will flow from these activities, which have already proven to be financially sustainable. The Council for Scientific and Industrial Research's (CSIR) Biotechnology Programme develops tissue culture techniques for the propagation of scarce medicinal plants. This work is enhanced by collaboration between the CSIR and the Agricultural Research Institute in the area of plant biotechnology. The Medical Research Council's (MRC)'s IKS (Health) centre has created a medicinal herb garden to educate on the safety and usefulness to propagate and conserve medicinal plants. The Community Partnership Centre in Cape Town and government departments such as Environmental Affairs and Tourism, Agriculture and Land Affairs and Water and Forestry are actively involved in efforts to conserve the country's natural resources, including medicinal plants.

In collaboration with Traditional Healers, the CSIR signed an agreement in 1999 to make the scientific capability of the organisation available for the purpose of validating traditional medicines (WHO Policy Perspectives on Medicine No. 2 of 2002). This work includes the development of a specialised database by the Information and Communications Division of CSIR, to capture and safeguard indigenous knowledge on medicinal plant remedies. This collaboration currently involves the investigation of nearly 500 plants provided by Traditional Healers, and includes the systematic collection, extraction and biological screening of all indigenous plants in South Africa (WHO Policy Perspectives on Medicine No. 2 of 2002).

The inability to produce safe, standardised medicinal plant products for further clinical evaluation is a major stumbling block in most countries wishing to enhance the quality of their traditional medicines. The CSIR collaborates with experts at research institutes and universities to establish the required biological assays for determining efficacy and toxicity.

In terms of the regulation of medicinal plants, the Medicines Control Council (MCC) appointed an expert committee on African Traditional Medicines (ATM's). Section 9 (1) (b) of the Medicines and Related Substances Control Act (Act 101 of 1965) empowers the MCC to appoint a committee to investigate and report to it on any matter within the preview of the Medicines Control Council (South African Health Review, 2007). The establishment of the ATM's Expert Committee was approved by the Minister of Health in August 2000 to advise the MCC on all aspects related to the regulations, registration and control of African Traditional Medicines. The MCC's

resolution to appoint an expert committee for ATM was motivated, inter alia, by the need to give ATM's a special priority and identity. It was important for the MCC to clearly define African Traditional Medicines as a category on its own in the medicine legislation of South Africa, so that it can entertain its own attention and enable its development.

The South African government has taken steps towards the official recognition and institutionalisation of ATM, including establishing a Directorate of Traditional Medicine in 2006 to co-ordinate and manage initiatives regarding ATM within the Department of Health as well as enacting the Traditional Health Practitioners Act No. 22 of 2007 which established the Traditional Health Practitioners Council (S.A. Health Review, 2007). The government has also provided funding for research and the development of ATM to manage and control diseases.

The Presidential Task Team on ATM was appointed in 2006 to make recommendations with regard to a national policy and an appropriate regulatory and legal framework for the institutionalisation of ATM in South Africa. The Task Team, after consultation with some stakeholders, drafted the draft National Policy on ATM in South Africa.

The draft policy defines ATM as a body of knowledge that has been developed over thousands of years and which is associated with the examination, diagnosis, therapy, treatment, prevention of, or promotion and rehabilitation of the physical, mental, spiritual or social wellbeing of humans and animals. The draft emphasised the following:

- Official support for acceptance and recognition of traditional medicine in the formal healthcare sector often through a national focal point such as an institute.
- Establishment of a system to regulate, register and license Traditional Health Practitioners and the provision of formal training of such practitioners.
- The establishment of a system to develop, regulate and register Traditional Medicine to ensure safety, quality and efficacy, including scientific research.
- The development of a national Pharmacopoeia or the updating of existing ones as part of the regulatory system.
- Collaboration with other countries and the WHO in order to exchange information and promote policies and regulations according to international standards.

The Indigenous Knowledge Systems Health Unit IKS (Health) is also a contributing sector to address health research priorities (Annika, Dahlberg & Trygger, 2009). The IKS (Health) has a major goal to facilitate research and development, identify relevant research areas, develop proposals in partnership with stakeholders, source funding, and implement and manage research teams on medicinal plants conservation.

Annika *et al.*, (2009) report that in terms of education, the MRC supports learners studying traditional medicines at universities. The IKS [Health] unit has outreach programmes for schools where it creates awareness at foundation levels about the importance of traditional knowledge and medicinal plants. The IKS [Health] unit has a grant from the City of Cape Town to train traditional healers as TB and AIDS treatment supporters. The IKS [Health] created an MRC Community Centre at Delft in Cape Town to train communities and traditional healers. There is also the medicinal

plant garden project that is frequently visited by learners and pupils to learn about traditional medicines. The Delft Centre is a community resource centre for traditional healers, communities and biomedical personnel.

The South African government is contributing to the empowerment of communities by supporting the conservation of medicinal plants. For instance, in Limpopo a R20-million medicinal plant conservation project is expected to advance the development, promotion and protection of natural resources in the province. The project entails the establishment of a nursery, laboratory, guard house, medicinal plant garden and research centre, as well as the fencing of the facility.

The medicinal plants to be placed in these gardens are used to treat ailments such as coughs, headaches, urinary disorder, throat problems, ulcers, wounds, fever, constipation, cancer and high blood pressure.

These initiatives where communities are engaged in government projects are important and it should be acknowledged that traditional medicinal practitioners are amongst the most knowledgeable people on medicinal plants in local communities. They have much to offer in identifying local conservation issues and the development of improved systems for managing medicinal plants. Conditions for conservation are greatly enhanced when the owners and stewards of medicinal plants receive equitable benefits arising from the use of these resources, and feel that they are properly compensated for the level of effort involved in their contributions.

The late, Health Minister Manto Tshabalala-Msimang urged traditional medical practitioners to use intellectual property rights to protect traditional medicines and indigenous knowledge. While, also encouraging an increase in research and development of such medicines.

South Africa established the Medicinal Plant Incubator project in the Gauteng province in April 2009, to protect its indigenous plants by ensuring that they are grown in a nursery environment and sold on to traditional healers and not merely plucked from the wild in an uncontrolled manner.

The KwaZulu-Natal (KZN) Department of Health has embarked on a process of consulting with municipalities, communities and provincial departments, calling for project proposals within the mandate to be funded through the social responsibility programme of the department. The programme is implemented by employing the principles of an extended public works programme for alleviating poverty and transferring of skills. These include the prevention of extinction of plant species through over-exploitation.

A number of projects have been set up in KZN. The Silverglen Medicinal Plant Nursery in Chatsworth, KwaZulu-Natal is one such example. It was established to prevent the unsustainable harvesting of medicinal plants from the wild. Techniques were developed to cultivate the medicinal plants required by traditional healers and *muthi*-gatherers. Over 200 medicinal plant species are grown in Silverglen (Diederichs, Mander, Crouch, Spring, McKean & Symmons, 2002).



The Durban Metro municipality has introduced a free education programme at the nursery to help combat over-harvesting in the wild. Traditional healers and *muthi*-gatherers are trained in plant identification, propagation, nursery establishment and management.

Another project in Northern KZN has been initiated by the Scientific SCIR and is focused on sustainable harvesting of the medicinal plant species through cultivation by the Mtubatuba (uMkhanyakude) Traditional Healers Association.

The Mtubatuba Female Traditional Healers Association in KwaZulu-Natal (KZN) is involved in a project to promote rural livelihoods and conserve threatened plant species that have nutritional and medicinal value, sponsored by the CSIR ([www.csir.gov.za](http://www.csir.gov.za)). The association is formed to tackle the problems of depletion of indigenous medicinal plants because of over-harvesting. The Mtubatuba Female Traditional Healers Association in KZN is set to embark on a R2.5 million medical plant conservation project with the help of a donor organisation and government departments.

The aim of the project is to promote rural livelihoods, conserve threatened species and preserve indigenous knowledge. It involves 30 female traditional healers in KZN. The start of the project involved planting 100 000 plants every three months. The primary aim of the project is to promote sustainable harvesting of natural resources, especially those with medicinal and nutritional value. The chairperson also explained that they wanted to embark on an environmental project targeting school children through campaigns to cultivate indigenous medicinal plants as crops. She went on:

“Traditional medicine has become a big business; as many people are trading and experimenting with endangered plant products without considering the future of the industry.” The chairperson emphasised the following:

“Propagating indigenous plants is our core business. We will work with researchers and technical experts who will help us to develop a database (of the plants) for future generations with information on how to use it.”

Another aim of the project is to fight for the protection of knowledge from commercial exploitation and bio-piracy (commercialisation of plant or animal products without fair compensation of knowledge owners) by big companies.

South Africa has approximately 10% of the world’s 250 000 known plant species and close to 300 000 traditional healers. One out of every four prescription drugs have been derived from plants, hence the need to conserve them. The medicinal plant market is estimated at R900 million per year.

Indigenous plants and trees thrive in local soil and climate conditions. Indigenous plants are resistant to pests and diseases and are more likely to attract local wild life. There is a need to have gardens that serve as wildlife sanctuaries in our communities.

The concern is what is going to happen to the sustainability of the indigenous plants when these projects run to completion. The best way is to empower our own communities to help themselves so that even without enforcement and supervision they are able to carry on with medicinal plant conservation.

There are also other initiatives by the government to empower communities on the sustainability of indigenous herbs. For instance, the Department of Science and Technology (DST) has a project on oil- producing plants in the Western Cape and Northern KwaZulu-Natal (DST report, 2004) the KZN Provincial government and KZN Wildlife is collaborating with the KZN Department of Agriculture to establish cultivation trials of the priority species. These trials will enable sound advice to be given to prospective growers, be they commercial farmers, small scale farmers or traditional healers or gatherers (KZN Wildlife Report, 2004). Research is aimed at enabling medicinal plants to be efficiently cultivated using appropriate technology to the prospective growers. This work will also provide information on the costs involved and the potential for income generation.

The problem from the medicinal plant sellers' point of view is the urgency in cultivating medicinal plants i.e. the time factor. A system on how to manage the available plants while waiting for those being cultivated needs to be in place.

### **3.6 MEDICINAL PLANTS AS A SOURCE OF LIVELIHOODS**

Medicinal plants can provide a significant source of income for rural people in developing countries, especially through the sale of wild-harvested material (Hamilton, 2004; Cunningham, 2001; Schippmann *et al.*, 2002; Karki *et al.*, 2000; Mander, 1998; Olsen, 1995). The collectors are often herders, shepherds or other economically marginalised sections of the population, such as landless people.

Medicinal plants are both a source of income and affordable health care. It is estimated that 80% of the African population make use of traditional medicine (Jäger & van Staden, 2000; Karki *et al.*, 2003). In other places like the Himalayas, the

collection and trading of medicinal plants contributes significantly to the income of the poor, particularly women. Between 50%–100% of households in the northern part of central Nepal and about 25–50% in the middle part of the same region are involved in collecting medicinal plants for selling purposes (Karki *et al.*, 2003). The money received from trading in medicinal plants is approximately 15–30% of the total income of poorer households. Thus, medicinal plant trading has the potential of creating jobs and pushing economic growth in resource-constrained areas suffering from limited education opportunities, lack of infrastructure and under developed commercial activities (Karki *et al.*, 2003; Williams, *et al.*, 2007).

Many South Africans, particularly rural communities, sustain their livelihoods by gathering and selling medicinal plants (Williams *et al.*, 2007; Dold & Cocks, 2002; Kepe, 2007; Mander, 1998).

According to Mander (1998) approximately 50% of the population, out of an estimated 15 million people in KwaZulu-Natal, derives their income from selling medicinal plants. However, the income is probably declining in areas where natural habitats are disappearing due to unsustainable harvesting of medicinal plants and other flora. A strategy that integrates sustainable management of medicinal plant business, conservation and cultivation of medicinal plants could create long term income opportunities for medicinal plant sellers (Krog *et al.*, 2006; Blignaut & Moolman, 2006).

### **3.7 SUSTAINABILITY OF MEDICINAL PLANTS**

The practice of harvesting medicinal plants for profit without replenishment is not sustainable in the long term. Recent developments in medicinal plant harvesting, have

seen destruction of the medicinal plant forest taking place in a shorter period of time, Hamilton (2005) recommends the introduction of new techniques to improve livelihood security or healthcare, based on the principle of building on local traditions. Many indigenous people have successfully managed the environment and encouraged sustainable ways of dealing with their environment.

Onwu and Mogege (2009) define indigenous knowledge as an all-inclusive local knowledge that is community based and unique to a particular culture that has been and is still used by local people for existence, survival and adaptation in a variety of environments. It is a way of life that is rooted in the spiritual, health and language of the people. Indigenous knowledge draws on local resources. People are less dependent on outside supplies, which can be costly, scarce and irregularly available. Indigenous knowledge gives local people and development workers extra options when designing projects. Instead of searching for feasible solutions only among western technologies, indigenous societies can choose from indigenous knowledge or combine indigenous knowledge and western technology.

Indigenous knowledge opens up the opportunity to research the effectiveness of indigenous technology. It must be remembered that indigenous people have lived in harmony with the environment for many years. There are many traditions and taboos associated with the collection of plants. These can be interpreted as a means of preventing over-harvesting of plant material. Cunningham (1998); van Wyk, Oudtshoorn and Gericke (1997) highlight the ways in which indigenous people ensured the sustainability of medicinal plants. These are briefly explained below.

### **3.7.1 Collection of bark**

It was traditionally believed that the bark obtained for medicinal purposes from a tree should only be collected from the east and west-facing parts of the trunk. For instance, the bark from *Acacia xanophloea* were taken from the east and west-facing sides since it was believed that this is where the sun strikes, making the medicine more active as a lucky charm. Bark taken from the north and south faces was believed to be ineffective for curative purposes. This method ensured that the plant, although semi-ring barked, was not killed and could be collected again in the future (Cunningham, 1998).

### **3.7.2 Collection of roots**

When roots were collected for medicinal use, not all the plant's roots were collected. The plant could, therefore, still feed from its remaining roots and survive. It was believed that if all parts of a plant were collected for medicinal use, resulting in that plant perishing then the patient being treated using that medicine would also die. Furthermore, van Wyk *et al.*, (1997), argue that Shangaan taboo dictates that if the remaining root system of *Elepharrbiza elephantine* is not covered after a portion has been removed, the patients treated with it will not get better.

### **3.7.3 Use of plants that have already been collected**

The collection of bark, roots, branches, leaves and other plant parts from a plant which showed signs of having been collected by another traditional healer was prohibited. It was believed that when a traditional healer used a plant to treat a patient, the patient's disease was transferred into the plant. When another traditional healer subsequently used the same plant to treat a patient, the disease of the previous patient would be transferred to the new patient. This belief ensured that plants recovered from the effect of collection.

#### **3.7.4 Use of annuals**

Whenever a traditional healer collected annual plants for medicinal use they had to leave behind individuals of the species at the collection site. It was a belief that if species were completely destroyed in a particular area, then the patient, to whom the medicine from the species was administered, would also die. By leaving behind some representatives of the collected species, localised rare species were prevented from extinction. *Alepidea amatymbica*, for example, is generally only collected in winter, thereby ensuring that the plant is preserved for the season when coughs, colds and influenza are most prevalent (Cunningham, 1998).

This tradition ensures that plants are left in the field to seed in the summer months. This is one of the reasons that in this study there was collaboration between the researcher and the pertaining medicinal plant sellers and users so that there was an exchange of information on how indigenous and scientific methodologies could be combined for find solutions to conserving indigenous plants.

If scientific, technological and indigenous knowledge become integrated to conserve medicinal plants, the livelihood of people can be sustained. The focus on medicinal plants speaks to the heart of some major questions on conservation and the use of biological diversity (Hamilton, 2004). If conserved, medicinal plants will continue to provide benefits in terms of healthcare, income and the support of people's cultural heritage.

### **3.8 USES OF MEDICINAL PLANTS**

Since time immemorial, plants containing beneficial and medicinal properties have been used by society (Silori & Badola, 2000; Hoarou & Daliva, 1999; Cunningham,

2001). In recent times, herbal remedies have become popular in the treatment of ailments such as stomach aches, headaches, chest problems, respiratory and urinary problems, cancer, and treatment of gallbladder, side pains, shingles, diabetes and other illnesses.

Hardon *et al.*, (2008), well as Blignaut and Moolman (2006) contend that traditional herbs also help to cure other diseases such as bleeding in women, treatment of wounds and snakebites and sexually transmitted diseases (STD's) (Mareges Ngassapa, Pieters, & Vlietinck, 2007; Vermani & Garg, 2002; Khan, Ather, Thomson, & Gambari, 2005) including human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS). Vermani and Garg (2002) and Hardon *et al.*, (2008) postulate that the cost associated with HIV and other STD treatment has caused many patients to seek help from alternative systems of medicines, including medicinal plants. One of the greatest drivers for the demand of indigenous medicines is the widely held view by black communities that illnesses are 'cultural' sicknesses which can only be treated with indigenous medicine.

In addition, HIV/AIDS is rapidly increasing within Southern African communities. Approximately 5.4 millions of people had been infected with HIV/AIDS by the end of 2007 (Mareges *et al.*, 2007). Traditional healers report that people with AIDS consult them (Mander, 1998). There are many healers who now advertise that they have a cure for AIDS, thereby promoting an increased use of traditional medicine. The problem is that there is no scientific evidence supporting the use of medicinal plants to treat HIV/AIDS. Global research is in progress to identify plants and the active



ingredients effective in preventing the transmission and treatment of STDs (Khan *et al.*, 2005).

Medicinal plants are also used in traditional beliefs and customs, such as sprinkling charms to repel evil spirits, or as love and lucky charms. Some medicinal plants are used to prepare mixtures that are believed to make guests behave well in ceremonies (Zobolo & Mkabela, 2006). Other medicinal plant species such as *Boweia volubilis* are used to facilitate child birth. There are medicinal plants that are thought to assist in the keeping of good relationships with ancestors and steering bad dreams away. There is also the belief that some medicinal plant species can be taken in during pregnancy to alter the baby's gender.

A number of medicinal plants are chewed and placed under the tongue with a belief that they avert anger when wrong is committed. Others are believed to be used as protective charms. The baTlokwa tribe in Botswana, used to chew *ntinge* (a medicinal herb) before battle believing that they would become invincible and be assured of a rapid decisive victory (Grivetti, 2006). The magical use of medicinal plants includes changes of human tissues to suit cultural beliefs. For instance, studies by Kokster & Price (2006) revealed that Rwandan females use medicinal plant taxa such as *Solanum aculeastrum* and *Bidens pilosa* to modify their genital organ (*Labia minora*) believing it would enhance their sexual activity.

Several medicinal plants serve as food, although there are a few overlaps with medicinal properties (Price, 2006). For instance Southern Italians consume the green leaves of the weedy vegetable (liakra) solely for dietary purposes (Pieroni & Quavata,

2006). There are medicinal plant species that can only be used for medicine, for instance, those plants that are taken as an enema and used to treat wounds. Most medicinal plants are used for both dietary consumption and for curing different ailments (Price, 2006; Pieroni & Quavata, 2006; Ogoye-Ndegwa & Hansen-Aardgaard, 2006).

Apart from the human use, animal husbandry uses many plant species as a primary source of health care (Kunene, Wilson & Myeni 2003; Ole-Miaron, 2003; Zobolo & Mkabela, 2006). In KwaZulu-Natal, chicken diseases are treated from crushed leaves of *Aloe maculate* (Zobolo & Mkabela, 2006). Kunene *et al.*, (2003) believe that other medicinal plant species, such as *Clerodendrum glabrum*, are used to treat common diseases like worms and diarrhoea in cattle. Some medicinal plants are believed to stimulate production of milk in cattle. Most farmers rely substantially on indigenous medicines to keep their livestock healthy (Kunene *et al.*, 2003). In Mexico, intestinal disorders in cows are treated with herbal extracts of *Polakowskia tobacco* (Hoaroau & DaSilva, 1999).

Despite the important role of traditional medicine in human nutrition and therapeutics, medicinal plants are experiencing over-harvesting pressures which depletes them from their natural environments. In the past, as previously mentioned, sustainable harvesting ensured the survival of the species in the wild (Cunningham, 1993; Kepe, 2007). Nowadays with new technology, destruction of forests can take place in minutes. This happens in the case of medicinal plant gatherers who harvest all the medicinal plants in one location until the species are depleted. Their business is profit driven without thinking about their future needs and the environment. The emphasis

of ESD is on integrating the social, political, economic and biophysical dimensions in solving environmental issues. As mentioned earlier, when communities are engaged in developing solutions to environmental problems, societies may learn and participate in the projects that may in turn sustain and improve their standards of living. Knowledge is power, so researchers and scientists should work with the communities, particularly medicinal plant users, to make them aware of the value of the medicinal plants for their livelihoods.

### **3.9 TRAINING AND CAPACITY BUILDING ON MEDICINAL PLANT SUSTAINABILITY**

Projects concerned with the conservation and sustainable use of medicinal plants would normally involve interactions between different knowledge systems, including associated knowledge holders, practices and institutions (Hamilton, 2004). Interactions between knowledge systems can provide valuable stimuli for learning how to tackle problems better. Thus, the development of improved systems for managing natural habitats, including populations of medicinal plants, will benefit greatly from collaborative work between scientists and those local people who are experts in the traditional knowledge of medicinal plants.

Worldwide, efforts have been made to build capacity of medicinal plant sellers. The Forest Department of the Great Himalayan National Park, India, promotes cultivation of medicinal plants as an income-generating enterprise linked to conservation (Hamilton, 2005). The People and Plants Initiative (PPI), at Shey Phoksundo National Park, at Nepal in South Asia is a developing community-based system for the sustainable harvesting of medicinal plants.

The South African government is engaged with medicinal plant users, particularly with the traditional healers on the sustainable use of medicinal plants. In KwaZulu-Natal, effort has been made to conserve medicinal plants used by traditional healers of Esikhawini, Mthunzini, Sundumbili, Ntuzi and Boulder Hill (Crouch & Hutchings, 1998). Hutchings held a three-day horticultural training course for traditional healers at the Silver Glen Medicinal Plant Nursery in Durban (KZN) in order to empower traditional healers to grow medicinal plants. There are also campaigns for sustainable harvesting of medicinal plants at KwaHlabisa. However, these gardens are for traditional healers who do not harvest medicinal plants in bulk for selling purposes.

Medicinal plant sellers and harvesters, however often cut down the whole tree even if it is too young, and cutting it too close to the ground inhibits re-sprouting of the plant (Ndangalasi *et al.*, 2007; Kepe, 2007). Medicinal plant harvesters can ring bark (taking out bark around the stem/trunk of a tree) causing a tree to die (Chungu *et al.*, 2007; Kowalski & van Staden, 2001, Jäger & van Staden, 2000; Cunningham 2001; Grace, Prendergast, van Staden & Jäger, 2002; Kepe, 2007; Dold & Cocks, 2002). Increasing sales figures and profits seems to be more important for some herbal medicine gatherers than the survival of scarce medicinal plants for future use.

A large body of information exists regarding *in situ* conservation of medicinal plants. This includes tissue culture for many medicinal plants such as *Boweia volubilis*, *Eucomis autumnalis*, *Ocotea bullata*, *Prunus africana* and *Siphonochilus aethiopicus* (Zschocke, Rabe, Taylor, Jäger, & van Staden, 2007). Further research on tissue culture of *Pinus patula* has been conducted by Nigro, Makunga, Jones & van Staden, 2007). Kowalski and van Staden (2000) have done *in vitro* propagation of *Ocotea*

*bullata* and *Warburgia salutaris*. Although these methods are effective in the propagation of scarce medicinal plant species, they are expensive and require specialisation, which rural communities cannot afford.

Seed propagation of indigenous plants including *Boweia volubilis*, *Eucomia autumnalis*, *Scilla natalensis*, *Bulbine frutescens* has been done in the Msunduze Valley Nursery, KwaZulu-Natal (Diederichs *et al*, 2002). Medicinal plant taxa, such as *Ocotea bullata*, *Prunus africana*, *Ansellia africana* were propagated by Diederichs (2006); *Haworthia limifolia* was propagated in Silver Glen Nursery, Chatsworth in KwaZulu-Natal using leaf and stem cuttings (Nichols, 2005). These are initiatives to conserve the threatened medicinal plant species that people need for their livelihoods. Thus, medicinal plant harvesters ought to be an opportunity to actively participate in the cultivation and propagation initiatives of these resources.

The relationships established at the onset of work between project teams, local communities and other local stakeholders are critical. These relationships may be relatively informal, but the tone they set may initially be important if more precise agreements are required later. This includes possibilities of commercial opportunities based on local biodiversity or emerging knowledge (Laird, 1993). Projects are also liable to go through a period of confidence-building as trust is established.

Harvesters of medicinal plants may not wish to reveal the localities of valued plants, fearing that this disclosure will be used by competitors to their disadvantage. An element of mystique increases the power of traditional medical practitioners (as indeed of doctors of all types); the revelation of certain medical formulae or recipes

may cause them to lose their potency. The medicinal plant trade is notoriously secretive, and one in which competition is feared. Scientists researching medicinal plants, and concerned with plagiarism, may hide their results until they are published.

Historically, there is a distinction between the attitudes to knowledge on the parts of academia versus those in industry. The ability to learn will depend on how open people ideas. A sense of history helps in understanding the biases contained in knowledge systems, allowing clearer views of their strengths as well as limitations.

Economics, religion and ideology all influence how cultures develop, including how dogmatic they become and their willingness to change. Conservationists should also have a reasonable grasp of the power and limitations of science, considered as a knowledge system that has developed according to such influences (Hamilton, 2005). A major task of conservationists is to create opportunities for the sharing of knowledge to encourage learning. In doing so, the medicinal plant sellers may find themselves in positions of trust, as confidants of private knowledge. Knowledge has typically been considered by educators as a ‘public good’, and the acquisition and dissemination of knowledge has, therefore, been encouraged.

### **3.10 SUMMARY**

The literature reviewed in this chapter reveals that medicinal plant selling business is providing income to many communities and also serves as a primary health care platform to communities, especially in rural areas. However, the business is carefully facing challenges in marketing and storing of medicinal plant materials and conservation of the medicinal plant species. Nevertheless, the government departments such as the Department of Health, Department of Science and

Technology and Department of Environmental Affairs are running projects to sustain the medicinal plants. However, the problem of illiteracy and poverty amongst rural communities is a challenge.

Although the Sector of Education and Training Authority is offering training on skills for the South African to be absorbed in job market and to have entrepreneur skills but the issues of overpopulation which results in high unemployment rates still need more attention. There is a saying that ‘knowledge is power’, which implies that training of communities to use their traditional knowledge to sustain their livelihoods is one of the initiatives that need to be looked at.

As indicated earlier, this is a participatory community engagement project with a view of conserving the threatened medicinal plant species that the medicinal plant sellers depend on for their livelihoods. For promotion of sustainable development of rural communities, the researcher is now working with the medicinal plant sellers in an effort to share information on the methods of propagation and cultivation of the medicinal plants in their own community medicinal plant gardens as this can protect medicinal plants from being harvested to extinction.

Education and training of people have been viewed as the most powerful weapons in the fight against rural poverty. It is also necessary for sustainable development. The researcher hoped that by sharing information with the medicinal plant sellers, and by stimulating recognition of our collective responsibility to protect our natural resources through ESD, she would be able to motivate the plant sellers to take action in favour of a sustainable environment. The following chapter is based on a design on how the ESD study of medicinal plant sellers was carried out.

## **CHAPTER FOUR**

### **RESEARCH DESIGN AND METHODS**

#### **4.1 INTRODUCTION**

Chapter four explores the research design and the research methods used in this study, and discusses the research paradigm, target population, sampling techniques and research sample of the study. The data collection instrument and data collection procedures are also discussed. The chapter also describes the data analysis and ethical issues considered in the study.

#### **4.2 RESEARCH PARADIGM**

As outlined in chapter one, the primary aim of the study was to explore existing knowledge and practices of medicinal plant sellers regarding marketing, conservation and storage of medicinal plants. A secondary aim was to determine whether an intervention based on non-formal education would significantly improve their knowledge and practices. These were sought to be achieved by the following research objectives.

1. To explore the most prevalent challenges faced by medicinal plant sellers with regard to storage, conservation and marketing of medicinal plants.
2. To investigate the perceived impact of the medicinal plant selling business on the environment and sustained livelihoods of the medicinal plant sellers.
3. To find out whether capacity building and empowerment programmes on knowledge related to storage, conservation and marketing of medicinal plants would enable the medicinal plants sellers to run their businesses more profitably and sustainable.



Das and Das (2005) contend that ESD pertaining to medicinal plants is concerned with exploring and understanding social phenomena which are educational in nature. This is because medicinal plants are associated with formalised and spontaneously occurring social, cultural and psychological processes which could be termed 'education'. As such, medicinal plant selling deals with educational questions that can be investigated, using methods which enable such satisfactory investigation and the utility of results emanating from such investigation. The orientation of the research methodology followed in this study was guided by a world view that is discussed below:

The term 'paradigm' refers to the philosophy that governs the plan on how the research methodology executes the specific objectives and addresses the research questions. Guba and Lincoln (1994:105) state that a research paradigm is the "basic belief system or world view that guides the investigation." In a similar way, Strauss and Corbin (2007) refer to paradigm as a collection of assumptions, concepts, and propositions to orientate the researcher's thinking. Smith (2006:4) defines a research paradigm as a school of shared assumptions, values and views about the phenomena addressed in a particular scientific study, regardless of whether it is humanities or natural sciences.

Kumar (2005) points out that the main purpose of a research paradigm is to determine the mode of enquiry. This point is supported by Jonson, Onwuegbuzie and Turner (2007) in their observation, that division between paradigms is unproductive. Thus, in Schwandt's (2000) view aligning oneself with a particular set of methods is no longer useful. Johnson *et al.* (2007) posit that the integration of two paradigms yields the

third research paradigm which is the mixture of qualitative and quantitative research paradigms. In their view, these mixed methods of research offer the most informative, complete and balanced research methods and presentation of results. This study aligns itself with the view of Johnsons *et al.*, (2007), in favour of the mixed methods research paradigm.

Although different authors settle for different terminologies with regard to research paradigms, Neuman (2000), as well as Cohen, Manion and Morrison (2007), state that research paradigms are peculiar to any discipline of study. For instance, whereas research in the humanities is dominantly governed by the interpretative paradigm, pure scientific research tends to be rooted in positivism. As such, it may be expected that the paradigmatic orientation of research carried out in education, much as in humanities, would follow interpretativist methodology.

One can argue that positivism predominates in science and assumes that science measures quantitatively independent facts about a single reality. On the other hand, interpretativists are concerned with making meanings of multiple realities of a phenomenon. The research in ESD, within the context of this study, roots itself in both social and natural science in the sense that scientific ways of doing things and indigenous knowledge are matched to come up with an idea of how the selling of medicinal plants can contribute to the livelihoods of the medicinal plant sellers in a sustainable way.

A number of authors distinguish research paradigms in terms of qualitative and quantitative paradigms (Denzin, 1978; Dzurec & Abraham, 1993; Johnson &

Onwuegbuzie, 2004; Guba & Lincoln, 1994). Neuman (1997) argues that although both approaches have similar basic principles they differ significantly in some ways, some of which are mentioned above. Furthermore, Neuman (1997) argues that since each style has its own strengths and limitations, it is better to combine the two approaches in order to neutralise the side effects of each style and to enhance the research project by adding the advantages of the two approaches. To Merriam (2001) the qualitative case study is suitable for dealing with critical problems of practice and extending the knowledge base of various aspects of education.

In this instance the researcher sought to find out how education could play a meaningful role in changing the medicinal plants sellers' ways of handling their businesses. The intention of qualitative data collection methods employed in the study was to gain information on how the medicinal plant sellers conducted their medicinal plant selling businesses, what challenges they faced and whether a programme of intervention in the form of a workshop could make a significant contribution to the medicinal plant selling business.

This study adopted a mixed methods research design. A mixed research method is an intellectual and practical synthesis based on qualitative and quantitative research; it is the third methodological approach of data collection (Schwandt, 2000; Johnson, Onwuegbuzie & Turner, 2007). That is one of the reasons that this study has employed both qualitative and quantitative methods to collect and analyse data.

Although quantitative and qualitative paradigms are commonly cited in the literature (de Vos, Strydom, Fouché & Delport, 2011; Johnson *et al.*, 2007; Guba & Lincoln,

1994), in the context of this study, the terms qualitative and quantitative refer to the approach of the research paradigms as the methods of data collection.

When planning the research methodology, the study themes of marketing, storage, packaging and conservation practices of the medicinal plant resources were contrived before data were collected. Numerical values including schooling, work experience, conservation and marketing strategies, storage, and packaging of the medicinal plants were collected and analysed following this paradigm.

On the other hand, qualitative research approaches were used to analyse written responses in terms of the challenges faced by the medicinal plant sellers on a daily basis in their business environment and also information on the possible solutions to addressing those challenges. The qualitative approach was also used to investigate how the medicinal plant sellers coped with those challenges and how the problems could be mitigated. Detailed information based on various discussions was analysed and grouped into the respective themes relevant for the discussions.

De Vause (2007) and Kumar (2005) distinguish between different types of triangulation, including theoretical triangulation and methodological triangulation. Theoretical triangulation draws upon the use of alternative or competing theoretical perspectives to make sense of the collected data. As elucidated in chapters two and three, the theories used in this study were alternative but complementary.

With regards to methodological triangulation, Cohen *et al.*, (2007), explain that this uses either the same method in different situations or different methods on the same

object of study. Interviews and questionnaires were used as a common method of collecting data in this study, as a way of methodological triangulation. In this regard, the use of both quantitative and qualitative techniques in combination was another form of both methodological and theoretical triangulation because this was in fact a form of triangulation that enhanced the validity and reliability of the study.

### **4.3 RESEARCH DESIGN**

The study employed survey and case study research designs – thus a combination of questionnaires, interview schedule and field observations. The intervention was mainly in the form of a workshop with a volunteer sub-sample of the initial sample that participated in the survey.

The questionnaire (Appendix 1) consisted of Sections A and B aimed at addressing the research objective number one. Section A primarily focused on the biophysical status of the respondents, which included the profile of the livelihoods of the respondents. For example, how many were there in a household? Who brought in an income; their age and education profile?

Section B focused on challenges that were faced by the medicinal plant sellers in their medicinal plant selling businesses. This questionnaire that was administered to 56 medicinal plant sellers, primarily aimed to elicit information concerning the challenges faced by the medicinal plant sellers. Semi- structured interviews based on questionnaires were performed to investigate the marketing, storage and conservation of the medicinal plants by the medicinal plant sellers (Appendix 1).

Another research instrument consisting of open-ended questions, was designed to address research objectives **two** and **three** (Appendix 2). This instrument was administered in the form of focus group discussions with medicinal plant sellers on how selling of medicinal plants affected their livelihoods and the environment.

There was another research instrument which entailed an intervention in the form of the ESD workshop (Appendix 3). This involved information sharing between the researcher, some experts and the medicinal plant sellers on how to effectively run the medicinal plant selling businesses. This aimed to empower medicinal plant sellers with business management skills.

**Objective number three** was addressed by designing an assessment tool consisting of oral questions and practical observations that were designed to assess the effectiveness of the ESD workshop on enhancing the sustainability of medicinal plants (Appendix 4). The efficacy of the intervention was assessed from the responses of the medicinal plant sellers, following the intervention. The items in this section sought information on whether or not the ESD had an effect on the ways in which medicinal plant sellers would run their businesses and on life styles, generally, with regards to the environment.

### **Pilot study**

The pilot study for the present research project took place during 2010 and the beginning of 2011. A preliminary semi-structured questionnaire was constructed consisting of items on storage, marketing, sales and conservation of medicinal plants. The interviews served the purpose of piloting the questionnaires for the actual study.

The pilot study was conducted before the actual research commenced in order to determine the validity and reliability of the research instrument. A selected number of medicinal plant sellers took part in the pilot study. Twenty-five medicinal plant sellers took part in the pilot study.

Direct visits to the medicinal plant selling sites were undertaken where many contacts with medicinal plant sellers were made. After conducting the interviews, the researcher worked on improving the questions. This involved rephrasing some of the questions and removing those questions that appeared to be irrelevant to the study objectives. Medicinal plant sellers who participated in the pilot study were not included in the actual study.

#### **4.4 POPULATION AND SAMPLING**

The target population of the study was all medicinal plant sellers in northern KwaZulu-Natal. Medicinal plant sellers were targeted for this study because they harvest large quantities of plant materials for selling purposes. This is over and above what is harvested by traditional healers for healing purposes, although they sometimes buy medicines from medicinal plant sellers.

The sampling took the form of purposive/judgmental sampling of the medicinal plant sellers. Kumar (2005) postulates that the primary consideration in purposive sampling is the judgment by the researcher as to who can provide the best information to achieve the objectives of the study. The researcher only goes to people who are likely to have the required information for that particular research. This type of sampling is useful when historical reality and description of phenomena are required.

Permission to administer semi-structured questionnaires for interviews for the households was obtained from the participants during the survey that took place at medicinal plant seller's workplace. This resulted in selecting **key informants**. A key informant basically refers to person who is well informed about the data being researched. Bernard (1994) is of the view that key informants are people with deep knowledge of the cultural rules, norms, values, language and motives of the society in question, and are willing to share knowledge and expertise about the subject.

In this study key informants were selected using informal household interviews. Informants were selected based on their knowledge of medicinal plants, and their willingness to share information and their experiences on medicinal plant gathering, storages, marketing and management. The key informants also included the medicinal plant sellers who volunteered to participate in the study from their market stands. Other key informants were the local authorities from which permission to conduct household interviews and field surveys were requested.

Officers from KwaZulu-Natal Wild Life (KZN Wild Life) and nature (game) reserve managers in northern KwaZulu-Natal were the other key informants in the study. It was not an initial plan to interview KZN Wild Life officers and game managers but for the purpose of cross validation, these were interviewed to cross validate information, particularly pertaining to on illegal harvesting of medicinal plants.

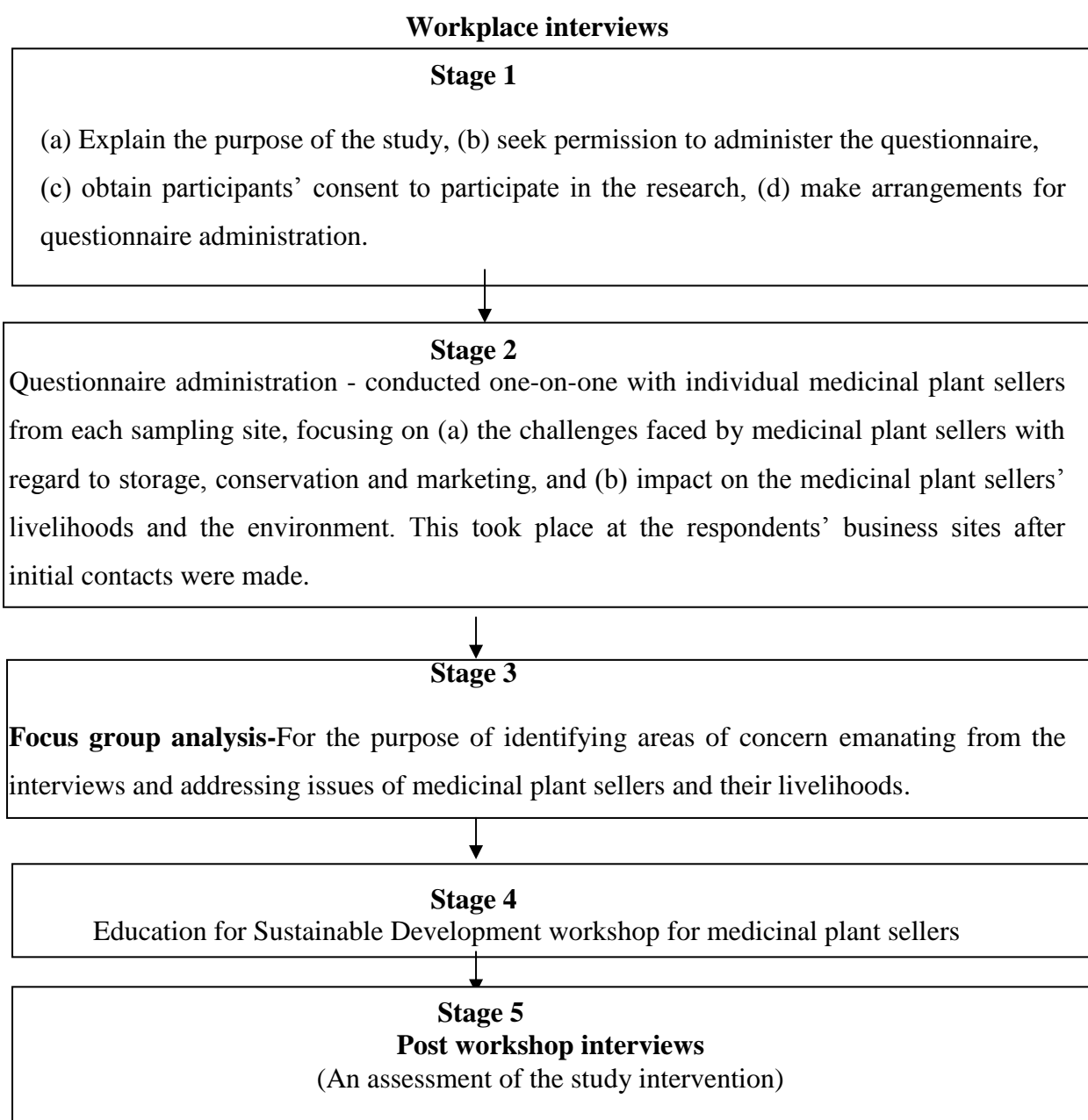
#### **4.5 DATA COLLECTION PROCEDURES AND PROCESSES**

As mentioned earlier this study focused on medicinal plant sellers and the influence of this type of businesses on the livelihoods of those concerned. A triangulation technique was used to collect data for this study. This involved meeting the medicinal



plant sellers at their business premises, during focus group discussions and during visits at their homes (see Figure 4.1). In order to satisfy research requirements for objectivity, reliability and validity, a combination of data gathering techniques in terms of research methods and resources were employed.

In terms of data gathering techniques a questionnaire was administered to the research participants. The instrument of collecting the data at this stage was a questionnaire, generally the low levels of literacy among the respondents required the researcher had to administer the questionnaire in the form of face-to-face interviews. The researcher together with the research assistants had to score and record the responses on the individual questionnaire. When considering that 56 respondents were interviewed, on one-to-one, face-to-face basis, research assistants after undergoing training by the researcher on how to administer the questionnaire assisted with regard to question administration. The following section outlines the specific steps taken in the gathering of data. This is summarised and presented in the following research methodology flow chart (Figure 4.1).



**Figure 4.1: A research methodology flow chart**

#### **4.5.1 Stage 1: Workplace initial visits**

The first stage of sampling was work place visits to solicit the application of the research instruments, for example explaining a mission of the research and to make appointments with the research participants who were willing to participate in the study. These market areas were chosen as the initial sites of contact as they provided the baseline data about the medicinal plant sellers in terms of directions to their

residential areas and contact phone numbers in order to prepare field participant observations. Furthermore, interviewing people at their business sites presented its own challenges, such as interference from some respondents wanting to have an input into what was being discussed. The researcher had to seek permission to conduct interviews at individual medicinal plant sellers' respective shops.

#### **4.5.2 Stage 2: Questionnaire administration**

The second stage was to conduct one-to-one interviews with respondents based on the questionnaire. These interviews were conducted with each medicinal plant seller at the three district municipalities indicated in Figure 4.2. It was during the site visits that the sellers' plant sacks were counted. This would have been difficult to establish had the household interviews been an option to gather data on the quantities of medicinal plants traded. In spite of the challenges related to both the market interviews and household surveys, the researcher tried to improve the validity of the instrument by ensuring that only one respondent was interviewed at a time and interviewing some respondents at the home. It was decided that the respondents be interviewed in their respective shops to avoid potential interference. The types of interviews were the face-to-face interviews based on the questionnaire (Appendix 1). This method of interviewing was preferred since it allowed the researcher to follow with probing questions when clarity was needed. This enabled a flow smoothly.

Part of the interviews was on the nature of the medicinal plant selling business, that is, how the medicinal plant sellers worked, how much their products were priced, the business flow and what marketing strategies they employed, if any, to market the medicinal plants. The interviews were conducted in the medicinal plants sellers' home language (isiZulu) and then translated into English by the researcher.

#### 4.5.3 Stage 3: Focus Group Discussions

Following the research survey, which was questionnaire administration, a case study in the form of focus group discussions involving selected medicinal plant sellers from each market and each site were conducted. They were conducted in order to address **research question number two** and to enhance the responses from a **research question number one**.

Focus group discussions were also the primary source of qualitative data. Borgatti (1999) and Bernard (1994) maintain that focus group interviewing is particularly suited for obtaining several perspectives about the topic including gaining insights into people's shared experiences of daily life and a topic to be discussed. The main purpose of focus group discussions in this research was to draw upon respondents' attitudes, feelings and beliefs, experience and reactions concerning the challenges they faced on daily life bases in their businesses and how this business sustained their lives (Morgan, 1996). Also, the questions that were not answered clearly from the market interviews with the medicinal plant sellers were followed up during the focus group discussions.

A group of five to six individuals from each sampling site participated in the focus groups with the exception of Richards Bay in uThungulu district, which was represented by two members who are the only medicinal plant sellers at that site. Altogether 12 participants took part in the focus group discussions.

Borgatti (1999) cautions that note-taking in this type of interviews is problematic; digitally audiotape records are recommended as supporting devices. Information from the focus groups were recorded, coded and analysed and is discussed in chapter five.

#### **4.5.4 Stage 4: Education for Sustainable Development Workshop**

An intervention in the form of a workshop was designed taking into consideration the concerns that emerged from the market interviews and focus group discussions. Prior to engaging medicinal plant sellers in the workshop, thorough planning and organisation of the workshop event was carried out.

Even though there had previously been traditional healers' training on medicinal sustainability, it was not for the medicinal plant sellers who used large stocks of medicinal plant material in order to gain profit (Crouch & Hutchings, 1998). As part of this study, a workshop was conducted for the medicinal plant sellers in an attempt to enhance their knowledge pool about sustainable use of medicinal plants. More specifically, the workshop addressed conservation, storage and marketing of medicinal plants.

Although the medicinal plant selling business is dominated by elderly women with minimal formal schooling (Price, 2006; Ndawonde, 2007), medicinal plant sellers were introduced to the concepts of balance sheets, record keeping and issues pertaining to banking. An accounting educator was invited to share with the medicinal plant sellers viable business skills in terms of storage and marketing of the medicinal plants. A science educator was invited to the workshop to address the issues of conservation. The researcher had a session on demonstration of propagation and cultivation of some medicinal plant species listed in table 1.1. Detailed methodology of the experiments is given in Appendix 10.

The main purpose of conducting experiments was to determine whether medicinal plants would germinate at different environmental conditions. The experiments were carried out without adding the plant species seedlings with growth stimulants. That was done for medicinal plant to carry those experiments on their own without having to add fertilizers and hormones to their plant seedlings.

The purpose of the workshop was to create space for social transformation among the plant selling communities, with the aim of taking them to a higher level of social responsibility. The workshop results were analysed following qualitative methods of data analysis. Neuman (1997) argues that qualitative research does not narrow the focus on specific questions, but ponders the interpretive paradigm in an open-ended manner. This suggests that research is an interactive process in which steps blend into each other and subsequently, steps may be built based on the previous ones. The information that was discussed in the workshop was prepared in a way to address the issues that emerged from the interviews and focus groups.

The aims of the workshop were put in place during the preparation and were communicated to the medicinal plant sellers in writing during their invitation. The discussions were carried out in the sessions and presentations were made according to the sessions they fell under (Table 4.1). The discussions were coded according to the themes that matched the workshop activities. Pictures based on the propagation and cultivated of medicinal plant species ( $10\text{ cm}^2$ ) were taken through a digital camera, by a researcher during experiments. Pictures of medicinal plant propagation and cultivation were shown to the workshop participants during the workshop. Learner assistants also took notes during the presentations; to supplement information an

audiotaped was used. In addition to videotaping and notes, pictures (10 cm<sup>2</sup>) were taken during workshop activities.

#### *4.5.4.1 Preparation of the workshop*

The workshop took place at the nature reserve where some the medicinal plants are cultivated. The site was chosen because it contained most of the medicinal plant species that the medicinal plant sellers confirmed during the interviews that they were facing regional shortages of. In terms of travel distance, the reserve was located mid-way between the different research sites.

The guest speakers (the reserve owners), understood isiZulu and were able to communicate their input in the home language of the medicinal plant sellers. The owners of the game reserve were invited in writing (Appendix 5) to deliver presentations on how to cultivate the medicinal plant species that they traded in. The budget breakdown is shown in Appendix 6. Following approval of the budget the medicinal plant sellers were invited to the workshop. The facilitators were also invited three weeks before the date of the workshop so that they had adequate time to prepare for it. Letters of invitation are attached in Appendix 5. The workshop was facilitated in sessions, and presentations were videotaped.

The following section shows how the workshop was organised:

Date:	20 November 2011
Venue:	Abumadi Game Reserve (MKUZE) KZN
Time:	08h00-17h30
Number of participants:	30 (22 interviewees plus 8 other participants)
Guest speaker (s):	Owners of the game reserve
Supervisor	Prof. S.N. Imenda
Organiser:	Ms. B. G Ndawonde

## **Facilitators**

The workshop was in the form of information sharing. This resulted in the exchange of information between the researcher and invited resource persons, none one hand, and the medicinal plant sellers, on another. The first group was the community based resource persons. This group presented on the challenges that they faced in their businesses and the possible solutions. They also presented information on indigenous medicinal plant propagation and cultivation.

### **a) Community based resource persons from the medicinal plant sellers.**

The letters are used as pseudo names of the respondents.

Mrs. a- KwaNgwanase

Mr. b - Mbazwana

Ms. c- Mtubatuba

Mr. d- Empangeni

Mrs.e- Nongoma

### **b) Facilitators invited by the researcher**

Ms. B. Ndawonde

Mr. P. Sibiya

Mr. S. Ncube

#### *4.5.4.2 Specific aims of the workshop*

- To address the everyday challenges faced by the medicinal plant sellers in their business of selling the medicinal plants with regard to storage, marketing, sales and conservation.
- To share information with the medicinal plant sellers on the ways to mitigate the problems facing their businesses.
- To share information on methods of propagation and cultivation of the medicinal plant species, as part of conservation.



#### 4.5.4.3 Summary of activities

- Everyday challenges faced by the medicinal plant sellers with regard to storage, marketing, sales and conservation the medicinal plants and possible solutions.
- Demonstration of the cultivation of the plants by nature conservationists.
- A presentation on how to propagate and cultivate medicinal plant species.
- Recommendations and way forward.

The programme of the workshop event is tabulated in Table 4.1.

**Table 4.1.** Programme of the day

Activity	Presenter	Original place	Time allocation		Responsibility
Challenges of the business	Ms c	Mtubatuba	15 min each person		Researcher
	Mrs a	KwaNgwanase	15 min each person		Researcher
	Mr b	Mbazwana	15 min each person		Researcher
	Mrs d	Richards Bay	15 min each person		Researcher
Tea Break					
Presentation on marketing and storage of the medicinal plants		Facilitators	UNIZULU	Two hours, one for each presentation	Researcher
Demonstration of conservation		Game reserve managers	Mkuze	One hour	Researcher
Lunch					
Presentation of plant propagation and cultivation		Researcher	UNIZULU	Three hours	-
Tea Break					
Way forward		Researcher	UNIZULU	30 minutes	-

The workshop took the form of session activities listed in Table 4.1.

#### 4.5.5 Stage 5: Assessment of the workshop programme

To address the third Research Question, the programme of intervention was assessed.

Assessment of the research participants was done through home visits by means of

open-ended interviews (Appendix 4). That was done in order to measure/judge whether the intervention in the form of a workshop was effective or not, regarding medicinal plant storage, marketing, sales and conservation. The investigation took the form of home visits of the workshop attendees (phase 1) two months after the workshop was conducted. This was done to check whether the recommendations from the workshop were implemented and to encourage the participants to practise lessons based on storage, marketing, sales and conservation of the medicinal plants they learnt from a workshop. Thirteen months after the workshop was conducted, follow up home visits were conducted (phase 2 of assessment) to assess whether the intervention programme was effective or not.

The researcher worked intensively with representative households throughout the period of assessment of the workshop interventions. In-depth interviews were conducted with the selected households to give a comprehensive insight into the issues of interest relevant to the study.

#### **4.6 STUDY AREA**

The study was conducted in the three district municipality areas indicated in Figure 4.2, namely: uMkhanyakude, uThungulu and Zululand.



**Figure 4.2: Sampling sites in northern KwaZulu-Natal**

Map taken from <http://www.kzntopbusines.co.za/site/municipal-structure>

#### **Site 1-uThungulu District municipality**

UThungulu is one of the 11 district municipalities (DM) of the KwaZulu-Natal province in South Africa (<http://www.kzntopbusines.co.za/site/municipal-structure>). The seat of uThungulu is Richards Bay. According to (<http://www.kzntopbusines.co.za/site/municipal-structure>) the DM is located in the North-Eastern region of the KwaZulu-Natal Province on the Eastern seaboard of South Africa. Richards Bay, as a harbour and industrial town, offers a unique combination of a laid-back coastal lifestyle combined with an abundance of career opportunities and economic activity within a variety of sectors, from large-scale global industries such as BHP Billiton's two aluminum smelters, Tata Steel and Foskor, to the burgeoning small and medium business sector.

The district is home to two mining giants which have capitalised on the mineral-rich land in uThungulu. Richards Bay Minerals (RBM) is a leading producer of titanium minerals, high purity iron and zircon, found in the coastal sands of the region. It supplies most of South Africa's needs, and exports the remaining products across the globe. Exxaro KZN Sands is South Africa's flagship empowerment mining company, involved in the mining, beneficiation and smelting of mineral sands, mainly to produce titanium slag from smelting ilmenite. These industries provide employment for many people in this area. However, the majority of the employees are Black people some of whom travel from the neighbouring rural areas such as KwaMthethwa, Mandlazini and Enseleni to work in Richards Bay. This site was chosen as it was easily accessible to the researcher, and contained a market place where the medicinal plant sellers sold their products.

### **Site 2-Zululand District Municipality**

Zululand, part of the province of KwaZulu-Natal, is peaceful, with green hills of rich soil, waving grasslands, abundant forests, and an unhurried lifestyle (<http://www.kzntopbusiness.co.za/site/municipal-structure>). The major towns of Zululand District are Vryheid and Ulundi. Zululand also has a small town called Nongoma. Nongoma has a huge traditional medicine market in a place called Mona. Tons of wildlife products, mainly plants, bark and tubers are sold at the Mona traditional market, in the third week of every month. The products are transported to markets in Durban, Johannesburg, Malawi, Botswana, Mozambique and Swaziland.

### **Site 3-uMkhanyakude District Municipality**

UMkhanyakude is situated in the North-Eastern region of KwaZulu-Natal. The district extends from Mtubatuba (St Lucia) in the south, to Kosi Bay in the north,

across to the Lebombo mountains in the west (<http://www.kzntopbusiness.co.za/site/municipal-structure>). The district includes the iSimangaliso Wetland Park (previously known as the Greater St. Lucia Wetland Park), the first World Heritage Site proclaimed in South Africa. The Park stretches along the Zululand coast from Mapelane in the south to Kosi Bay in the north.

A high proportion of the District is under thicket, grassland and wetland. The remaining areas are disturbed by cultivation and settlement. Large areas of land are under communal tenure-located in the traditional authority areas under the jurisdiction of the Ingonyama Trust. UMkhanyakude is in the deep rural area of northern KwaZulu-Natal. The main town is Mtubatuba. Other small towns include Hluhluwe, KwaNgwanase, Jozini, Mkuze, Mbazwana and Ingwavuma. UMkhanyakude has rich biodiversity, including different biomes ranging from sub-tropical forests, grass lands, dune forests, savanna grasslands and woodlands. These areas are home to a variety of medicinal plant species.

#### **4.7 CONSIDERATION OF ETHICAL ISSUES**

Researchers are expected to be genuinely concerned about other people's quality of life (Benn, 1977; Mugenda, 1996; Kumar, 2005; de Vos *et al.*, 2011). They need to be people of integrity who will not undertake research for personal gain only or conduct research that will have a negative effect on others. There are laws that govern ethics in research and if these laws are ignored, it amounts to fraud and/or unprofessional conduct (Hammer, 1992). Ethical issues concerning research subjects include the following:

#### **4.7.1 Voluntary participation**

Research participants need to be afforded an opportunity to decide whether they want to take part in a study or not (de Vos *et al.*, 2011). During this study, only those who volunteered to participate were included in the research sampled and those who did not want to participate were not forced to provide any information.

#### **4.7.2 Confidentiality and privacy**

Keeping information supplied by participants confidential protects respondents from any harm (Kumar, 2005). When this study was conducted there was concern by the researcher that the information on plant usage would be regarded as confidential by the respondents. The researcher, therefore, asked for the permission from the informants to share their information and knowledge, but some refused. It was clear that the informants did not trust the researcher. In addition, traditional healing, by its very nature, is confidential.

After explaining that the information needed was not for healing purposes, but was part of an effort to promote sustainability of traditional medicines, some of the targeted participants, particularly females, provided the information on what they sold and what it was used for.

#### **4.7.3 Anonymity**

Anonymity refers to the identity of individuals being protected either by using numbers, third parties or pseudo names (Mugenda, 1996). A researcher may declare information about a particular individual but protect the identity and privacy of the individual. During this study permission was sought from the informants on whether their names could be used, and photos taken. Some of them agreed and others did not. It was explained to the informants that the research was not conducted on them but

rather with them. It is well known that although indigenous knowledge is communal in nature, it is not openly shared with strangers, as is the case with scientific knowledge. Indigenous people usually consent to sharing their knowledge on an individual basis but not if it is to be commercialised, distorted, trivialised or otherwise debased. It was explained to the respondents that the information that they provided would not be used to generate profit.

#### **4.7.4 Informed consent**

It is unethical behaviour if a researcher fails to disclose the real purpose of the research, fearing subjects' refusal to participate (Mugenda, 1996; Kumar, 2005). Informed consent includes explaining the purpose of the study. For this investigation prior informed consent was sought from all participants. Pictures of the plant species had to be taken with the consent of the stakeholders.

#### **4.7.5 Debriefing of participants**

Debriefing sessions provide the subjects with an opportunity before and after the study to work through their experiences and potential misconceptions (de Vos *et al.*, 2011). Prior to conducting the interviews, the purpose of the study was explained to the participants. The mutual benefits, in terms of information sharing (actual and perceived) for both the researcher and the participants were also addressed.

Although it is debatable whether research participants should be remunerated in a study in the case of this study, in the case of this study it made sense to thank them for their time spent during the interviews. Furthermore, the participants were provided with information from the study that they could potentially use for their own personal benefit. Participants were also compensated for their views and time spent during the

interviews by purchasing their medicinal material worth an amount of R20-00 per participant which was used as seedlings.

## **4.8 DATA PRESENTATION**

Data for this investigation is divided into sections, namely biographical status of respondents, data on storage, marketing and conservation of the medicinal plant species. There is also a section on the impact of selling medicinal plants in the medicinal plant sellers' livelihoods and the environment. Data on the study intervention and its assessment were presented.

### **4.8.1 Biographical status of respondents**

Data on this sub-section includes geographical area, gender, age, education, occupation, and households of the information such as household headers and income contributors, number of family members in a household, occupation status and sources of income of family members. Information on gender, age distribution, residence areas, data were presented graphically. Specifically, bar graphs and tables were used to show information on the nature of households.

### **4.8.2 Storage data**

Bar graphs were used to show data on how the medicinal plant sellers and gatherers stored their products, including wrapping material and the ways of preserving the medicinal plant material.

### **4.8.3 Marketing data**

In order to illustrate information of the marketing strategies used by the medicinal plant sellers to market the medicinal plants, advertisement methods, pricing, packaging, weighing and flow of their business data were presented in bar charts.



#### **4.8.4 Data on conservation of the medicinal plant species**

Information on whether the medicinal plant sellers cultivated the medicinal plant herbs was represented in bar graphs. Tables were used to quantify the reasons for the cultivation of the medicinal plant species. Bar graphs were used to show information on harvesting equipment and substitution of the species. Bar graphs were also used to present information related to the respondents' knowledge of conservation, training of the medicinal plant sellers about conservation and the listing medicinal plants that were restricted from harvesting by the medicinal plant sellers.

Pie graphs were used to present information on age of the respondents and occupation of children. Information on permission to harvest and whether there were rituals performed when harvesting the medicinal plant species was shown in bar graphs.

Bar graphs were also used to present information on the harvesting practices of medicinal plant sellers and data on the sources of supply of the medicinal plants.

#### **4.8.5 Workshop information**

The results from the pilot study showed that medicinal plant sellers were harvesting medicinal plants without planting new ones to replace those harvested. A non-formal environmental education workshop was subsequently organised in order to ask the medicinal plant sellers to reflect of their medicinal plant selling businesses with a view to understanding the sustainability of the plant species concerned. One of the proposals for the workshop was to establish home gardens in order for the medicinal plant sellers to grow the medicinal plants that were threatened by over-harvesting.

Piaget's work provided the foundation for constructivist theory, which takes the view that learners build knowledge rather than receive it in its final and processed form. It

was for this reason that the intervention programme took the form of information sharing rather than presentation of methods and techniques of medicinal plant cultivation to the medicinal plant sellers. It would have been possible for the researcher to present to the medicinal plant sellers on how to propagate the medicinal plants and *vice-versa*. However, the researcher hoped that by sharing information with the medicinal plant sellers and by stimulating recognition of our overall responsibility to protect medicinal plants, the intervention would enable both the facilitators and the participants to jointly come up with possible solutions to some of the challenges. This approach was in line with Vygotsky's zone of proximal development (Vygotsky, 1986).

In this study, the researcher formed a partnership with the communities selling medicinal plants with the aim of embarking on the conservation of threatened species. Informed participation of medicinal plant sellers was considered to be important so as to ensure that they understood their responsibility to conserve resources that formed part of their livelihoods.

#### **4.8.6 Data presentation arising from workshop information**

Data based on the assessment of the workshop were presented qualitatively using direct quotations from the respondents. The sample that was used in the study amounted to 56 respondents but for the intervention programme because of the logistics involved only 25 respondents were recruited, therefore, the data was analysed for the 25 respondents who took part in the workshop.

## **4.9 DATA ANALYSIS**

A coding process was done which described the location of variables and attributes composing each variable (Appendix 1). Answers from open ended questions were converted into numerical categorical codes based on the respondents' answers. The numerical values that represented answers from the respondents were processed using then Microsoft Excel programme to prepare for further analysis.

## **4.10 RELIABILITY AND VALIDITY OF THE STUDY**

This ESD research employed both positivist and naturalistic paradigms. The design of the study was in such a way that it took into account the validity and reliability of data collected from both the qualitative and quantitative approaches used in the study. These are briefly explicated below:

### **4.10.1 Validity and reliability of quantitate approach.**

The use of the mixed-methods research paradigm is associated with the value inherent in examining something from different points of view. Bapir (2010: 4) puts this point across as follows:

The debate, currently, is one between two traditions in social research, namely quantitative and qualitative. Each tradition, in turn, has different ontological and epistemological standpoint in relation to the social world. In a metaphorical sense, it is like looking through different lenses, viewing the social world differently; different things seem important and hence seek finding answers to different questions. That is, the quantitative research regards the social world as separate to the observer; such an ontological objectivism subsequently breeds a positivist epistemological alignment to view the social world as a measurable object. The qualitative research, on the contrary, ontologically takes the social world as a

construct of the researcher and the researched, and thus, is epistemologically interpretivist.

Midgley (2011: 1) makes a similar point in his statement that “it is now largely accepted as uncontroversial amongst systemic action researchers that there is practical value in theoretical pluralism: seeing through multiple theoretical ‘lenses’ that bring different (sometimes contradictory) assumptions into play.” Thus, in this study, questionnaires were used to collect quantitative data, whereas interviews were conducted with a smaller sample of the respondents for qualitative data. In explicating the main difference between these two approaches Isaacs (2014: 322) had the following to say:

“A major difference between the presentation of qualitative and quantitative research lies in the results section. While the focus of the results section of quantitative studies is numbers, in qualitative research papers, the results section is built on words. The phenomenon being studied is explained by themes which are substantiated by participants’ quotations. These quotations are classically embedded within the text.”

Roberts, Priest and Traynor (2006: 42) also concur with this view in their statement that “quantitative research is the conduct of investigations primarily using numerical methods, whereas qualitative research tends to use exploratory approaches and produce textual data rather than numbers or measurements.”

However, because the instruments for data collection in qualitative and quantitative research – as well as the processes attendant thereto, are different the notions of

reliability and validity are also, of necessity, conceptually different. This evokes different modalities of determining their validity and reliability. According to Roberts, et al (2006: 41), “reliability and validity are ways of demonstrating and communicating the rigour of research processes and the trustworthiness of research findings.” In explaining the respective roles played by these two processes, Roberts, et al opine that “reliability describes how far a particular test, procedure or tool, such as a questionnaire, will produce similar results in different circumstances, assuming nothing else has changed”, whereas validity is construed as referring to “the closeness of what we believe we are measuring to what we intended to measure” (p. 41).

Patton (2002) gives guidance on two factors related to quantitative and qualitative research with regard to designing and judging the quality of any research project; these are reliability and validity. In this study, the questionnaire was validated via the process of pilot study. In this regard, the researcher took into account the following as the aims of the pilot study: (a) identify unsuitable and unclear items in the instruments; (b) identify pre-knowledge, possible conceptual difficulties and alternative conceptions; (c) have a prior test run for the intervention and to learn from the pilot study; and (d) establish equivalence of participating groups (Coetzee, 2008). The results of the pilot study suggested a few changes, including re-wording of some items to enhance clarity. This was in addition to the initial feedback that was received from two experts in questionnaire construction – that is, the researcher’s Promoter and one other senior staff member in the Faculty of Education.

The determination of reliability for questionnaires is somewhat problematic. In the use of tests, it is much easier to compute reliability coefficients. The common techniques include calculating the (a) inter-rater or inter-observer reliability coefficient – for assessing the degree to which different raters/observers give consistent estimates of the same phenomenon, (b) test-retest reliability coefficient – used to assess the consistency of a measure from one time to another, using the same instrument, (c) parallel-forms reliability coefficient – used to assess the consistency of the results of two tests constructed in the same way from the same content domain of content, subject matter or construct, and (d) internal consistency reliability is used to assess the consistency of results across items within a test. With regard to this last estimate, the common approaches are the split-half method and the computation of Chronbach’s alpha – which is essentially “an estimate of the average of all split-half estimates of reliability” of a given instrument (Roberts, et al., 2006: 42).

When it comes to questionnaires these traditional methods of estimating reliability become controversial. One reason for this is that, typically, the responses to questionnaire items are subjective – unlike for an objective test where the researcher could check, say, internal consistency on the basis of the respondents consistently and correctly answering certain conceptually related items in a given test. In the case of most questionnaires, it is difficult to expect consistent responses to questions because each question could elicit different emotions, understandings and experiences from the same respondent – let alone different respondents within the same research sample. In short, for most questionnaires, there are no definite intended responses upon which some degree of consistency may be measured. With respect to the ‘test-retest’ technique, the difficulty is summed up very well by Roberts, et al (2006: 43) in their contention that “test-retest reliability is potentially

flawed if respondents' previous experiences in the first testing influence responses in the second testing ... Moreover, intervening events between the two administrations may account for differences between the two sets of results and contribute to flaws in external.”

It was in view of the above constraints that no measures of reliability of the questionnaire used in this study were done.

#### **4.10.2 Validity and reliability of qualitative approach**

The question of whether the findings of qualitative inquiry are worth paying attention to is answered by Healy and Perry (2000) as cited by Golafshani (2003). In her report Golafshani (2003) asserts that the quality of a study in each paradigm should be judged own its paradigm terms. This study aligned itself with the criteria used to judge the quality of the naturalistic paradigm (Lincoln & Guba, 1985; Guba & Lincoln, 1994; Perry & Herry, 2000). They include; credibility, neutrality or conformability, consistency or dependability and transferability or applicability.

##### *4.10.2.1 Credibility*

Lincoln and Guba (1985) look at the concept of credibility as a measure of whether the findings are believable in qualitative research. In concurrence with Bapir (2010), who posits that in a qualitative research a researcher is close to social reality and considers the views of research participants, this study complied with creditability. The researcher worked with the research participants with a view, not only of collecting data from them, but also learning the participants' own methods of

ensuring the sustainability of the medicinal plants upon which their businesses were dependent.

#### *4.10.2.2      Neutrality or Conformability*

To ensure reliability in qualitative research, conformability is crucial. Conformability shows a degree of neutrality or the extent to which the findings of a study are shaped by the respondents, and not by the researcher's bias, motivation, or interest (Lincoln & Guba 1985). As an ESD study, the ethos of participatory research was followed. Thus, respondents (i.e. the researched) were actively engaged in the research with the researcher, including their participation in a capacity-building intervention programme on various aspects of business management and conservation of targeted plant species, commonly harvested for the medicinal plant trade.

There were some instances when the respondents held on to their original ways of doing things – such as ignoring the information presented during the workshop on record keeping of sales by some of the research participants. In such instances, the researcher reported things as they were, and gave possible explanations as to why the respondents appeared to be hesitant to change some of their old ways. This shows that results were reported as they were from the respondents, thereby conforming with the required neutrality by focusing on, and reporting, events as they occurred – and not influenced by personal expectations and interest.



#### 4.10.2.3 *Consistency or Dependability*

The term ‘dependability’ corresponds to the term reliability in quantitative research (Lincoln and Guba, 1985: 300). To ensure the dependability or consistency of data, data collection methods such as focused group discussions/interviews were coupled with workshop-based discussions to examine their consistency with the quantitative data emanating from the questionnaires. Furthermore, the assessment of the effect of the workshop on the participants was conducted twice to ensure the consistency of qualitative data in the research. This conformed with the views of Bapir (2010:17) who opines that the consistency of data is achieved when the steps of research are verified through a series of steps in data collection, and that “reliability is entwined with the notion of consistency.”

#### 4.10.2.4 *Transferability or applicability*

Lincoln and Guba (1985) describe the concept of applicability or transferability of research as to do with whether or not the findings apply to other contexts. This is what is generally referred to as external validity (Krefting, 1991; Seale, 1999; Rodon & Sesé, 2008). In this regard, the findings of the study complied with the criteria for judging qualitative research from the point of view of applicability and transferability. Each section of the results could be used either in practice or in the world of research. For instance, the results obtained from a workshop could be used to show how medicinal plant sellers conducted their businesses; challenges they experienced regarding marketing, sales, storage and conservation of medicinal plants. The biographical data and data from focus group interviews and discussions, as well as from the workshop attendees, could also be used to determine the market chain of medicinal plant selling businesses.

#### **4.10.3 Validity of Qualitative data**

According to Golafshani (2003) one of the important criteria to judge qualitative research lies in the trustworthiness of the research. Similarly, Neuman (2003) contends that the integrity of qualitative research depends on whether the research methodology, design and results are real measures of what they are meant for. With regard to this study, different methods of collecting data were employed, in order to ensure that the research questions were answered by the end of the research project. Trustworthiness was in addition catered for in the ethical issues as the research involved intellectual property rights. At the beginning of the study the respondents were reluctant to participate in the study. However, with time and through successful interaction and explanation of the purpose of the study, trust towards the researcher was eventually developed by medicinal plant sellers. Therefore, the research findings conformed to the trustworthiness criteria of qualitative research as a form of validity.

#### **4.11 SUMMARY**

The above sections outline the techniques and methods that were used to analyse the data. Using the mixed modes of data collection helped in collecting data for the survey, which was collected using the questionnaire and also to gather data for the case study which was mainly in the form of discussions such as focus groups and workshop facilitation. Different methods of data collection were used strategically to enhance the validity and reliability of the study. Although there were difficulties of using volunteer sampling, especially interfering with the medicinal plant sellers during their operational business hours, nonetheless, all these obstacles had been removed in the ways outlined in this chapter. The next chapter presents the results,

interpretation, analysis of data resulting from this investigation. A discussion of the findings is also presented.

## **CHAPTER FIVE**

### **RESULTS, INTERPRETATION, ANALYSIS AND DISCUSSION**

#### **5.1 INTRODUCTION**

This chapter is divided into three main sections in line with the research questions of the study:

1. What challenges are faced by the medicinal plant sellers with regard to ensuring that the marketing, sales and conservation and storage of medicinal plants are sustainable in the long run?
2. How does the selling of medicinal plants impact the sustainability of the environment and the livelihoods of the medicinal plant sellers?
3. Would a programme of intervention based on non-formal education enable the medicinal plant sellers to improve their understanding and practices regarding the storage, conservation, sales and marketing of medicinal plants from the point of view of business profitability and environmental friendliness?

#### **5.2 BIOGRAPHICAL INFORMATION**

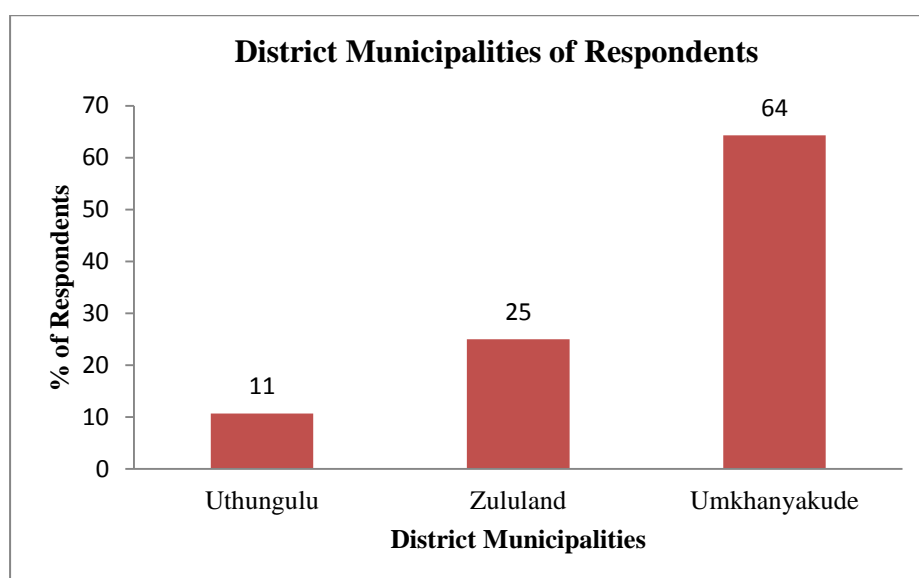
This section presents the analysis of results that were produced from data collection instrument on biographic characteristics of the respondents, such areas of origin of the medicinal plant sellers, gender, age, number of children in a household, occupation, schooling and sources of income of the medicinal plant sellers.

Subsequently, data on storage and marketing of the medicinal plants are presented, as well as information related to whether or not the medicinal plant sellers pay attention on the issues of conservation of the medicinal plant species they use.

The biographic characteristics of the respondents are presented under various sub-headings.

### 5.2.1 Areas of origin of the medicinal plant sellers

The study took place in three district municipalities in northern KwaZulu-Natal. Figure 5.1 shows the percentage of participants from different district municipalities where medicinal plants were sampled.



**Figure 5.1: Areas of origin of the medicinal plant sellers, N=56**

Figure 5.1 shows that 64% of the medicinal plant sellers came from the uMkhanyakude district municipality. uMkhanyakude is found in a deep rural area of northern KwaZulu-Natal. It is one of the heritage sites in northern KwaZulu-Natal because of the high diversity of plants and presence of animal life. The area is characterised by different types of biomes ranging from savanna to subtropical forests, and is home to different types of plant species including shrubs and higher plants. uMkhanyakude carries more diversity of medicinal plants than any other district. It is one of the reasons that certain species of plants that are rare in other areas

are still available in this DM. Therefore, more people from this district tend to be involved in this business because of the availability of plants in their environment.

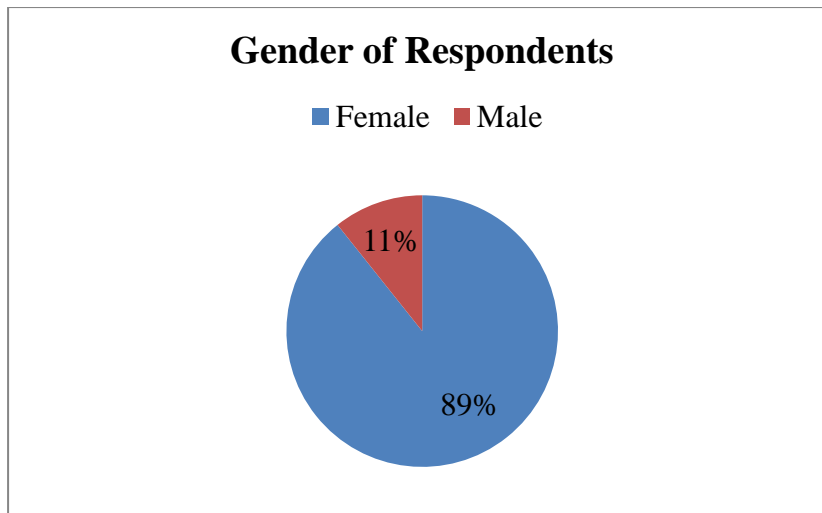
Another reason could be that communities in this area comprise the majority of unemployed people and they turn to the medicinal plant selling business as a source of income. For instance, uMkhanyakude had 64% of the medicinal plant sellers as compared with 11% from uThungulu. Hence, one could say industries in the uThungulu DM supply jobs to the communities around it, and support education and other community projects that the communities may depend on for their livelihoods.

There are many industries within the uThungulu district, such as Mondi, Allusaf, Richards Bay Minerals (RBM), Iscor, Richards Bay Coal Terminal (RBCT) and others that provide employment to people of this area. This could be one of the reasons that there are relatively fewer medicinal plant sellers originally from the uThungulu DM than uMkhanyakude and Zululand. The two DMs are located in rural areas with limited job opportunities.

### **5.2.2 Gender distribution of the medicinal plant sellers**

The biophysical characteristics of the respondents which include gender are graphically represented below.

Figure 5.2 shows the gender distribution of the medicinal plant sellers.



**Figure 5.2: Gender of medicinal plant sellers, N=56**

The study showed that medicinal plant sellers were mainly female. Out of the 56 different participants interviewed, 89% were female and 11% male. This trend is also reported in other studies. For example, a case study on medicinal plant selling in northern KwaZulu-Natal showed that there were more women medicinal plant sellers than men (Ndawonde *et al.*, 2007). Studies by Williams *et al.*, (2007) at Faradays medicinal plant market, Gauteng Province, showed that there were 75% women and 25% men selling medicinal plants.

At Durban market, Mander (1998) found that there were many women from KwaZulu-Natal who left their families for long periods of time to sell medicinal plants. The reason may be that there is a trend for Southern African women to practise as diviners, while men practise as herbalists (Cunningham, 1998). This could lead to the smaller number of males who are medicinal plant sellers since herbalists are not supposed to be in the streets, as medicinal plant sellers do, but to perform their work in the homesteads. This is also a global trend, for instance, Silori and Badola (2000) reported gender imbalances in medicinal plant trade in India, where women also dominated.

The amount of work, such as gathering plants in dangerous forests and grasslands which is done by these women cannot be underestimated. With reference to the intersectional theory, it is clear from these results that women's life in a sexist society is difficult for many reasons. In the case of South Africa, many women did not have equal opportunities to attend formal schooling as men did (Aitchison & Harley, 2004).

This is affirmed by Kirk and Okazawa-Rey (1998) in their essay, 'feminist approaches to women's work and income' which refer to the fact that women and children constitute the vast majority of poor people in the world, as a result of unstructured inequalities and discriminatory policies that do not address this very important issue. This with regard to this study, the ratio of women (majority) to male (minority) discrepancy could also be attributed to low schooling levels of medicinal plant sellers as well as lack of professional jobs which could explain the high incidences of women in the medicinal plant selling businesses.

### 5.2.3 The age of respondents

The following graph shows the age categories of respondents.

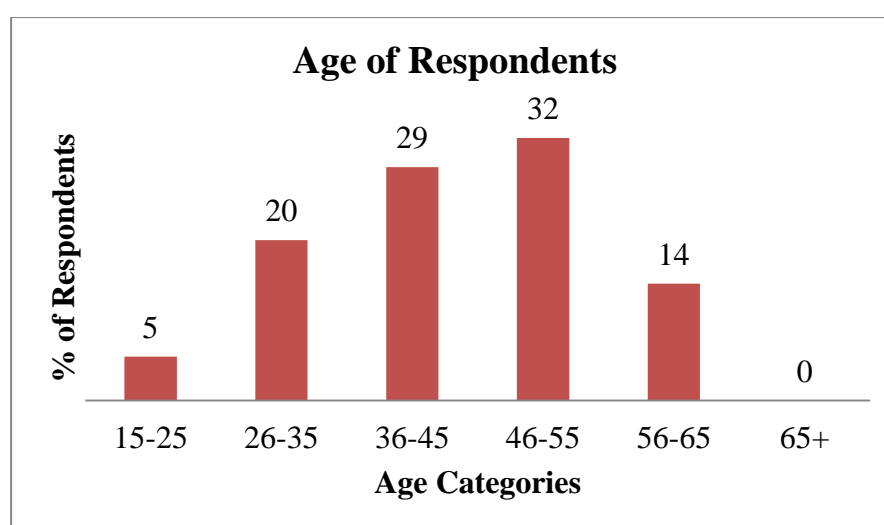


Figure 5.3: Age distribution of respondents, n=56



Fewer respondents (5%) were found within the age range of 15-25 years than 29% that were found within a range of 36-45 years. The reason could be that the youth is not inspired by the job of selling plants. The majority of the plant sellers (32%) fell under the age group of 46-55 years. The possible reason is that older people have knowledge of medicinal plants, as Zobolo and Mkabela (2006) showed in their study of knowledge of home gardens in northern KwaZulu-Natal, where older females were found to have knowledge of medicinal plants better than girls. This was also reported in a study of indigenous plants in EEASA Monograph no. 3 (1999) in which the number of plants known by elders exceeded those known by young people. There were fewer medicinal plant sellers of 55-64 years (14%) and none of the traders fell within 65 and above age category.

It is possible that children of medicinal plant sellers are not inspired by the business of medicinal plants, thus the lower rate of participation of younger generation in the medicinal plant selling business. Another reason could be the nature of knowledge and teaching that is involved in indigenous medicines. Indigenous knowledge is secretive and is meant for the consumption of people chosen in mysterious ways. For instance, if you had knowledge of a special herb that could cure a serious disease, your grandfather might appear in a dream to tell you who should be given the privileged information about how the herb should be administered. Indigenous knowledge is surrounded by such mysticism, which helps to explain things that people do not understand.

Sometimes the way traditional knowledge is passed from one generation to another is contrary to developmental learning by Piaget. Jean Piaget posits that children progress

through four stages and that they all do so in the same order (Inhelder and Piaget, 1964). One could say also that learning builds up in a scaffolding process, whereby support and resources are provided to learners in order to promote learning and acquisition of new skills-and then gradually removing the support as learning becomes more entrenched and consolidated (Lui, 2012). This was the basis for the intervention followed in this study. It was hoped that by introducing medicinal plant sellers to some of the techniques, which had been covered during this intervention, this form of support would start them on a good conservation/sustainability trajectory.

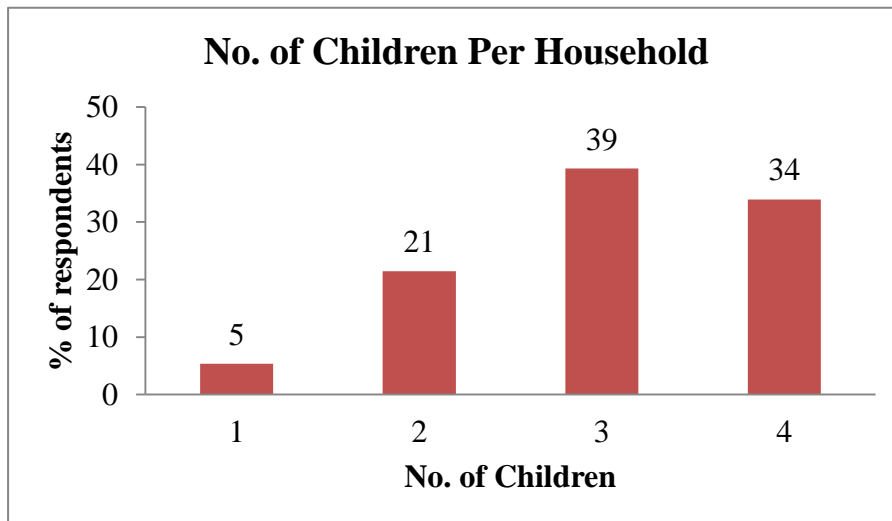
In the same view, constructivists such as John Dewey and Jerome Bruner also emphasise the point that learners construct new ideas or concepts based upon existing knowledge/concepts, and discover new concepts (Lutz & Huitt, 2004). In other words, learning is an interaction between what learners know, the new information they encounter, and the activities they engage in as they learn.

One of the reasons why there were fewer youth medicinal plant sellers than adults could be due to the fact that traditional knowledge transmission tends to be secretive. It is only passed from elder to a person whom is perceived to have a spiritual gift. It could be likely that older people are perceived as having spiritual gifts than younger ones. The perceived ungifted do not get the privilege of receiving knowledge about medicinal plants, thereby restricting access to the medicinal plant selling businesses.

Issues of whether the medicinal plant sellers have children or not, and the number of children in the households, could be among the factors that lead to the observed dominant age categories of the medicinal plant sellers.

#### 5.2.4 Children in the households of the medicinal plant sellers

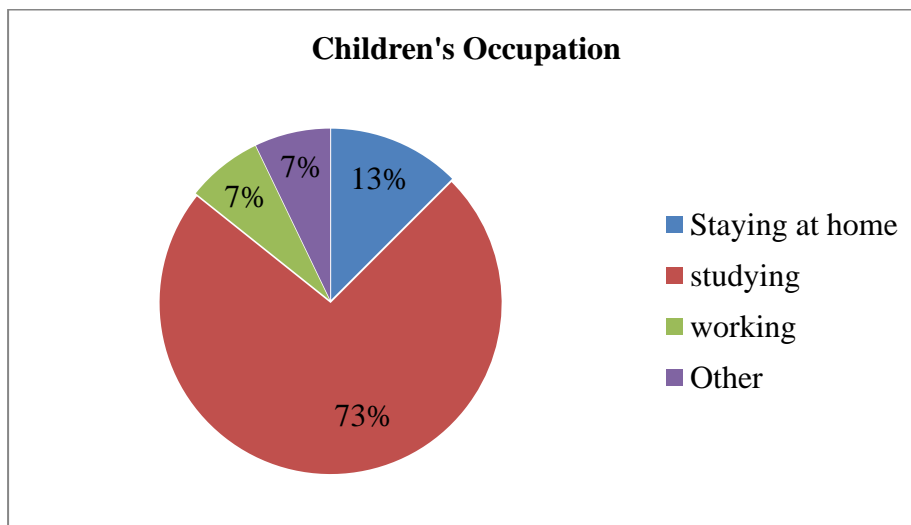
Figure 5.4 shows the number of children in the households of the medicinal plant sellers.



**Figure 5.4: Number of children's in the medicinal plant sellers' households, n=56**

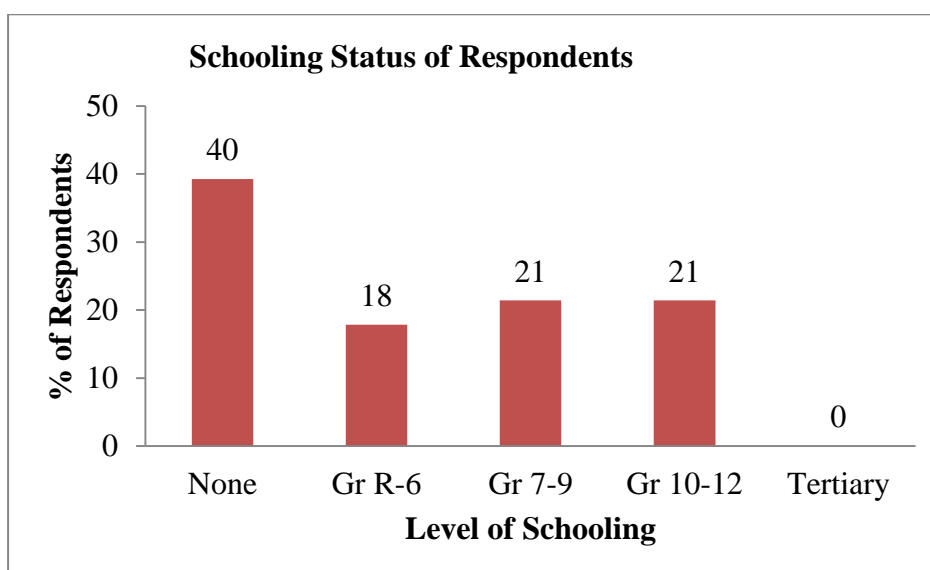
Figure 5.4 shows that 39% of the respondents had 3 children while 34% had 4 children. The respondents did not have bigger families. However, fewer (5%) had one child. Taking into account factors such as maintenance of children, age of their parents and occupation of some of their parents, for instances of 15-25 years of age, having four children could be a challenge. However, it depends on the income that is brought into a household. Accordingly, Figure 5.5 shows the occupation status of children in the medicinal plant sellers' households.

### 5.2.5 Occupation profile of medicinal plant sellers' children



**Figure 5.5: Occupation of medicinal plant sellers' children, n=56**

Figure 5.5 shows that 73% of the children of the medicinal plant sellers were studying, whereas 13% were staying at home. Seven percent of the children were working. This implies that the income contributors in the families were mainly the parents or guardians. This is a responsibility that requires mutual support from two parents in order to take care of the children and make sure that they receive quality education. Figure 5.6 presents the education profile of the medicinal plant sellers.

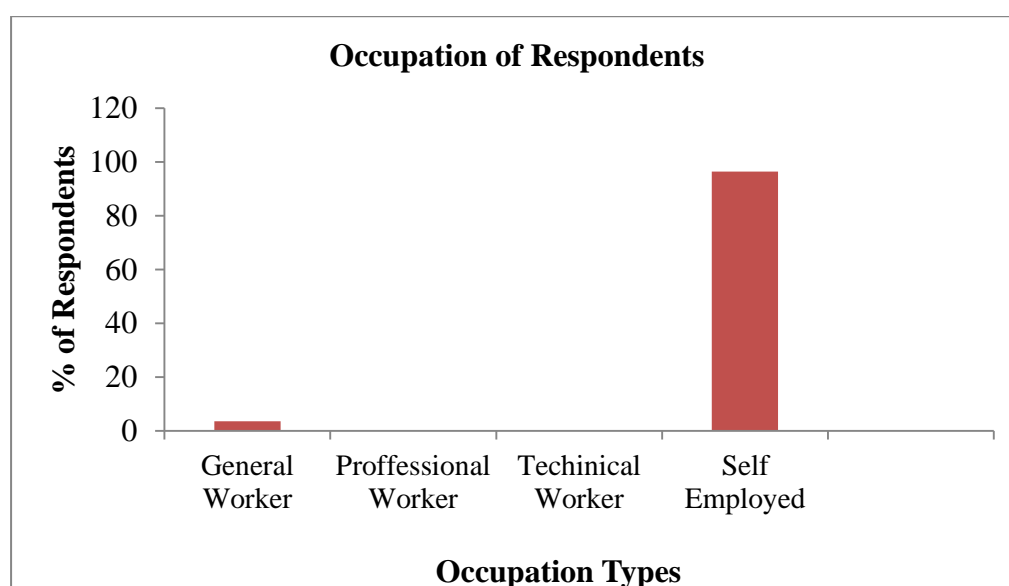


**Figure 5.6: Schooling level attained by medicinal plant sellers, n=56**

Figure 5.6 shows that 40% had no formal schooling and out of those who attained formal schooling, none of them reached the tertiary level. Only 18% attended primary school, followed by 21% who had senior phase, which is grades 7-9 level of schooling and another 21% who attended school up to the level of Further Education Training (FET), which is grades 10-12 according to the South African schooling system. Although some of the participants did not receive formal school education, it was interesting to note that the majority of the medicinal plant sellers (60%) had different doses of basic education (grade R-grade 12). This could assist them with skills in running their businesses. As reported by Aitcheson and Harley (2004), adult illiteracy among Black people living in rural areas is high, however, they need to be encouraged to engage in self-employment and reflect about their deeds.

#### 5.2.6 Occupation status of the medicinal plant sellers

One of the questions the interviews sought to find out about was whether or not the participants had other occupations that they engaged in, apart from selling traditional medicines. The results are presented in Figure 5.7.



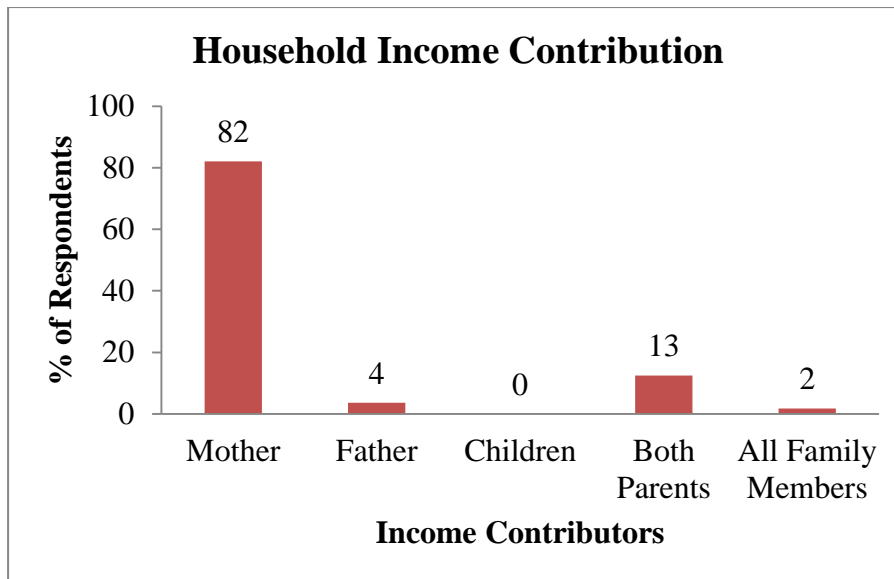
**Figure 5.7: Other Occupations of the medicinal plant sellers, n=56**

From the 56 medicinal plant sellers interviewed, 96% were self-employed (Figure 5.7). That can be attributed to the educational status of the respondents as shown in Figure 5.6, which showed that none of the respondents had tertiary education. Therefore, there were few chances that the medicinal plant sellers could occupy professional jobs. This is supported by the demographic statistics of 2001 (<http://www.demarcationboard.org.za>), which showed that northern KwaZulu-Natal is characterised by high unemployment rates, resulting in rural communities deriving their income from selling products such as mats, animal skins and medicinal plants. Indeed, it was also highlighted in the literature that many South Africans sustain their livelihoods by gathering and selling medicinal plants (William, Balkwill, & Witkowski, 2000; Dold & Cocks, 2002; Kepe, 2007).

According to Mander (1998), about 50% of the population out of approximately 15 millions of people in KwaZulu-Natal derived their income from selling medicinal plants. This shows that medicinal plant selling business was and is presently a popular business among rural communities in KZN, thus, the medicinal plant selling business has a high potential for creating jobs. The following section shows who contributed income to the households of the medicinal plants.

#### **5.2.7 Income contributors in medicinal plant sellers' household**

The following figure shows the income sources in the households of the medicinal plant sellers.



**Figure 5.8: Income sources in the medicinal plant sellers' households, n=56**

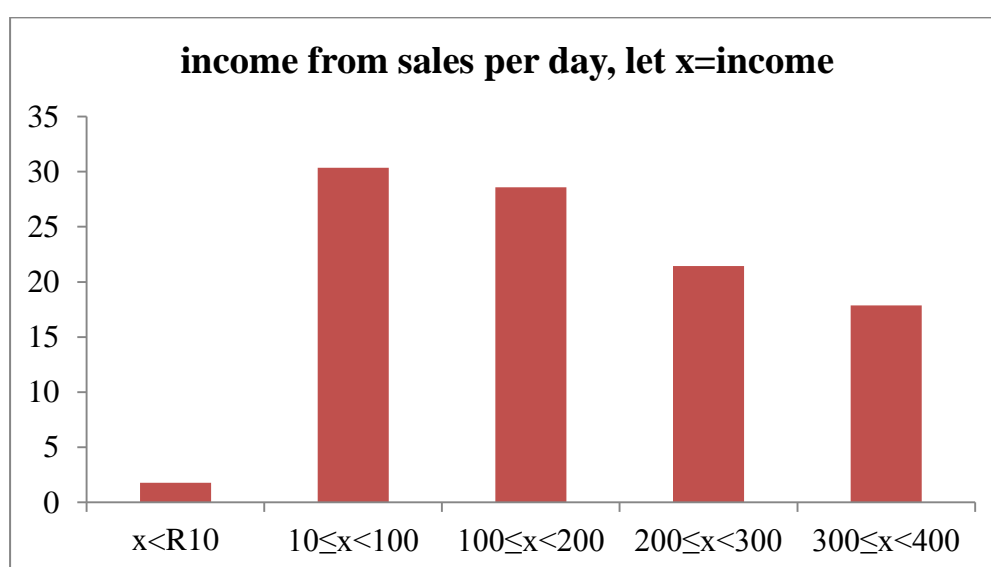
Figure 5.8 shows that 82% of the biggest income sources in the research participants' families were female medicinal plant sellers. There were 2% responses where all family members contributed some income to the households. This relates to Figure 5.5 where the majority of medicinal plant sellers' children were reported to be studying. This suggests that medicinal plant selling may have uplifted many rural people, particularly women, in supporting their families from money made from gathering and selling medicinal plants. This is supported by Jäger and van Staden (2000) who report that 80% of African populations make use of traditional medicine. This situation is also observed worldwide. For instance, Karki *et al.*, (2003) state that the collection and trading in medicinal plants contribute significantly to the cash income of the poor Himalayans. This is also shown in the studies on the ethnobotanical survey of medicinal plants commercialised in the markets of La Paz and El Alto, Bolivia, conducted by Macía, García and Vidaurre (2005).

Once the income contributors from money of selling medicinal plants had been identified, it was crucial to determine whether such income was significant in

sustaining the families of the medicinal plant sellers. The section below looks at income generation from selling medicinal plants.

### 5.2.8 Income generated from the selling of the medicinal plants

Generally, it is difficult for one to disclose his or her salary, especially to people who are not family members. Although mutual trust was established earlier with the medicinal plant sellers, when they were asked about their income, they were reluctant to give the exact figures that they received in a month. The reason they gave was that they never knew since some of them neither record nor bank the money received from selling the medicinal plants. The option of looking for an income received in a day worked better since the researcher was there at times when customers came to purchase the medicinal plant materials. Figure 5.9 shows the estimated income that the medicinal plant sellers in northern KwaZulu-Natal received in a day.



**Figure 5.9: Average income generated from selling medicinal plants per day, n=56**



Figure 5.9 indicates that there were fewer medicinal plant sellers who made less than R10 per day (2% out of the 56 respondents), 30% made between R10 and R100 per day. 29% made an average income of R100-R200 per day, which is good when compared with domestic workers some of whom receive less than R50 per day. However, the medicinal plant sellers had to calculate their profit after taking out the capital and logistic costs such as transportation, buying of stock and processing some of the medicinal plant species, wastage, and so on.

Although their business fluctuates, R200 per day is not sustainable enough to take care of a family of five members, as it was the case in other households. Depending on the period of the month, if the flow of business is good, one seller can make up to R300-R400 per day (as reported by 18% of the 56 medicinal plant sellers), thereby making about R2000 per week. Two thousand rands is good income considering that most medicinal plant sellers harvest directly from the wild. When other business costs are deducted there could still be profit of up to R1000 per week generated from selling the medicinal plants. Better adaptation in the business can contribute to the high profit generated in terms of harvesting strategies, networking and knowledge acquisition by customers.

Therefore, capacity building in the business management skills, including marketing and proper storage of the medicinal plant products, can contribute significantly to stabilising the profits gained from selling medicinal plants. However, medicinal plant sellers reported that there are challenges with regard to the marketing, packaging and processing and storage. They also highlighted that they were concerned about the

issues of conservation of the medicinal plants which are depleted from their local environment.

The following section discusses the challenges of the medicinal plants with regard to marketing, sales, storage and conservation of the medicinal plants.

### **5.3 CHALLENGES WITH RELATED TO MARKETING, SALES, STORAGE AND CONSERVATION OF MEDICINAL PLANTS**

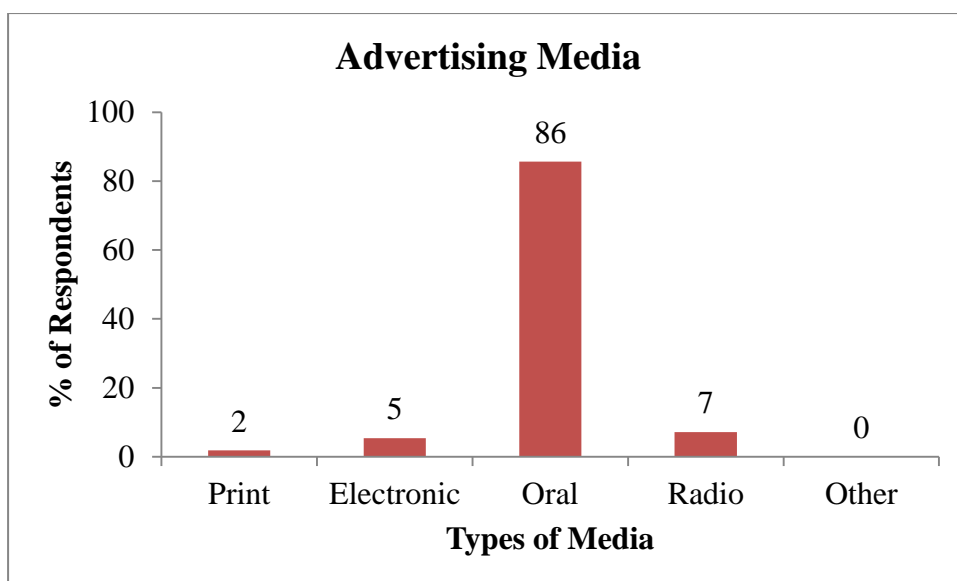
The following section discusses the information on the marketing of medicinal plants collected from the respondents. This addresses the first research question of the study.

#### **5.3.1 Challenges related to the marketing of medicinal plants**

Variables that are discussed under the challenges related to the marketing of medicinal plants include advertisements of medicinal plant products, determining price units and pricing of the plant species, business flow, recording of income received versus expenses incurred.

##### *5.3.1.1 Advertisement of medicinal plant products*

Typically, business owners market their products and services to the consumers so that the consumers know how and to where access those products. This is done through advertisement. Advertisement can be in the form of print media, visual media, oral and display. This helps the customers to know about the nature of the products and prices beforehand. Figure 5.10 indicates different advertising media used by the medicinal plant sellers in marketing their medicinal plant products.



**Figure 5.10: Advertisement of the medicinal plants, n=56**

Figure 5.10 shows that products sold by the medicinal plant sellers get to be known by customers who use those products orally (86%), more specifically from other customers who use those products. The problem may be the time of introduction of new species or an attempt to substitute the species. Although there are certain ways of advertising medicinal plants, such as radio, only 7% of the sellers knew about those channels. In addition to radio being a commercial medium like television, the purpose of interviews was to separate the two since the respondents seemed confused when they asked questions were related to this (lessons from a pilot study).

Figure 5.10 indicates that only 5% reported to advertise their medicines in electronic media. The medicinal plant sellers reported that there are traditional medicines that were advertised in newspapers; however, those were processed mixtures that were often done by pharmaceuticals. The respondents explained that it may be expensive for them to pay for those types of advertisements, given that sometimes they made R10 per day from selling their medicines. This is a challenge since marketing products by word of mouth may cause discrepancies in terms of dosages and amounts

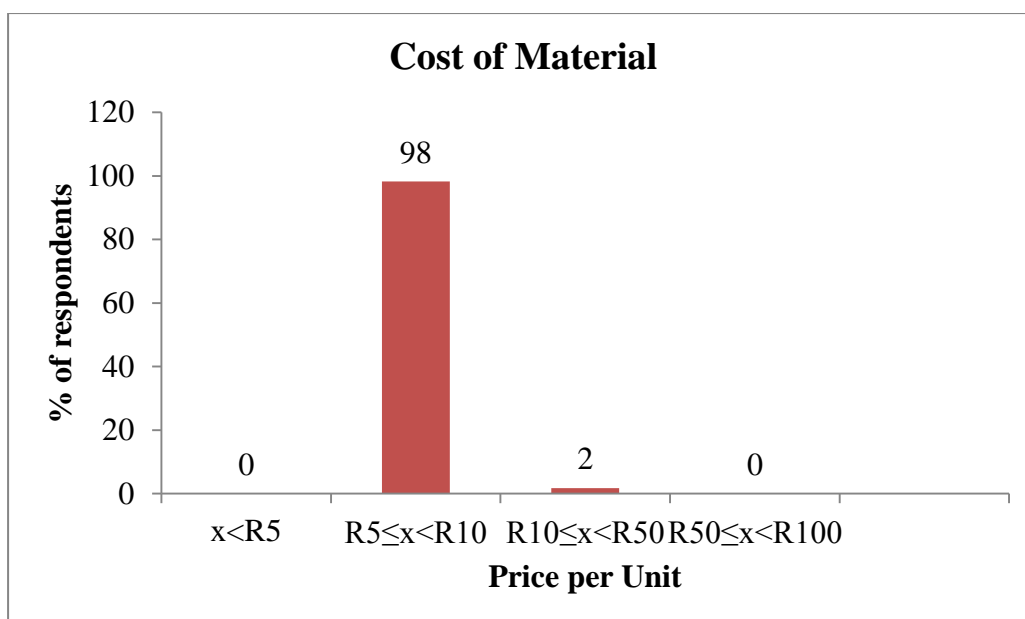
charged for the medicines. Placing advertisement in newspapers, radio and television is costly; however, there are some newspapers that are free of charge, such as 'Bay Fever'. The implication is that they are accessible by public.

Medicinal plant sellers can make use of those newspapers for advertising their medicinal plant products because they are free of charge. Other newspapers are cheaper to buy; placing an advert in those newspapers may also be cheaper. Yet they are released every day and some are written in isiZulu, one example is 'Isolezwa newspapers'. Other options that medicinal plant sellers can use to advertise their products include pasting pictures of their medicines on the walls of their shops, nearby supermarkets and other public places that may permit them to do so.

The following section discusses the price units of the medicinal plants and also the determinants of those prices.

#### *5.3.1.2 Unit pricing*

Although it was difficult to access the value of a single medicinal plant species, as some came in mixtures, Figure 5.11 shows the unit pricing of the medicinal plant material from the respondents.



**Figure 5.11: Unit prices for medicinal plant species, n =56**

The pricing of the medicinal plants mainly fell in the R5-R10 price range per tuber (98%) at all the stations, except for Mona market where bunches of material, about four or more tubers were charged the same price as for one tuber at other stations. Processed material was charged at R50-R100 per 2 litre. The cost of the packed material in re-used, labeled 50 kg bags, at Mona Market was R120. Although the material filled the sacks it was not determined whether or not their mass was 50kg. The sacks which originally contained 50 Kg of maize meal were mainly used as a unit of measure for bulk selling.

Some respondents reported that there were cases of 1 variations in the price units of the medicinal plants. The variations of prices charged for the medicinal plants are shown in (Table 5.1).

**Table 5.1: Reasons for variations, n = 56**

<b>District number</b>	<b>Price variations</b>	<b>Respondent number</b>
1	Scarcity of species e.g <i>Scilla natalensis</i> is R20, per tuber since it is difficult to find.	2
1	Changes of Mona market pricing	21
1	Depends on the type of material, liquid mixtures cost from R50-R100 per 2 litre. Dried material costs from R10-R20 of the amount that can fit in a cup of tea.	56
3	Affordability by a customer. If a customer seems to have more cash by, for instance, possession of a late car model.	46

It is logical to have different prices charged for different material, for instance, processed material. The amount of labour in collecting and processing of material should be taken into account when the prices of the medicinal plants are determined.

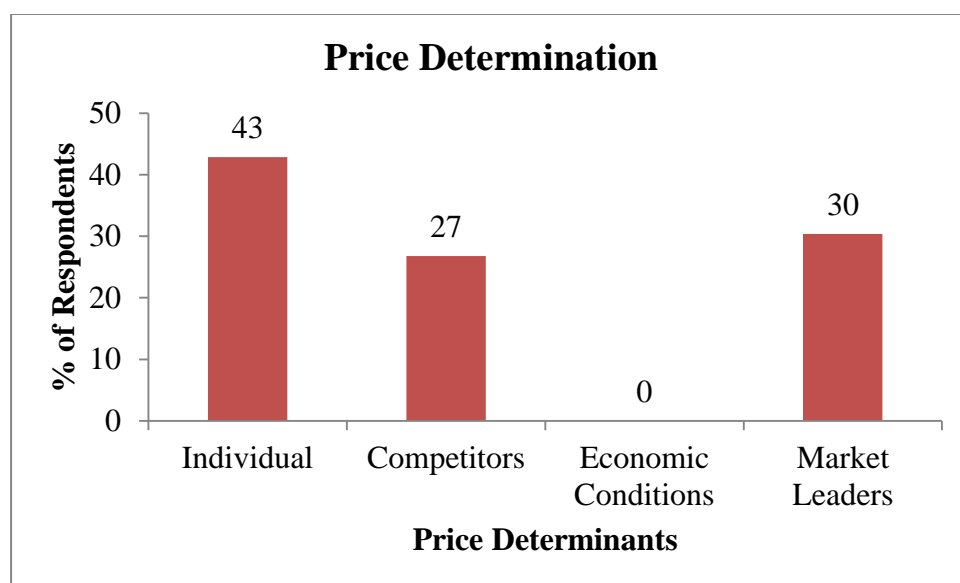
Processed mixtures were rare to find from the sellers. They explained that they made medicinal mixtures only if there were special orders placed by the customers. The reason for not having processed (available) herbs was that the medicinal plant sellers preferred to sell separate dried material since fresh mixtures expired if they were kept for long periods. As a result, the medicinal plant sellers preferred to prepare the mixtures when the customers wanted them or to give the method of processing to the buyer if the order was not placed ahead of time.

It was of interest to find out who determined the price units charged for the medicinal plants as presented in Table 5.1. In the medicinal plant selling business, 56 medicinal

plant sellers interviewed said that prices were independently determined as discussed in the following section.

### 5.3.1.3 Price determination

The following figure shows how the prices of the medicinal plant products were determined, according to the respondents.



**Figure 5.12: Price determinants of the medicinal plant products, n=56**

What determined the prices charged at different medicinal plant markets were the individual sellers (43%). Other price determinants included market leaders of the selling stations (30%). Medicinal plant sellers reported that their prices were also influenced by the changes of prices by other medicinal plant sellers, suggesting that regardless of coming up with the price units of the medicines, as individual sellers, there were also some forces that increased or decreased prices with reference to other sellers in their markets (27%). This also applied other products such as vegetables and fruits. Price units of these materials were the same under each market. It was surprising though to get responses that said that prices charged for the medicinal plants were determined on an individual basis. However, when other factors including

the accessibility of the plants and processing done by individual medicinal plant sellers are considered, determination prices by individual sellers might be the reality.

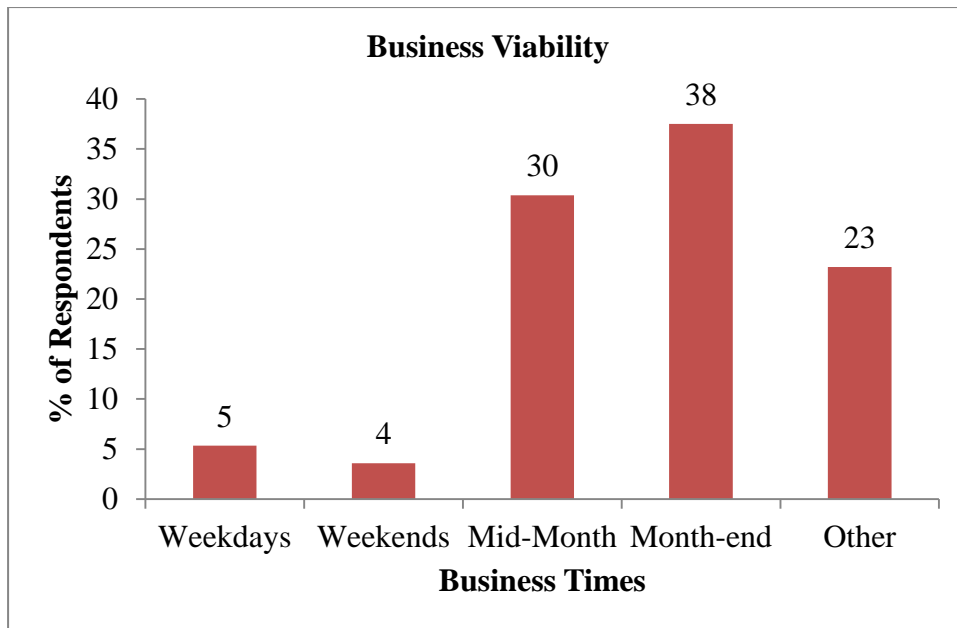
Medicinal plant sellers at Mona market reported that the price units of the medicinal plants were determined by the market leaders (30%). They explained that the prices of the medicinal plants increased approximately once in two years. It depended on the decision of market leaders on the pricing of the medicinal plants regardless of the places from where the products were harvested, economic factors and the availability of the medicinal plants from the field.

Medicinal plant sellers explained that they got informed about the issues of pricing during meetings, either among themselves or with their leaders to discuss the pricing issues. It is during meetings that the proposals on new prices are made and the amount to increase by the market leaders. In spite of the changes in the demands and economic factors, the prices of the medicinal plant species remain the same till certain individuals decide on pricing after a certain period of time.

#### *5.3.1.4 Business flow*

Most small businesses tend to be affected by cash flow in tandem with their customers. This manifests in fluctuating cycles, where by most of the businesses get busy at month ends or shortly after pay days. However, this study found that the medicinal plant selling business in northern KwaZulu-Natal was busy throughout the month.



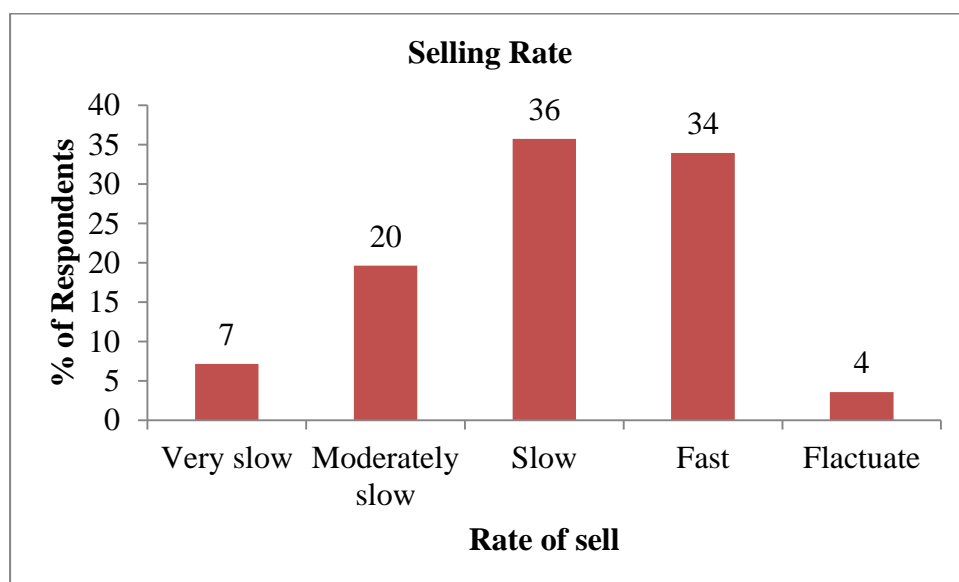


**Figure 5.13: Business Flow of Medicinal Plants, n=56**

Figure 5.13 shows that the medicinal plant selling business in northern KwaZulu-Natal peak flows are at month ends (38%) , followed by the middle of the month (30%) and other business times which included seasons of the year (23%). This also is influenced by the availability of the material at the wholesale market sales, which take place at the end of each month. That is when there is available fresh stock from the market. Medicinal plant sellers from different areas stock their material at month ends, and this is where they record highest sales. As one would expect, the retailers charge the medicinal plant species according for the prices at which they had purchased their stock from Mona market. There are many employees who get paid on the 15<sup>th</sup> of the month; this explains the mid-month peak of business.

The viability of the medicinal plant selling businesses would also be expected to fluctuate according to the changes in the market price of western medicines. If the price units of western medicines are high, customers may shift to purchase more

traditional medicines, thus increasing selling rates. The following section looks at the selling rates of medicinal plants.



**Figure 5.14: Selling Rates of the Medicinal Plants, n=56**

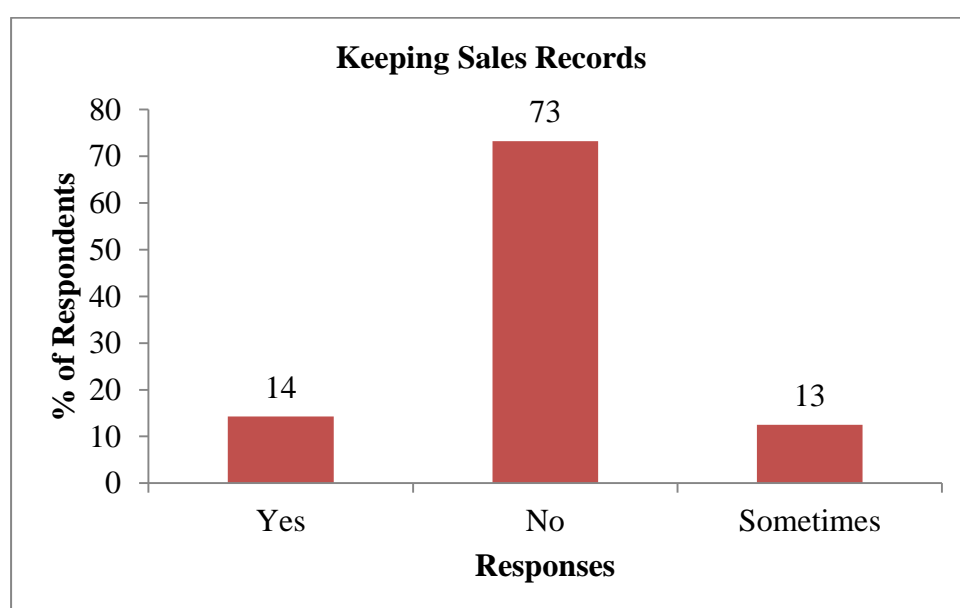
As mentioned earlier, most businesses tend to fluctuate with regard to sales, depending on various factors such as economic conditions, time of the month or year, competition, demand for products and others. However, when the medicinal plant sellers were asked how well their medicinal plant product sold throughout the year, (36%) of them reported that their businesses were slow, whereas 34% responded that their businesses went fast, 4% stated that their businesses fluctuated with times of the year.

The respondents mentioned different contributing factors, such as their sitting position in the market as contributing to the sales status of their businesses. Customers tended to buy from the first sellers they come across. If information on the uses, prices and description, and sources of medicinal plants, can be advertised this challenge could be addressed. As a result, most of the sellers would get a fair chance to sell their

medicines. Once the business flow and selling rates issues had been identified, it was important to determine whether such information was recorded by the medicinal plant sellers. The section below looks at whether the medicinal plant sellers recorded their cash flow that could determine how their businesses operated.

### 5.3.2 Keeping record of sales

Although some of the participants did not attend formal schooling, it was interesting to find that they were able to count their money. That indicated strength in their businesses. However, Figure 5.15 shows that the majority of the medicinal plant sellers (73%) did not keep records of their sales.



**Figure 5.15: Keeping Sales Record of Medicinal Plants, n=56**

Although the respondents explained that they did record some of their profits from selling the medicinal plants it was not always the case. In most instances they spent what they obtained from selling medicinal plants for their daily running costs. In those cases it was difficult to see how the businesses were doing in terms of sales, if there were no records.

If time spent on harvesting and selling the medicinal plant products and other costs, including transportation, are considered one would arrive at the conclusion that the hands-to-mouth businesses were not viable for the plant sellers. Therefore, the medicinal plant sellers needed to be taught how to prepare budgets, make balance sheets, keep records of sales and prepare cash flow statements, as well as an awareness of issues pertaining to investments. Education of accounting, or people with knowledge of business management, were required to teach the medicinal plant sellers some viable business skills. This research project had the potential of collaborating across departments and faculties. A gathering in the form of a workshop could also help the medicinal plant sellers to learn from one another as some sellers had practised record keeping of their sales.

Table 5.2 shows different ways that the medicinal plant sellers used to record their income and expenditure after selling their products.

**Table 5.2 Record keeping methods, n=56**

<b>District number</b>	<b>Ways of keeping records</b>	<b>Respondent number</b>
1	Have a booklet where a record profit gained separately, e.g. money gained from selling liquids should be recorded differently from tubers and mixtures	2
3	Banking over a period of a month	41
3	Use a booklet to record profit gained per day	22
3	Have a 32 page exercise book where profit is recorded	45

It was interesting to note that in spite of the illiteracy levels of the medicinal plant sellers, there were some of them who kept records of their income and expenditure. They explained that they kept records so that they could determine whether or not

they gained anything from their businesses. It was reported in the literature that the majority of the medicinal plant sellers make their living from selling the various medicinal products; therefore, keeping records of their businesses would ensure sustainability.

In order to address research question **number two** and enhance the responses from research **question number one**, focus group discussions were conducted.

The sellers reported that they made profit from selling medicinal plants and they used that money to take care of their families. ‘I use money from selling medicinal plant to buy grocery.’ This was concurred by other participants who said, ‘on our way from Mona market we used to stop by the supermarkets and grocery and other materials such as clothes, stationery that are liked by our families as a token of thanking them to take care of themselves when we are away to sell our medicine products.’

Other participants reported that they use money from selling medicinal plants to pay for their children school fees.

‘I pay for stationary for my children; I do not pay for school fees since my children are at a no pay fee school.’

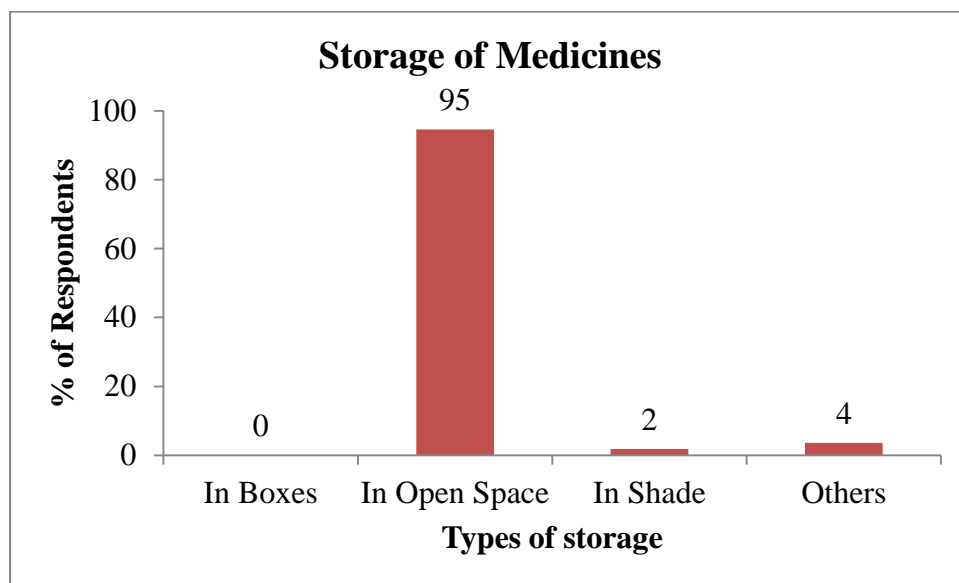
One of the participants said that she was able to pay for the university fees using the income she generated from selling the medicinal plants.

The following section reports on the information about the storage of medicinal plants.

### 5.3.3 Challenges related to storage of medicinal plants

This section further presents the results on challenges faced by the medicinal plant sellers with regard to storage. Packaging and preservation are also discussed under this section since they are part of the process of storage (enablers).

The types of storage practices used by the respondents are indicated in Figure 5.16.



**Figure 5.16: Storage of medicinal Plants, n=56**

The highest percentage of medicinal plant sellers (95%) stored their medicines in open spaces such as the top of their huts in the homesteads. They explained that open spaces allowed quick drying of medicines, thus decreasing the rate of rotting. Other sellers (4%) reported that they kept liquid medicines in bottles. Boxes were not used to keep the medicines. This differed from the western storage practices of medicines whereby they are kept in boxes so that they do not come in contact with direct sunlight and most of them are kept at temperatures below of 25<sup>0</sup>C to prevent the growth of microorganisms. In this case many the medicinal plants were stored at high

temperatures in open spaces; fewer respondents (2%) reported to store their medicines in the shade.

Storage of medicinal plants was also pointed out as a major challenge during focus group discussions. This is what the sellers said about the ways in which storage of medicinal plants affected their businesses.

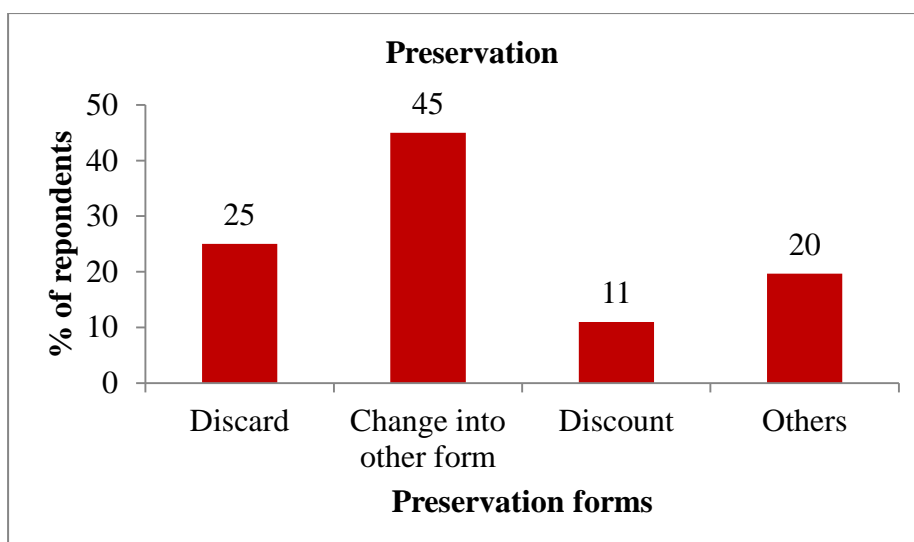
‘If there are some medicinal plant materials that are not bought, there is no safe place to keep the. In such cases we organise a security guard that we pay R10.00 per day.’

When the interviewees were asked on their involvement in such business in spite of the challenges they mentioned, they reported that they enjoyed being involved in the medicinal plant selling business, as it brought in income without having to stock the plant materials. However, they continued to cite the challenge of shelter as one barrier which frustrated their businesses. ‘During rainy days our plants become wet and turn into waste material, thus we lose customers and profit.’

The following section shows quantitative data based on how the medicinal plant sellers packaged and kept their medicinal plant material for future use.

#### *5.3.3.1 Preservation of medicinal plants*

Figure 5.17 and Figure 5.18 show the responses of medicinal plant sellers on how they preserved their medicinal plant products.



**Figure 5.17 : Preservation of medicinal plants if not bought per day, n=56**

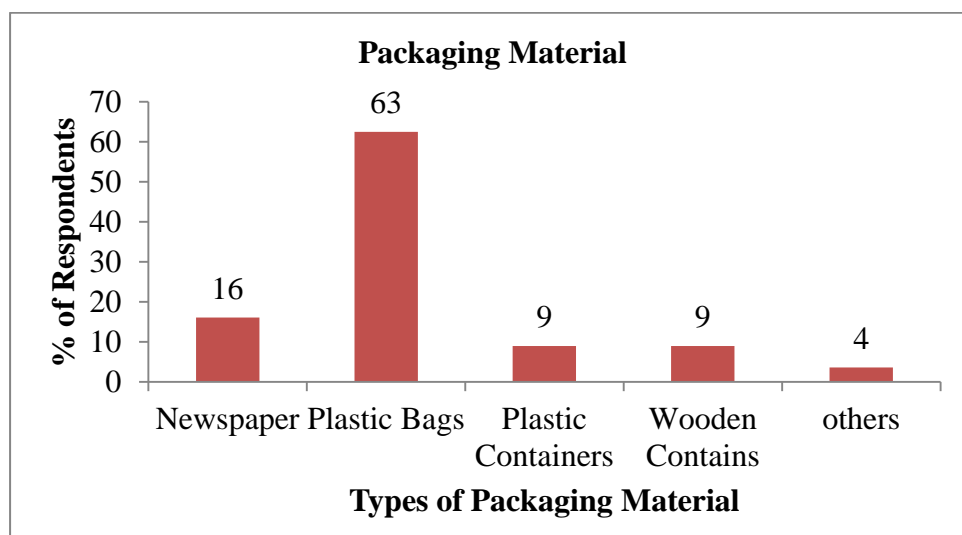
In this study, plant sellers explained that they discarded fresh material (25%) if not bought in time and kept the dried material in their selling station for future use. There were other methods (20%) employed by the medicinal plant sellers to preserve their medicines including putting the plants back in the soil, in the case of succulents.

Discovering that 45% of medicinal plant sellers do change their material into other forms rather than discarding them, was encouraging. Mainly, they did this by chopping the material and drying it in the sun. That was still a challenge since the drying process is weather dependent. In the absence of sunlight this process cannot be successful. Since medicinal plant sellers may discard the material, there was therefore a need for empowerment on how to preserve the herbal medicine if too much was harvested. This is one of the reasons that the current study also aimed at making the plant sellers' trade more viable by empowering them with preservation skills of medicinal plants. A project involving science educators to work with medicinal plant sellers on how temperature affects the medicinal plant material and devise alternative preservation methods would be essential.



### 5.3.3.2 Packaging of the medicinal plant material

Packaging can also affect the quality of the material. The section is on how the medicinal plant sellers packaged their medicines.



**Figure 5.18: Packaging of Medicinal Plants, n=56**

Most of the medicinal plant materials (63%) were kept in plastic bags (Figure 5.18). This indicates that medicinal plant sellers were using plastic bags for wrapping their material, whereas, in May 2003, South Africa introduced legislation intended to diminish the use of plastic bags with a view to decreasing plastic bag litter. This legislation combined standards and increased the price of plastic bags as an attempt to reduce the public's demand for them. This implies that the sellers use expensive material to cover the medicinal plant material, which is not a sustainable business practice if the material is kept in the expensive wrappers.

Plastic materials also produce moisture which may increase the contents' moisture thereby promoting spoilage of the contents. There is a need to correct this by engaging in discussions with the medicinal plant sellers to reflect on the way they pack their materials.

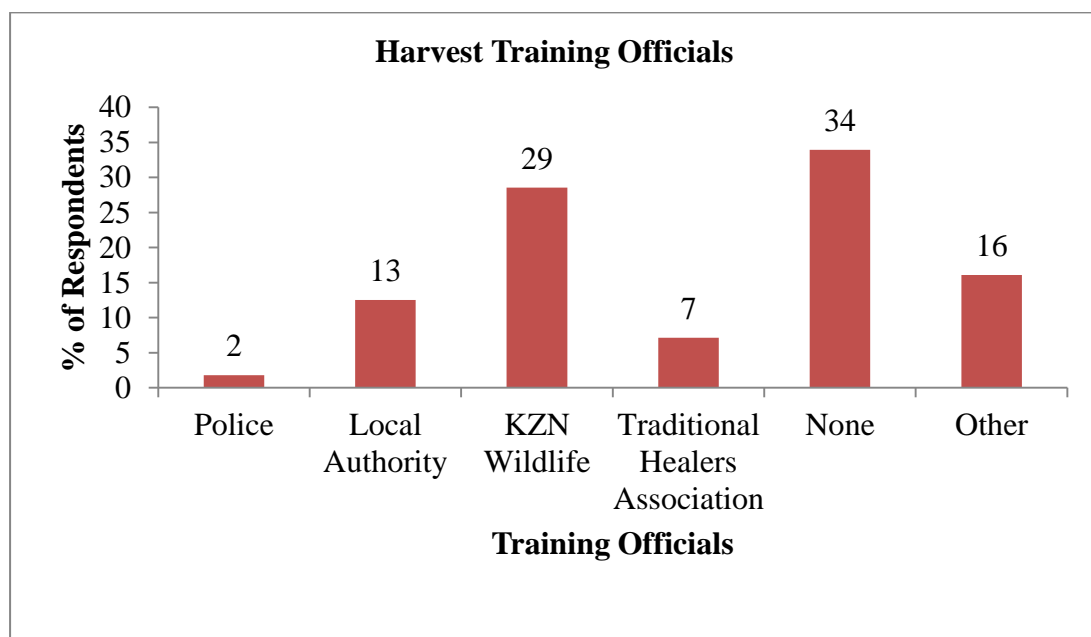
### 5.3.4 Challenges faced by medicinal plant sellers with regard to conservation

Conservation through education, by legislation, harvesting and cultivation are discussed under this section.

#### 5.3.4.1 Education on sustainable harvesting of medicinal plants

Education, including both formal and informal education, public awareness and training are all indispensable in changing people's attitudes, promoting sustainable development and improving the capacity of the people to address environmental and developmental issues (Convention on Biological Diversity, 1992). According to Cunningham (2001) indigenous people and communities can sustain natural resources, due to their historical relations with their land and nature. The researcher set out to find out whether there was training received by the medicinal plant sellers on conservation of the medicinal plants.

Figure 5.19 shows the sources of training received by the medicinal plant sellers on sustainable harvesting.



**Figure 5.19: Training of the medicinal plant sellers on sustainable harvesting of the medicinal plants, n=56**

Although 34% of medicinal plant sellers reported that they had not trained on conservation of medicinal plants (Figure 5.19), it was worth noting that government organisations, especially the (KZN) Wild Life (29%) offered training to the medicinal plant sellers. This was done when they were about to receive their certificates as a license to sell and harvest medicinal plant species. The respondents explained that training offered by the local authorities (13%), Traditional Healers Association (7%), and KZN Wildlife was based on harvesting of barks, such as collecting bark of plants on the east side and west side to prevent ring barking.

The respondents orally explained that they were trained on how to harvest roots and climbers. “When harvesting the roots we need to leave some roots and replace the soil where the roots were harvested”, said some participants. From this response, it appeared that the way the participants said they harvest the roots of medicinal plants, enables a process of roots regeneration

One participant said that ‘on cutting the climbers, I only cut the part that I need and leave the rest for re-growth.’

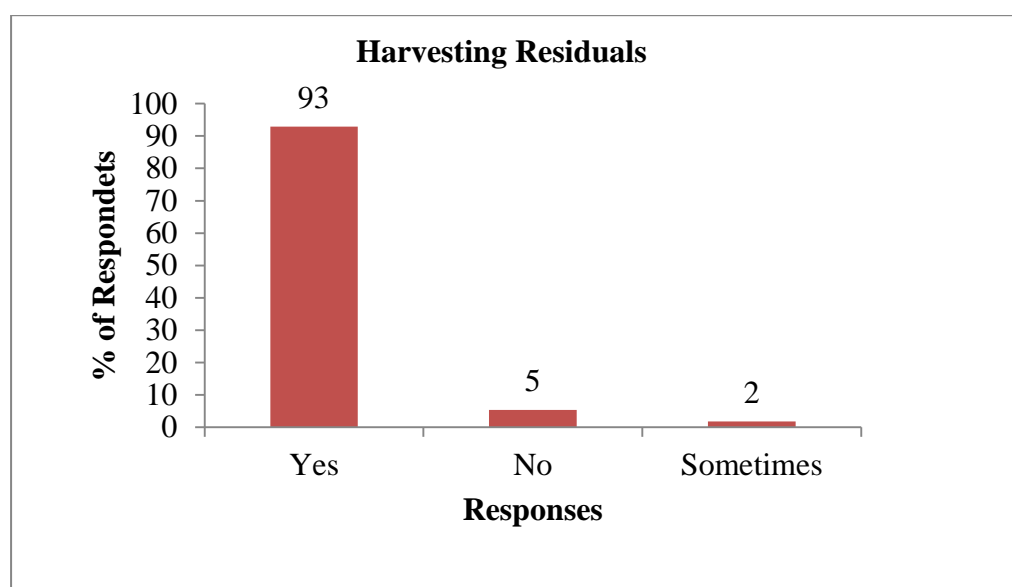
With regard to the reasons behind conservation, the respondents said the following

‘I want to have medicinal plants available in future.’ Although some said that they did so because they wanted to retain their certificates, others responded that “having not harvesting medicinal plants till they are depleted, would ensure the availability of the plants to sell, hence the smooth running of the medicinal plant selling businesses.’

In addition to officials who offered on medicinal plant conservation (Figure 5.19) 16% (represented by other) referred to training received from folks. The medicinal

plant sellers in this category reported education on sustainable harvesting was received from their grandparents and from their parents as well.

The following figure highlights the outcomes of training received from KZN government on sustainable harvesting methods of collecting the medicinal plants.



**Figure 5.20: Harvesting Residuals, n=56**

Although 5% of the respondents did not leave residuals after harvesting, ninety three percent of the sellers reported that they left material such as roots and stems after harvesting medicinal plants (Figure 5.20). As Malsow's theory of hierarchy of needs advocates, human beings are driven by a circle of motivation. It could be possible that some medicinal plant sellers were motivated by cash, and were not concerned that there should be a long term structured way of generating income so that the business survives for a long time.

If partnerships with other organisations assist in this matter, the sellers can change and learn from others. This study brought the participants in contact with some of the resource persons who could provide them with support on how to make their business

more profitable and sustainable. Certainly, with the constructivist theory, social interaction plays a fundamental role in the process of cognitive development (Vygotsky, 1978). Thus, creating opportunities for medicinal plant sellers to interact among themselves and with other resource persons as was done in this study, is one way to elicit change in favour of SD. Indeed, as Bandura (1989:21) points out...

“The constraints of time, resources, and mobility impose severe limits on the situations and activities that can be directly explored for the acquisition of new knowledge. Humans have evolved an advanced capacity for observational learning that enables them to expand their knowledge and skills on the basis of information conveyed by modeling influences.”

Much social learning occurs either deliberately or inadvertently by observing the actual behaviour of others and the consequences for them. To Piaget (Piaget, 1967) learning is essentially an active process in which the learner constructs his or her knowledge through interaction with the environment and the resolution of the cognitive conflict which may occur between expectations and observations.

#### 5.3.4.2 *Challenges with regard to conservation through medicinal plant legislation*

The medicinal plant sellers confirmed that they were prohibited by law from harvesting certain species of the medicinal plants. They were also aware of the plants that were restricted for collection. These included *Scilla natalensis*, *Dioscorea sylvatica*, *Warburgia salutaris*, *Ocotea bullata*, *Stangeria eriopus*, *Dioscorea dregeana*, *Ledebouria cooperi*, *Bowei volubilis*, *Eucomis autumnalis*, *Cassine transvaalensis*, *Dianthus zeyher*, *Encephalitis species* and *Sclerochyna bere*.

Appendix 7 lists the medicinal plant taxa that were mentioned by the medicinal plant sellers as protected by law from harvesting.

When the medicinal plant sellers were asked if they saw their businesses running for the next decade, given the depletion rate of the species from the wild, they explained that they were uncertain. They conceded that they were already experiencing regional shortages of some medicinal plants, and explained that they were aware of some laws that restricted the harvesting of some plants. However, the problem was that the plants mentioned were the ones in high demand. As a result of high demand from their customers, the medicinal plant sellers had developed some means of collecting the medicinal plants from protected areas illegally. The methods that they used are tabulated in Table 5.3.

**Table 5.3: Ways of getting the restricted species, n=56**

<b>District</b>	<b>Ways of illegal collection</b>	<b>Respondent number</b>
3	When you are in possession of illegal species put legal material at the bottom of the sac and put the illegal material in the middle and cover with legal material at the top	7
3	Bribe the police	12
3	Buy from others who can still access the medicinal plants	52
3	Steal by hiding under the clothes	29

The participants were very reluctant to disclose information about this question. They were concerned that legal actions could be taken against them. The researcher

promised the participants that anonymity and non-disclosure and privacy would be strictly adhered to; and also promised that by revealing the places where restricted medicinal plants were harvested illegally this would protect the medicinal plants from being harvested.

In cross-validating this information, one of the game reserve officer confirmed during the key informant interviews (Appendix 8) that there was illegal harvesting of the medicinal plants.

Triangulations of methods were employed in the study in order to gain insight about other responses that emanated from market interviewers. Holding key informant interviews was another way of obtaining qualitative data from the respondents. Responses from the participating medicinal plant sellers concerning illegal harvesting were cross-validated with information collected from 'key informants'. The first interview with the key informants took place at Hluhluwe Game Reserve. When the respondent was asked whether there was illegal harvesting of the medicinal plants front the reserve, the interviewee answered as follows:

‘Presently there is no illegal harvesting. It happened during 1990 before the game reserve was fenced. Medicinal plant sellers used to come and steal *Encephalitors species*. Due to security and wiring of the reserve there are no more cases of illegal harvesting reported.’

The second interview was conducted at Mkuze game reserve.

The second informant mentioned that they experienced illegally removal of bark from the plants in the game reserve. He explained that there was a side of the reserve that was not fenced.

‘The Mkuze river runs on the other side of the game reserve, we did not wire that side because of the river flow. However, the medicinal plant sellers cross the river, irrespective of crocodiles and hippos to harvest the plants in the reserve’ reported the reserve officer.’

The third interview was conducted at Abumadi game reserve, also at Mkuze. The officers in the game reserve reported that there were no cases of illegal harvesting since the whole area got fenced off.

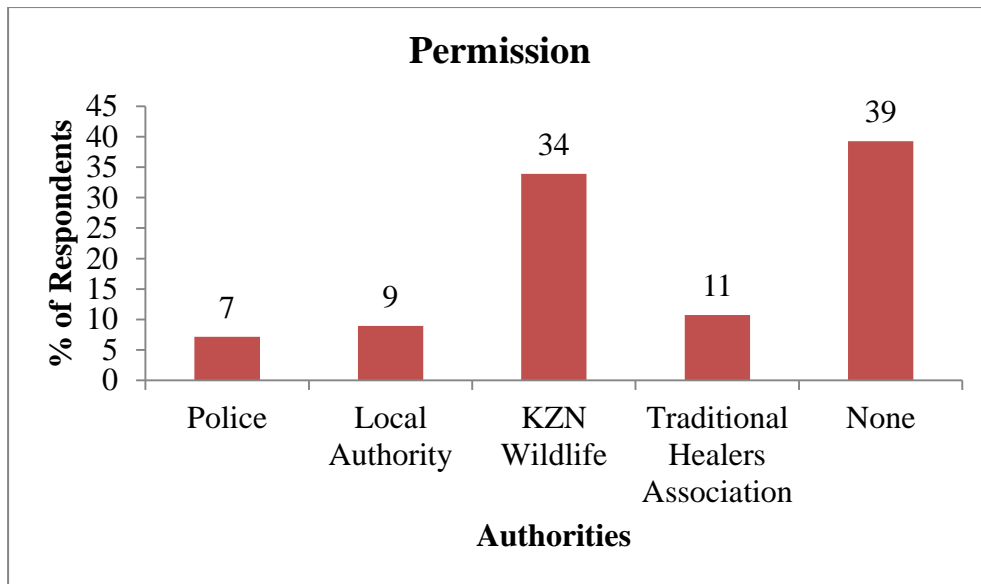
It transpired from the interviews that there were some instances whereby the medicinal plant sellers faced the threat of depleting the medicinal plant species from their localities. If the medicinal plants were not protected in game reserves they would all have been harvested. This threat could possibly be alleviated if the medicinal plant sellers were encouraged to cultivate these medicinal plant species in their home yards. Therefore, there is a need to encourage and teach them to cultivate these medicinal plants. This calls for an empowerment programme through information sharing. In this study information sharing took the form of a workshop.

The government has put in place some mechanisms to protect the plants from both illegal and over-harvesting. That is done by registering the medicinal plant sellers in a database where they are given permits by the government which stipulate the quantities of the plant material that one seller can harvest from the field per year.

The medicinal plant sellers reported that they received information about the medicinal plant conservation during the time when certificates were issued.

The following figure displays the access permit authorities to which the medicinal plant sellers applied for permission to harvest medicinal plant species.

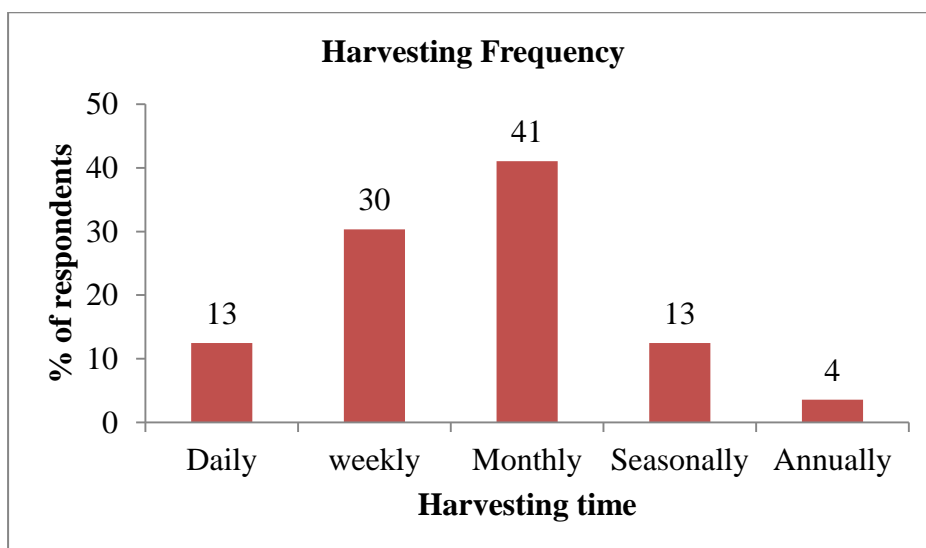




**Figure 5.21: Permission sources of the medicinal plant sellers to harvest and sell the medicinal plant material, n=56**

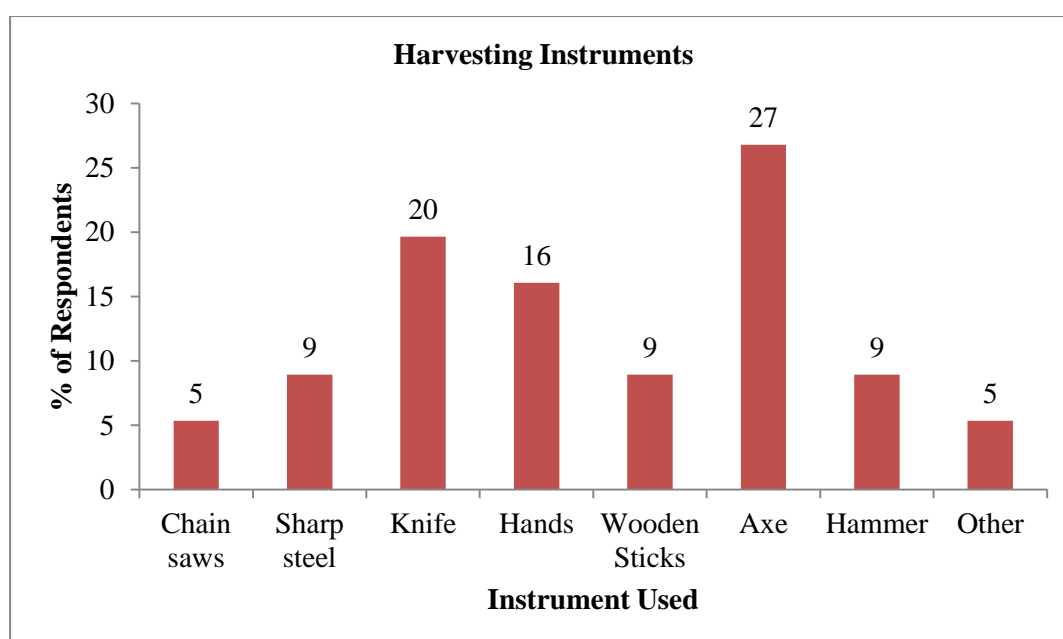
#### 5.3.4.3 Challenges related to harvesting of medicinal plants

One of the reasons stated by medicinal plant sellers, for not cultivating the medicinal plants was that the medicinal plants took too long to mature, meaning that the readiness of the plants would take too long. The graph below shows the frequency of harvesting by the medicinal plant sellers.



**Figure 5.22: Frequency of harvesting medicinal plants by the medicinal plant sellers, n=56**

Due to the high demand for medicinal plants it was found that some medicinal plant sellers harvested the medicinal plants weekly (30%) and monthly (41%). This high frequency of harvesting could have a devastating effect on the environment, especially given that these plants are harvested from the wild. The way in which they are collected may also have a negative effect on the plants, especially since they are harvested frequently. They may not get enough time to regenerate. Figure 5.23 shows the instruments that are used by the medicinal plant sellers to harvest the plants.



**Figure 5.23: Harvesting instruments used by the medicinal plant sellers to harvest the medicinal plant species, n=56**

The harvesting instruments by which the medicinal plant taxa were harvested are given in Figure 5.23. A sizeable number of the respondents (27%) used an axe as a harvesting instrument, followed by knife (20%). The medicinal plant sellers explained that an axe was a tool used to collect barks. Although some medicinal plant sellers (16%), harvested medicinal plants using their hands, instruments such as knives (20%), hammers (9%) and chain saws (5%), were also used to harvest the medicinal

plants, yet these instruments did not promote plant regeneration. In some instances these tools can enable the plants sellers to gather all the plant parts without leaving seedlings to regenerate. This is because plant sellers collect the plant species in bulk for selling purposes and their concern is to get profit to meet their immediate financial needs.

This is an unsustainable way of collecting the medicinal plants and is opposed to the indigenous methods such as using hands, wooden material and following environmental user friendly rituals of collecting the plants, particularly for healing purposes. Some of the participants mentioned that they did not harvest the medicinal plants from the wild but only bought from other people (the gatherers). Other interviewees explained that they performed both the role of gathering and selling. The market chain, which explains the stakeholders involved in the selling of medicinal plants is represented in Figure 3.3, in Chapter 3.

Traditionally, there were medicinal plants that were regarded as annual plants (EEASA Monography No. 3, 1999). When traditional healers collected annual plants, they had to leave some species of the medicinal plants at the collection site. It was believed that if the species were completely destroyed in a particular area, then the patient, to whom the medicine from the species was administered, would die. By leaving behind living parts of the collected species, localised rare species were protected from extinction. Wooden sticks and hand picking would ensure that the plants were sustainably harvested by leaving behind some seedlings. That is why awareness of sustainable plant harvesting is important.

In addition to training on sustainable harvesting, the medicinal plant sellers stated that they used some indigenous ways of harvesting the plants. These ways incorporated taboos which they performed when harvesting certain species. Table 5.4 shows the rituals performed by some of the medicinal plant sellers when collecting the medicinal plant species. The information contained in table 5.4 was recorded from the responses after following up with interviews.

**Table 5.4: Rituals performed when collecting the medicinal plants, n=56**

<b>District municipality</b>	<b>Ritual</b>	<b>Respondent number</b>
3	You put some silver coins after removal as a way to appreciate the plant	20
3	Pray to ancestors to be with us in the forest before we start harvesting	47
2	Ask the bush to give permission to harvest the plant	48

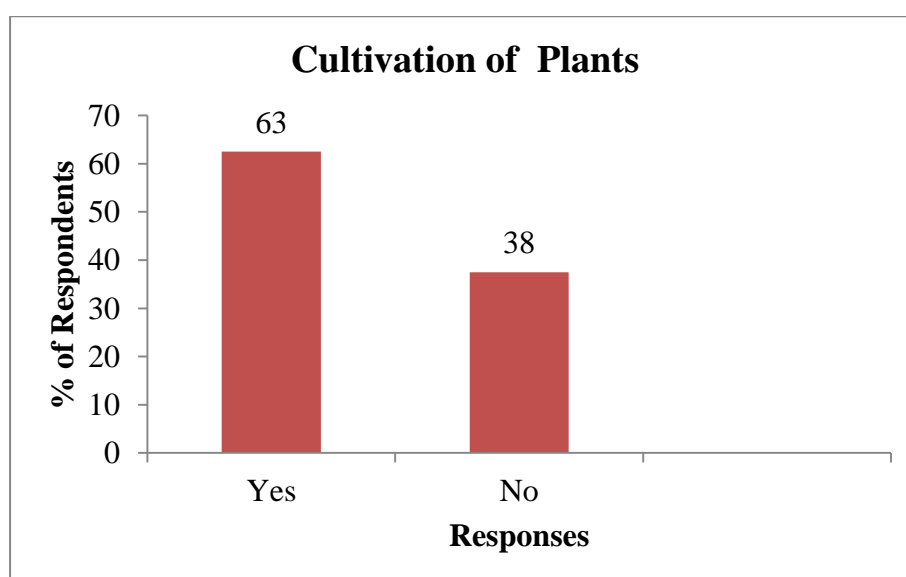
One of the methods of medicinal plant species conservation is by using indigenous rituals. As some of these methods are reviewed in chapter three, they include collecting of barks around tree trunk in a way to decrease ring barking, roots were harvested sustainably to avoid uprooting outlined.

Medicinal plants were harvested once of by the traditional healers following the belief that if the same plant would be collected by another healer, the patient to administer the medicine would also die. That ensured sustainability of the medicinal plants and also of the environment. However, for this study, there were few instances when the medicinal plants sellers reported that they performed rituals when collecting medicinal plants from the field. These rituals are different from what is outlined by Cunningham (1993).

Table 5.4 highlights the rituals performed when collecting medicinal plants, which do not really amount to conservation. These rituals were not seen to have served the plants from over-harvesting. They are just the beliefs which are associated the part of the medicinal plant sellers when collecting the plants. If rituals were performed for the sake of plant conservation, one would expect some restrictions of plants to be harvested at certain periods of time and certain gender or ethnic group of people.

Schippmann *et al.*, (2002) pointed out that commercial harvesting and habitat destruction, often by the poorer members of the communities are the major causes of the medicinal plants depletion in the environment. This in turn threatens the livelihoods and health care system in developing countries (Maundu, Kariuki & Eyog-Matig, 2004). As a result, cultivation of medicinal plants has been suggested as a means to recover medicinal plants depleted from the natural habitats (Cunningham, 1993).

The following figure displays medicinal plants cultivation methods followed by respondents.



**Figure 5.24: Cultivation of the medicinal plants by the respondents, n=56**

Economic returns are also a major problem, which could be one of the reasons that 63% of the medicinal plant sellers cultivated their own medicinal plants. Although 38% of the respondents did not cultivate medicinal plants in their home yards due to the reasons mentioned in Table 5.5, however, it was interesting to note that the majority of the medicinal plant sellers had medicinal plant home gardens.

**Table 5.5: Problems associated with cultivation, n=56**

<b>Nature of a problem</b>	<b>% sellers</b>
Poor soil quality	12
Slow growing	31
Water and irrigation problems	17
No time to manage the plants	14
Sometimes the plants become weedy e.g <i>Calamus</i> spp.	2
Lack of seedlings	6
No land access	4
Stealing of plants by strangers	2
Poor healing power	12

One of the concerns the respondents had expressed concern about water requirements of the plants. Non-availability of water was a major problem that also affected conservation of the medicinal plants through cultivation. One medicinal plant seller from the group explained that it was hard to get water, for their plants and they could not cultivate their plants on river banks and dams for fear of the plants getting stolen.

The medicinal plant sellers reported that sometimes they had to buy water to irrigate the medicinal plants. This factor alone increased the cost of managing the plants, thus negatively impacting the revenue generated from selling the medicinal plants. One other matter to bear in mind is that medicinal plant sellers are street vendors, that is,

they leave their homes in order to sell the medicinal plants in the streets for a long time. This means someone else has to attend to the plants while they are away; they have little or no time to take care of the cultivated plants. Some of the sellers (2%) reported that sometimes their plants were stolen from their homesteads, while they were away selling their plants in towns.

According to Table 5.5, many medicinal plant sellers (31%) reported slow growing rates as one of the problems associated with medicinal plant cultivation. The slow growing rates of some of the medicinal plants served as a major constraint against cultivation since they would not have anything to sell while waiting for the cultivated plants to grow. The concern that some medicinal plant species are slow growers, and that some take between three to eight years to mature, is supported by Lewu *et al.*, (2006).

One of the challenges in cultivation is the attitude associated with the healing power of the medicinal plants. One explanation is found that cultivated plants are considered inferior to wild-gathered specimens. This is because there is a belief that ancestors play a major role in giving wisdom to traditional healers with regard to choosing the correct plant.

Scientific studies partly support this issue of the ineffectiveness of cultivated medicinal plant, as compared to the wild-collected medicinal plant species in healing diseases. Medicinal plant properties are mainly due to the presence of secondary metabolites which the plants need in their natural environments under conditions of stress and competition, which perhaps, would not be expressed under mono-culture

conditions (Schippmann *et al.*, 2002). Active ingredient levels are much lower in fast growing cultivated medicinal plants, whereas wild populations can be older due to the slow growing rates and have higher levels of active ingredients.

Cunningham (1990) supports this view in the inventory of medicinal plants in Africa, where it was found that traditional healers in Botswana reported that cultivated material was unacceptable, as cultivated it did not have the same efficacy as material collected from the wild. However, the activity of plants can be enhanced under controlled conditions (Schippmann *et al.*, 2002; Karki *et al.*, 2003), whereby the medicinal plant activity is stimulated by subjecting the plants to stress thereby making them convert their active metabolites into steroids (Schippmann *et al.*, 2002). So, it may be said that, ecological factors such as slow germination and growth rates, poor quality of soil to support plant growth and a need of labour to weed and irrigate the plant species were found in this study to be the major constraints to medicinal plant sellers in cultivating the medicinal plant species in this study.

However, in spite of the challenges associated with medicinal plant cultivation, medicinal plant sellers need to be encouraged to grow medicinal plants in their home yards (Semenya, Potgieter & Erasmus, 2013). This saves medicinal plant sellers' money for transporting the plants and a lot of physical effort when the plants have to be harvested from the wild.

When medicinal plant sellers were asked about the issues that are associated with medicinal plant cultivation during the focus group discussions, they reported that some of them had started medicinal plant gardens. They also reported that they



exchanged their plants for groceries, clothes and children's toys to a white man, who used the plants as seedlings for propagation. However, that was a challenge on its own.

‘It takes time for the white man with whom we barter medicinal plant seedlings to come and buy our seedlings. However, when he comes we get these toys for our children and groceries for our families.’

From the discussions, it was clear that the medicinal plant sellers had common problems irrespective of the areas of origin. Storage of the medicinal plants was cited as the main challenge the medicinal plants faced in their medicinal plant selling business, yet storage affects the marketing of the plants and thus the profit gained from selling the medicinal plant products.

Water, hygiene and security were also cited as some of the challenges faced by the medicinal plant sellers. When the medicinal plant sellers were asked about what motivated them to continue in this business, in spite of the challenges, the participants explained that they had adapted to these conditions and they were motivated by the profit they gained through selling the medicinal plants. Some of the participants said that they used the money they got from medicinal plant selling to pay tertiary education fees for their children.

Finally, medicinal plant sellers were asked to propose solutions that they thought could assist in alleviating some of the problems, and this is what they said:

‘We need tanks as water reservoirs; we also need proper infrastructure to be our market place.’

Another respondent commented on the importance of training

‘The training we receive is making a difference since we now know that it is wrong to harvest all the barks around the tree. Although we are not happy about the costs of the certificates, we know that certification decreases illegal harvesting.’

From these responses it became clear that the medicinal plant selling business sustained the lives of the communities. The government is also doing something to address some of the challenges in the medicinal plant selling business, such as capacity building on conservation of the medicinal plants. However, the government alone cannot overcome this challenge.

Thus, to answer the first research questions concerning the challenges faced by the medicinal plant sellers with regard to storage, marketing and conservation of the medicinal plant species, it emerged that it was not only the conservation and marketing that were the major challenges, other issues that affected the medicinal plant business included environmental factors such as crime, sanitation and non-availability of water. This calls for collaboration among other organisations, including public and private partnerships working together with the medicinal plant sellers in addressing the challenges mentioned above.

#### **5.4 SUMMARY OF THE RESEARCH FINDINGS FOR RESEARCH QUESTIONS NUMBER ONE AND TWO**

With regard to research question number one, the information presented hereto ought to find answers on the challenges of storages, marketing and conservation of the medicinal plant sellers, and also to find whether there were knowledge gaps with

regard to sustainability and environmental management of medicinal plants by the medicinal plant sellers.

Triangulations of methods were employed in the study in order to gain insight about other responses that emanated from market interviewers. Having done interviews based on a semi-structured questionnaire, the researcher gathered additional information by using the field participant interviews. Field observations were done in order to gain a practical view on how the medicinal plants were grown and harvested.

The researcher and assistants moved around the homesteads with the permission and assistance of the medicinal plant sellers. The cultivated plants were observed and the pictures of the plant species were taken. The results of these interviews are discussed under the following section.

Photographs of the medicinal plant species and the estimate of the co-ordinates where the species were found are included in Appendix 9. *Warbugia salutaris* was one of the species of interest since it is reported by both the medicinal plant sellers and the literature as facing extinction. The plant species was found in northern KwaZulu-Natal. One reason for its threatened existence could be the site where it was found, which was nearby a homestead, not in the wild. This means site conservation could be one of the strategies to conserve the medicinal plants.

In the light of the information obtained from the medicinal plant sellers, there were challenges with marketing which included advertising of medicinal plant products, price determination and keeping of sales and expenditure records. The study revealed

that the products that were sold by the medicinal plant sellers were rarely advertised in print or visual media. This study showed that advertisement of medicinal plants was through references by customers to the medicinal plant sellers.

In terms of pricing, literature revealed that in some areas the prices charged for medicinal plants was determined by government or different associations of traditional healers.

This ESD study showed that the system of determining price units charged for the medicinal plants was determined by market leaders where medicinal plant sellers had shops. Neither banking nor record keeping of income versus expenditure was found to be commonly practice among the medicinal plant sellers in this study.

With regard to storage, this study revealed that the medicinal plant sellers dried up their medicinal plants in the sun as a way of keeping them for longer periods of time.

With regard to conservation, unsustainable harvesting was evident in some areas, while cultivation posed a challenge as medicinal plant conservation strategy. The results also showed that the medicinal plant sellers were keen to receive certificates of medicinal plant harvesting, which allowed them permission to harvest the medicinal plants in approved quantities.

To address the above challenges, the study devised a programme, **to address research question number 2** in order to engage with the medicinal plant sellers in

order to address the challenges they faced in their businesses so that the medicinal plant sellers' business skills and their livelihoods could be enhanced.

## **5.5 EFFECT OF THE INTERVENTION PROGRAMME**

The third research question was addressed by way of action research aimed at aligning itself with the government policy that states that any research conducted must benefit the community as well. Thus, the results in this section report on the 25 medicinal plant sellers who attended the workshop. As stated in chapter 4, a sample of 56 medicinal plant sellers participated in the study. However, out of the 56, 25 medicinal plant sellers volunteered to take part in the workshop.

Briefly, the main aim of the workshop was to present information on the identified challenges that affected the medicinal plant selling business, in an attempt to finding possible solutions. The workshop also aimed at bringing awareness to the medicinal plant sellers about the ways of sustaining medicinal plant species and also medicinal plant selling businesses. The facilitation of this workshop followed key aspects of the principles of non-formal education. One of these principles was recognition that adult learners possess invaluable knowledge, skills and experiences which must be taken into consideration in all adult education programmes. In this regard session one was set aside for the researcher and other facilitators from knowledge and experiences of the participating medicinal plant sellers.

### **Session one**

Session number one was done through presentation by medicinal plant sellers from different areas. Although the workshop was planned to address various aspects of the medicinal plant selling business that emerged from the data gathered from the

research questionnaire and focus group discussions, it was felt that there should be a slot whereby the medicinal plant sellers would present their views together and try to come out with possible solutions to the problems that they faced in their businesses. Also it helped the facilitators to get first hand presentations from the medicinal plant sellers themselves. The main issues that emerged from the medicinal sellers' presentations were (a) conservation through cultivation and (b) business management.



**Picture 1: Demonstration of medicinal plant conservation techniques**

It was learned from the medicinal plant sellers that they had started medicinal home gardens where they cultivated the medicinal plants on a small scale.

### **Challenge**

One challenge cited by the medicinal plant sellers with regard to these gardens related to the scarcity of water for irrigating the medicinal plants. The medicinal plant sellers mentioned that they did not have water to irrigate their plants to the extent that they had to buy water by hiring tractors to fetch water from streams far

from their homes. The medicinal plant sellers, therefore, requested funding to buy water tanks so that they could store water at their homesteads.

### **Possible solution**

Information based on water retention by plants can be enhanced by putting a plant in a plastic bag with old dead leaf compost saves water than using sand and newly formed compost since a plastic bag retains moisture content than plant pots. It was also suggested that the plant sellers could use man-made water collecting devices to collect water during rainfall so that they have rain water that can last longer.

Other issues mentioned were the shortage of materials, such as plant pots and plastics, to use in cultivating the medicinal plants. Collecting compost manure to support the medicinal plants was found to be one of the major challenges.

The researcher demonstrated to the medicinal plant sellers that they could re-use water bottles, old pots and containers to cultivate their materials. The containers could bear openings at the bottom to drain water.



**Picture 2: Re-used containers to cultivate medicinal plants**

The medicinal plant sellers were encouraged to continue having medicinal plant gardens in their home yards to avoid dangers and the excessive physical effort of collecting the medicinal plants in the field. They were also encouraged to have vegetable gardens so that they could use the dead leaves, e.g. maize leaves, as compost manure for the medicinal plants. Furthermore, having medicinal plant gardens could also serve as an alternate source of income since vegetables could also be sold while the sellers were waiting for the medicinal plants to mature.

A second major challenge was that medicinal plants took too long to get ready for selling. The medicinal plant sellers explained that in order to gain profit from selling the medicinal plant species, they had to sell them at least monthly. However, some of the species took about three months to six years (tree species such *Prunus africana*) to grow.

## **Solution**

It was discussed that although the growth rates of some of the medicinal plant species were slow, it was also the case that medicinal plants generally needed less care, as compared to other plants such as garden flowers. Weeding was minimally needed as the plants grew in spite of weeds. As far as watering was concerned medicinal plants had an ability to retain water once they established themselves. It was interesting to note from the garden in the game reserve that some medicinal plants did not wilt during dry sessions. “Although some plant species wilt, they re-appear when the rain season commenced”, explained the nature reserve manager. That, in itself, was a strong reason enough for having a garden of medicinal plants, instead of just gardens for other flowers.



## **Session two**

It was discovered during the workshop that some of the medicinal plant sellers were unable to take notes during presentations as they were illiterate. That is one of the major problems that is faced in the medicinal plant selling business, particularly when one considers that the medicinal plant sellers need to make cash balance sheets and record their profits. However, it was discovered that although some of the medicinal plant sellers could not write down their profits, they were, nevertheless, able to count. Counting was found to be a skill that could be enhanced through ESD on the part of the medicinal plant sellers in order to promote sustainability of the indigenous plants and improve their livelihoods.

The medicinal plant sellers were introduced to how to record cash flows and bank their money. They were given record books to record their money using the bank deposit slips that reflected the banked amounts.

The second session was facilitated by presenters from natural science as well as economic and management sciences. The main focus of the presentations was on the business approaches followed by street vendors, particularly vegetable sellers. The medicinal plant sellers were shown how to keep their stock while selling their products. For instance, the issue of converting the unsold perishable medicinal plant products was emphasised. It was recommended that the medicinal plant sellers chop the material into dried mixtures if not bought, rather than discarding the medicinal plant materials.

The medicinal plant sellers were discouraged from using plastic bags for wrapping the medicinal plant materials as plastics materials promote fungi and rotting of the medicinal plants. The facilitators encouraged the medicinal plant sellers to re-use bottles for storing their medicinal materials.

Although the medicinal plant sellers confirmed that they were putting their materials in the work places, instead of packing them back home if not bought on the day, the facilitators emphasised that the sellers should harvest the medicinal plant species according to the demand by the medicinal plant consumers instead of having large stock of materials that needed to be stored. The facilitators encouraged the medicinal plant sellers to observe the business viable period patterns so that they avoided stocking more materials than what their consumers needed.

Recording of sales was discussed in the workshop. The facilitators came out with an approach that the medicinal plant sellers could use to record their income and expenditure even if they were unable to read and write. It was suggested to the medicinal plant sellers that their records could be done weekly or at least monthly whereby the sellers could bank their cash and paste their slips in the record books. That would show the selling trends so that the medicinal plant sellers had an idea of the viable periods of the year or month for their businesses.

The facilitators also helped in giving business tips to the plant traders. The results of this study showed that the plant sellers harvested medicinal plants in bulk but sold the plants at the lowest price, for example, R10 for a big plant sample or mixture. The pictures of medicinal plant samples were taken as shown in the following figure.



**Picture 3: Bulk medicinal plant material sold by medicinal plant sellers**

The sellers were made aware on how to calculate the unit prices of their medicinal plants. The facilitators presented the issue of considering labour, transportation, time spent and marketing of the products, as contributing towards pricing their commodities.

Time constraint limited the presentation on weighing of the medicinal plants using weighing balances. It was felt that presenting science skills to medicinal plant sellers would give information on medicinal plant dosages for medicines but that would require medicinal plant sellers to read weighing balance which was limited by the problem of illiteracy. The limited number of the scale balances also hindered a demonstration based of measurements of medicinal plant quantities. However, the presenters emphasised that the sellers should use a standard weighing container, for instance, a 500g of empty jam containers for the same species or mixtures, and other containers for other medicinal plant materials. The presenters also explained to the medicinal plant sellers about the importance of revisiting their selling prices as the experts felt each medicinal plant species and mixture had different values and qualities that did not have to cost the same.

### Session three

It had been decided that the workshop should be conducted in an area where the majority of the medicinal plant sellers lived and where there were conservation activities of the medicinal plants taking place. The majority of the research participants came from Mbazwana and Manguzi areas. The workshop took place at Abumadi Nature Reserve at Mkuze which is about 80 km from Mbazwana and 120 km from Manguzi. Abumadi owners explained that they were fascinated by the medicinal plant gardens since the medicinal plants did not require extensive garden management as other garden flowers such as *Eucledia species*.

The owners of the nature reserve held a session in which they presented the ways in which medicinal plants were conserved. They showed the medicinal plant sellers around their gardens where the plants were grown. The participants moved around the yards, observing and seeing demonstrations on how the medicinal plants could be conserved through cultivation, in the picture below:



**Picture 4: Presentation on how medicinal plants such as *Ansellia africana* (an epiphyte) are cultivated**

There were different medicinal plant species in the reserve that the medicinal plant sellers confirmed were difficult to find in the field, and some of the species were no longer available in the areas where the medicinal plant sellers previously used to harvest them.

The following pictures show some of the plant species that were found in the nature reserve and their conservation status from the RED DATA LIST.



*Alepedea amatymbica*-Threatened



*Scilla natalensis*-Vulnerable



*Dioscorea sylvatica*- Rare



*Ansellia africana*-Vulnerable

**Picture 5: Different species of the medicinal plants that are conserved in the reserve**

The medicinal plant sellers explained that they were troubled to see that the medicinal plant species were on high demand by their customers, but they were no longer able to provide with the species. The medicinal plant sellers moved around the yard and observed how various medicinal plant species were cultivated.



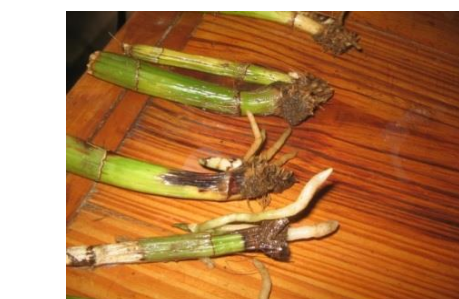
Session three was concluded by giving the medicinal plant seedlings to the medicinal plant sellers to plant them at their home gardens.

#### **Session4: Presentation of medicinal plant propagation and cultivation**

This session was based on how to propagate some of the above mentioned medicinal plants using cuttings. The main aim of performing these experiments was to replicate seedlings to supply to medicinal plant sellers. The method of vegetative propagation and the appearances of the plants after propagation were demonstrated to the medicinal plant sellers. Although not all the medicinal plant species were propagated due to time limit, the species such as *Ansellia africana*, *Haworthia limofolia*, *Boweia volubilis* and *Stapellia gigantea*.

##### ***Ansellia africana***

The following pictures show appearance of the plants in the river sand after a period of 21 days.



**Picture 6a, 6b, 6c and 6d: *Ansellia africana* cuttings with roots and shooting appearance.**

Medicinal plant sellers reported that they propagated the plant species by attaching it to tree and holding it with cow. That plant species was propagated in same way at the game reserve.

When sharing the information on vegetative production of *Ansellia africana* by the researcher, both the game reserve manager and medicinal plant sellers wanted to attempt the methods of the plant species propagation in sand. The workshop participants confirmed that they did not know that *Ansellia africana* could be propagated through cuttings and using sand as a growth medium. The second demonstration by the researcher was on vegetative propagation of *Haworthia limifolia*.

### ***Haworthia limifolia***

It was interesting to find that the top cuttings developed roots (Figure 8a), after seven days after the start of propagation period. The bottom cuttings at the bottom stimulated the growth of shoots. After a period of 30 days the plants appeared as shown in the following pictures.



**Picture 7(a): Root formation of *Harworthia limifolia***



**Picture 7b: Shoot and inflorescence formation of *Haworthia limifolia***

The medicinal plant sellers reported that they have not thought of propagating *Haworthia limifolia* through cuttings. They said they cultivate the whole branch of the species and put it on the top of the hut and on kraal in their homestead. The researcher explained that it is possible to multiply the plant species through cuttings. The participants were told that the decisions of propagating the species without the growth stimulants and expose the other set of the experiments to the sun was done in order to get a cost free propagation methods. The methods of propagating the medicinal plants in that way could easily be done by medicinal plant sellers in their homes.

Medicinal plant sellers expressed their interest to the results and methods demonstrated by the researcher and requested that they wanted to have presentations of plant propagation before they took a tea a short tea break. An initial planning in Table 4.1 was to break a three- hour presentation into two slots to cater for the understanding and concentration of the workshop percipients towards presentation. The workshop insisted that they wanted to get more and confirmed that they were



enthusiastic to get the propagation techniques of medicinal plants that were demonstrated by the researcher.

The researcher carried on with the presentation of the third medicinal plant species that was propagated vegetatively- *Staphelia gigantea*.

### ***Staphelia gigantea***

The following pictures shows the appearance of *Staphelia gigantea* that was propagated in order to (a) have seedlings to dispatch to the medicinal plant sellers and to (b) share with medicinal plant sellers methods of propagating this species of medicinal plant.



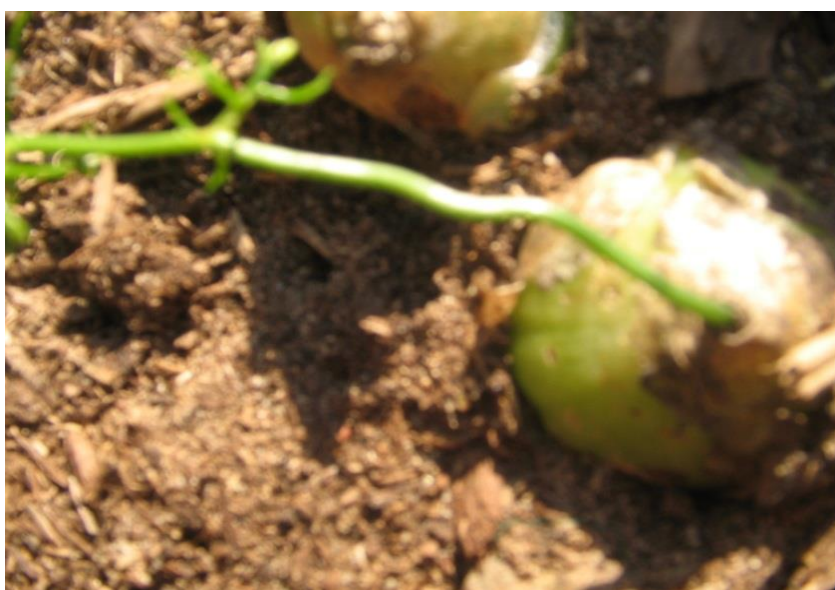
**Picture 8a: Shoot bearing of *Staphelia gigantea* propagated outside the nursery**



**Picture 8b: Matured *Staphelia gigantea* after propagation**

The medicinal plant sellers reported that they grew the medicinal plant species in old three- legged pots therefore the plants continued replicating themselves. They said that they did not know that one plant could be cut to produce more seedlings. The medicinal plant sellers promised to try the method using the seedlings they received from the workshop.

Results of vegetative propagation of *Boweia volubilis* were demonstrated to the medicinal plant sellers.



**Picture 9(a): Shoot formation of *Boweia volubilis***



**Picture 9(b): Matured *Boweia volubilis*, with inflorescence propagated in the open space of the nursery**

The workshop attendees were shown how to propagate the medicinal species that were propagated by the researcher. It was explained to the workshop attendees that the success rate of propagating the species in river sand is about 100%. It was interesting to note that the medicinal plant sellers were inspired about the success of the experiments. They paid attention to the presentation and were willing to attempt the methods on their own to establish their home gardens. Session four of a workshop presentation was concluded by giving the medicinal plant seedlings that were propagated by the researcher to the medicinal plant sellers.

Medicinal Plant sellers were given a booklet on the medicinal plant propagation that was compiled by the researcher. The booklet contained the detailed method of medicinal plant vegetative propagation done in this research project and it also includes sexual reproduction of medicinal plants done by authors cited in the booklet

(Appendix 10). The booklet is written in both isiZulu (10B) and English (10A), for easy reference by the workshop participants.

### **Highlights of the workshop events**

The medicinal plant sellers were given sacks and stationery. Sacks were given to the sellers with the purpose of packing their medicines collected from the field. The sizes of the bags were smaller than the sacks that they normally used. The stationery was given to the medicinal plant sellers in an attempt to promote record keeping and completion of balance sheets showing the profits gained from selling the medicinal plants.

### **Way forward**

The medicinal plant sellers explained that they saw a further need of having the medicinal plant gardens at their homes. They promised to start growing the seedlings that were given to them by the researcher and the nature conservationists. They requested that the project may assist them with water tanks since they had water irrigation problems. However, it was explained to them that the project had limited funding since it was for study purposes.

The presenters from the game reserve were given presents to thank them for their contribution during the workshop.





**Picture 10: Thanks giving to the research participants**

## **5.6 SUMMARY OF THE WORKSHOP RESULTS**

In the workshop the participants were not only empowered with knowledge on how to harvest medicinal plants in a sustainable manner, but were briefed on the need to be educated on how to make their business ventures viable. The research project therefore aimed not only at sharing information related to the sustainability of medicinal plants but also at encouraging the participants to take positive action towards sustainable exploitation of natural resources.

The literature reveals information about programmes of sustaining medicinal plants in northern KwaZulu-Natal including the establishment of medicinal plant gardens, such as at Hlabisa, Jozini (Wildlands project) and Esikhawini (Crough and Hutchings, 1998). There are studies focusing on medicinal plants trade (Williams *et al*, 2007; Mander, 1998). However, none of them had holistically focused on the medicinal plant selling businesses. Also, there are fewer instances where information

existed related to the exchange of information between the researchers and the medicinal plant sellers. This current research project envisaged researching about issues that affected medicinal plant selling as whole. Issues related to the socio-economic status of medicinal plant sellers, their education profile, marketing, storage and packaging, and also the conservation status of medicinal plants.

It was felt that both the researcher and the medicinal plant traders benefited from the workshop given that both parties not only provided information on the propagation of medicinal plants, but were also empowered with information about medicinal plants, especially in areas where knowledge gaps in terms of medicinal plant marketing, sales, storage, packaging and conservation existed. At the same time the medicinal plant sellers were empowered by business tips, e.g. in revisiting the costs of medicinal plants they were taught to think about ways of making medicinal plant selling a more viable business that was properly administered.

The participants were empowered in the sense that the workshop were arranged in a manner that made them feel free to express themselves. The language used by the researcher and the presenters was very simple such that the participants felt welcome. The researcher gave the participants some bags to put their stationery in and the printout of the researcher's presentation prepared in isiZulu (Appendix 10B).

The workshop was conducted at the area where medicinal plants are conserved. The managers of the nature reserve also participated in the workshop. The participants had an opportunity to speak to the manager of the nature reserve. The researcher, the nature reserve conservationists, other resource persons and workshop participants all

shared with one another the propagation, harvesting, storage, marketing and the cultivation techniques of the medicinal plants.

The participants were also pleased to gain knowledge and skills from the workshop presenters who gave them business tips regarding the medicinal plants they sold. The importance of reviewing the selling prices by medicinal plant sellers was discussed at length with the participants. The sustained interest in the topic showed that the participants not only gained the techniques of cultivating medicinal plants but also empowered them with business skills.

An assessment was conducted to follow up on whether or not the medicinal plant sellers practised what they were taught in the workshop.

## **5.7 ASSESSMENT OF THE INTERVENTION PROGRAMME**

To address the third Research Question, the programme of intervention was assessed. Assessment is basically a process of measuring learning achievements and passing judgments formally or informally, using observation/oral/written/practical over a period of time. Mutasa and Willies (2013:112) state that assessment is the process by which quality of individual's work or performance is judged. Hungerford and Volk (1990) and Killen (2010) opine that assessment is used so broadly that it is often used to indicate the use of formal data gathering procedures and combining of data in a global fashion to reach an overall judgment.

In this study, assessment of the research participants was done through home visits by means of open-ended interviews (Appendix 4). That was done in order to

measure/judge whether the intervention in the form of a workshop was effective or not, regarding medicinal plant storage, marketing and conservation.

The programme of intervention assessment was conducted in terms of intervals, namely phase 1 (two months after the workshop) and phase 2 (thirteen months after the workshop). The phase 1 was conducted in order to follow up implementation of the lessons learnt from the workshop and to motivate the participants to carry out the activities that were agreed upon during the study intervention programme. The second interval was conducted to allow a lapse of time between the intervention programme and its assessment. The results of these assessments are presented below:

### **Phase 1 Assessment**

#### **5.7.1 Assessment on the impact of the workshop on the marketing and sales of the medicinal plants**

During the phase 1 assessment the respondents explained that there was no significant change in their business practices after the workshop in terms of pricing.

One responded reported as follows:

‘The price unit of selling the medicinal plants has not been changed since it is the responsibility of our leaders to review the issue of prices charged for the medicinal plants. However, we raised this issue during the meeting, we hope that the leaders will come back to us after they have decided and we are going to charge our medicinal plant products according to the prices that are stipulated by the leaders.’

Another informant added by saying...



‘I am going to raise the issue of the factors that need to be taken into account, such as transport costs, labour when preparing and collecting the plants as well as the rise of fuel price which affects all of us.’

When the interviewees were asked about when they were expecting feedback, they answered that they expected feedback during the meetings that took place once every three months.

In terms of record keeping, here is what some of the informants said:

‘I forgot my book at home; otherwise I would show you how I record my profit, reported the old lady.’

‘I do have my book, but sometime I do not bring it, said the second informant.’

‘I often leave my book at home so that my children will help with the recording, reported another informant.’

Other respondents said they had given the books to their children for them to write their school work.

The researcher asked the informants whether their children did not receive their stationery from the government, if they were in public schools. The respondents contended that the schools supplied them with books but sometimes they had to buy hard covers on their own.

Although none, of the respondents reported to have lost their recording book keeping, it transpired from their explanations that they underutilised or did not use their books altogether.

That seemed defying a purpose of the workshop presentation on record keeping, however, some of the medicinal plant sellers who sell their products at Mona in Nongoma reported that they recorded their money through banking.

‘We bank our profit when coming back from the market, that is how we manage to indicate which seasons or months are productive in terms of our business since we just go to Mona once a month.’

With regards to banking most sellers reported that they saved their money in club accounts. ‘We are saving our money in club accounts (stockvel) within our market. That is one way we record our money.’

However, they were told that club servings would only show summary of contributions over a period of time, and did not reflect the amount of money generated by each seller per day. From these responses it was apparent that budgeting, banking and record keeping were still a big challenge among medicinal plant sellers.

It could be that the respondents were unaware of the importance of record keeping in the management of their businesses. Equally, they were probably not quite sure about the ways to keep important business information on a daily basis.

Furthermore, depending on the content with regard to learning, sometimes it takes time to master what has been learnt. With practice, however, studying and conceptualisation of concepts can be understood, and appropriately applied.

This is in line with David Ausabel's meaningful learning theory, in that meaningful learning recognises learning as an independent way of instruction. As teachers we plan and sometimes expect knowledge to be assimilated in a specific way only to find that learners perceive knowledge differently. Meaningful learning theory, which states that in order for new information to be learned it must be put into a context or linked to knowledge that already exists. This theory provides a view on why the respondents did not change their practice of not keeping records of their sales and expenditures immediately after the workshop. That could be due to the fact that the recording revenue and expenditures was still a new idea to the medicinal plant sellers and there should have been follow-up interventions to consolidate initial learning. Another way to put this perhaps not enough scaffolding had been used, and that scaffolds had been removed too soon (Lui, 2012).

The researcher made use of the theory of connectionism by Thorndike. She had repeatedly explained the necessity of recording sales in the booklet and importance of money banking. Thorndike's analysis of this behaviour is that the action that produces the desired effect becomes dominant and, therefore, occurs faster in the next experiments. He argues that more complicated behaviour is influenced by anticipated results, not by a triggering stimulus as Pavlov had supposed.

Thorndike's theory of connectionism concurs with Skinner's (1953) reinforcement theory and he also extends it to the fact that the behaviour which is being positively reinforced is likely to be repeated. Thus, in the present study, the respondents were cautioned about the dangers and risks of keeping money at home and highlighted the importance putting money in fixed accounts and other options that might be of benefit to them. It was emphasised that record books were not meant to record cash only. In addition, they could be used to record stock, budget and important information regarding the business.

### **5.7.2 Packaging and Storing of medicinal plants**

With regard to packaging the practice of packing their medicines in plastic bags had persisted. 'I am using plastic bags since they are easily available as compared to glass and wooden material.'

With regard to storage, the respondents reported that they preferred a method of storing by exposing their material to the sun since it was cost free.

The respondents also said that during sunny days, plants were exposed to the sun to dry out. In wet weather conditions, medicinal plants were covered with plastics to prevent them from getting wet. It was noted that some medicinal plant sellers were trying to change their method of storing their medicines. Those participants reported that they had started to sell dry mixtures instead of fleshy prepared products. This method of mechanical preparation of medicines lengthens shelf life of material compared to fleshy prepared medicinal plants.



**Picture 11: Chopping and drying out material by exposure in the sun**

### **5.7.3 Conservation of medicinal plants**

This section reports on assessment based on cultivation, training and certification, sustainable harvesting, as all aspects of conservation of medicinal plants.

#### *5.7.3.1 Assessment on challenges with regard to cultivation*

When the respondents were asked on whether they had started to conserve medicinal plants by cultivating them as proposed from the workshop, one respondent said instead she had increased the amount she cultivated by ensuring that the garden is protected through the use of old plastic bags which were put as a fence. Furthermore, she had fenced her home to eliminate intruders who stole vegetables and medicinal plants from her garden. One respondent expressed her appreciation for the intervention on behalf of the others, as follows:

‘Although some of the things have not changed since the workshop, however, we have changed slightly from the way we are running a business and we use the advice from one of the presenters that we need to sell some of the goods instead of relying from selling only the medicinal plants. We are now selling sweet potatoes and fruits which make a difference in our lives.’

It was worth noting that the researchers could not fix all the problems of the medicinal plant selling business, particularly, in a very short space of time. However, the research was an attempt, in part; to contribute to the ways the medicinal plant sellers managed their businesses. Indeed, the sellers had later confirmed that they were getting more income by employing some business tips they got from the study intervention. However, some of their business practices had not changed. The theory on conditioning stimuli by Pavlov, partially explains this. In Pavlov's experiment, the sound of a bell meant nothing to the dogs at first. After the bell's sound was associated with the presentation of food, it became a conditioned stimulus. In this case, the respondents were not familiar with business strategies presented in the workshop. It was necessary to follow up with medicinal plant sellers and re-explain the ways and benefits of running the medicinal plant selling business profitably and sustainably.

Much of our behaviour today may be shaped by the pairing of stimuli, which basically implies that organisms are classically conditioned. It could be possible that the medicinal plant sellers were conditioned to their traditional practices of conducting their business. Then, it would take a long time for the medicinal plant sellers to get used to the new sustainable methods of running their businesses.

One of the ways of dealing with resistance to change is through schedule reinforcement, proposed by Skinner (1953). Whether continuous or intermittent, schedule reinforcement may increase the desire to learn. In the ESD of medicinal plant sellers, participants were rewarded with gifts. Specifically, seedlings and

stationary were given to the participants with the aim of enhancing their behaviour with regard to record keeping and medicinal plant cultivation.

#### *5.7.3.2 Assessment based on conservation through training and certification*

There were no significant changes that had taken place with regard to training and certification. One respondent from the Zululand District Municipality reported that there was no significant change in the ways they ran their businesses following the intervention. He complained that the medicinal plant sellers in his area were scattered, as a result there was no proper communication with regard to what had happened to some medicinal plant sellers after the workshop. He also reported that one of his colleagues whom he worked closely with had relocated.

In terms of training and certification the respondents explained that they wanted to have certificates and permits to medicinal plants.

The reasons for this were two fold. It was possibly an indication that conservation of natural resources through legislation and compliance especially, medicinal plants was receiving attention by the medicinal plant sellers. Secondly, probably include the problems of cultivation, thus permits and certificates, would allow harvesting of medicinal plant from the field, and this was received preferred over cultivation, though the medicinal plant sellers were only allowed limited amounts of medicinal plant materials at a time.

#### *5.7.3.3 Assessment on conservation of medicinal plants through sustainable harvesting*

The following were common responses from the respondents:

‘We have learnt that when collecting barks from the trunk of tree we need take them on different sides not the whole round like a ring, thus ring barking. We have been told that ring barking causes trees to dry off and death of plants, that is what the officials from Wildlands and university told us.’

## **5.8 SECOND PHASE OF THE WORKSHOP ASSESSMENT.**

The second phase of the workshop assessment took place in January 2013. That was after 13 months following the first assessment which was conducted in November 2011.

### **5.8.1 Assessment based on the marketing and sales of the medicinal plants**

The price units for medicinal plants had been reviewed by the time of the second assessment. The respondents reported that instead of the price charged for medicinal plant material at R10.00, the raw medicines had increased by R5.00 to R15.00 per unit. However, the price of processed mixtures, such as boiled medicines had not changed.

One of the respondents reported that...

‘The committee has decided to increase the prices charged for our medicines. We are hoping that we are going to generate more profit’ but we are happy to receive a difference of R10.00 more than we used to get before.’

Other interviewees added on saying that the issue of the prices charged for their medicines had been their priority concern. “We are happy that we resolved this, we are hoping that we are going to generate more profit”, said the respondents.

‘I fail to budget due to the fluctuation nature of our business. During this month, January, the flow of business is slow. I did not have enough money to stock of my shop.’



This indicated challenges with regard to budgeting as it had emerged from the first phase of assessment. However, when they were asked how they survived during the slow business periods. One of the respondents reported that she had reverted to an alternative business, while continuing with selling medicinal plants. This is what she said:

‘While I am at my medicinal plant shop, I also do ladies hair. Making hair is adding income during these drought seasons of the medicinal plant selling business. I can also open a hair saloon at home. When working at home I can send someone to carry on with duties in my shop.’

It was interesting to note that the answers were varied for this question. One lady responded as follows:

‘During the times when our business is not doing well, I work from home to cut down the costs of coming here (meaning to market). I continue healing people and selling my plants from home. My customers phone me and I direct them to my place.’

From these two responses, it shows that the participants were empowered with business skills including delegation of duties. During the workshop, they were taught about the importance of selling a variety of products.

### **5.8.2 Assessment based on packaging and storage of medicinal plants**

The practice of packaging the medicinal plant material was the same as before the intervention programme during the first assessment of the intervention and second programme of intervention. Most respondents were still keeping their material in plastic bags. They explained that plastic bags were readily available and they prevented their medicines from getting wet during rainy weather.

‘Although plastics moisten our products, but they are also used as the protective storages since they are translucent and prevent wetness. Some of the plants such as Undonganazibomvana (*Drimia robusta*) should not have direct contact with sunlight so they are better kept in plastics.’

Presumably, the value of the plastic bags and cover are not dark enough in colour to block the sunrays. ‘Plastics are having a high package capacity than containers and they are easy to carry’, reported other respondents.’

The respondents justified their continued use of packing their material in plastic bags, as opposed to wooden and glass packaging as presented to them during the workshop.

During the workshop information on the concept of re-use of material was presented to the workshop attendees. Alternative packages such as newspapers which are reusable and biodegredeable were recommended as one of the material that could be used to pack medicinal plant material.

With regard to storage of medicinal plants, more than 50% of respondents shared the following view:

‘During sunny days plants are exposed to the sun for them to dry out.’

The following picture shows how the medicinal plant sellers dried out their material:



**Picture 12: Temporary storage of medicinal plant material**

‘When it is raining, plants are put under a plastic cover to prevent the plants from getting wet.’

The respondents reported the following during the phase two of assessment of the intervention:

‘After exposure to the sun, I have realised that time taken for boiling of medicine made by umhlabele (*Trichilla emitica*) should be decreased from 15 to five minutes when using dried material, whereas, fresh material requires 15 minutes of boiling.’

From this quotation there are two important points that are made by the respondent. The first one was about the effect of temperature on the efficacy of material. Secondly, it was about time- saving. Good business practices are about time-saving. If the participants were saving time it would mean their practice towards their business had a positive influence towards the profitability of their business, hence

improved livelihoods. Quite importantly, though, is the learning and experimentation that, this respondent exhibited. This shows that under favourable conditions, opportunities of IKS to grow exist.

As mentioned earlier, this represented an improvement on the side of medicinal plant storage. In adding to addressing shelf life of the medicinal plant material, issues concerning effects of temperature as addressed during the workshop were considered by the respondents. Some of the medicinal plant sellers mentioned that they considered the boiling time of their material when preparing mixtures. This suggests an improvement on science skills regarding medicinal plant processing and can improve the dosage prescriptions.

The method of drying medicinal plants would also help the medicinal plant sellers in the long run because they could no longer buying and harvesting medicinal plant from time to time if they had material that could last them longer. This is a major advantage to the business since they would be more income than expenditure that is incurred when buying medicinal plants from other sellers.

### **5.8.3 Assessment on conservation through cultivation**

There has been less progress on medicinal plant cultivation in the period following the workshop during both times of assessment. This means there are challenges that need long term solutions with regard to cultivation of medicinal plants. However, some medicinal plant sellers who attended the workshop mentioned that they had cultivated some of the plants they received from the workshop for trial purposes.

‘I did not know that umababaza and imfeyenkawu can be cultivated. I thought they only germinated naturally. I have cultivated them on a smaller scale to see how well they grow.’



13a



13b

**Picture 13a and 13b *Ansellia africana* grown from the homestead**

Another respondent had the following to say: ‘I wish I had a tractor for ploughing a bigger land so that I have a medicinal plant farm, so far I have attempted to grow the following species and they are growing well.’





**Picture 14: *Staphelia gigantea* cultivated in a home garden**

The above pictures show that medicinal plant sellers had cultivated some of the medicinal plant species in their home yards. This suggests that medicinal plants could be cultivated, however, on small amounts, given the small areas of home gardens.

The sellers were concerned about cultivation of medicinal plants on a larger scale could be limited by the size of their home gardens. Therefore, because of sometime limitations in particular, home gardens alone cannot accommodate cultivation of medicinal plants on a larger scale to satisfy the high demands of the medicinal plant species by medicinal plant clients. This calls for joint hands from all organisations so that the target farms are established to meet the growing demands for traditional medicine.

In rainy seasons, such as spring and summer of the year 2012 and January 2013, medicinal plant sellers were still reluctant to cultivate the medicinal plant in their home yards. They mentioned that time and weeding during rainy seasons were major

problems for cultivating the plants in their homes. The following responses bore testimony to this:

‘Cultivating medicinal plants is demanding since they take a long time to mature as compared to vegetables. It is better just to harvest them in the field.’

‘In spite of buying from other sellers, we still make profit out of selling medicinal plants’, reported one of the respondents from sampling site 3.

‘It’s better to buy the plants to do away with weeding and watering duties.’

This was different from what the respondents reported during the first assessment. From the responses of the first assessment (immediately) after the workshop, the respondents were keen to try out the recommendations on cultivations. During the second assessment, some of informants gave an inclination to want to go back to their ordinary practice, which is field harvesting and retailing. However, it was interesting to note that some of the respondents had tried out establishing their own medicinal plant gardens, though not that successful due to the challenges mentioned earlier.

## **5.9 SUMMARY OF THE ANSWERS TO RESEARCH QUESTION NUMBER THREE**

Giving a two phase assessments of the intervention has enabled the researcher to have a clearer understanding of the impact of the workshop. The results of the two assessment phases revealed that not much had changed in terms of the practice of the medicinal plant sellers, especially with regard to marketing and sales, except for price increases that were charged for the medicinal plants.

As discussed above, the price units charged for the medicinal plants were R5.00/ bunch of tubers, before the medicinal plant sellers attended the workshop. This was revisited by the participants after deliberating on the issue of pricing during the workshop. This gave the participants an opportunity to reflect on issues of prices and pricing of their medicines.

Thus, from the pricing point of view, it would appear that the intervention foregrounded the principle of profit making in the minds of the medicinal plant sellers. Although the issues of keeping records, banking and money saving were not attended to by the majority of the participants, it should be noted that the high levels of illiteracy could contribute to this challenge. With more interventions and programmes of financial business skills, this might change in the long run.

It was worth noting that field observations revealed that the majority of the participants (60% out of the sample of 25 respondents who attended the workshop had resorted to selling other products in addition to the medicinal plants. Others were selling plastic containers, foodstuffs, fruits, vegetables and also cosmetics. Prior to attending the workshop the medicinal plant sellers were selling only traditional medicines in their shops. For these participants, was evidently one of the benefits of the study.

The practice of packaging medicinal plants was the same for the medicinal plants before and after the intervention programme. However, storage techniques appeared to be receiving attention with drying and boiling coming up as common ways of increasing the shelf life of the medicines since the intervention programme took place.



Although it is said that tradition herbs are more effective when they have been kept for a long time, proper storage might result in the proper dosages hence improving their effectiveness in the healing of diseases.

Medicinal plant sellers also reported that they had observed that boiling prolonged the shelf life of their medicines thus saving their money from stocking all the times. That was another contribution of the study intervention to medicinal plant sellers.

In terms of cultivation, it was observed from the second phase of assessment that the medicinal plant sellers had started to establish their home gardens, albeit on a small scale. In spite of the challenges of cultivating the medicinal plants, the participants who attended workshop had added to their gardens some of the seedlings of rare medicinal plants that they were given during the workshop. That was one of the contributions from the workshop while the participants received lessons about conservation through cultivation they obtained seedlings that were difficult to find from the wild.

It appeared from the assessments that conservation of medicinal plants using only *in situ* methods of conservation was a challenge to the sustainability of medicinal plants. The ESD intervention introduced different techniques of medicinal plant cultivation using asexual and sexual plant reproduction (Appendix 10). However, the challenges of land accessibility to cultivate on a larger scale, and nursing of the plants, were a still outstanding challenge. Medicinal plant sellers explained that they preferred to be assisted with medicinal plant farms to cultivate the plants on a larger scale, rather small home gardens. They said that plants cultivated in the small numbers would not

be sufficient to meet the market demands for medicinal plants. It is thus, recommended that *in situ* and *in vitro* plant conservation should be incorporated to enhance the production of plants in larger quantities.

This study was in part, an assessment of the workshop was an effort of bringing the higher education institution to interact with the community not only by teaching the community scientific methods of propagating the plants, but also attend to some of social, economic and environmental effects of the medicinal plant selling business. One of the respondents said she was inspired by workshop facilitators and reported that she would like to further her studies in some way or the other. When the researcher did this assessment she felt welcome and it was interesting to note that partnerships had developed between the institution and the communities. Further enforcement is required to ensure that the empowerment of local communities about issues of sustainable development takes roots.

#### **5.10 SUMMARY**

The results presented in this chapter showed that the respondents from the three DMs faced some challenges with regard to marketing, storage and conservation of medicinal plants. The major challenge under marketing related to price units of the medicinal plants, whereby there were no procedures that are followed when these prices were determined. There was also an issue of the traditional way of advertising the medicinal plants, which was principally by word of mouth, as opposed to the use of technological media, such as television, radio, social networks and in newspapers. Under storage, the issues of putting material in plastic bags, preserving material by drying without checking microbial effects appeared to be the major challenges in the medicinal plant selling business.

Conservation of the medicinal plants was one of the challenges faced by medicinal plant sellers, which was mainly cultivation. Accessibility of harvesting permits was also a challenge. However, it appeared in the study that the government had embarked on awareness programmes on sustainable harvesting of medicinal plants and the medicinal plant sellers were becoming aware of these training opportunities offered by the government. That is one of the reasons why education and training of people have been viewed as the most powerful weapons in the fight against rural poverty. It is also necessary for sustainable development. The next chapter gives a summary of the whole study, a conclusion and recommendations arising out of the findings of this investigation.

## **CHAPTER SIX**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **6.1 INTRODUCTION**

This chapter summarises entire study, draws pertinent conclusions from the major findings and makes recommendations for both practice and further research.

##### **6.1.1 The purpose of the research**

The main purpose of this study was to explore t existing knowledge and practices of medicinal plant sellers regarding marketing, conservation and storage of medicinal plants and find out whether an intervention based on non-formal education would significantly improve their knowledge and practices. In particular the study sought to:

- (a) Explore the most prevalent challenges faced by medicinal plant sellers with regard to storage, conservation and marketing of medicinal plants.
- (b) Investigate whether the medicinal plant selling business was environmentally sustainable to sustain the livelihood of medicinal plant sellers; and
- (c) To find out whether capacity building and empowerment programmes in knowledge and skills of sustainability of medicinal plants would enable the medicinal plant sellers to run their business sustainable.

Whilst the study was primarily aimed at establishing challenges faced by medicinal plant sellers in their businesses to sustain their lives and environment, the latent aim was to build partnerships between the respondents, and the researcher. It was envisaged that such partnerships would bring about changes in the medicinal plant

selling business so that it was managed in a sustainable way. The study also aimed to bring awareness about environmental issues that affected medicinal plant businesses while sharing the information on how medicinal plant sellers could help one another to escape the poverty trap by maximising their sales while bearing in mind the sustainable development issues, for instance, sustainable harvesting.

The study was also an attempt to make the indigenous people who participated in the study to reflect on the challenges of effectively managing their natural resources, on the other hand, while at the same time recognising the value of sustainability of medicinal plants. Working with rural indigenous communities bring about important partnerships which, in turn, help to pull together the expertise which makes it possible to mainstream environmental education and sustainability across a number of socio-economical strata.

### **6.1.2 Method of investigation**

The study took the form of an action research through capacity building with regard to the knowledge related to storage, conservation and marketing of medicinal plants, and how to improve the medicinal plant sellers' skills to run their businesses more profitably and in a sustainable manner.

This study adopted a mixed methods research design. The reason to follow this research data collection method was that part of the research project dealt with items that were easily quantifiable, while other part of the study sought information of qualitative nature. In particular, this related to interview data on how the medicinal plant sellers sustained their livelihoods through selling medicinal plants, and

information sharing by the respondents on the sustainability of the medicinal plants, which was collected qualitatively.

Ethical issues including sellers' intellectual property rights concerned the participants during the study. The researcher assured them that the information and knowledge collected would be used to make sure that their businesses became more sustainable through the promotion of appropriate skills, knowledge and methods, and that the researcher did intend to generate profit by any means from the information given by the respondents.

### **6.1.3 Major findings**

The study objectives were addressed and the research questions were answered based on the findings:

#### *6.1.3.1 Challenges on marketing of medicinal plants*

The study revealed that medicinal plant sellers were involved in the informal trade of traditional medicines. These results affirmed the findings by Botha *et al.*, (2007) who reported that medicinal plant sellers traded within the informal sector throughout South Africa, and that they operated within the survivalist end of the economic spectrum, with little spare cash available for investing into their businesses once household expenses had been met. In general, the results showed that the medicinal plant sellers charged prices of R10 per bunch of tubers. However, following the intervention programme, this study reports that the prices charged for the medicinal plants were reviewed and increased to R15.00 per bunch of tubers.

As far as the income profile of the medicinal plant sellers is concerned, this study has revealed that the medicinal plant sellers used money they obtained from selling the medicinal to pay school fees for their children, including tertiary education.

During the workshop medicinal plant sellers were introduced to some business skills including selling a variety of products for the viability of their business. The programme of intervention had a positive effect in the medicinal plant sellers' business and their livelihoods. During the second assessment of the study intervention programme it was found that the medicinal plant sellers were no longer relying on selling only the medicinal plants as their only and sole source of income.

In addition to selling medicinal plants, the sellers were found selling other products such as food and cosmetics in their shops. It was interesting to find out that the respondents had diversified in terms of the products they sold. In explaining reasons for diversification, Baptista, Karaöz, Leitão (2010) attested that the cause of failure in many businesses is that the start-up size is smaller than the minimum efficiency scale in the industry. The larger the minimum efficiency scale in an industry, the higher the cost of adjustment for new businesses. In order for small size businesses to survive in the corporate world, the only way is through diversification.

A study by Raddix (2014) indicates that diversification is a favoured strategy among small, emerging businesses. In highlighting benefits for diversification, which includes risk reduction, capital preservation and ability to hedge business portfolio, Baptista, *et al* (2010) and Raddix (2014) opine that diversification helps to protect

business capital from wild swings of the market, while achieving long term growth at the same time.

During this study it was found that medicinal plant selling businesses were small scale, with a turnover that would not be enough for sustaining the livelihoods of the respondents. Therefore, diversification was one of the ways that the respondents would maximise their profits. This alleviates the pressure of medicinal plant harvesting and also increases the income received by the medicinal plant sellers, resulting in a positive impact on their livelihoods and the environment.

However, in terms of advertising, the results of the study showed that medicinal plant sellers were not using technology- based devices, such as print and visual media; instead their businesses were advertised mainly by word of mouth even after the intervention programme. The practice of advertisement had not been changed. While, John Dew in his discovery learning implies that learning is innate, Piaget argues that a person expects to understand each new experience in terms of what he or she already knows. When a person assimilates new experience, his or her knowledge structure is adjusted or has accommodated to it. As explained, earlier, it could be possible that the respondents were not yet comfortable with the new business strategies presented to them during the workshop.

Robert Gagne` (1977) concurs with other philosophers including Bruner and Piaget. According to Gagne the prerequisite lower level skills and knowledge required to achieve a given instructional objective should be identified and taught first. New skills learned should build on previously acquired skills; positive reinforcement



should be used continuously; instruction should be tested formatively and the effectiveness of the instruction should be evaluated summatively. However, barriers and enhancers which affect the transfer of learning when developing different methods of instruction (such as application exercises, time to apply the learning, supportive climate for learning) could be attributed to resistance to change. The researcher considered the saying that:

‘Tell me, and I will forget;  
Show me, and I may remember;  
Involve me, and I will understand.’

Overall, this ESD research project emphasised integration, and hands-on involvement of medicinal plant sellers in the activities which could sustain the medicinal plant selling businesses, instead of merely presenting information to the medicinal plant sellers. Bruner (1986) contends that any domain of knowledge, problem or concept can be presented anybody by a set of actions, images and graphics and by a set of symbolic or logical statements. Thus, the researcher had earlier propagated and cultivated the medicinal plants in the nursery. During the workshop medicinal plant sellers were presented with pictures and methods that showed the growth stages of medicinal plants that were cultivated by the researcher and also the methods of propagating those seedlings.

Although the medicinal plant sellers were equipped with the business skills of keeping records for their businesses, fewer respondents had adapted the recording keeping practices for the recording and record keeping of their sales and expenditures.

Although, the practices and the challenges of marketing of the medicinal plant businesses could not been addressed in a short period of time, the issues of

sustaining livelihoods and the environment had been intervened through the study when medicinal plant sellers were found practising business skills of selling variety of products to maximise their profit.

#### *6.1.3.2 Challenges of storing medicinal plants*

Storage of medicinal plants was found to be one of the challenges facing medicinal plant sellers in their businesses. The common solution to this mainly entailed drying out of materials by exposing them to the sun. During the information session in the workshop, medicinal plant sellers were asked to reflect on their methods of storing the medicinal plants and to suggest alternatives. The theory of constructivism took its course since the medicinal plant sellers had to try other methods of storing medicinal plants for themselves and they came out with possibilities such as boiling their medicines, as a way to prolong the shelf life of prepared mixtures.

#### *6.1.3.3 Challenges relating to conservation*

In terms of conservation through harvesting, the study revealed that the medicinal plant sellers were harvesting medicinal plants in large quantities for selling purposes. Rising unemployment and poverty could be as a resulted of increased numbers of unspecialised informal medicinal plant selling sectors operating and selling directly to the public and supplying urban traders.

Illegal harvesting of medicinal plants was also found as threat to medicinal plant conservation. With the alert to getting permits to harvest medicinal plants and the certificate medicinal plant sellers guaranteed the rightfully to harvest the medicinal plant during the workshop, some of the medicinal plant sellers agreed to seek for the permit to harvest the medicinal plant that would guard them against from illegal

harvesting. Permit to harvest the medicinal plant requires the medicinal plant to permissible limits, thus reducing pressures of over-harvesting.

With regard to cultivation of medicinal plants, one of the concerns the respondents had expressed was water requirements of the plants. One medicinal plant seller from the group explained that it was hard to get water, for their plants and they could not cultivate their plants on river banks and dams for fear of the plants getting stolen.

The medicinal plant sellers reported that sometimes they had to buy water to irrigate the medicinal plants. This factor alone increased the cost of managing the plants, thus negatively impacting the revenue generated from selling the medicinal plants. Medicinal plant sellers also raised concern of cultivation of medicinal plants such as limited land for farming medicinal plants, water to irrigate the plants and the prolonged periods based before maturity of medicinal plant species. Nonetheless, the participants were motivated during the intervention programme to engage themselves in medicinal plant sustainability.

In the study, the researcher sought to develop partnerships with the participants in order to encourage them to cultivate medicinal plants as crops. The advantage to this approach is that the cultivation of medicinal plants as crops makes it easier to develop and improve strains of plant life, while reducing the need for wild collection. Wild collection exposes women to dangerous situations, e.g. rape and being attacked by wild animals.

The researcher had developed a strong partnership with the respondents, to the extent that they now understand the consequences of unsustainable harvesting of plants. They were partners in the research. While the researcher was a facilitator and participant in the partnership, she was also a learner with regard to indigenous ways of planting and managing medicinal plants, with the respondents as the instructors. Urmilla *et al.*, (2006) in addressing interdisciplinary/multidisciplinary research state that the process of knowledge sharing and knowledge generation is increasingly taking place at the interface of traditional disciplines and approaches to scientific research, which are becoming more integrative (Urmilla *et al.*, 2006).

That is one of the reasons that education and training of people have been viewed as the most powerful weapons in the fight against rural poverty. It is also necessary for sustainable development. That is why the researcher hoped that by sharing information with the medicinal plant sellers and by stimulating recognition of the overall responsibility to protect medicinal plants; medicinal plant sellers would be motivated to take actions to conserve the environment.

The study showed that most of the workshop attendees were barely literate in that many of them could hardly sign their names in the focus group and workshop attendance registers. This indicated a high rate of early dropout from school. This research used a workshop as an information sharing platform with the plant sellers to reflect on their harvesting methods and their effect on the environment. It was deemed necessary to alert the sellers that they should harvest plants wisely and think of future generations by taking corrective action before many of the plants become extinct.

Scientific and indigenous methods of medicinal plant propagation were shared between the respondents and the researcher during the workshop. That implied that indigenous knowledge and scientific knowledge can be integrated to promote ESD.

The study acknowledged that the medicinal plant sellers relied on knowledge that had developed over many years pertaining *inter alia*, conserving the environment. In writing on Southern Africa's dreams for development education and sustainability, Janse van Rensburg (1999), argues that indigenous, traditional, ecological or local knowledge should be encouraged as it recognises marginalised ways of knowing, which have the potential to replace unsustainable ways of dealing with the environment. It must be remembered that indigenous people have lived in harmony with the environment for many years.

Gorjestani (2000) adds on by stating that "Indigenous knowledge is an integral part of the culture and history of a local community. We need to learn from local communities to enrich the development process". Basically, what this means is that expanding information and the involvement of different stakeholders is the key to solving environmental problems.

Engaging them in information sharing sessions during the workshop was one of the methods of recognising communities in decision making about issues that concern them.

One of the possible solutions is empowerment through education. The focus of this research on the sustainability of the medicinal plant selling business was one way to address these challenges. An intervention programme based on non-formal education was devised as one of the strategies to mitigate the problems associated

with storage, marketing and conservation of the medicinal plants. The programme was also aimed at addressing the environmental and business profitability issues in the medicinal plants selling business.

## **6.2 CONCLUSIONS**

This was an action research project, whereby all the research participants had played an active role. A conservation strategy in the form of non-formal education was devised with an aim of conserving the medicinal plants. Non-formal education was used to empower individuals (medicinal plant sellers) to restore the Earth's natural resources and foster support for the well-being of future generations by promoting sustainable life styles.

The study concludes that the intervention (workshop) was for social transformation of the plant selling communities with the aim of taking them to another level of social responsibility. Although the assessment of the intervention has shown that some of the lessons from the workshop were not yet implemented by the medicinal plant sellers, in recognising that education for sustainable development is a process, it is hoped that medicinal plant sellers would attempt to implement some of the business skills to make their businesses viable, thus have a positive effect on their lives and the environment in the long run.

Awareness campaigns, workshops, discussions, teaching about conservation of the medicinal plants are crucial in order to sustain these dwindling plant species. That is where informal education of the medicinal plant sellers on sustainable harvesting can play a role. It is for this reason that the researcher went on to form partnerships with the communities selling medicinal plants with the aim of embarking on

conservation of threatened species with their help. Informed participation of medicinal plant sellers is considered to be important so as to ensure that they understand their responsibility to conserve resources that form part of their livelihood.

### **6.3 RECOMMENDATIONS FOR FURTHER STUDIES**

The following emerged while conducting this study.

**Marketing, Conservation and Storage:** When exploring the most prevalent challenges faced by medicinal plant sellers with regard to storage, conservation and marketing of medicinal plants, it was found that these aspects pose a challenge in the medicinal plant selling businesses. It is recommended that storages like the one at Mona market be built in other market places where medicinal plants are sold. Availability of medicinal plant storage facilities would help to prolong the shelf life of medicinal plant materials. Other challenges including, price units of the medicinal plants, advertisement and recording of expenditure and sales of medicinal plants. Further awareness, education and empowerment of medicinal plant sellers about these issues ensure an increase the viability of the medicinal plant selling businesses. Hygiene has prevailed during this action research. It is recommended that local municipalities address the problems of hygiene in the local towns and bus ranks.

The research revealed that there was a warehouse for storing the medicinal plants at Mona market, Zululand district municipality. If there could be such storage rooms in other places such as uMkhanyakude and uThungulu, the safety of the medicinal plant species could be ensured for the medicinal plant sellers.

Marketing was found to be a challenge that needed to be addressed. Like western medicines, it is recommended that the traditional medicines be advertised in print and visual media and also be screened for safety and dosage standards in the South African Bureau of Standards (SABS). The marketing issue should be done by the medicinal plant sellers with the assistance of local media industries and scientists.

The government, private and public sectors have already embarked on the initiatives for awareness of the conservation of the medicinal plants. However, the conservation projects targets more the traditional healers who do not over-harvest the medicinal plants. Future projects should target the medicinal plant sellers since they are the ones who harvest lots of the medicinal plants from the environment.

Legislations, regulations and laws should be enhanced to limit illegal harvesting of the medicinal plants.

**Sustainability:** when investigating whether the medicinal plant selling business is environmentally sustainable to sustain the livelihood of the medicinal plant sellers, the current study lacked some ways of enforcing business management skills in various ways. A workshop was not enough to address the business issues and profit making issues such that the medicinal plant sellers make their living profitably through selling the medicinal plants. However, follow up assessments were measures to make of the ways of making sure that the intervention programme did have a positive impact on the medicinal plant selling business. Also, during the assessments, especially phase one, medicinal plant sellers were encouraged further and helped to implement the workshop recommendations.



Future studies should incorporate other ways of addressing this problem, for instance through seminars, frequent presentations, and conferences such that a major change can be realised. However, through the positive attitude of the medicinal plant sellers to learn more about issues that affect their business, the current study has gone an extra mile in augmenting government interventions. In this regard, some of the participants had already devised other ways of sustaining their businesses by inter alia, selling other material in addition to the selling of the medicinal plants. This means that if there was enough time to engage the medicinal plant sellers in training, lots would have been achieved in the way the medicinal plant sellers run their businesses, thus their livelihoods.

**Assessing a programme of intervention:** with regard to whether or not the capacity building and empowerment programmes of medicinal plant sellers enabled them to run their businesses sustainably and profitably, there were some limitations. Firstly, not all the research participants attended the workshop due to some logistics problems. Out of the 56 research participants who were initially sampled for the study, the intervention programme only had 25 participants. It is recommended that further studies of this nature increase the sample of medicinal plant sellers who engage in empowerment programmes to increase the awareness about sustainability of medicinal plants.

Also, future assessment of interventions of this nature should involve various forms of assessments in addition to field-work-based assessment to gain a broader picture of the effectiveness of such interventions. Forms of assessment such as paper-pencil assessment would give researchers idea knowledge and understanding level before

application in the field is assessed. Where paper-pencil assessments cannot be done, oral testing can be tried out.

Secondly in this study time was also a constraint, it would have been better if there were different intervals for assessment, whereby the researcher would have done the assessment more than two times to measure further changes in the business practices of the medicinal plant sellers. However, it was interesting that some of the recommendations from the workshop were subsequently practised by the medicinal plant sellers.

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## APPENDIX 1: QUESTIONNAIRE FOR MEDICINAL PLANT SELLERS

Date.....

### Section A: Biogeographical information

Contact number of respondent (where possible).....

#### 1.1 Geographic information of respondent

##### 1.1.1 Where do you live?.....

UThungulu	Zululand	uMkhanyakude

#### 1.2

##### 1.2.1 Age

15-25	26-35	36-45	46-55	56-65	65 and above

##### 1.2.2 Gender

Female	Male

##### 1.2.3 Did you attend school?

<b>Yes</b>	<b>No</b>

##### 1.2.3 If yes, which grade did you last attend?

Grade R-6	Grade 7-9	Grade 10-12	None	Other

For office use only

V1 C1-C3

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V2 C1-C6

--	--

V3 C1-C2

--	--

V4 C1-C2

--	--

V5 C1-C5

--	--

1.2.5 How many children do you have?

None	1-2	3-5	>5

V6 C1-C4

<input type="text"/>	<input type="text"/>
----------------------	----------------------

1.2.6 What are they doing?

Staying at home	Studying	Working	Other

V7 C1-C4

<input type="text"/>	<input type="text"/>
----------------------	----------------------

1.2.7 What is your occupation?

General worker	Professional worker	Technical worker	Self employed	Other

V8 C1-C5

<input type="text"/>	<input type="text"/>
----------------------	----------------------

1.2.8 Who is also contributing to the household income?

Mother	Father	Kids	Mother and the father	All family members

V9 C1-C5

<input type="text"/>	<input type="text"/>
----------------------	----------------------

1.2.9 Does selling of medicinal plants contribute to your income?

Yes	No

V10 C1-C2

<input type="text"/>	<input type="text"/>
----------------------	----------------------

1.2.10 What are other sources of income

.....

.....

.....

Box 1

## Section B: challenges faced by the medicinal plant sellers

### 2. Storage

2.1 Where do you keep the dried medicinal plant material?

In boxes	Expose to the sun	In shade	Others

V11 C1-C4

<input type="text"/>	<input type="text"/>
----------------------	----------------------

2.2 What happens if the materials get rotten before it is sold?

Discard	Put it on sale	Change it to other form	Other ways

V12 C1-C4

<input type="text"/>	<input type="text"/>
----------------------	----------------------

2.3 What material do you use to wrap your medicinal plant products?

Newspaper	Plastic bags	Plastic containers	Wooden containers	Others

V13 C1-C5

<input type="text"/>	<input type="text"/>
----------------------	----------------------

### 3 Marketing

3.1. How well do the plants in your shop sell?

Very slow	Moderate slow	Slow	Fast	Fluctuate

V14 C1-C5

<input type="text"/>	<input type="text"/>
----------------------	----------------------

3.2 Do your customers mention the medicinal plants by name?

Yes	No	Sometimes

V15 C1-C3

<input type="text"/>	<input type="text"/>
----------------------	----------------------

### 3.3 What are the busiest times for your business?

weekdays	weekends	Middle of the month	Month end	Other

V16 C1-C5

--	--

### 3.4 If your customers do not get the material they intend, do you refer them to other sellers?

Yes	No

V17 C1- C2

--	--

### 3.5 How much do you get per day from selling your medicines?

<R10	R10- R90	R100 -200	R300- R400	R500- R700	R800- R1000	R1000- R2000	>R20 00

V18 C1-C8

--	--

### 3.6 Do you keep records of your sales?

Yes	No	Sometimes

V19 C1-C2

--	--

If, yes. How do you keep the records?

.....

.....

Box 2

### 3.7 How do your customers know about your product?

Tick in an appropriate box

Print media	Mass media	From other customers	By chance	Other means

V20 C 1-C5

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

### 3.8 What do you use to weigh your material?

Bare hands	Size of a finger	Weighing scale	Size of a bark	Others

V21 C1-C5

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

### 3.9 What is the cost for the material(s) in Rands ?

<R5	R5-R10	R20-R50	R60-R100	>R100

V22 C1-C5

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

### 3.10. Are there any season variations in selling the plants?

V23 C1-C2

Yes	No

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

### 3.11 What could be the possible reasons for price variations?

.....  
 .....

Box 3

### 3.12 Who determines the selling price of your medicinal plants?

Individuals	Other sellers	Economic conditions	Other

V24 C1-C4

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

## Conservation

4.1 List the five mostly demanded medicinal plant species and where you get the medicinal plants you sell?

No	Name of the species

4.2 What instruments do you use to collect the plants?

Chain saws	Sharp steel	Knife	Hands	Wooden sticks	Axe	Hammer	Other

4.3 If you do not harvest your plants from homestead your how far is the place from your home?

<1KM	1-3KM	4-10KM	>10KM

4.4 How many sacks of these plants do you sell per month?

<1sack	2-4 sacks	5-10 sacks	>10 sacks

Box 4

V25 C1-C8

<input type="text"/>	<input type="text"/>
----------------------	----------------------

V26 C1-C4

<input type="text"/>	<input type="text"/>
----------------------	----------------------

V27 C1-C4

<input type="text"/>	<input type="text"/>
----------------------	----------------------

4.5 How often do you harvest your plants?

Daily	Weekly	Monthly	Seasonally	Annually

4.6 Do you change areas where you harvest the same species

Yes	No	Sometimes

4.7 Do you cultivate some of the plants?

Yes	No	Sometimes

4.8 If not, why don't you cultivate your own plants?

.....  
.....

4.9 Is there any difference between grown material and wild sourced material in terms of your customer preferences?

Yes	No	Sometimes

4.10 Would you substitute the medicinal plant species if one that is needed is not available?

Yes	No

V28

☐

C1-C5

☐

V29

☐

C1-C3

☐

V30

☐

C1-C3

☐

Box 4

V31 C1-C3

☐☐

V32

☐

C1-C2

☐



4.11 Are there any rituals that you perform in collecting some of the species?

Yes	No

V33 C1-C2

--	--

4.12 If yes, what are they?.....

.....

.....

Box 5

4.13 Are there any restrictions about the species?.....

Yes	No	Sometimes

V34 C1-C3

--	--

4.14 Mention the species that are restricted.

.....

.....

Box 6

4.15 Have you received a certificate as a permission to collect the plants?

Yes	No

V35 C1-C2

--	--

4.16 Who gives you permission to access the species?

Police	Local authority	KZN wild life officers	Healers association	None

V36 C1-C5

--	--

4.17 If you have not yet obtained permission, how do you get the plants that are restricted?

.....

.....

Box 7

4.18 Do you leave some plant material after collecting?

Yes	No	Sometimes

V37 C1-C3

--	--

4.19 Have you received any training based on collecting the plants?

Yes	No

V38 C1-C2

--	--

4.20 If yes, who offered that training?

Police	Local authority	KZN wild life officers	Traditional healers association	Other	None

V39 C1-C6

--	--

4.21 Do you think training on selling can impact your profit?

Yes	No

V40 C1-C2

--	--

4.22 Why do you think so?

.....

.....

.....

.....

**The end**  
**Thank you**

## **APPENDIX 2: INTERVIEW SCHEDULE**

The purpose of this instrument is to conduct focus group interviews with medicinal plant sellers in order to find out the challenges they faced regarding **storage**, **conservation** and **marketing** of medicinal plants from the point of view of business profitability and environmental friendliness.

### **1. STORAGE**

1.1 How do you store your medicinal plants? What are the challenges that you experience by using the storage methods you currently using.

### **2. Marketing**

2.1 How do determine prices charged for your medicines?

2.2 What are the marketing strategies do you use to market your business?

### **3. CONSERVATION**

#### **3.1.1 Harvesting**

3.1.1.1 How do you harvest your medicinal plants?

#### **3.1.2Cultivation**

3.1.2.1 Is there anything you can tell me concerning cultivation of your medicines?

#### **3.1.3 Education and training**

3.1.3.1 Have been heard about trainings on harvesting?

## **APPENDIX 3:       WORKSHOP PROGRAMME**

### **Aims of a workshop**

The main of the workshop was to share information on the challenges that affect the medicinal plant selling business with an attempt of finding possible solutions. The workshop also aimed at bringing awareness to the medicinal plant sustainable about the ways of sustaining the medicinal plants and also their business of selling medicinal plants. The workshop plan is as follows:

Date:	20 November 2011
Venue:	Abumadi Game Reserve (MKUZE) KZN
Time:	0830-17h30
Number of participants	30 (22 interviewees plus 8 other participants)
Guest speaker:	Mr. M and Mrs. M. Balcomb
Supervisors	Prof. S.N. Imenda
Organiser:	Ms. B.G Ndawonde

### **Facilitators**

#### **a) Demonstrators from interviewees panel**

Mrs. Mpontsana - KwaNgwanase  
Mr. Mathenjwa - Mbanzwana  
Ms. T. Mkhwanazi- Mtubatuba  
Mr. S. Nxumalo - Empangeni  
Mrs. Mkwana Nongoma

#### **b) Faculty members**

Ms. B. Ndawonde

### **Summary of activities**

1.    Everyday challenges facing the medicinal plant selling business and possible solutions.
2.    Demonstration of cultivation of the plants by nature conservationists
3.    A presentation on how to propagate and cultivate each plant species.
4.    Recommendations and way forward.

**Table 1. Programme of the day**

<b>Activity</b>	<b>Presenter</b>	<b>Original place</b>	<b>Time allocation</b>	<b>Responsibility</b>
Challenges of the business	Ms. Mkhwanazi Mrs Mpontshana Mr. Mathenjwa Mrs. Buthelezi Mrs. Mkhwanazi	Mtubatuba Manguzi Mbazwana R/Bay Nongoma	15 min each person	Ms. Ndawonde
Presentation of economic and scientific business management skills	Mr. Sibiya and Mr. Ncube	UNIZULU	One hour for each presentation	Ndawonde
Demonstration of conservation	Abumadi Game reserve personnel	Mkhuze	30Minutes	Ndawonde
Demonstration of plant propagation and cultivation	Ms. BG Ndawonde	UNIZULU	One hour	-
Way forward	Ms. BG Ndawonde	UNIZULU	5 minutes	-

#### **Appendix 4: ASSESSMENT OF THE STUDY INTERVENTION**



The purpose of this instrument is to administer open-ended interviews to medicinal plant sellers in order to find out about the practices regarding the **storage, conservation** and **marketing** of medicinal plants from the point of view of business profitability and environmental friendliness, after attending a workshop on medicinal plant sustainability which was held at Abumadi Reserve on the 20<sup>th</sup> November 2011.

## 1. STORAGE

- Do you still remember how you stored your medicinal plants before you attended the workshop? How do you do it now?

## 2. CONSERVATION

### (i) Harvesting

- How do you harvest your medicinal plants now, compared to the way you did it before the workshop?

### (ii) Cultivation

- Is there anything you can tell me concerning your involvement in the cultivation medicinal plant, including watering?

### (iii) Education and training

- You remember in the workshop we talked about harvesting certification, what has it been like for you since that time?
- Have you been to any workshop on harvesting – either before or after the workshop?

## 3. MARKETING AND SELLING

### 2.3.1 Packaging

- What could you tell me about the ways of packaging your medicines before and after the workshop?

### 2.3.2 Pricing

- How do you compare the ways of pricing before workshop and after the workshop?
- How are the sales of your medicines currently, compared to the period before the workshop?
- What was it like to record your sales (e.g for the purpose of determining profit) and prices of your medicines before the workshop and how is it now?

**APPENDIX 5a: INVITATION OF FACILITATORS**

P. O. Box 30, internal mail  
University of Zululand  
KwaDlangezwa  
3886  
18 November 2011

**Dear Sir/Madam**

**Re: Invitation to be a Facilitator in Environmental Education Workshop  
(20/11/2011)**

You are kindly invited to facilitate in the environmental education workshop on medicinal plant sales in northern Zululand.

The workshop will form the basis of the De. Ed thesis on Education for Sustainable Development by Ms. B. G. Ndawonde (student no.981486) at University of Zululand promoted by Professor Imenda.

The workshop will be based on the demonstration and feeling the gaps of knowledge in medicinal plant traders about propagation of medicinal plant species that are threaten and medicinal plant business management skills. You are requested to perform the task as they appear in the programme.

Kindly receive the following document herein:-

Yours Faithfully  
B. G. Ndawonde



## APPENDIX 5b: INVITATION OF WORKSHOP PARTICIPANTS

**ZULULAND**

***Faculty of Education***

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Internal Box 30  
University of Zululand  
P/Bag 1001  
Kwa Dlangezwa  
3886  
Tel: 035 – 902 6353  
Fax: 035 – 9026260

04 November 2011

.....

### **Isimemo Somhlangano wokongiwa kwezihlahla**

Uyamenya emhlanganweni wokongiwa kwezihlahla zokwelapha kwesintu ohleleke kanjena:

Usuku : 20 November 2011

Isikhathi : 8H30

Indawo : **Umkhuze Abumadi game reserve**

Izinto zokuhamba-Imoto yasenyuvesi eyosuka ngeSabatha Ntambama mhlaka 19 idlule inithathe e Mtubatuba ngo 16H30 nilale esiqiwini.

Ngiyabonga

Ndawonde BG-0739299216

## Translated English version of a letter

**ZULULAND**

***Faculty of Education***

---

Internal Box 30  
University of Zululand  
P/Bag 1001  
Kwa Dlangezwa  
3886  
Tel: 035 – 902 6353  
Fax: 035 – 9026260

04 November 2011

.....

### **Invitation to attend a workshop on medicinal plant conservation**

You are invited to attend a workshop on medicinal plant conservation arranged as follows:

Date : 20 November 2011

Time : 8H30

Venue -**Umkhuze Abumadi game reserve**

Transport arrangement- We are going to depart at 16H30 on the 19<sup>th</sup>, we are going to stay a night at Abumadi, A university transport is arranged for you.

Thank you

Ndawonde BG-0739299216

## APPENDIX 6: ESTIMATED BUDGET FOR THE WORKSHOP

### Transport

Manguzi, Mbazwana-Mkhuze (300km x R3.05)	=	R 915.00
Nongoma to Mkhuze – (150km X R3.05)	=	R457.50
Richards Bay and Empangeni-Mkhuze (400KMx3.05=	=	R1220-00
<b>Accommodation</b> R350/nightX15	=	R5250-00
<b>Lunch</b> – (30people x R100)	=	R3000-00
Payment of facilitators	=	R1000X3peopleX1 day=R3000-00
Payment of research assistants	=	R120X4X2days=R960
Photocopying of learning material	=	250, 00
Hiring conference venue	=	R500-00
<u>Hiring of video services</u>	=	<u>1200. 00</u>
<b><u>Total</u></b>	<b>=</b>	<b><u>R16752</u></b>

**APPENDIX 7: RESTRICTED SPECIES REPORTED BY  
MEDICINAL PLANT SELLERS**

<i>Species name</i>	<b>Zulu Name</b>	<b>Number of species</b>	<b>District numbers</b>	<b>Respondent number</b>
<i>Boophane elistricha</i>	(i) Ngcotho	1	3	3
<i>Crocospia aerea</i>	(u) Ndondweni	1	3	3
<i>Callilepis laureola</i>	(i) Mpila	5	3	3, 12, 14, 20, 51
<i>Ximenia caffra</i>	(u) Mgwanya	1	3	6
<i>Species 1</i>	(u) Vulakuvaliwe	1	3	6
<i>Justica capensis</i>	(i) Khokhela	1	3	6
<i>Acacia Xanthophloea</i>	(u) Mkhanyakude	4	3	7, 9, 27, 41
<i>Encephartos species</i>	(i) Sigqiki somkhovu	10	1, 2, 3	1, 2, 7, 9, 10, 12, 15, 28, 53, 56
<i>Sclerocarya birrea</i>	(u) Mganu	3	1, 3	8, 18, 27
<i>Cassine transvaalensis</i>	(i) Ngwavuma	2	2, 3	8, 14
<i>Synaptolepis kirkii</i>	(u) Vuma	1	3	8
<i>Warburgia salutaris</i>	(I) Sibhaha	5	1, 3	2, 18, 19, 20, 32
<i>Ocotea bullata</i>	(u) Nukani	4	1, 2, 3	19, 30, 50, 53,
<i>Capparis tomentosa</i>	(i) Qwaningi	1	3	41
<i>Chlorophytum modestum</i>	(i) Phamba	1	3	41
<i>Olinea radiata</i>	(u) Mhlanukelwa/Mzaneno	1	3	41
<i>Bersama swinnyi</i>	(u) Mhlakza	1	1	53
<i>Scilla natalensis</i>	(i) Nguduza	3	1, 2, 3	28, 30, 54,
<i>Gunnera perpensa</i>	(u) Gobho	1	3	28
<i>Eucomis autumnalis</i>	(u) Mathunga	2	1, 3	18, 20
<i>Bauhinia bowkeri</i>	(u) Mdlandlovu	1	3	20
<i>Hypoxis gerrardii</i>	(i) Nkomfe	1	2	42
<i>Haemarithus albiflos</i>	(u) Zeneke	1	3	34
<i>Hypoxis hemerocallidea</i>	(i) Labatheka	1	3	32
<i>Gnidia kraussiana</i>	(u) Msilawengwe	1	3	31
<i>Species 2</i>	(u) Tshani bezwe	1	3	31
<i>Species 3</i>	(a) Manzi amhlophe	1	3	31
<i>Species 4</i>	(u) Macasha	1	2	30
<i>Stangeria eriopus</i>	(i) Mfingo	1	3	15
<i>Adenia gummifera</i>	(i) Mpindamshaye	1	3	15
<i>Plectranthus hadiensis</i>	(u) Mbola	1	1	18
<i>Species 5</i>	(i) Femba	1	3	39
<i>Secamone gerrardii</i>	(u) Gobandlovu	1	3	39
<i>Helinus ingrifolius</i>	(u) Bhuhubhu	2	3	14, 39
<i>Othonna natalensis</i>	(i) Ncama	1	3	14
<i>Vernonia naocorymbosa</i>	(u) Hlunguhlungu	1	3	14

**APPENDIX 8: LETTER TO REQUEST PERMISSION TO THE KEY  
PERFORMANCE INTERVIEWEES**

**UNIVERSITY OF ZULULAND**

*Faculty of Education*



Internal Box 30  
University of Zululand  
P/Bag 1001  
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3886  
Tel: 035 – 902 6353  
Fax: 035 – 9026260

10 May 2011

The Manager  
KwaZulu-Natal Wild Life Department

Dear Sir/Madam

**RE: Appointment to conduct the research interviews**

I am a University of Zululand student, reading for Doctors degree in medicinal plant conservation. I would like to request an appointment with you to conduct the interviews based on medicinal plant conservation. The interviews are expected to take about 7-10 minutes. The information will be treated privately and the results obtained from the given information will not be used to generate income.

I would like to come on the 17<sup>th</sup> May 2011. I would appreciate it if we can meet in the morning at about 10H00-10H10 AM if your work schedule can permit that time slot.

Thank you

Yours Faithfully

B. G. Ndawonde (Ms.)

## Questionnaire for key informants

### 1. Accessibility

1.1. Are there any species that sellers collect from game reserve?

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1.2. What are they?

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1.3. How sellers get species that are no longer found in your area?.....

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## **2. Training**

1.4. Do you offer training to medicinal plant sellers on sustainable harvesting of medicinal plants. Yes/No

.....

1.5. Which areas did you cover?

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.....

1.6. Do you offer certification on medicinal plant collection? Yes/NO

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1.7. What is your procedure?

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## APPENDIX 9: RESULTS FOR FIELD VISITS



Imfingo-*Stangeria eriopus*

Place: KwaNgwanase-East of the  
star of the sea school



Isigqiki somkhovu-*Encepharitos  
species*

Mbazwana-North west of Fisagie  
resolts



Imfe yenkawu -*Ansella Africana*

KwaNgwanase-KwaMazambane  
West of Manguzi town



Isibhaha-*Warbaurgia salutaris*  
KwaNgwanase-Kwamazambane area





Isibhaha-*Warbugia salutaris*



Ikhathazo-*Justica flava* Star of the sea beach dunes



Umondi-*Mondia whitei*  
Along side of the Manguzi researve



Impinda-*Adenia gummifera*

Dune forest of the  
Star of the sea beach

## APPENDIX 10: PROPAGATION OF THREATENED MEDICINAL PLANTS



**APPENDIX 10A: ENGLISH VERSION OF THE PROPAGATION METHODOLOGY**

Taxa	Methods of cultivation and propagation
<i>Alepidea amatymbica</i>	<p><b>Propagation</b></p> <p><b>Seed:</b> Propagation from seeds, which have a pleasant scent when rubbers colour from green to purple, then brown as they ripen and should be collected between January and May. Fresh seeds should be planted in a mixture of river sand and compost. Fresh seed germinate well starting in 2 weeks. Eight percent (80%) of seeds germinate with 9 weeks. Seedling must be watered daily. Once the two-leafed stage is reached, transfer seedlings into beds, ½ litre bags or larger frays should be carried out.</p> <p><b>Vegetative:</b> Plant that produces multiple crowns can be split and transplanted.</p> <p><b>Cultivation:</b> seedlings do not really tolerate replanting and are easily drought stressed. Space seedlings 20cm apart in a warm place with well-drained soils and much. Provision of shade should be 30%. Water daily. Seedlings can be planted in tyres or in moisture retentive soils (e.g. with a medium high clay content). Once plants are established they are more droughts tolerant, but for better production should be regularly watered. If plant shows signs of heat (yellow of leaves) apply increased shade, water and much. Organic fertilizers should be avoided, as these plants are prone to terminate activity, which can lead to ring barking and death of the plant. The plants flower after two years.</p>
<i>Ansellia africana</i>	<p><b><u>Propagation</u></b></p> <p>Vegetative: The stem may be divided at the base and strapped to the fork of a tree. Similarly a semi-shaded deadwood trellis could be made to hold a number of plants in accessible positions.</p> <p>Propagation through stem cuttings is possible at temperatures of 25<sup>0</sup>C - 35<sup>0</sup>C . Cuttings germinate roots and shoots after placing in sandy soil</p>

	<p>from the period of 14 days.</p> <p>Tissue culture: plants have been produced from tissue culture using seed tissue and stem cuttings.</p>
<i>Bulbine frutescens</i>	<p><b><u>Propagation</u></b></p> <p>From seed: Few maturing seed-heads can be collected by hanging a paper-lined container or in a large paper bag. As the seeds ripen they will fall out of the seed-heads. Seed should be placed in a mixture of 2 parts sand and 1 part of compost and be placed in tray. Ripe seeds could be spread quite sparsely over the surface of the soil. Provision of about 35% shade and watering of seeds with a fine sprayer, taking care not to disturb them should be done. Germination will start in 2 to 3 week, and about 80% of the seeds will grow. Seedlings grow rapidly and need to be transferred to large seedling trays with the same soil mix, or they can be planted out.</p> <p><b>Vegetative:</b> Sometimes the fleshy leaves will divide root and stem merge. Lift plants from the ground, separate at the point where the stem and roots merge using a clean sharp blade, ensuring that each plant portion has root. Replant directly into the ground or bag in a potting soil mix river sand and compost in equal proportion until the plants are again firmly root. It is not advised to attempt leaf cutting of this succulent plant as these rot very quickly.</p> <p><b>Cultivation:</b> <i>Bulbine</i> is very prone to leaf rot and infections in areas where temperatures and humidity are high. The plant is best cultivated in cooler inland regions where there is no frost. The plants should be cultivated in a deep, well-drained soil, high in organic matter. New seedlings should be planted into beds with 35% shade. Water every day for first 2 weeks. Watering can is decreased to once every 2 days. Plants may be placed in full sun six weeks after being planted out. The leaves turn yellow when the plant is water stressed. Plant will produce seed within a year. Removing dead flower/seed-head is known to encourage flowering.</p>

<i>Boweia volubilis</i>	<p><b><u>Propagation</u></b></p> <p><b>From Seed:</b> The tiny yellow-green flowers develop into a swollen ‘fruit’ towards the end of flowering season. These fruit turn yellow and brown as they mature and should be harvested when the fruit have turned yellow. A plastic sheet could be placed under the shoot when the fruits start to turn brown. As they split open tiny black seeds fall out and can be collected from the sheet. Before sowing, the soft, black seed coat and brown under layer should be removed by rubbing the seeds between your fingers until the white part is exposed. Only a small percentage of seed will germinate, so make sure you have a lot of seeds before sowing. Fresh seeds should be scattered onto the growing medium and sprinkled lightly with sand. This will help prevent the roots from pushing the plant out of the soil. Fresh seeds take about seven days to germinate.</p> <p><b>Vegetative:</b> Bulb scales may be broken off from large bulbs at the end of the growing season (i.e. the autumn or winter) and inserted upright into sand. Bulb is will form along the base should be transplanted when large enough to handle.</p> <p>Propagation through tubers is also possible by making two equal halves of the tubers and be place in river sand. After a period of 2 to three week halves develop roots and become established.</p> <p>Cultivation: Bulbs should be planted with the top ¼ exposed above soil. A stake should be planted next to the bulb for the shoot to climb up and be supported on, or a wire trellis could be put for a number of bulbs in a cultivation plot. Bulbs should not be mulched or they will not receive light to grow and may rot. If the bulbs are planted in an open plot, soil should not be mechanically turned over before planting, as these soil conditions result in the bulb dying out too quickly. The bulbs grow well in tyres, plant pots and plastics as the soil moisture content can be kept</p>

	high enough so that the bulbs do not dry out, but not so wet that they rot.
<i>Dioscorea dregeana</i>	<p><b><u>Propagation</u></b></p> <p><b>Seed propagation:</b> Seeds should be sown it into well-drained mixture of soil and compost, and cover lightly with soil. Germination takes place about 10 days.</p>
<i>Dioscorea sylvatica</i>	<p><b><u>Propagation</u></b></p> <p><b>Seed propagation:</b> Outer covering of seeds should be removed for easy emerging of roots. Seeds should be sown into a well-drained mixture of soil and compost and cover lightly with soil. Germination takes about 10 days. Seedlings should be left for a season, or until the plants are large enough to handle.</p>
<i>Eriospermum mackeni</i>	<p><b><u>Propagation</u></b></p> <p><b>From Seed:</b> Collection of seeds should be done before capsules have opened. Transplantation of seeds into trays containing two parts of sand and one part of compost should be carried out. Water with fine sprayer and place in 35% shade. When seeds have germinated and seedlings have two leaves, they can be replaced in ½ litre bags containing two parts of sand and one part of compost.</p>
<i>Haworthia limifolia</i>	<p><b><u>Propagation</u></b></p> <p><b>From Seed:</b> A dry-off period in autumn will stress the plants slightly and stimulate the flowering process. Seeds should be harvested as soon as capsules turn a straw colour and split. A mixture of equal amounts of sand and vermiculite should be sprinkled over the soil surface where seeds are placed. The seedling trays should be watered from the base to minimize disturbances, at least until the seeds have started to grow. Seeds should be planted fresh and could germinate within 7 days. Seeds are 100% viable during the first 3 weeks, thereafter viability decreases rapidly. If bottom-heated (25) nursery mist beds are available, this is the most effective way to germinate the seeds. Young seedlings appear as shiny green translucent matchheads after about 4 weeks. Roots grow quickly, and the plants reach thumb-size within a year under optimal</p>

	<p>growing conditions.</p> <p><b>Vegetative:</b> Some form of <i>Haworthia</i> species produce long offsets. The vigorous forms should be collected for vegetative propagation. The offsets can be separated and planted out in spring. If the offsets lack roots then allow them to dry out for 3 days before planting. The new plants will produce more offsets within 2-3 years (Diederichs, 2006). New plants may also be grown from leaf cuttings, if these have a piece of stem attached. Water the plant from which you are going to take a cutting well. Typically, plants should be soaked once to twice a week (with watering halted over a 3-month winter-flowering rest period). Make tiny cuts into the thick skin of the stem on either side of leaf to be removed, and then carefully twist it off. Enough of the stem should still be attached to the torn off leaf to ensure that it roots properly. Fill a container to <math>\frac{1}{3}</math> with sterilized coarse organic peat. Leave it in a warm, shady spot (80% shade) and spray once daily with a mist spray in which a little fungicide has been added.</p> <p><i>Haworthia limifolia</i> is propagated through cuttings offsets into two pieces with the top and bottom having enough leaflets so that roots may germinate from each of the pieces. After seven days of placing into sand both the top and bottom part of cuttings develop roots. Shoots come out after a period of four to five weeks, at temperature of 18<sup>0</sup>C-30<sup>0</sup>C.</p> <p><b>Cultivation:</b> Plants reach the flowering size after approximately four years and grow best in bright shaded sunlight. Leaf sunburn may develop following prolonged exposure to full sun. The diameter of the leaf rosette can be expected to increase by 1cm per year with weekly watering and nutrient feeding in the spring. Plants respond well to fertilization.</p>
<i>Hypoxis hemerocallidea</i>	<p><b><u>Propagation</u></b></p> <p><b>From Seed:</b> After flowering, seed capsules develop with a top cap that is released to shower out the rough, shiny dark brown seeds. Seeds should be collected before the capsules open to get maximum seed from each plant. If necessary seeds should be stored in a cool, dry place (with</p>

	<p>fungicidal powder if possible, if not, use a powdered wood fire ash.) in the highveld sow the seeds in early spring (August to September). Fresh seed may be sown at any time of year in milder climes such as coastal Zululand Kwa-Zulu Natal. Viable seeds should be tested with floating in water whereby viable seeds sink. Mix two parts of sand to one part of compost (or 1: 1:1 mix of quartz-rich granite gravel: coarse sand: leaf mould: compost or 100% pine bark milled to ¼ inch) and put into small seed trays or open beds under cover. Place seeds in freshly boiled water, remove when cool to room temperature and sow. Bury seeds 1mm deep and cover with fine grass compost. Keep the soil moist but not wet, good ventilation and low humidity. Up to 75% germination can be expected with 3 to 8 weeks.</p> <p><b>Vegetative:</b> Fibrous rhizomes may be lifted in late winter and cut longitudinally into two halves before replanting. The wound becomes covered by resin that seals it off from infection, although an additional dusting with ‘flower of sulfur’ is recommended.</p> <p><b>Cultivation:</b> older tubers do not transplant as well as younger tubers, and are prone to insect and fungal attack. Small and medium sized bulbs grow relatively faster than large bulbs, so these smaller sizes should be planted as they yield higher returns per hectare over time.</p>
<i>Mondia whitei</i>	<p><b><u>Propagation</u></b></p> <p>Vegetative: Mondia creepers can be grown through cuttings. About 15cm of stems can be placed into water which needs to be refreshed daily. After a period of one to two weeks, new leaflets start to immerse from the stem.</p>





Roots develop after a period of three weeks. Caution should be when growing *Mondia whitei* since it can be weed. Therefore, enough the plants should be given plenty growing space.

*Ocotea bullata*

**Propagation**

**From seed:** The egg-shaped seeds must be removed from a corn-like fruit. Seeds are recalcitrant and so cannot be stored dry. Fill seedling trays with equal amounts of sand and compost. Press the seeds into the soil until flush with the soil surface. Sprinkle with soil mix until the seeds are no longer visible. Place trays in 35% shade over a heated cutting bed and water daily with fine sprayer. About 70% of the seeds will germinate within six weeks. After six months replant the seedlings into ½litre bags packed with equal amounts of sand and compost. Keep in 35% shade and replant into six litre bags the following spring. Exposure the saplings to ore sun harden them off. Two seasons later or when the plants are 1m tall, they can be planted out.

**Vegetative:** Take stem cutting in August and dip into rooting hormone. Place up to 8 together in a 120cm high culture pot containing lightweight aggregate stones of 2-4mm coarseness. Place the culture pot in a round

	<p>tin [16cm diameter] filled to a height of 9cm with ordinary tap water [pH8.5]. Cover the tin culture pot with a protective cover to keep humidity high; and leave on the southern side of a greenhouse. Do not provide bottom heating. Change the daily. White root shoots should have developed along the stems after 10 weeks. Thereafter replace the water weekly. By November, some of the root shoots will have developed into roots while others turn black and stop growing. At the end of December, replant rooted cutting into ½Litre bags packed with equal amounts of sharp river sand a mix of 98% pine bark with 2% washed river sand. Return the plants to the cover for a month to acclimatize. Then move to 60% shade for a few weeks, followed by 35% shade. Investigation have shown that ‘Rockwool’ may be used as a viable rooting medium, with cuttings rooting after only 60days, This has been attributed to the high water-retaining properties of Rockwool,</p>
<i>Prunus africana</i>	<p><b><u>Propagation</u></b></p> <p><b>From seed:</b> The fruit should be collected from the crown of the tree, or from the ground, between September and November. The seeds should be used fresh. Soak the seeds in water for 24 hours, and then wash them to remove the outer pulpy covering. Spread the washed seeds in a thin layer in an airy, shaded place to dry for no more than four hours. Fill standard seedling trays with two parts sand and one part compost. Press the seeds into the soil until flush with the surface. Sprinkle lightly with some of the soil mix until the seeds are no longer visible. Place trays in 35% shade in well aerated place (e.g. over pebbles) and water with fine sprayer. Seeds take about 4 to 6 weeks to germinate. And about 60% of the seeds will grow. Remove the seedlings after 4 to 6 months and plant into ½ litre bags packed with equal amounts of sand and compost. In the fourth year plants should have reached a height of 1m, and can then be planted out.</p> <p><b>Vegetative:</b> Shoot-tip cuttings comprising the top 10cm of a shoot (about three nodes) should be taken in spring or summer. Remove all but ⅓ of</p>

	<p>the leaves, and cut the remaining leaves in ½. Place the cuttings in mist-house in cutting beds with under bed heating. Cuttings take 4 to 6 months to grow callus and roots. Leaves rooted planted in positions in one year reducing the amount of aerial misting as the root system develops. After this period, plant into 1½-litre bags packed with 2 parts sand and 1 part compost. Place in 35% shade and water regularly. Expose the sapling to more sun to harden them off. When they reach 1cm height, they can be planted out.</p>
<i>Scilla natalensis</i>	<p><b><u>Propagation</u></b></p> <p><b>From seed:</b> ripe seeds should be sown as soon as they become available (November to January) and will germinate with 7 days. If fresh, bulbs may be divided at the base. Keep bulbs dry during winter.</p>
<i>Stangeria eriopus</i>	<p><b><u>Propagation</u></b></p> <p><b>From Seed:</b> Seeds should be soaked in water overnight the outer-coated seeds. Scatter the woody seed over seedlings trays packed with a mixture of two parts of coarse sand and one part of compost. Water with fine sprayer. Place in 35% shade. Some seeds can germinate within 35 day, but other take up to 10 months. The seedlings can be transplanted into larger bags containing equal amounts of sand and compost when large enough to handle.</p> <p><b>Vegetative:</b> The underground stem may branch into separate sections, and it is possible to split these into new plantlets. Each separate section split off must have some roots attached. These plantlets can be placed just under the soil in ½ litre bags filled with equal amounts of sand and compost and then watered well.</p>

<i>Warbugia salutaris</i>	<p><b><u>Propagation</u></b></p> <p>From Seed: Soak the fruit in cold water overnight, then rub them against wire mesh to remove the hard waxy black/brown seed from the fruit, Place seeds in trays on a mixture of equal parts of sieved compost and river sand, cover lightly with the soil mix. The seeds germinate readily and start growing after about 21days. 80% of freshly collected and sown seed should grow within 2months of sowing Storage of seeds is not advised as they dry out and die. Seedling should be left in the trays until they reach 5cm in height, or the 2-leaf stage, When they may be repotted into 1½ litre bags with 1part river sand and 2parts compost, and later into six litre bags.</p> <p>Vegetative: Take long shoot-tip cuttings, consisting of the top 15cm length of new apical shoots, in the early morning and keep them in a bucket of water, Depending on the time of the year that the shoot-tip cuttings are taken, the tip types will vary from semi-hardwood to softwood. The harder tip cuttings work best Trim smaller cuttings (3-4nodes; 8-10cm) from the original 15cm-long tip and strip them of their lower leaves. Cut the remaining leaves in half. Place the cutting in to 5-second sprays at 10-minute intervals. It take 3to 4 months for the cuttings to take roots, About half of them will take roots. Thereafter replant them into 1½ litre bags containing 1 part river sand and 2 parts compost. Place in 35% shade and water regularly. Leaves to grow to 3 years, replanting into larger bags as needed. Place the plants in successively sunnier places to harden then off. When the saplings are 1m tall they can be planted out, The rooting period can be reduced if rooting hormones are applies, or stricter environmental control (e.g. temperature, mist-drift) is exercise at the mist bed site. The best rooting response has been noticed in March and August.</p>
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Methods taken from Diederichs, *et al.*, (2002).

**APPENDIX 10B: CULTIVATION OF THE MEDICINAL PLANT SPECIES  
TRANSLATED IN ISIZULU**

<i>Igama lesiZulu</i>	<b>Indlela yokutshala</b>
<i>iKhathazo</i>	<p>Izinhlamvana ezibonizi Imbewu ibonakala ngokubansundu uma sezivuthiwe kumele ziqoqwe ngoMasingana. Zidinga ukutshalwa emhlabathini oyingxubevange yesihlabathi sasemfuleni nesivundisi Izinhlamvu ziqala ukuqhumu emuva kwamasonto amabili. Inani elingamashumi ayisishagalombili ayisishagalombili nanhlanu. Kufane ziniselwe zonke izinsuku bese kuqikekelwa ukuthi azifakwa kakhulu izivundisi. Uma sekuqala kuvela okungamaqabungana amabili, kumele uzitsizifakwe emibhedeni noma mathileyi amakhudlwana. Noma kulabopulasitiki abangu uhhafu welitha. Singatshaleka futhi lesisihlahla ngokutshala izithombo emhlabathini owadedelayo amanzi. Shiya izikhala ezingamacentimitha angamashumi amabili ngaphakathi kwezithombo. Vumela ithunzi eliyinani elingamashumi amathathu.</p> <p>Uma ngabe izihlahla zikhombisa ukubaphuzi, nyusa izinga lethunzi namanzi. Ungawufaka umanyolo. Isihlahla siqhakaza emuva kweminyaka emibili</p>
Imfe-yenkawu	Uyatshaleka ngesiqu. Uyasishoka ngezihlahlana ezomile ukuze singawi.
10Ibhucu	<p>Wendlala izinhlamvu esezivuthiwe maphezulu nomhlabathi bese wemboza ngomhlabathi kancane. Lokhu ungakwenza ngokusefa inhlabathi phezu kwezinhlamvana. Beka ethunzini elingamazinga angamashumi amathathu nanhlanu. Nisela ngesipreyi esincana ugade zingaphazamiseki izithombo.Emuva kwamasonto amabili kuya kwamathathu zizoba sezimilile izithombo inani elingamashumi ayisishagalombili. As Kwesinye iskhathi singatshlwa lesisimila ngokubheka phakathi kwamaqabunga lapho kuvela khona isiqwana. Phakamisa isihlahla phezu komhlabathi bese usika lesisiqu uqikele ukuthi sisikeka nempande ngereza ebukhali. Buya usitshale sesizimele emhlabathini ohlanganiswe nesihlabathi nomanyolo.</p> <p>Zingasthaleka futhi izithombo emhlabathini onothile. Zibeke elangeni ngokuphele kuze kube ngamasonto ayisithupha.</p>
Ugibisila	Izimbali ezindumbile ziyakhula ngokwanele emuva kwentwasahlobo. Zibonaka

	<p>ngokushinstha zibe phuzi uma sezikhulile, lapho kusuke sekufanele zivunwe. Beka upulasitiki ngaphansi kwesimila. Uma ngabe seziqhuma, izinhlamvana ezimnyama ziyawa futhi zingaqoqeka kulowo pulasitiki okade ubekwe ngaphansi kwesihlahla. Ngaphambi kokuba kutshalwe lokhu okumbathise inhlamvu kufunaka kususwe. Zincane nokho izinhlamvu ezimilayo ngakho kumelwe zitshalwe zibe ningi. Kuthatha izinsuku eziyikhombisa ukuba izinhlamvu ziqhume</p> <p>Impande ingatshalwa ngokuyivelisa ikota yayo ngaphezu komhlabathi. Seka ngendukwana noma ngocingo ukuze isimila sikwazi ukukotela. Kumila kahle kumsokama ongekho manzi kakhulu futhi ongomile kakhulu.</p>
uDakwa	Izinhlamvu zingatshalwa emhlabathini ovundile onomanyolo. Zimbozwe kancane ngenhlabathi. Ukumila kwazo kuthatha izinsuku eziyishumi.
iNgwevu	Kutshaleka ngezinhlamvu ezisuswe ikhava. Zitshalwa emhlabathini ofakwe umanyolo bese zembozwa kancane ngomhlabathi. Ukuqhuma kuthatha izinsuku eziyishumi.
uNsulansula	Tshala izinhlamvu ngaphambi kokuba imidumba ivuleke. Nquma imbali okumile kunye lemidumba. Tshala emathileyini anezingxenywe ezimbili zomhlabathi engxenyeni eyodwa kamanyolo. Vuvuzela umhlabathi phezu kwezinhlamvu. Nisela ngesipreyi esinezimbobo ezincane. Beka emthunzini engamanani angamashumi amathathu nanhlanu. Uma sezimilile faka ezikhwameni ezinguhhafu welitha.
uMathithibala	Izinhlamvu zitshalwa emuva kokuba imidumbu isiqhumile. Hlanganisa isihlabathi sasemfuleni nesikhuthazo besi utshala izinhlamvu kokuzivuvuzela emhlabathini emathileyini. Nisela ngaphansi kwamathileyi ukuze zingaphazamiseki izinhlamvu kuze kube ziyamila. Ukuqhuma kuthatha izinsuku eziyisikhombisa.
iLabatheka	Qoqa izinhlamvu ngaphambi kokuba imidumbu ivuleke . ibonaka ukuthi isivuthiwe ngokuthi iveze amakepisi ngaphezulu. Izinhlamvu zona zibonakala ngokuthi zibe nsundu ngokuzothile. Tshala emathileyini ahlanganise ingxenywe eyodwa yomhlabathi engengxenyeni eyodwa yesivundisi. Mboza ngotshani obuvundile bese unisela ngamanzi angemangingi. Kudinga indawo engenisa umoya nelanga. Ukumila kuthatha amasonto amathathu kuya kwamane.

uMondi	Simila ngokutshalwa usebenzisa izinhlamvu. Sidinga indawo enkulu yokutshala.
uNukani	Izinhlamvu zikhishwa esithelweni. Gcinazela izinhlamvu emhlabathini emathileyni zize zingaveli emhlabathini. Nisela nsukuzonke ngesipuleyi esincane bese ubeka ethunzini elingamanai angamashumi amathathu nanhlanu. Kufanele isiqu sibe sesevela emasontweni ayishumi. Singatshalwa ngokusebenzisa isiqu, ngokunquma indukwana bese ifakwa emhlabathini noma kumahomoni. Nisela ngokuphelele.
iNyezangoma - elimnyama	Isithelo sitholakala esihlahleni noma emhlabathini phakathi kukaMfumfu noLwezi. Cwilisa izinhlamvu emanzini amahora angamashumi amabili nane. Susa ikhava. Zomise izinhlamvu kungaze kweqe amahora amane. Faka emathileyni ngokugcinazela izinhlamvu zize zimbozwe umhlabathi. Beka endaweni ethola umoya ngokwanele. Beka ethunzini eliyinani elingamashumi amathathu nanhlanu. Nisela ngesipreyi esincane. Kuthatha amasonto amane kuya kwayisithupha ukuze zimile.
iNguduza	Izinhlamvu ezivuthiwe zitshalwa phakathi kukaLwezi kuya kuMasingana. Ukumila kuthatha izinsuku eziyisikhombisa. Zingatshaleka futhi ngokutshala impande. Izimpande kufanele zomiswe ebusika.
iMfingo	Izinhlamvu zicwiliswa emanzini ubusuku. Ikhava kumele isuswe ngaphambi kokuba zitshalwe. Hlwanela izinhlamvu emathileyni afakwe izingxenye ezimbili zesihlabathi nengxenye eyodwa yesivundisi. Nisele ngesipreyi esincane. Beka ethunzini elingamanani angamashumi amathathu nanhlanu. Ezinye zezinhlamvu zimila ezinsukwini ezingamashumi amathathu nanhlanu kodwa ezinye zithatha izinya kuya kweziyishumi ukumila. Siyatshalwa futhi nangesiqu. Kodwa uqikele ukuthi leyongxenye yesiqu inezimpande.
iSibhaha	Cwilisa isithelo emanzini abandayo ubusuku. Sivule bese ukhipha izinhlamvu ezibonakala ngokuthi zibensundu ngokumnyama. Faka izinhlamvu emathileyni afakwe engxenyeni elinganayo yesihlabathi nesivundisi. Izinhlamvu ziqhuma ezinsukwini ezingamashumi amabili nanye. Siyatshaleka ngesithombo nangesiqu ngokusika indukwana uyitshale emhlabathini bese uyeseke.