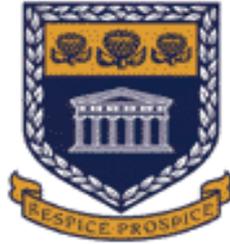


University of the Western Cape



CONSERVATION AND USE-VALUES OF MEDICINAL PLANTS IN RURAL EASTERN ZIMBABWE: A STUDY OF SELECTED MEDICINAL PLANTS

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requirements for the degree of Magister Artium in Development Studies**

SUPERVISOR: PROFESSOR OLAJIDE OLOYEDE

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Abstract

*Medicinal plants remain a very important natural resource used as traditional medicines for health needs in many developing countries. In the current deepening economic and political crises in Zimbabwe a significant number of the population has inevitably relied more on natural resources which has led to receding population and scarcity of many medicinal plant species in their natural habitat. It is against this background that this research, using Rural Eastern Zimbabwe that this study explored the extent to which use values of medicinal plants increased since the Zimbabwean crises and the different use values of these species among men and women. The rational choice theory, use value approach and concept of utility constituted a theoretical grounding of the research process. The study essentially used qualitative research methods with some quantitative data. A mix of interviews and focus group discussions were employed for this study. Interviews were conducted with community leaders, traditional healers, NGOs in the similar field and Government stakeholders eliciting their views on use values of medicinal plants and sustainable interventions that can be enacted in conserving these species. The findings of the study were shown through using tables, charts and the quantitative data was presented using STATA. The calculated total use-values of the 11 medicinal plants showed that *Kirkia ancuminata* Oliv, *Dicoma anomala* Sond, *Syzgium guineense* DC, *Zingiber officinale*, *Acacia Karoo* Hayne were found to have “high total use-values” and *Lannea edulis* Engl, *Aloe*, *Lippia javanica* Spreng, *Virtex payos merril*, *parinari curatelli* and *Coleochloa setiflora* have “low total use-values”.*

DECLARATION

I declare that “Conservation and use-values of Medicinal plants in rural Eastern Zimbabwe: A study of selected Medicinal plants” is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Kudakwashe Matongo

May 2012

Signed

Supervisor: Professor Olajide Oloyede (University of the Western Cape, South Africa)



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Acronyms and Abbreviations

CAMPFIRE- Communal Areas Management for Indigenous Resources

CBD- Convention of Biological Diversity

CVM- Contingent Valuation Method

EMA- Environmental Management Agency

ESAP- Economic Structural Adjustment Programme

GDP- Gross Domestic Product

IMF- International Monetary Fund

IMK- Indigenous Medical Knowledge

IUCN- International Union for the Conservation of Nature

MDG- Millennium Development Goals

NCS- National Conservation Strategy

MIMS- Multiple Indicator Monitoring Survey

RDC- Rural District Council

RDDC- Rural District Development Council

TMA- Traditional Medicinal Authority

UNEP- United Nations Environment Programme

VIDCO- Village Development Council

WADCO- Ward Development Committees

WCED- World Commission on Environment and Development

WHO- World Health Organisation

WTO- World Trade Organisation

ZIMPREST- Zimbabwe Programme for Economic and Social Transformation

ZINATHA-Zimbabwe National Traditional Healers Association



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1 CHAPTER ONE: INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 INTRODUCTION

It is well established that plants represent direct inputs to satisfy different household needs for food, medicine, shelter, fuel, firewood and so on. Indeed some plants species may also contribute to monetary incomes through commercialisation of plants (Olsen, 2005). In relation to plant medicines there is a long history of indigenous people's dependence on herbal medicines worldwide for their primary health care needs (Chigora, et. al, 2007). WHO, estimates are that more than 80% of the population of developing countries rely on traditional medicines for their health needs (Bannerman, 1982). Some writers suggest that medicinal plants can be viewed as a possible bridge between sustainable economic development, affordable health care and conservation of biodiversity (Srivasta, Lambert and Vietmeyer, 1996). It would perhaps be clear that a lot of emphasis tends to be placed on medicinal plants in many societies.

In the context of Zimbabwe, the current deepening economic and political crises can be said to have inevitably resulted in a significant proportion of the population relying more heavily on medicinal plants that are derived from nature rather than pharmaceutical medicines. This reliance and consequent continued exploitation of medicinal plants has resulted in receding population and scarcity of these plant species in their natural habitat. In Zimbabwe, many rural households and traditional healers tend to depend more on these various plant species, which they use commonly for medicinal purposes (Gelfand et. al, 1985). However despite the importance of these species, there seems to be increasing threat on these medicinal species. Mavi and Shava (1997) note that in Zimbabwe, it is increasingly difficult to prevent local people from destroying the plants around them despite the steps have been taken towards conserving the environment.

Given the importance of these plant species, the research issue is to what extent has the use value of medicinal plants shot up in Rural Eastern Zimbabwe and how the conservation of these species be sustained. This general research question is better understood within the wider context of Zimbabwe's economic development crisis since 1980 particularly between

the period 2000 to 2008 when the country experienced a deep economic and political crises. This is detailed immediately below.

1.2 BACKGROUND AND CONTEXTUALISATION

At Independence in 1980, Zimbabwe inherited a dual and diversified modern economy operating alongside a large subsistence peasant agricultural sector that was skewed in favour of the racial minority. During the first decade of independence, 1980–1990, real GDP growth rate averaged 3-4% per annum and reached a peak of 7% in 1990. During this period, public expenditure was geared towards the social sector and the expansion of the rural infrastructure, with the aim of reducing social and economic inequalities. Such spending led to strong positive indicators in education and health (Millennium Development Report, 2010).

The period of economic liberalisation, 1990–2000, saw the implementation of the Economic Structural Adjustment Programme (ESAP) that was introduced in response to poor macro-economic indicators. The economic decline led to an increase in urban households relying in the informal sector and also heightened the economic links to rural areas (Potts, 2008). Zimbabwe's unprecedented economic decline saw spiralling inflation, deteriorating physical structures and, in 2008, the inability of the public sector to deliver basic social services. From 2000 to 2008, Zimbabwe's economy suffered a further decline, with GDP shrinking by an estimated 40% between 2000 and 2007. Extremely high levels of inflation ensued, with profoundly negative consequences for development and the eradication of poverty. The country faced severe human resources capacity constraints in the public sector, the health sector in particular. This grave situation reached breaking point in 2008 when the health workers took prolonged industrial action, which resulted in very few services being offered in health facilities and in communities. Drugs and medical supplies were largely unavailable. The consequences of this difficult situation were further reflected in a major outbreak of cholera in 2008–2009, which saw 98,591 documented cases and 4288 deaths, and an outbreak of measles in 2009–2010 (Millennium Development Report, 2010).

In Zimbabwe as in most African countries medicinal plants are valued for cultural reasons, non-monetary utilitarian purposes (food and medicine), industrial demand and as a subset of the national biodiversity health. As such, following the crisis in Zimbabwe natural medicines became more important to rural households in a bid to deal with the health crisis in rural

areas for improving people's health (Chigora et. al, 2007). According to Chavhunduka (1998:39) indigenous knowledge has contributed positively to provision of health care in rural Zimbabwe through practices by traditional healing and local herbalists. The importance of medicinal plants becomes clear as many people in rural Zimbabwe tend to commonly use and rely upon medicinal plants for their health needs.

Various laws and conventions have been passed in a bid to promote the conservation of the endangered biodiversity. The Convention on Biological Diversity is such a convention that was negotiated under the auspices of the United Nations Environment Programme (UNEP) for the sustainable use and conservation of natural biodiversity (CBD, 1992). The Convention stated three main goals which include the conservation of biological diversity; sustainable use of its components; and fair and equitable sharing of benefits arising from genetic resources. Additionally in the World Trade Organization (WTO, 1967) Trade-Related Intellectual Property Rights (TRIPS) section "c" of Article 27.3, promulgated that developing countries and the African Union, including member-nations are allowed to develop their unique and separate (Sui generis) protection frameworks that would mediate their comparative advantage in biological diversity (AU, 2001).

As such, following the need for protection of natural biodiversity the Zimbabwean government promulgated the Traditional Medical Practitioners Act (Chapter 27:14) in 1981 which signified the importance of the conservation of medicinal plants in Zimbabwe. Through this Act, Traditional Medical Practitioners Council and the largest organization of traditional healers, the Zimbabwe Traditional Healers Association (ZINATHA) were created. Traditional Medical Practitioners Council and ZINATHA were empowered to oversee the registration and practice of indigenous medicine and plants in Zimbabwe through cultivation or propagation of traditional medicines of proven therapeutic value (TMA, 1981). In this way, law was now being used as an instrument of empowering the local systems.

The Zimbabwean government also passed in 2002 through the parliament Environmental Management Act (20:27) in a bid to promote sustainable management of natural resources and the protection of the environment as stipulated in the Convention on Biological Diversity. The Act provides for the establishment of the Environmental Management Agency (EMA) whose primary task is to formulate and oversee the implementation of environmental policies in the country Environmental Management Agency (EMA) was also entrusted to regulate and

monitor access by any person to the biological and genetic resources of Zimbabwe (Environmental Management Agency, 2002). Given the wide and increased usage of plants in Zimbabwe, Environmental Management Agency becomes an important agency that facilitates the conservation and sustainable use of medicinal plants and other genetic resources in the rural areas.

1.3 Problem Statement

Despite the importance of natural medicines in the provision of health care in most communities, destruction of natural habitats has resulted in the exhaustion and reduction of various medicinal plants. Githens (1949:67) observed that in Africa there are over 14 000 drug plants but most of these species are vanishing at alarming rates. Endangering of medicinal plants has been witnessed following high reliance on these species by people who cannot afford the high costs of modern medicine in most rural areas (Chavhunduka: 1994:38). In Zimbabwe various medicinal plants are of importance use and value as they are used in treating disorders of digestive system, respiratory system, sexually transmitted diseases and dermatological diseases. People in the rural Zimbabwe gain utilitarian value from among others the following medicinal plants which include *Rhus Dentata* (**Mubikasadza**); *Psidium guajava* (**Mugwavha**); *Crossopteryx febrifuga* (**Mukomberwa**); *Kirkia Acumata* (**Mubvumira**); *Maytenus heterophylla* (**Chizuzu**); *Lippia Javanica* (**Zimbani**); *Pellesea adiantaceae* (**Mudziwabwe**); *Vilox payos* (**Mutsubvu**); *Coleochloa setiflora* (**Rufuri**); *Aloe ferox* (**Gavakava**); *Syzygium cordatum* (**Mukute**); *Strychnos spinosa* (**Mutamba**) and *Acacia karroo* (**Muvungu**). *Androstachys johnsonii* (**Musimbiti**); *Macaranga capensis* (**Musvosve**); *Entadoragma contandum* (**Mubanana**) and *Aloe excels* (Chigora, et. al, 2007).

Given the wide usage of plants, it becomes an issue of conservation to enable their uses. However as mentioned earlier, the economic crisis has necessitated a situation whereby many people rely on traditional medicines for health care needs than before, thus resulting in its increased use and value of traditional medicines. In addition these plants are becoming depleted. The resultant increase in the use value therefore requires investigation. This study therefore explores the extent increase of medicinal plant use-values in Zimbabwe. It asks the singular question: to what extent has there been an increase in the use values of medicinal plants in Zimbabwe? This question is explored in rural eastern Zimbabwe, where there is a use of traditional medicines for primary healthcare.

1.4 Research Aims

The aim of this research is to explore the extent to which the use-value of medicinal plants has increased since the Zimbabwean crisis and the different use values among men and women.

1.5 Research Objectives

- To establish the extent of increase in use of medicinal plants since the economic crisis in Zimbabwe
- To explore the different use-values of plant species among men and women in Rural Eastern Zimbabwe
- To establish the social, economic and environment factors that facilitate the sustainable conservation of natural medicinal species

1.6 Limitation of Study

Due to time and resource limitations, only 72 individual interviews and three focus group discussions were conducted in the study. The limited time and resources posed a challenge in the overall research process. I acquired data through the use of the native Shona language spoken in the case study area. I had to use the native language in collecting the data and then when recording the data I had to write in English. This required careful attention as translating data into English needed tact so that some of the relevant issues that are weighty in Shona and not in English are not lost. Regardless of the limitations, I am optimistic that the research serves as build up to knowledge on plant use-values extent of increase in rural eastern Zimbabwe.

The research is presented in seven chapters. The remaining chapters present key issues, which include:

Chapter Two: Literature review. In this chapter concepts of sustainability were explored in depth and moreover empirical studies that have been done in the field of medicinal plant use, value and conservation were discussed.

Chapter Three: This chapter provides a background of the case study area highlighting its early history, development of this community and livelihoods. The following section describes the research design and methodology.

Chapter Four: Case Study: This chapter presents the key findings of the study and presentations on Medicinal Plant use in Rural Eastern Zimbabwe.

Chapter Five: This chapter provides the discussion of the results of the study highlighting the key themes teased out from the findings and relating them to other studies undertaken in different contexts.

Chapter Six: This chapter concludes the study.

1.7 Conclusion

This introductory chapter outlined the context of the study. A brief overview of what the study aims to achieve was provided by stating the study's objectives and highlighting its relevance. The next chapter (Chapter 2) will provide a literature review of medicinal plants, sustainability, and numerous studies on medicinal plants and conceptual and theoretical approaches that inform the study.

2 CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter presents the pertinent literature and theoretical perspectives that inform the study of conservation and use-values of medicinal plants. This chapter also provides an overview of empirical studies that have been done in the field of medicinal plant use-value in some selected countries. The literature review provides background information to understanding the general context of the study. In Zimbabwe, in relation to medicinal and ethnobotanical studies, there are numerous studies that have been conducted relating to the use, conservation and management of plant species. What is however apparent is that there is limited published literature on issues of conservation, value of trade and consumption of medicinal plants. Given this gap, this study shows conservation and extent of increase in use-values of medicinal plants economically and culturally in Zimbabwe. This chapter also discusses the concept of sustainable development. The dimensions of sustainability can be used in conservation of medicinal plants as they raises issues of the extent to which exploitation of these plants can be sustained. This literature review also has a section that provides the conceptual and theoretical frameworks drawn from the rational choice, use-value and utility concepts which help to understanding the study.

Structurally, this chapter discusses development issues in relation to sustainable plant use and conservation of medicinal plants. It can perhaps be therefore teased out that sustainable use conservation of medicinal plants enhances human growth and development in various societies. This chapter discusses the concept of sustainability highlighting its origins and providing the key definitions of the concepts that speak to the study. Sustainability encompasses three fundamental approaches which include economic, environmental and social development, which are interrelated and complementary. These dimensions in sustainability will be explained in the detail in the forthcoming sections. Economic and environmental dimensions tend to be more highlighted in the discourse of sustainability although the social dimension is also important. For the purposes of this chapter, the economic, environmental and social dimensions of sustainability will be explored in detail. The following section discusses the concept of development in relation to the sustainable use

of environment's biodiversity and medicinal plants then move on to discuss the dimensions of sustainability from the various schools of thought propounded by varied authors.

2.2 Environment and Development

The context of the interrelationship between population, resources, environment and development is well deeply rooted and usually unquestioned (Chambers, 1988). It can be established therefore that medicinal plants use and conservation is a development issue. Medicinal plants are species commonly used in treating and preventing specific ailments and diseases and are considered to play a beneficial role in health care (Srivasta, Lambert and Vietmeyer, 1996). Medicinal plants are species known to beneficially modulate the physiology of sick mammals and that has been used by mankind (Fellows, 1992). Biodiversity refers to the life support systems and natural resources (such as forests, wildlife and aquatic life) upon which humankind and other organism depend upon. Similarly, the Convention of Biological Diversity (1992) describes biodiversity as the variation between ecosystems and habitats; between different species and the genetic variations existing within species. It can therefore be seen that with the emphasis being put on the importance of medicinal plants, they now tend to be part of the development discourse.

Development is quite a complex term with a host of authors coming up with different definitions in a bid to explain what it is. Coetzee (2001:120) notes that development encompasses values such as capacity building (which encourages more people involved in the development process thus enabling them to acquire skills), equity (encouraging everybody to partake in the process) sustainability (creating a sense of belonging which makes people to take ownership of what happens in their society, self-reliance) and empowerment (helping people to gain from participation and getting more skills thereof). For Gharajedaghi and Ackoff (1986) development is a mechanism in which people increase their abilities and desires with the objective to satisfy their own needs. In the light of this, medicinal plants tend to be crucial as they help people satisfy their health needs.

Human Development Report (1995:1) defined development as, 'enlarging people's choices by providing equality of opportunity for all people in society, sustaining such opportunities from one generation to the next and empowering people so that they participate an benefit from development processes'. In analysing and establishing the relevance of medicinal plants

in development issues, Srivasta, Lambert and Vietmeyer (1996) noted that medicinal plants can be viewed as a possible bridge between sustainable economic development, affordable health care and conservation of biodiversity. What is apparent by now is the importance of medicinal plants in development discourse as these species increase people's health provisions and their conservation ensures the health provision of future generations is not compromised.

2.3 Sustainability

The doctrine of 'sustainable development' derives from a discipline in economics that has been evolving for almost two centuries (Biasago, 1999). Given the wide usage of medicinal plants, sustainable development can be discussed as issues of conservation of medicinal plant border around sustainability. Sustainability raises the issue of the extent of exploitation of medicinal plants.

The term, 'sustainable development', first appeared in the World Conservation Strategy drafted by the United Nations Environment Programme (UNEP) and the International Union for the Conservation of Nature (IUCN) in 1980. In Rio 1992 and in New York 1997 world leaders affirmed their intent to pursue sustainable development by delivering improved quality of life whilst living within the carrying capacity of supporting ecosystems (Agyeman, Bullard and Evans, 2003). In relation to the environment, today's environmentalist, are alarmed at the continued rapid erosion of that carrying capacity through pollution and exploitation fuelled by escalating consumption. As the UN Environment Programme put it, humanity's inefficient use of resources and patterns of wasteful consumption are, "*driving us towards environmental precipice*"(UNEP, 1997).

The Brundtland Commission Report, *Our Common Future*, (WCED, 1987:43) coined what has become the most often quoted definition of sustainable development as being development that "meets the needs of the present without compromising the ability of future generations to meet their own needs". According to this report, sustainability is a means of trying to resolve the conflict between various competing goals, and it involves the simultaneous pursuit of economic prosperity, environmental quality, and social equity (WCED, 1987). *Our Common Future* Report recognizes that development could 'erode the environmental resources on which they must be based', and hence that environmental

degradation could undermine economic development. The report argues that, it would be a futile attempt to try to undertake environmental problems without looking at factors underlying poverty and international inequality. An important element of the report was the underscoring of the reciprocal relationship between poverty and the environment. The report also recognised that poverty being seen ‘as a major cause and effect of environmental problems’ (WCED, 1987:3). In analysis therefore the report made two key propositions namely the need to meet basic needs and secondly setting limits of environment’s use. In the context of this study, this report can be used to evidently show that sustainable use of medicinal plants should be ensued to meet basic needs of the people while also setting limits for use to ensure future generation’s benefit.

For Harrison (2000) sustainable development discourse has a mix of values and beliefs with three dominant narratives, “efficiency”, “equity” and “ethics”. All these three narratives are guided by an obligation to permit future generations, at a minimum, development choice comparable to those enjoyed by the present generation. The efficiency narrative is the first and most common. The premise of this narrative is that sustainable development can be achieved by reducing consumption of natural goods required to maintain or improve human well-being (Harrison, 2000). The equity narrative was popularised by the Bruntland Commission and is supported by many United Nations agencies. Commenting that “even a narrow notion of physical sustainability implies concern for social equity between generations”, the Bruntland Commission states as the premise of equity narrative that “a concern must logically be extended to equity within each generation” (WECD, 1987:43). The ethics narrative illustrates the importance of ideas on the pursuit of sustainable development (Harrison, 2000). What is apparent from these narratives is the need for the equitable and sustainable use of resource in order to sustain the future generation’s needs. In relation to medicinal plant use and conservation, these narratives can be used to guide the sustainable exploitation of these species to meet the needs of the present generation efficiently and equitably with regard for future generation.

As a general concept, sustainable development encompasses three fundamental approaches which include economic, environmental, and social development, which are interrelated and complementary. Traditionally, the concept of sustainable development involved three equivalent components which include environmental, economic, and social development; as well as three dimensions of wellbeing. These include economic, ecological, and social, and

their complex interrelations. Therefore, sustainable development is a certain compromise among environmental, economic, and social goals of community, allowing for wellbeing for the present and future generations (Ciegis, Ramanauskiene and Martinkus, 2009). Munasinghe (1993) notes that adoption of the concept of sustainable development was facilitated by recognition that too many things had gone wrong and that past development efforts have achieved only part of what should truly compromise human progress. Thus as mentioned earlier, the concept of sustainable development includes economic, social and environmental interrelations which should reduce compromise of the ability of future generation's to meet their own needs.

Many other definitions have been put forward by a host of authors who believe that there is some ambiguity around the concept sustainable development as a concept that promises many things to many people and is continually redefined to cover parts of life on the planet (Mawhinney, 2002). For Pearce, Markandya and Barbier (1989) sustainable development includes the creation of a social and economic system that guarantees support for the following aims: increase in the real income, the improvement of the level of education, and the improvement in the populations' health and in the general quality of life. Rio de Janeiro declaration on Environment and Development described sustainable development as long-term continuous development of the society aimed at satisfaction of humanity's need at present and in the future via rational usage and replenishment of natural resources, preserving the Earth for future generations (Rio Declaration on Environment and Development, 1992).

2.4 Economic Sustainability

As discussed earlier, 'sustainable development' derives from the discipline of economics (Basiago, 1999). From the 1950 to 1960's development traditionally meant the capacity of national economy, whose initial economic condition has been more or less static for a long time, to generate and sustain an annual increase in its gross national income. (Todaro and Smith, 2006). For many decades, economic prosperity of any society was equated to development of that society. However concerns related to the environment started receiving attention as they were a very important part and aspect of development. There has been several links between economic and environment, as sustainable utilization of natural resources is regarded as a prerequisite for economic prosperity (Goodland, 1995).

'Economic sustainability' implies a system of production that satisfies present consumption levels without compromising future needs. The 'sustainability' that 'economic sustainability' seeks is the 'sustainability' of the economic system itself (Basiago, 1999). Goodland (1995) notes that economic sustainability focuses on the natural resources that provides physical inputs, both renewable (e.g forests.) and exhaustible (e.g. minerals.) into production the production process. According to Goodland, (1995) Economic sustainability adds consideration of the physical inputs into production, emphasizing environmental life support systems without which neither production nor humanity could exist.

Pezzy (1992) notes that economic sustainability is most commonly interpreted as a condition of non-declining economic welfare projected into the future. Economic optimacy (maximisation of the present value of consumption) is quite distinct from sustainability and that in fact optimality can be compatible with unsustainability, such that on the optimal path future consumption can decline, even to zero (Ekins, 2000). Economic sustainability seeks to maximize the flow of income and consumption that could be generated while at least maintaining the stock of assets (or capital), which yield beneficial outputs (Hicks, 1946). The main goal of implementation of sustainability principles tends therefore to be of safeguarding an optimal amount of general capital (or sum of different kinds of capital) for the future generations (Ciegis, Ramanauskiene and Martinkus, 2009).

Sustainable development can therefore be grouped as either an economist's or an ecologist's perspective. These have given rise to an important distinction that focuses on the substitutability between economy (economic goods/manufactured capital/physical capital/human-made capital) and environment (environmental services/natural capital) known as weak and strong sustainability (Sunkar, 2008). Miller (2007) notes that neoclassical economists view natural resources as important but not indispensable or extremely necessary because of people's ability to find substitutes. However ecological economists such disagree. Ecologist's points out there are no substitutes for many vital natural resources. They believe that conventional economic growth eventually will become unsustainable because it can deplete or degrade many natural resources. Ecologists call for the redesigning of economic and political systems to encourage environmentally sustainable forms of economic development and to discourage environmentally harmful forms of economic growth (Miller, 2007).

Economists have traditionally defined capital as things people have built that have value, such as roads or factories. Environmental economists define this as ‘human made’ capital. ‘Natural capital’ is created by bio-geophysical processes rather than human action and represents environment’s ability to meet human needs whether through providing raw materials or what functionalists term ‘services’(Adams, 2009).

Economic development has always implied increasing capital stocks, but insights of environmental economics suggest the need to account for both human-made and natural capital separately. Thus, development that increases human-made capital while depleting natural capital could be said to be unsustainable. This view of sustainability is commonly referred to ‘strong sustainability’ (Beckerman, 1994). ‘Strong sustainability’ places a special importance on natural capital and requires that the stocks of both natural and human-made capital be maintained. ‘Weak sustainability’ allows trade-offs between natural and human-made capital’ (Adams, 2009). Biasago (1999) believes that the alternative models of development should embody the integration and interlinkage of economic, social, and environmental sustainability. As it is apparent that there is link between economic, environmental and social sustainability, these other dimensions of sustainability are discussed below. Environmental sustainability is also an important dimension of sustainability is discussed immediately below.

2.5 Environmental Sustainability

Environmental sustainability involves ecosystem integrity, carrying capacity and biodiversity. It requires that natural capital be maintained as a source of economic inputs and as a sink for wastes. Resources must be harvested no faster than they can be regenerated. Wastes must be emitted no faster than they can be assimilated by the environment (Kahn, 1995). ‘Environmental sustainability’ requires maintaining natural capital as both a provider of economic inputs called ‘sources’ and an absorber called ‘sinks’ of economic outputs called ‘wastes’ (Basiago, 1999). For Goodland (1995) environmental sustainability seeks to sustain global life support systems indefinitely by protecting the sources of raw materials used for human needs and ensuring that the sinks for human waste are not exceeded in-order to prevent harm to humans.

As already noted, sustainable development is a certain compromise among environmental, economic, and social goals of community, allowing for wellbeing for the present and future generations (Ciegis, Ramanauskiene and Martinkus, 2009). Therefore, economic, environmental and social sustainability are part of a multidimensional approach towards sustainable development. It can therefore be argued that each one of these dimensions is interrelated and complementary upon each other. As social aspects influence the well-being of people and stability of ecosystems, the social dimension is a very important aspect that needs to be explored. This exploration helps in understanding the relationship between people and the environment. This forms the cornerstone of the study as the study is concerned with the conservation and extent to which use-values of medicinal plants has increased which essentially depends upon equilibrium in economic, environmental and social dimensions of these natural resources. The social dimension of sustainability is discussed below.

2.6 Social Sustainability

In the most basic sense, 'social sustainability' implies a system of social organization that alleviates poverty through establishment of socially shaped relationships in communities. In a more fundamental sense, however, 'social sustainability' establishes the nexus between social conditions such as poverty and environmental decay (Ruttan, 1991). Social sustainability seeks to preserve the environment through economic growth and the alleviation of poverty (Kahn, 1995). Social sustainability refers to a society's ability to maintain, one on the other hand, the necessary means of wealth creation to produce itself and on the other hand a shared sense of purpose to foster social integration and cohesion (Ekins, 2000). Social sustainability can be achieved only by systematic community participation and strong civil society. Cohesion of community, cultural identity, diversity, solidarity, comity, tolerance, humility, compassion, patience, forbearance, fellowship, fraternity, institutions, love, pluralism, commonly accepted standards of honesty and laws constitute part of social capital least subject to rigorous measurement, but for social sustainability (Goodland, 1995).

Ekins (2000) notes that a way of life is a complex bundle of values, objectives, institutions and activities, with ethical, environmental economic and social dimensions. What is apparent is that environmental problems are closely linked to internal problems within social structures. That is to say that, environmental problems are linked to social problems and thus

environmental sustainability is a pre-requisite for solving social problem in various societies. Poverty is an economic problem both because it denotes chronic scarcity at an individual level and because it can lead to reduced productivity. It is an ethical problem because this scarcity may be the result of social injustice. In some industrialised countries poverty is also a growing social problem in terms of the social fabric and on resulting on social sense of insecurity, which act to produce the well-being of the non-poor (Ekins, 2000).

In essence therefore, social sustainability cannot take place without environmental sustainability. Becker and Jahn (1999) provided a comprehensive definition of social sustainability, identifying three main approaches to the concept of social sustainability. The first approach incorporates a social perspective into the study of the complex interplay of intertwined social, economic and political processes with the environmental impact of societal processes. This may be done by measuring societal metabolism in terms of material throughput or energy consumption or by analysing social factors of land use patterns. In this light it what is perhaps apparent from this approach is that when defining social sustainability, it is imperative to consider a societies natural forces that's influence and affect social cohesion, unity and harmony.

The second approach of social sustainability is within a closely related with bridging and reshaping of the relationships between the environment and people. This approach calls for investigation social actors on how their interactions with the environment are shaped and mediated by institutional arrangements. Becker and Jahn (1999) also note that analysing the variety of socio-economic conditions, political and institutional arrangements is important in ensuring social sustainability as the relations of social actors with biophysical environment are not the same at different places. This approach is very significant as social actor's activities on the environment needs to be investigated which forms the cornerstone of protection and conservation of the environment for the benefit of future generations.

The third approach for social sustainability calls for commitment from humans to have positive actions and influence on the environment. This approach calls for the exploration of cultural and social meanings that are attributed to social practices of people in different societies in order to achieve social sustainability (Becker and Jahn, 1999). Michale Redcliff (in Becker and Jahn, 1999) argues convincingly, that the perception of and behaviour towards the environment rely on social commitments that do not simply reflect individual values or

attitudes but are rather deeply incorporated into habits and lifestyles as well as being embedded in institutional arrangements and technical infrastructure of societies. In essence, as human's social practices are crucial in environment issues, the reshaping of the relationships between the environment and people can ensure social sustainability.

It is clear from the wider discourse of development that the idea of sustainable development brings to the fore the issue of natural resources. Most people in less developed countries live in the rural areas and directly rely on exploitation of natural resources for all aspects of their life. Specifically in relation to their well-being, the use plants are a second nature suggesting the importance of plant use for medicinal purposes and its conservation. The research in this area is rich especially in the field of ethnobotany. Some of the key studies that have significantly explained knowledge of plant use are discussed immediately below.

2.7 Global Overview of Empirical Ethnobotanical Studies in different countries

Numerous studies show that rural people use plants for a variety of purposes for food, medicine, shelter, fuel, firewood and so on. Gomez-Beloz (2002) undertook a study on plant use knowledge of 18 medicinal plants among the Winikina Warao people in Venezuela. The empirical study captured the basic plant knowledge comparisons, different use values which included Reported Use (total number of uses reported for each plant.), Specific Use (use as described by respondent), Plant Part Value (value given for a specific plant part), Intra specific Use Value (use of importance within a specific plant part) and Overall Use Value (comparison of uses within a group of plant and is used to compare importance for a group of plants). Their findings showed 18 plants under study were used for commercial, construction, dye, firewood, fishing and healing wounds, showing the importance of plants to the Winikina Warao people.

Reyes-Garcia, et. al (2006) undertook a study of the cultural, practical and economic value of wild plants in Bolivia. The purpose of this study was to build on previous researches done in quantitative ethnobotany and economic anthropology to develop a new way to value different plant species for a cultural group. An index capturing cultural significance (function of a plants potential uses and the number of participants reporting to the plant), practical daily value (function of the number of uses observed, the number of times the species was used and potential life good made from the plant) and economic value (function of the number of times

plant was used and the estimated local price of the plant) was developed in an attempt to overcome problems faced by previous researchers using observational and interview data. A combination of methodologies was applied in the fieldwork including free listing, scan observations, and specimen identification. The findings revealed that there were six main categories of plant use: medicine, firewood, construction, tools, food and other. The results also found a positive association between the economic, cultural and practical values. However the results showed that the cultural value of plants do not however necessarily correspond with the practical and economic values as some species are known but rarely used. Therefore higher correlation between the practical and economic value was shown from free listing exercises and scan observations conducted.

Kiringe and Okello (2004) conducted an empirical study on the use and availability of tree and shrub resources on Maasai communal rangelands in Kenya. The authors investigated use of tree and shrub resources by a local Maasai community, through discussions and a questionnaire. This study focussed on plant resources utilisation in the Maasai communally-owned Kuku Group Ranch of Kajiado District, southern Kenya. Structured and semi-structured questionnaires were administered to gather information regarding the utilisation of tree and shrub resources. In order to capture the frequency of use and quantity of plant resources utilised, plant resource availability, relative quantities of plant resource consumed and relative categories, three categories (high, medium and low) were used. The findings revealed that some of the important species and their main purposes were: *Acacia mellifera* (used for fencing, firewood, building and medicinal purposes); *Balanites glabra* (mostly used for medicinal purposes, fencing and building); *Acacia tortilis* (fencing and firewood); *Acacia xanthophloea* (fencing and firewood). Other important tree and shrub species that were used for a variety of purposes included: *Acacia robusta*, *Acacia nubica*, *Commiphora africana*, *Acacia drepanolobeum* and *Acacia nilotica*. This study demonstrated the value and extent of use of trees and shrubs in the Kuku Group Ranch, from qualitative information based on interviews and discussions with the local Maasai community.

Voeks and Leony (2004) undertook a theoretical and empirical study assessing medicinal plant erosion in Eastern Brazil. The sampling strategy for this study consisted identifying a sample of *pharmacopocia* plant known to have medicinal application among the Afro-Brazilian community of Lencois and censuing a sample of the community to determine the degree to which locals were familiar to these species. The results of the questionnaire and

medicinal plant census elicited a wide variety of responses including correct identification of names, and medicinal uses. The study showed that women were significantly better informed about the names and the medicinal properties of sample flora than men. Evident from the results of the study was the high level ethnobotanical decay in Eastern Brazil. An important lesson learnt was that among all features considered increasing age was the best predictor of medicinal plant knowledge. The older people in the study area took more time to provide information about medicinal plants and healing properties than younger people. The study also revealed that formal education is associated with decreasing extractive dependence on native species for survival but however positive increased access to formal education may be used in terms of economic prosperity of rural folk they are counterbalanced by decreasing connection with and understanding of nature's providence.

Kelbessa, Bekele, and Yinegar (2008) conducted an ethnobotanical study of medicinal plants in Mama Agetu in Ethiopia. The purpose of this study was to document the indigenous medicinal plant utilization, management and the threats affecting these plants. In sum, the use of 230 plant species was documented in the study area. The methods used for ethnobotanical data collection were semi structured interviews, field observation, preference ranking and direct-matrix ranking. The study captured the respondents' background, health problems treated, diagnosis and treatment methods, local name of medicinal plants used, source of collection (wild/cultivated), growth form, degree of scarcity, plant part used, methods of preparation and application, threats to medicinal plants and conservation practices of respondents were carefully recorded. The study showed that in Mana Angetu District various factors were considered to be main threats to medicinal plants. The major factors that were claimed to be principal threats to medicinal plants were deforestation (90%), agricultural expansion (85%), fire (53%), overgrazing (15%), drought (12%) and trading charcoal and firewood (10%).

Olsen (2005) undertook a Valuation of Commercial Medicinal Plants trade in central Himalayas. The study estimated the national level and value of commercial medicinal plant harvest in Nepal. The study showed that in the Himalayas there is a wide scale trade of medicinal plants. The medicinal plants are harvested in the wild by local people in the forest and meadows throughout the mountains. The trade of these medicinal plants in the Himalayan is well established as there market chains that run up to the lowland cities were they are consumed in processed form. The results for the study revealed that the total annual

harvest was estimated from 7000-27000 tons with 14 500 tons harvested in case year 1997 to 1998. The annual export value calculated using average regional wholesalers purchasing prices in the main markets in India was estimated at US\$7-30million with a value of US\$16million in 1997 to 1998. The top five products traded included *Swertia chirayite*, *Sapindus mukorossi*, *Asparagus racemosus*, *Neopicro rizha scrophulariifolra* and *Morchella spp* which appeared to be used for traditional medicinal applications use in perfumery and condiments.

Larsen, Smith and Olsen (2005) undertook a study on Nepal's conservation policy options for commercial medicinal plants harvesting. The study investigated the commercial medicinal plant management in Nepal. The data was obtained through 175 semi-structured interviews with persons from five stakeholder plant exploitation and conservation in Nepal: harvesters, traders, District Forest Office staff, staff at departments and ministerial level of the Ministry of Forests and Soil Conservation, and international and local NGO's and donors. Emphasis was placed on recording respondents views on the official mechanisms regulating harvest of alpine medicinal plants. The findings revealed that the current approaches non-timber forest policy formulation and implementation needs to be revised so as to achieve conservation and sustainable use of alpine plants. Identified problems from the study, were the exclusion of harvesters from policy formation processes and widespread agreement among respondents that current collections permits and bans do not strongly affect resource utilisation.

2.8 Ethnobotanical Studies in Southern Africa

Ribeiro, et al, (2010) explored an ethnobotanical survey on medicinal plants and traditional knowledge in Canhane village, district of Massingir, Mozambique. The main objective of this study was to organize a database of medicinal plants including their applications and associated procedures in the case study area. In an attempt to gather information about indigenous medicinal plants eleven informants were selected taking into account the dimension of the site and the fact that the vegetation presents a great homogeneity. The data was collected through intensive structured and semi-structured interviews performed during field research. The results of the study revealed that a total of 53 plant species were reported, to be used to treat 50 different human health problems in Canhane village. More than half of the species were used for stomach and intestine related disturbances (including major diseases such as diarrhoea and dysentery). In this study it was noted by the authors that the

community was conscientious and motivated about conservational issues and has adopted measures for the rational use of medicinal plants.

Coopoosamy and Naidoo (2012) undertook an ethnobotanical study of medicinal plants used by traditional healers in Durban, South Africa. Medicinal plants in the study are used for various treatments including stomach ailments, skin diseases, blood purifiers, rashes, burns and other infections used were documented through the use of structured questionnaires. Respondents of the study included traditional healers, herbalists and herb sellers. The information collected from the study revealed that 25 plant species belonging to various families were currently being exploited for their curative properties. The study showed that some of these species such as *Siphonochilus aethiopicus*, *Warburgia salutaris* and *Haworthia limifolia* are on the endangered list and traditional healers or collectors need to be educated on how to sustain any available wild populations. From the survey, the most frequently used parts are the leaves followed by root, rhizome or bulb. Stems, flowers and fruits were seldom used. The survey indicated that traditional healers administered their medications via extracts that were obtained by boiling, either as a tea or concoction.

Similarly, Cheikhyoussef, et. al (2011) conducted an Ethnobotanical study of indigenous knowledge on medicinal plant use by traditional healers in Oshikoto region, Namibia. Data was collected through the use of questionnaires and personal interviews. A total of 47 respondents were interviewed with the majority of them aged 66 and above. The traditional healers in Oshikoto region use 61 medicinal plant species that belong to 25 families for the treatment of various diseases and disorders. The highest number of species being used in the area were being used for mental diseases then followed by skin infection and external injuries. In Oshikoto region 28 tree species were found to be the most used plants followed by 15 herb species, 10 shrubs species and 4 climbers species. The average of the informant consensus factor (FIC) value for all ailment categories was 0.75. High FIC values were obtained for *Pergularia daemia*, and *Tragia okanyua*, which were reported to treat weakness and dizziness problems, snake bites, swelling and cardiovascular problems indicating that these species traditionally used to treat these ailments are worth examining for bioactive compounds. The study concluded that traditional healers in Oshikoto possess rich ethnopharmacological knowledge. In this regard, this study allows for identifying many high value medicinal plant species, indicating high potential for economic development through sustainable collection of these medicinal plants.

The two previous sections have shown the numerous studies that have been undertaken in the field of ethnobotany which shows the plant uses and their values in the selected countries and in particular the second section highlighted studies in the Southern African region. From the studies undertaken it is evident that most people in less developed countries live in the rural areas and directly rely on exploitation of medicinal plants resources. Medicinal plants have multiple functions in the everyday lives of rural people in these developing countries, specifically in relation to satisfying their health needs. The increased use of medicinal plants that has been shown from the studies perhaps tends to signify the importance of these plant species and thereby justifies the need for their conservation. The following section will discuss the plant use studies undertaken in Zimbabwe.

2.9 Ethnobotanical Studies in Zimbabwe

The following section looks at some of the studies that have been conducted in relation to plant use in Zimbabwe. In Zimbabwe the economic and political crises necessitated a significant number of the population relying more on natural resources to satisfy their needs. The following studies show the importance and use of these plants among the people in Zimbabwe.

Chigora, et. al, (2007) explored the importance of Indigenous Medicinal Knowledge (IMK) in the Treatment of Ailments in Mutirikwi Rural Zimbabwe. The study argued and justified that herbs have useful complements that can be used in curing diseases alongside other medicines. The authors documented the medicinal value of medicinal plants in treating, preventing and ailments. The study recommended that there should be indigenous medicinal knowledge projects to assist rural communities to protect their rich knowledge on the functions of indigenous plants from being illegally acquired and patented by western pharmaceutical companies. The also highlighted the need for better management of indigenous plants and the need for increasing of the traditional leader's role in managing the harvesting and exploitation of the plants in the projects. Best practices to manage and sustain indigenous medical knowledge in Zimbabwe were underscored in order to ensure the sustainable use of medicinal plants.

In 2007 Southern Alliance for Indigenous Resources (SAFIRE) evaluated UNDP/GEF project implemented in 2003 on Conservation and Sustainable Use of Traditional Medicinal Plants in Zimbabwe. The objectives of the project were to promote the conservation,

sustainable use and cultivation of endangered medicinal plants in Matobo, Bulilima, Mangwe, Chipinge and Chimanimani Districts by demonstrating effective models at the local level, and developing a legal framework for the conservation, sustainable use and equitable sharing of benefits from medicinal plants at the national level. The project adopted a community-based approach through which local communities are involved in project implementation. The findings of the evaluation of the project pointed out the need to consider integrate biodiversity management with programmes for the supply of water to participating communities. The study showed that in Zimbabwe the rural folk tend to depend on the stock of resources basis for their survival. The evaluation also revealed that there were small businesses that were being established to sell medicines which showed that medicinal plants have an economic value in the study areas.

Maroyi (2011) recently undertook an ethnobotanical survey of medicinal plants used by the people in Nhema communal area, Zimbabwe. This study showed the importance of plant resources in Nhema communal area. This study particularly captured the significance of medicinal plants in primary healthcare. This research showed and reflected that this area had rich ethnobotanical knowledge of medicinal plants as they were used widely in their wide range of medicinal applications. In order to document information on medicinal plants used for primary health care and to maximize the collection of indigenous knowledge in Nhema communal area, nine traditional healers were identified using the Participatory Rapid Appraisal (PRA) approach. Data was collected through open-ended interviews with traditional healers. The results of the study showed that a total of 61 plant species representing 45 general and 28 families were found to be commonly used in the treatment of 34 different human health problems. More than a third of the plant species were used for diarrhoea, which is a prevalent disease in the study area. In the study, the root was the most commonly used plant part while decoction was the most common method of traditional drug preparation.

A survey of the medicinal uses of plants by folk practitioners in both the urban and rural communities was undertaken jointly by Faculty of Medicine, University of Zimbabwe and the National Herbarium (Mavi, 1996). The stimulus for this survey was provided partly by the fact that certain groups of herbalists were willing to impart their knowledge and partly by the realisation that the longer one delayed a comprehensive investigation of this nature, the

more information would be lost. 248 traditional practitioners were invited to bring examples of plants they were using at that time. The results of this study showed that the flora of Zimbabwe includes more than 5 000 species of flowering plants and ferns. Of these not many more than 1 000 have vernacular names. The fact that a plant has a vernacular name implied use and *vice versa*. The plants known to be used medicinally numbered about 500 which constitute 10% of the flora. From the study of the 500 medicinal plants used 40 were reported to be toxic. The research showed that to sustain the use of their flora traditional healers follow certain rituals when collecting their medicine. When collecting bark they do not ring bark the trees, but rather strip the bark of the tree one side of the tree either on the western or eastern sides. This practice is good as ring barking involves killing of the whole specie which is not sustainable. Moreover when collecting roots of species not all roots were to be removed but a few were left and as for annuals seeding was done to allow regeneration (Mavi, 1996).

Campbell (1993) explored the Monetary Valuation of tree-based resources in Zimbabwe. The study was concerned with monetary valuation of trees. There were a wide range of non-monetary indicators of value that can be used such as frequency of consumption of forest products, frequency of collection, and percent of household time-budgets devoted to forest-related activities. Values of tree-based resources were classified into three classes: values associated with use (use value); values related to potential use (option-value) and values associated with mere existence. The study used the Contingent Valuation Method approach. Ten cards representing commodity categories of trees and two cards representing commodities not related to trees were explained to respondents, and respondents ranked and distributed 50 matches among the cards to reflect the relative importance of each category of commodities. In this study the monetary value of trees and other biodiversity was shown using the Contingent Valuation Method approach. The results from resource valuation exercise in Zimbabwe showed that values derived from the CVM are regarded as capital values, and can be converted to annual benefits using an appropriate discount rate. Using rates between 5 and 20 %, annual benefits derived from tree resources amount to between Z\$84 and Z\$336 per household per year (i.e for the base year, 1993).

Lukwa, et. al (2001) conducted an ethnobotanical survey in Mola Kariba district in order to collect information on some common herbal remedies used by traditional healers and rural folk in the treatment and the prevention of malaria. Structured questionnaires were administered to 220 respondents in Mola, Kariba. There were 88 (40%) males and 132 (60%)

females. A total of 133 (60.5%) had no formal education at all, 57 (25.9%) had primary education and 30 (13.7%) had secondary education. A total of 192 (87.3%) of the respondents mentioned mosquitoes as transmitting malaria, one (0.3%) mentioned dirty water and 27 (12.4%) did not know. A total of 155 (70.5%) respondents would go to the clinic if they suspect they have malaria and 36 (16.4%) will visit a traditional healer. Other important emerging points from the study are that people are aware of signs and symptoms of malaria and either visit clinics traditional healers for treatment. From the study, it was evident that malaria is affecting many people. The importance of medicinal plants that were being used as anti-malarials was underscored in this study.

Fromer (2003) explored a study on Protecting Traditional Medicinal Knowledge in Zimbabwe focussing on the African Potato (*Hypoxis Hemeracallidae*) which was famous in Zimbabwe in the year 2000. For many years the African Potato (*Hypoxis Hemeracallidae*) had appeared in some of the street markets in the capital of Harare alongside other 'muti' like ginger, as a remedy for stomach aches. The African Potato (*Hypoxis Hemeracallidae*) was believed to have "cure-all" effects which increased its popularity among the Zimbabweans. Despite intense interest from pharmaceutical companies, drug legislation agencies and ethnobotanical sciences in identifying the "right plants" for health and other uses, the story of the African Potato reveals the importance of such species. Species like the African Potato are significant in the lives of people and they should be preserved by identifying the "right individuals" and the "right practices" attached to such plants to ensure their sustainable use.

Takawira-Nyenyema and Stedjeis in 2011 conducted a study investigating ethnobotanical uses and ethnotaxonomy of the genus *Sansevieria Thunb.* (Asparagaceae) in Zimbabwe. *Sansevieria* is a genus of xerophytic perennial herbs that occur mostly in dry tropical and subtropical habitats. The aim of this study was to document the indigenous knowledge on the uses of the genus *Sansevieria* by various ethnic groups in Zimbabwe, and to present information on methods of use. Direct observation of plant use by informants, open-ended and informal interviews covering questions on local names of species, uses, mode of administration and the specific plant part used were employed during the study. Ethnobotanical uses for four species that included *Sansevieria aethiopica Thunb.*, *Sansevieria hyacinthoides* (L.) Druce, *Sansevieria kirkii Baker* and *Sansevieria pearsonii N.E.Br.* were recorded from 60 informants. A total of 11 use categories were defined including

ornamentals, medicinal use in humans, medicinal use in animals, food, play, processed fiber, unprocessed fiber, crafts, making whip ends, spiritual uses and other uses. Medicinal use in humans was the most prevalent category, contributing 33% of the total responses. This study showed several uses of *Sansevieria* in Zimbabwe which were not previously documented in the extant literature of ethnobotany.

Kambizi and Afolayan (2001) undertook survey of plants used for the treatment of sexually transmitted diseases (STDs) in the Guruve District, Zimbabwe. Ethnobotanical information obtained from traditional herbalists and other knowledgeable rural dwellers, revealed 15 plant species belonging to 10 families as medicinal plants used for the treatment of these infections in the area. Six of these were the commonest and most frequently prescribed by the healers. Roots were the most frequently used parts of the plants constituting 53% of preparations while oral administration of extracts is the main method of prescription. Based on the information gathered from the traditional healers, *Acacia nilotica* (L.) Willd. ex Delile, *Cassia abbreviata* Oliv. *Dichrostachys cinerea* Wight and Arn, *Solanum incanum* L., *Vernonia amygdalina* Del. and *Zanha africana* (Radlk) Excell are the most frequently used plants for the treatment of STDs. The methanol extracts of *Cassia abbreviata*, *Zanha africana* and *Acacia nilotica* showed significant inhibition against Gram-positive and Gram-negative bacteria, while acetone extracts of these plants inhibited most of the species.

In 2010, Chimponda and Mukanganyama conducted a study on Antimycobacterial activities of selected medicinal plants from Zimbabwe against *Mycobacterium aurum* and *Corynebacterium glutamicum*. The study was carried out to offer a better understanding of the ethnomedicinal and biological use of some of the plants widely distributed in Zimbabwe. A total of 30 ethanol extracts from nineteen different plants belonging to seventeen families were analysed. Plants were selected on the basis of their ethnomedicinal uses in the treatment of symptoms associated with TB in Zimbabwe. The plants used in this work were collected from three provincial localities of Zimbabwe, Norton (Mashonaland West), Centenary (Mashonaland Central) and University of Zimbabwe (Harare), Zimbabwe. The results showed that all the plant extracts were bacteriostatic and showed antagonistic effects when combined with rifampicin. The extract from *P. curatellifolia* made *M. aurum* and *C. glutamicum* accumulate the highest amount of ciprofloxacin. The accumulation of ciprofloxacin caused by *P. curatellifolia* extract was greater than that caused by the drug efflux inhibitor reserpine. This plant may serve as a source of lead compounds in the search

of new antimycobacterials with new mechanisms of action. The study concluded that the spread of multi-drug resistant tuberculosis necessitates the discovery of new classes of antibacterials and compounds that inhibit macromolecules involved in these resistant mechanisms.

From the literature, a number of issues stand out. The empirical studies explored clearly show the importance of medicinal plants in many countries. From the various ethnobotanical studies conducted world over there seems to be a high indication that medicinal plants are a very important natural resource used by local people to make traditional medicines for health needs in many developing countries for food, medicines, firewood, shelter, shade and construction. The literature on medicinal plants shows their economic, practical and cultural uses. Conservation of these species over time has come to the limelight as there has been increased usage of these species particularly in developing countries. Consequentially some researchers argue that identifying relevant groups of plant species for local people may help in defining and implementing priorities for conservation and management strategies (Olsen, 2005).

In relation to Zimbabwe, medicinal plants are a very important natural resource used by urban and rural folk as traditional medicines for health requirements. Medicinal plants have varied uses including providing wild foods wild medicines and other wild goods; a large number of uses for wood, including for timber, energy and construction materials. Medicinal plants have become very important to aid the health service delivery and treating of various diseases such as malaria, tuberculosis, stomach ailments and sexually transmitted diseases. However as mentioned earlier, in the case of Zimbabwe there is limited information on the value of trade, consumption of medicinal plants and extent of increase of these uses since the crisis period. This research thus shows medicinal plant conservation and increased extent of use values.

From the several studies undertaken different methods were used in conducting the varied researches. Some studies used use-value approaches, Participatory Rural Appraisal (PRA), Contingent Valuation Method approach (CVM) and indexes capturing cultural significance, practical daily value and economic value of medicinal plant species. This study made use of

rational choice theory, use value approach and concept of utility. These approaches are discussed immediately below.

2.10 Conceptual and Theoretical Framework

The rational choice theory, use value approach and concept of utility constituted a conceptual and theoretical grounding of the research.

The rational choice theory provides a theoretical grounding in the study of conservation and use-values of medicinal plants. Basics to all forms of the rational choice theory, is the assumption that complex social phenomena can be explained in terms of the elementary individual action of which they are composed. In the rational choice theory individuals are seen as motivated by the wants or goals that express their preferences. Rational choice theory holds that individuals must anticipate the outcomes of alternatives course of action and calculate that which will be best for them (Scott, 2000). As such in the application of this theory people's medicinal wants shape the way in which they value and conserve of medicinal plant species.

According to Reyes-Garcia et. al (2006) the total plant use value can be understood as the sum of cultural, practical and economic values. Their index calculates the total use value as $V_e = CVe + PVe + EVe$. V_e is equal to the total use value, CV_e is the cultural value of ethnospices that have cultural virtue according to respondents (Turner, 1988), PV_e is the practical value which shows the different number of plant uses and EV_e shows the estimated price of the plant. Hunn (1982) pointed out that the concept of utility can be broadened to incorporate specific plant use values of different plants and human behaviour. Plants are recognised and used because they have morphological or ecological idiosyncrasy and have high cultural significance. Potential utility of plants is signified by the presence of edible fruits, flexible limbs, hard wood, medicine and mythology (Hunn, 1982). The study made use of the rational choice theory, use value and utility concepts in understanding issues of medicinal plant use and value from people who gain various utilitarian values and show the correlation between medicinal plants and sustainable development.

2.11 Medicinal Plants and their sustainability in Zimbabwe

There is a long tradition of using medicinal plants in Zimbabwe (Chavhunduka, 1998, Mavi and Shava, 1997 and Gelfand, et. al, 1985). Various parts of plants such as roots, bark and leaf material are collected, processed and used throughout the country. The rural people who constitute the bulk of Zimbabwe's population are heavily dependent on the vegetation around them for fuel-wood and for medicine. They are mainly subsistence farmers, and cannot afford alternative fuels, let alone the high prices of modern medicine. As a result vegetation is lost and environmental degradation takes place (Mavi and Shava, 1997). The use of medicinal plants in traditional healing is an important pillar of the health sector. The increasing numbers of practitioners selling herbal remedies and medicinal plants indicate the acceptance and popularity of the use of herbal medicine in Zimbabwe. Due to lack or loss of traditional knowledge and the growing demand for these herbal remedies from both domestic and foreign markets, many of the medicinal plants in the open woodlands of Zimbabwe are being over-harvested and/or unsustainably harvested and becoming highly threatened (Khumalo, Fröde and Sola, 1996).

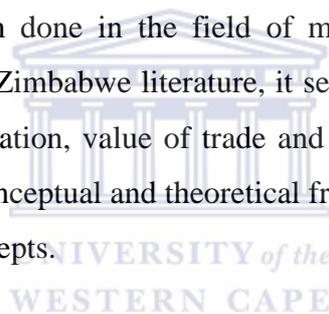
According to Chavhunduka (1998) more than 500 different types of plants are used for medicinal purposes in Zimbabwe. About 80% of the people in the country use these plant medicines at some stage of their illness. There are about 50,000 registered traditional health practitioners in Zimbabwe. They derive their income from harvesting, preparation and the sale of medicinal plants, and they also attend to patients. Besides the 50,000 professional healers, there are also hundreds of traders who derive much of their income from selling indigenous medicinal plants at the various urban markets. It is estimated that around 4,000 tons of plant material with a value of Z\$150m is used annually for medical purposes. But the country is slowly losing some of these valuable medicinal plants and medical knowledge. The medicinal plant industry therefore, plays a critical role in empowering large numbers of people (Chavhunduka, 1998).

In relation to medicinal plant usage in Zimbabwe approximately 500 species, 10% of Zimbabwe's flora, including many tree species, are used medicinally by traditional healers (Gelfand et. al, 1985). Traditional healers have an important role in both rural and urban communities, providing advice, divination and herbal prescriptions for physical and psychological complaints. Traditional healers in relation to population figures in Zimbabwe

are estimated to be 1:234 in urban areas and 1:956 in rural areas ratios much lower than those for medical doctors (Cunningham, 1990). Major steps have been taken towards conserving the environment in Zimbabwe. These strides include discouraging cutting down indigenous trees and encouraging the local people to plant indigenous trees for domestic use, the inauguration of a national tree planting day and the creation of nature reserves. However, despite this intensified drive towards conservation, it is still difficult to prevent local people from destroying the plants around them (Mavi and Shava, 1997).

2.12 Conclusion

This chapter began by defining the development, medicinal plants and the concept of sustainable development in the context of natural resource use. The chapter highlighted the three themes of sustainability which are namely economic, environment and social dimensions that are critical and very important to this study. This chapter also provided of empirical studies that have been done in the field of medicinal plant use-value in some selected countries. In relation to Zimbabwe literature, it seems to appear that there is lack of information on issues of conservation, value of trade and consumption of medicinal plants. This chapter also provided the conceptual and theoretical frameworks drawn from the rational choice, use-value and utility concepts.



3 CHAPTER THREE: DESCRIPTION OF THE CASE STUDY AREA AND METHODOLOGY

3.1 Introduction

This section provides a detailed description of Zimbabwe for background purposes and research area Zindi Village in Mutasa District and its surroundings, in terms of geography, economic, social, political, and institutional aspects. Thereafter the methodology used in this study will be outlined. The research design, research sampling methods, research instruments and data analysis plan are also shown in the forth-coming sections.

3.2 ZIMBABWE

3.2.1 Geography

Zimbabwe is a landlocked country covering some 39 000 000 hectares. It is located between 15⁰ and 22⁰ south latitude between 24⁰ and 33⁰ east longitude. Zimbabwe is bounded by the Zambezi river in the north and the Limpopo river in the south (National Conservation Strategy, 1987). Zimbabwe consists of four main physiographic regions. One of these, the eastern mountains, forms a narrow band along the Mozambique boundary. The rest of the country is characterised by a north-east to south-west watershed, the high veld (above 1,200m); this descends to the Zambezi river in the north-west and the Limpopo in the south-east, in a series of plateaux, with the middle veld (900 - 1200m) giving way to the low veld (below 900m). Approximately two-thirds of the country lies above 900m. Five main vegetation types cover Zimbabwe: Afromontane forest and grassland in parts of the eastern highlands; Zambezian miombo woodland covering the high and middle veld; mopane woodland and scrubland dominating the lowveld; large areas of Acacia scrubland in the southwest; and dry forest and scrubland on the Kalahari sands in the west (Campbell, 1993). It becomes clear that Zimbabwe's geography latitude tends to enable certain medicinal plants and other biodiversity to grow and thrive.

3.2.2 Population Status in Zimbabwe

The republic of Zimbabwe has an estimated population of between 12.2 and 12.4 million (CSO, 2009). Available information shows that Zimbabwe has 52 % of the above population

are women was less and males (48%) (National Gender Policy of Zimbabwe, 2004). Both in the 2002 Census and 2008 ICDHS, 41% of the population was below 15 years of age, 55% was between the ages 15 and 64 years, and a very small proportion (4%) was 65 years of age or more. 3.6% of the population were under one year old in 1992, with a figure of 3.3% in 2008 (CSO, 2002). Zimbabwe has a broad based population pyramid and a narrow top, reflecting a youthful population with a large proportion of children (Ministry of Health and Child welfare, 2009). Zimbabwe has an annual population growth of 4.31% (CIA, 2011.est). According to the United Nations World Health Organisation, the life expectancy for men was 37 years and the life expectancy for women was 34 years of age, the lowest in the world in 2006 (Explodia.com, 2011). The birth rate is pegged at 31.86 births/1,000 population (2011 est.) According to the Economic watch (2012) Zimbabwe's death rate is pegged at 13.58 deaths/1,000 population (July, 2011 est.) and Net migration rate is pegged at 24.83 migrant(s)/1,000 population. In relation to urbanization, urban population consists of 38% of total population (2010) and the rate of urbanization was pegged at 3.4% annual rate of change (2010-15 est.) (Ministry of Health and Child welfare, 2009). Over the years given the crisis, it appears that the health sector has deteriorated in Zimbabwe and could still be said to be on the increase. It could perhaps be arguably said that in studies of medicinal plants, it is imperative to look into population health issues of areas being studied.

3.2.3 The Economy

A clearer outline of Zimbabwe's economic performance since independence in 1980 can be broken down into three periodizations: the post-independent era of 1980–90, the economic liberalisation and ESAP period of 1990–2000, and the crisis period of 2000–2008. During the first decade of independence, 1980–1990, real GDP growth rate averaged 3-4% per annum and reached a peak of 7% in 1990. The period of economic liberalisation, 1990–2000, saw the implementation of the Economic Structural Adjustment Programme (ESAP) that was introduced in response to poor macro-economic indicators. The key elements of the reforms were an emphasis on export-led policies, monetary policy reforms in the form of liberalised interest regimes and exchange rate policies, government divestiture from public enterprises, and the liberalisation of labour markets (Millenium Development Goals Report, 2010).

By 1997, the economic crisis had deepened such that the government replaced ESAP with the Zimbabwe Programme for Economic and Social Transformation (ZIMPREST), 1996–2001.

Notwithstanding the introduction of ZIMPREST, the onset of the land reform programme and the decline in the output of the commercial farming sector, in exports, and in inputs for the manufacturing sector, together with a growing budget deficit and severe foreign exchange shortages, contributed to further declines in GDP from 0.0% in 1998 to -7.4% in 2000 and subsequently -10.4% in 2003. From 2000 to 2008, Zimbabwe's economy suffered a further decline, with GDP shrinking by an estimated 40% between 2000 and 2007. Extremely high levels of inflation ensued, with profoundly negative consequences for development and the eradication of poverty (Millennium Development Goals Report, 2010).

The GDP of Zimbabwe is estimated at about U.S. \$7.48 billion (IMF, 2010). The real GDP growth rate is estimated at 9.01% (ibid). GDP per capita is estimated at \$594 (IMF U.S. dollars, current prices, 2010). Avg. inflation rate 3%. Agriculture and industry account for about 17% and 29% of gross domestic product (GDP), (IMF, 2010) respectively. Zimbabwe has an important percentage of the world's known reserves of metallurgical-grade chromite. Other commercial mineral deposits include coal, platinum, asbestos, copper, nickel, gold, diamond and iron ore (USDS, 2011). From this review, it can be seen that between 2000 and 2008 there has been a severe decline in the economy which has led to the collapse of many sectors of the country such as health. Therefore in studying medicinal plants, the economic issues there perhaps need to be explored in order to understand reasons for extent of increase in use-values of plants in the context of this study.

3.2.4 Health Status in Zimbabwe

Zimbabwe's unprecedented economic decline saw spiralling inflation, deteriorating physical structures and, in 2008, the inability of the public sector to deliver basic social services. The country has been facing severe human resources capacity constraints in the public sector, the health sector in particular. During the decade 2000–2010, state investment in health varied from 4.2% of the state budget in 2001 to 15.3% in 2009. An important commitment was to keep to the Abuja Recommendation of 15% of the state budget for health. However, this proportion of the national budget fell significantly short of the per capita health cost allowance, which, according to the Ouagadougou Declaration, should be US\$34-US\$40. Currently, Zimbabwe's annual budgetary allowance only stretches to US\$9 per capita (Ministry of Health and Child welfare, 2009). It seems clear from the above that the collapse of the health sector in Zimbabwe has led to the deterioration of the well-being of people in

Zimbabwe which justifies the wide use of medicinal plants in many areas rather than pharmaceutical medicines.

3.2.5 Education Status in Zimbabwe

Zimbabwe has consistently maintained relatively high levels of primary school enrolments. In terms of literacy rates Zimbabwe seems to maintain high literacy rates as 94.2% of the males are literate and 87.2% of the females are literate (2003 est.). The net enrolment ratio (NER) increased from 81.9% in 1994, peaking at 98.5% in 2002. Since 2003, however, there has been a gradual decrease, with the 2009 Multiple Indicator Monitoring Survey (MIMS) recording an NER of 91%. In urban areas the NER is 94% compared to 90% in rural areas. Gender equality at primary school level is good; in fact, 2009 saw a pro-female enrolment rate of 50.5% (Ministry of Health and Child welfare, 2009). A critical look into education levels is justified as other studies have argued that modernisation and western education are a threat and have negative significant consequences on plant use knowledge. This study consequently looks into this assertion in the discussion section of the thesis.

3.3 Zimbabwe's Biodiversity Status

Zimbabwe has a consistent record of environmental conservation in both natural heritage and wilderness areas. The country maintains good implementation of land use systems in varied agro-ecological regions, but in over half of our land surface, the resource base is being subjected to pressures that are beyond its capability (National Conservation Strategy, 1987). Zimbabwe is rich in plant and animal genetic resources which contribute significantly to national and household economies. These species account for a significant proportion of the Gross Domestic Product and directly support livelihood of about 65% of the country's population. However, despite the importance of these species, these vegetation resources are being lost at an alarming rate (Shumba, 2003).

3.4 Environmental Policies on Natural Resource Management in Zimbabwe

Zimbabwe protects its natural resources through a number of comprehensive laws. These acts provides for the conservation of a wide range of resources. The issues of conservation and

use-values of medicinal plants, which is at the centre of this study, is mainly covered by various laws which follow.

The Forest Act provide for the protection and management of these respective resources. Zimbabwe's natural forests consist almost entirely of savanna hardwood trees, which constitute the chief source of fuel and construction material for the rural population. Zimbabwe's Forest Act provides the Ministry of the Environment with a comprehensive framework for the management of state forests and the conservation of timber resources. In general, the Forest Act forbids the cutting of timber or trees from any state land or the removal of any indigenous trees from private land unless one first obtains a permit from the Mining Timber Permit Board (Nickerson,1994)

Environmental Management Act (20:27) was passed by parliament in 2002. Essentially, the act is aimed at promoting sustainable management of natural resources and the protection of the environment. The Act provides for the establishment of the Environmental Management Agency ("EMA") whose primary task is to formulate and oversee the implementation of environmental policies in the country. This Act also provides a solid platform for the development of the institutional, legal and policy framework that is necessary for developing a sustainable environmental protection system. The Act correctly identifies the problems arising from the use of biological and genetic resources and attempts to provide the platform upon which measures can be built for purposes of solving the problems. The legislature accepted the claims that indigenous knowledge is an important tool in the protection of the environment. Its commitment to meet its international obligations is confirmed by the enactment of this Act. Nonetheless there are some weaknesses as far as the key area of this study is concerned (Summary of the Environmental Management Act, 13 November 2002:15-16).

The Act repealed a number of previous Acts on the basis that these laws were too old and no longer in tune with the way in which people live and use the environment. The repealed former acts were:

- *Natural Resources Act (Chapter 20:13)*
- *The Atmospheric Pollution Prevention Act (Chapter 20:03)*
- *The Hazardous Substances and Article Act (Chapter 15:05)*

- *Noxious Weeds Act (Chapter 19:07)*.

The repealed acts are now incorporated into the Environmental Management Act. The Communal Land Forest Produce Act was amended to deal with new environmental problems. The concerns were related to the increased use of wood resources within communal lands which needed to be controlled. This act gives people living in communal areas the right to exploit any forest produce for their own use. The occupants in communal areas have the right to exploit any forest produce including reserved trees, on any land which they are permitted to use for residential or agricultural purposes in the course of clearing such land for development. (Katerere, Guveya and Muir, 1999).

Rural District Councils Act (1989, Chapter 29:13) was also amended to deal with new environmental concerns. The Act allows for the establishment of rural district councils responsible for initiating and regulating development in rural areas (Katerere, Guveya and Muir, 1999).

'CAMPFIRE' (the 'Communal Areas Management Programme for Indigenous Resources') was conceived in 1982 by Zimbabwe's Department of National Parks and Wild Life Management (DNPWLM) (Thomas, 1991). It was incorporated into the National Conservation Strategy in 1985. Specifically it was designed to assist Local Councils in the establishment of wildlife utilization programs. Its declared objectives, amongst others, were to initiate a programme for the long term development, management and sustainable utilisation of natural resources in the communal areas. The rationale behind this Act was to achieve management of resources by placing the custody and responsibility with the resident communities and to allow communities to benefit directly from the exploitation of natural resources within the communal areas (Thomas, 1991).

To this end, these above mentioned legislations show that Zimbabwe has an enabling natural resource conservation base and the presence of these laws help in ensuring the conservation and protection of the environment and biodiversity species in Zimbabwe. However, despite these measures that have been undertaken, the environment and its biodiversity are under threat from rural dwellers in many communal areas that are unsustainably using, utilising and destroying the species in areas they live in.

3.6 Mutasa District

Mutasa District has 27 wards and a total population of 167 462 with 39 847 households (CSO, 2002). Through the Rural District Councils Act of 1988, Mutasa Rural District Council has the legal authority to ensure the planning and coordinating of all developmental activities in the district. The day-to-day management of the RDC is entrusted in a Chief Executive Officer. Development structures linked to the RDC include the Ward development committees (WADCOs) and the Village Development Committee (VIDCOs). Both VIDCOS and WADCOs are accountable to Village and Ward Assemblies respectively. All Wards are represented by elected Councillors who sit on the Rural District Council which has a Rural District Council chairperson (World Vision International, 2009).

All VIDCO/WADCO plans are expected to filter into and are consolidated into an overall district strategic plan formulated by the Rural District Development Committee (RDDC). The District Administrator represents the Ministry of Local Government at District level and has the responsibility of supervising the RDC ensuring that it is not in breach of the RDC Act and all other relevant Government policies. In Mutasa District Government Departments comprise of Government Ministries representing different sectors and facilitating development work. The Government is represented by various service Ministries at the district and sub-district levels. Government ministries include the ministries of Agriculture, Health and Child Welfare, Education Sport and Culture, Local Government, Home Affairs, Justice and Youth, Gender and Employment Creation. Most service ministries have employees both at both district and ward levels. Their role is to provide technical support to communities in their developmental efforts. Most government departments are however facing financial and human resource constraints that are currently hindering their capacity for effective service delivery (World Vision International, 2009).

3.6.1 Economy of Mutasa District

Mutasa District economy is agriculture based. Villagers practice semi-commercial agriculture. The district has several plantations and estates which provide employment to the rural communities. Being an agrarian community, the bulk of the community's livelihood is based on agriculture. Approximately 78% of the community engages in subsistence crop farming. Approximately 10% of the population is engaged in informal trading of bananas,

pineapples, yams, avocado pears and vegetables and forest resources comprising of reed baskets, mats, honey, traditional medicines and wood carvings. Maize, beans, wheat and bananas are the major crops grown by the farmers in the Villages raise cattle, goats and chicken. Some of the villages are small holder growers of coffee, tea and banana plantations while there are also large scale commercial plantations produces timber, coffee and tea estates (World Vision International, 2009).

3.6.2 Health Sector of Mutasa District

Mutasa district has 3 hospitals namely Old Mutare, Hauna and Bonda general hospitals. Hauna hospital serves as the referral centre for more than 30,000 people in the district. The shortage of clinics has resulted in some sick community members walking for long distances of up to 15 km to the nearest clinic to seek treatment. All the clinics in the area are not adequately staffed with trained health practitioners and lack basic drugs and medicines. Shortage of qualified personnel has been attributed to poor accommodation and the remoteness of their locations. Generally health operations are hindered by limited resources and the unavailability of foreign currency to import drugs and medicines. Major diseases prevalent in the area are malaria, diarrhoea, acute respiratory infections, skin diseases, injuries, HIV and AIDS and some Sexually Transmitted Infections (World Vision International, 2007).

Acute Respiratory Infections, skin diseases and malaria rank as the three top most prevalent diseases in the district. These are followed by HIV and AIDS and diarrhoea. Diarrhoea and skin diseases are more related to the quality of water accessible to the community. According to the Mutasa DAAC, the HIV and AIDS pandemic has resulted in approximately 10 000 orphans, 150 child headed households, 1 300 PLWHA, and 300 HBC givers. HIV and AIDS have led to increased poverty in the community as households tend to dispose of their productive assets in an effort to acquire financial resources to cater for medical needs. Households also spend most of their productive time giving home-based care to their sick relatives and in some cases the girl-child has had to drop out of school to take care of sick relatives. The increased number of deaths has also resulted in reduced labour leading to increased household insecurity due to decreased household production. The spread of the pandemic and its continued impact can be attributed to lack of community awareness about HIV and AIDS. Communities in Mutasa tend to now rely more heavily on traditional

medicines in order to treat the major diseases that affect the people in the district (World Vision International, 2009).

3.6.3 Environment and climate in Mutasa

Mutasa district lies mainly in the wet but mountainous and rugged eastern border high lands of Zimbabwe and is situated in agro-ecological regions 1 (45%), 11 (35%) and 111 (20%). The area under research is located in natural region 1 (one). The district receives an average annual rainfall of 1000mm. Annual temperatures are generally low at 10 degrees Celsius in winter and high summer temperatures of 38 degrees Celsius. An average of 70% of the district is communal with the remaining 30% dominated by large and small scale commercial farming mainly characterised by tea and banana plantations. The rainy season normally runs from November to April while the rest of the year is fairly dry. The mountainous terrain of the district has resulted in limited grazing land leading to limited livestock production in the form of cattle and goats. Climatic conditions in the district are favourable for the production of crops such as sugar cane, maize, beans, wheat, yams, bananas, avocado pears, coffee, tea and pine apples (World Vision International, 2009).

3.6.4 Drainage and Vegetation in Mutasa

Mutasa's drainage system is dominated by 5 perennial rivers namely Odzi, Pungwe, Nyatande, Odzani and Honde and various other perennial streams. Water Supply for the Honde Valley comprises small piped systems and motorised pumps serving small towns, growth points, commercial plantations, service centres and some villages, as well as direct abstractions from the rivers by riparian village communities not connected to developed installations. There are a total of about seven small to medium sized metered piped water systems at Hauna, Sachisuko, Honde Army, Zindi, Samanga, Mpotedzi and Sahumani. In addition there are other smaller un-metered water supply schemes that serve a number of villages and schools. The known smaller un-metered water supply schemes are Honde "Povo" Pipe Scheme, Chingaira Piped Scheme, St Columbus Secondary School, Sagambe Primary and Secondary School, Marige Water Project, Mahobo Piped Scheme and Mupenga Gravity Water Scheme. The area's topography is rugged and undulating giving rise to the fast drainage. The whole district is mountainous. Vegetation is mainly open hyperhaenia veld with scattered *Brachystegia* woodlands and wattle and pine forests. Soils are dominantly

shallow to moderately shallow granitic sandy loams of fair fertility (World Vision International, 2007).

3.6.5 Food Security and Agriculture

In Mutasa district food security is an issue that requires attention due to the increasing vulnerability levels resulting from poor agricultural production and the impact of the HIV and AIDS pandemic that has resulted in reduced availability of labour and an increase in the number of orphans and widows. Perennial rivers and streams are present in the district area but there is poor infrastructure and skills required to facilitate the establishment of irrigation schemes. According to the 2006 ZIMVAC survey, 44% of the targeted population was food insecure during the 2006/2007 agricultural marketing season (World Vision International, 2009).

3.6.6 Emergency Response and Disaster Mitigation in Mutasa

Food insecurity is usually coupled with a number of other effects such as malnutrition, kwashiorkor in children and other related conditions in adults. Livestock deaths due to diseases such as anthrax, red water and other tick-borne diseases are a major cause of food insecurity and household vulnerability. In times of drought, the community relies mainly on food hand-outs from two major non-governmental organisations such as World Vision, AFRICARE and PLAN International. Besides food aid, communities have also adopted various coping mechanisms which include relying on unusual foodstuffs such as tree leaves and roots and wild fruits. Family networks also enable the sharing of food by the better off community members with the poor. This arrangement is however being threatened by the harsh economic environment prevailing in the country particularly in the rural areas. Disposal of assets such as livestock in an effort to secure money to purchase food is a common coping mechanism which has left many households more vulnerable (World Vision International, 2009).

3.6.7 Micro Enterprise Development in Mutasa

The district is characterised by household with low income. Low household income has resulted in high school drop-out rates due to failure by parents to pay school fees. Lack of financial resources also leads to household food insecurity due to limited financial resources to purchase food. Access to health facilities is also limited in the Mutasa area due to lack of

money to pay for medical facilities which has led to traditional healers, herbalists and some community member surviving on the sale of traditional medicines which is cheaper and readily available as opposed to pharmaceutical medicine (World Vision International, 2007).

3.7 METHODOLOGY

3.7.1 Research Design

For this study, the researcher used the Case Study Design. Case study research is associated with the investigation of a particular place, community, setting or organization (Patton, 1990). The case study method is an empirical investigation that examines a contemporary phenomenon within a real life setting in which the margins between phenomenon and context are not evident, and in which multiple sources of evidence are used (Yin, 1984). However, the case study method is often criticized against the backdrop of being ‘microscopic’ and thus incapable of providing a generalizing conclusion due to its lack of sufficient number of cases (Yin, 2009) but remains useful all the same. In this study, Zindi village was selected because of its accessibility, unique flora and other biodiversity. The aim of the case study was to have a comprehensive and detailed understanding of conservation and use-values of medicinal plants in Rural Eastern Zimbabwe. The case study approach was very important in this study as it offered a better way to understand and comprehend the conservation and use-values of medicinal plants in Zindi village through limiting the scope of the research to one area and enabling the researcher to critically engage in a practical setting.

For this study respondents who were targeted, involved village leaders, traditional healers, ordinary community members, World Vision Zimbabwe staff, Mutasa Rural District Council officials and members of Environmental Management Agency that work in the Mutasa District. Zindi village was chosen as the case study area as the researcher had worked in this community before and had gained a lot of knowledge about the area about the environment and medicinal plants.

3.7.2 Research Methodology

Broadly speaking two methodological paradigms in the scene in recent social science that are, quantitative and qualitative. According to Babbie and Mouton (2008) the quantitative approach is linked to positivism in one form or the other and qualitative approach is linked to phenomenology or interpretivism. Babbie and Mouton (2001) describe the quantitative

paradigm as one concerned with numbers of related themes. Quantitative paradigm is pillared around three dominant themes i.e quantification, variable analysis and control for sources of error (Babbie and Mouton, 2008:49). Quantitative researchers collect data in the form of numbers and use statistical types of data analysis (Blanche, Durrheim and Painter, 2006). Qualitative researches are more inclined to the interpretive paradigm in social science research which inherently takes the insider perspective in social action (Babbie and Mouton, 2008:53). In direct contrast to the quantitative paradigm, qualitative approach is underpinned by the ultimate goal of “describing and understanding rather than explanation and prediction of human behaviour” (Babbie and Mouton, 2008:53). For this study considering the relevance and importance of the research topic, the research essentially used qualitative research methodology with some quantitative data.

3.7.3 Population Sample

The purpose of sampling was to obtain a group of participants who were to represent the wider population in Mutasa, Zindi village. In this research purposeful random sampling techniques was used to select participants and informants for the Interviews and Focus Group Discussions. The population sample consisted of 72 respondents who were purposefully sampled consisting of village leaders, traditional healers, ordinary community members, World Vision Zimbabwe staff, Mutasa Rural District Council officials and members of Environmental Management Agency that work in the Mutasa District. This purposive sampling was done to ensure and enable sharing and exchange of knowledge among community members, stakeholders in Mutasa. The 72 respondents were interviewed by using questionnaires.

Participants were recruited from going from house to house with a local resident in Zindi village who was knowledgeable about the area. The informants were selected randomly by picking cards which were in a small hat written “Yes” or “No”. This was done for both the Interviews and Focus Group Discussions. Those who picked cards written “Yes” had their names written and were able to participate in the Interviews and Focus Group Discussions. This method was used to ensure that there was equal selection of participants in the research in order to reduce any bias. This method was used until all the 72 respondents were selected. The 72 randomly selected respondents were notified of the selection criteria and what knowledge of medicinal plants was needed.

3.8 Research Instruments

3.8.1 Structured Interviews

The main instrument used in data collection was interviews. Interviews provided a better understanding, capture the complexities, knowledge, attitudes, and their effects on the environment (Holl et al, 1999). The researcher designed an interview guide prior to the field work exercise, outlining all the issues to be covered during the interviews to ensure flow in the interview questions. Through interviewing, the researcher got a deeper understanding of occurrences of medicinal plants, conservation of medicinal plants issues, various economic and cultural use-values, markets, diseases and ailments healed by medicinal plants. Interviews also enabled the researcher to order, direct, probe and make follow up questions to verify information that was coming from the informants.

The Interview guide used for this research consisted of three sections. Section A consisted of Basic Demographics capturing Name, Age, Sex, Marital Status, Education Level and Community Category. Section B of the Interview guide aimed to elicit the Plant use Knowledge of Medicinal Plants in Mutasa Zindi Village. This section captured names of medicinal plants found in Zindi village, Availability of these species, Medicinal plants uses and plants part used for different uses, Economic benefits derived from these species, Markets, Increase in significance and use of these species since 2008 crisis. Section C captured the Conservation aspects of Medicinal Plants in Mutasa District, Zindi Village. This section elicited information on how the community protects and conserves threatened or endangered medicinal plants, Medicinal plant conservation strategies that exist in the community, Increased dependency of these plants since the health crisis, Factors which enable or constrain protection of medicinal plants in Zindi village and other initiatives that can be taken to protect and conserve medicinal plant species.

3.8.2 Focus Group Discussions

According to Kumar (2005), focus groups are effective in eliciting data on the cultural norms of a group and in generating broad overviews of issues of concern to the cultural groups or subgroups represented. The major aim of focus group discussions in this research was also to complement the semi-structured interviews in order to enhance reliability accuracy of information drawn from the interviews. In the context of this research on conservation and

use-values of medicinal plants, focus group discussions helps to explore issues that data had not been included in interviews, as people come together and discuss issues that might have been excluded or not fully explored in interviews. Focus group discussions allowed the researcher to question several individuals systematically and simultaneously (Babbie, 2008).

Three Focus Group Discussions were conducted in Zindi Village with community stakeholders containing 10 people each. The 30 participants selected for the focus groups were part of the 72 respondents from the interviews. These participants were those who showed high plant use knowledge, hence their incorporation in the discussion to further understand plant the extent of increase of medicinal plant use-values in Zindi village. The discussion guide had three sub-sections. Section A noted the Date, Venue, Duration and Any observation worth noting. Section B captured the Medicinal Plant Uses in Zindi village probing Medicinal Plant species used for health care purposes, Medicinal species used for cultural purposes, Medicinal Species which have high economic value and the extent of increase in use of these species since the 2008 health crisis. Section C of this discussion guide elicited the measures that are there in place that facilitates sustainable use of medicinal plants, and what more can be done to ensure sustainable use and value of medicinal plants. The shortcomings of Focus Group Discussions were that not all informants in the focus group discussions participated equally. There were others who participated and aired out their views more than others. However, the researcher tried to probe and as much as possible to involve everybody in the discussions by being more inquisitive and asking more direct questions to particular participants.

3.9 Data Collection Procedure

The research was carried out in Mutasa District in Zindi village. The research was concerned with the Conservation and use-values of medicinal plants in this area. Before carrying out field work the researcher sought for permission from the District Administrator's Office for Mutasa to collect data this research. Permission from the District office was very important as the District Office has the authority and is responsible regulating any activities being held in Mutasa. The researcher also sought for permission from the village councillor for Zindi Village who coordinates all Ward 3 activities. When permission was granted the researcher identified relevant respondents who were to be interviewed and those who were to participate in group discussions. Data was gathered over a period of four weeks with three interviews per

day. Interviews and focus group discussions were done during the day. Interviews were conducted when the researcher visited the selected respondents in their households. Focus Group discussions were conducted at Zindi Primary school which was a central venue to many people in this area.

Data was collected through the use of structured interviews questions and focus group discussions to understand the conservation and use-values of medicinal plants in the Rural Eastern village of Zindi in Mutasa district. Data was collected from different stakeholders in the community which comprised of community members, village leaders, traditional healers, Mutasa rural district staff and World Vision International staff. Data that was captured specifically captured the economic values, cultural values, spiritual values, market values, non-market values, benefit sharing, conservation measures of these medicinal plants and extent of increase in the use and value of medicinal plants in Zindi village since 2008. When all data was presented, analysed and interpreted, a summary of the responses was provided. The summarised findings show the responses that came out from the interviews and discussions and enable better understanding, presentation, analysis and interpretation of the findings.

3.10 Data Analysis Plan

Data analysis was essentially in qualitative form with some quantitative data. The information acquired from the fieldwork was read and arranged according to themes based on research questions for easy analysis. The researcher also carried out content analysis on the research questions, which guided the interviews and groups discussions and thereafter arrange the information in themes, categories and later subcategories. Quantitative data was processed using STATA Statistical Package. Tabular presentations were constructed using statistical computation method to measure and analyse the different and increased use value of plants among different variables. The results were presented using descriptive statistics (charts, tables, and graphs). Data was presented using diagrams, labelled categories, and verbal descriptions.

3.11 Conclusion

In conclusion this chapter discussed the methods used in the research. As highlighted earlier, for this study the researcher used the Case Study Design. Case study research is associated

with the investigation of a particular place. In this study Zindi village was selected because of its accessibility, unique flora and other biodiversity. For this study considering the relevance and importance of the research topic, the researcher used qualitative methodology with some quantitative data. The main instrument used in data collection was interviews. Interviews provided a better understanding, capture the complexities, knowledge, attitudes, and their effects on the environment. The major aim of focus group discussions in this study was to complement the semi-structured interviews in order to enhance reliability accuracy of information drawn from the interviews. Quantitative data was processed using STATA Statistical Package. Tabular presentations were constructed using statistical computation method to measure and analyse the different and extent of increase in use value of plants among different variables. The results were presented using descriptive statistics (charts, tables, and graphs). Data was presented using diagrams, labelled categories, and verbal descriptions.



4 CHAPTER 4: FINDINGS and ANALYSIS OF STUDY RESULTS

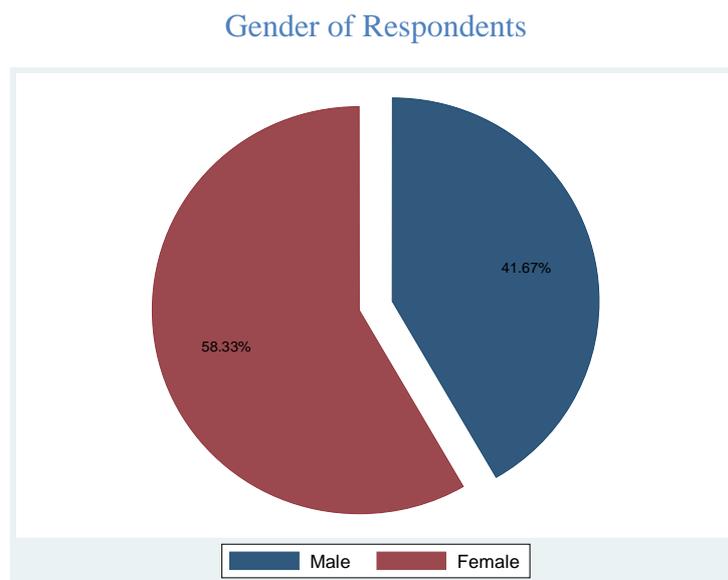
4.1 Introduction

This chapter presents the findings, and analysis of the study. As discussed in the methodology section, data was collected through the use of structured interviews questions and focus group discussions in order to understand the conservation and use-values of medicinal plants in Zindi village in Mutasa district. A total of 72 respondents were selected for this study and were interviewed and discussed with. Of the 72 interviewed respondents, 30 respondents who were high knowledgeable about medicinal plants were consolidated to form the focus group participants. The breakdown of the respondents is as follows: 42 (58%) community members, 17 (24%) traditional healers and 13 (18%) government stakeholders and NGO staff working in the district were interviewed. These respondents were selected because of their knowledge in medicinal plants and biodiversity conservation in the study area. This section discusses the demographic patterns, plant use-values and summaries of the conservation threats and conservation efforts in Zindi village in order to understand the study on the conservation and use-value of medicinal plants in Rural Eastern Zimbabwe. Inconsistencies and unique statements were noted and given particular attention.

4.2 Demographic Patterns

4.2.1 Gender

Figure 1 showing Gender of Respondents



42 (58%) of the total sample of the 72 respondents were women and 30 (42%) were men. This distribution perhaps suggests that women were more knowledgeable about plant use and their value in the case study area as they were the majority of the respondents. Of the 17 traditional healers interviewed 9 were female and 8 were men. This also possibly shows that women tend to be more involved with the environment and knowledgeable about medicinal plants and other biodiversity than men.

4.2.2 Age

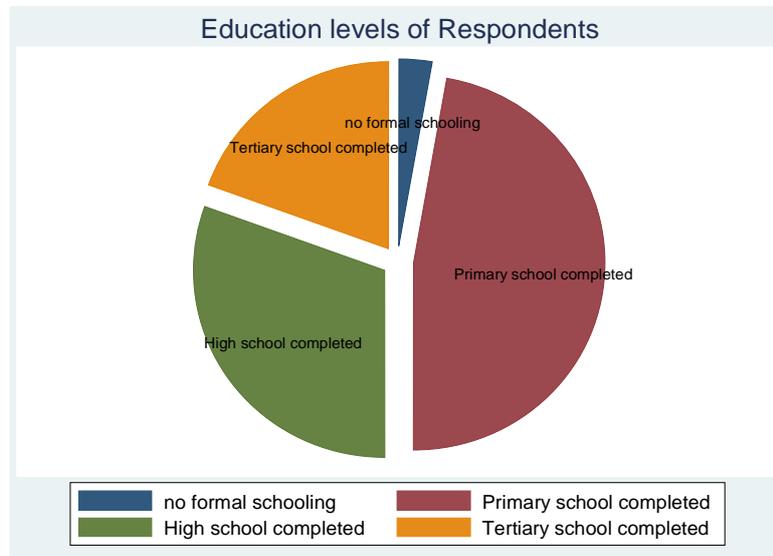
Table 1 showing Age of Respondents

Age of respondent	Number	Percent
25-30	8	11.11
31-40	21	29.17
41-50	22	30.56
51-65	21	29.17
Total	72	100.00

The age range analysis shows that 11% of the respondents were between the ages of 25 to 30. 29% of the respondents were in the age group of 31 to 40. 31% of the respondents were between the ages of 41 to 50 years. 29% of the respondents were between the ages of 51 to 65 years. This age group of respondents had the highest number of the traditional healers. It was observed that during the focus group discussion that the older people were more knowledgeable about and respected by the other colleagues. This possibly showed that the community valued the knowledge imparted to them by the older experienced people.

4.2.3 Education

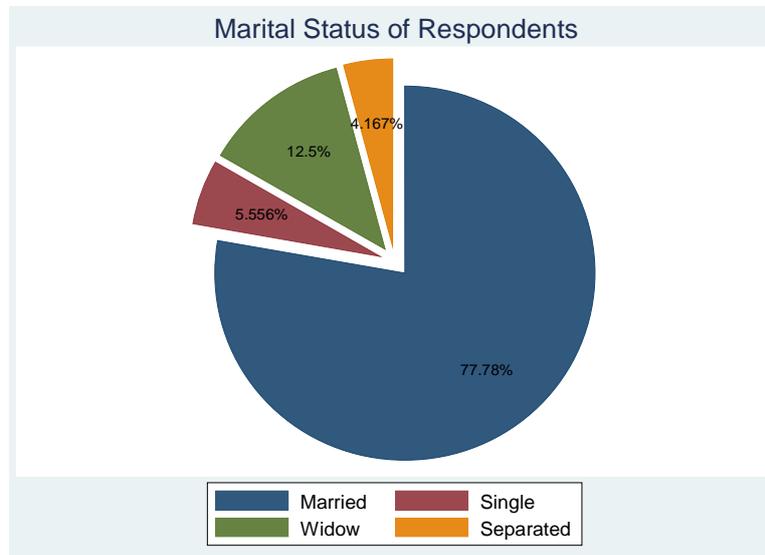
Figure 2: showing Education level of Respondents



Of the 72 interviewed sample respondents 2 (3%) had no formal schooling, but were however knowledgeable about plant uses. 34 (47%) of the respondents had received primary school education as they could read and write. 22 (31%) of the respondents had reached High school. 14 (19%) had reached tertiary level education. In relation to the level of plant use knowledge from those asked, 30% had fair knowledge of medicinal plant uses, 65% showed that they had very good knowledge of medicinal plant uses and 5% had little knowledge of medicinal plants. The findings show that the sample population were highly literate. However there was no correlation drawn between the level of education and the age group of the respondents. From the findings it was evident older people who had mostly primary schooling were more knowledgeable about plant uses and their conservation in Zindi village. This showed that medicinal plant knowledge and their uses do not require one to be too educated but rather the ability to memorise the teachings which are given orally by the older experienced and knowledgeable village elders. The majority of the traditional healers were able to read and write. This is shown by the fact that 82% of the healers received primary school education and 6% had received high school and 12% of the healers had not received any formal schooling.

4.2.4 Marital Status of Respondents

Figure 3: showing Marital status of Respondents



The pie chart above shows the marital status of the respondents in the study. 78% of the respondents were married, 6% single, 13% widowed and 4% separated.

4.2.5 Category of the Respondents

Table 2 showing Category of Respondents

Category of Respondents in the Community	Number	Percent
Traditional Healers	17	23.61
Community Members	42	58.33
Government and NGO Stakeholders	13	18.06
Total	72	100.00

From the table above, it can be depicted that 42 community members, 17 traditional healers and 13 NGO stakeholders participated in the study. Community members consisted of village heads, councillors, traders, harvesters and other stakeholders. Thus, community members who participated in the study comprised of those who live in the Zindi village and were knowledgeable about medicinal plants and their conservation.

The study made use of 17 traditional healers who participated in this study and provided medicinal plant uses, healing properties and cultural uses. Many traditional healers were elders in the age group of 40 to 65 years. Traditional healers were highly experienced, knowledgeable and trusted in medicinal plants uses and their conservation. As mentioned in the previous section, the majority of these traditional healers were averagely literate as 82% of the healers received primary school education and 6% had received high school and 12% of the healers had not received any formal schooling.

As shown earlier, 13 government stakeholders and NGO staff working in the district were interviewed. In Zindi there are various Mutasa District Officials and NGO's such as World Vision and Plan International who have environmental and health programmes. These government stakeholders and NGO staff provided very useful insights especially on the conservation aspect of biodiversity which they were also working in.

4.3 Medicinal Plant uses in Zindi Village

11 medicinal plants were studied in order to show the extent of increase of medicinal plant use-values. The plants that were used in this study are shown immediately in the below table.

Table 3: Medicinal Plant Names

Plant Botanical Name	Vernacular Name
<i>Kirkia ancuminata Oliv</i>	Mubvumira
<i>Dicoma anomala Sond</i>	Chifumuro
<i>Lannea edulis Engl</i>	Musambasi
<i>Aloe</i>	Gavakava
<i>Lippia javanica Spreng</i>	Zimbani
<i>Virtex payos merril</i>	Mutsubvu
<i>Syzygium guineense DC</i>	Mukute
<i>parinari curatelli</i>	Muhacha
<i>Zingiber officinale</i>	Tsangamidzi
<i>Acacia Karoo Hayne</i>	Muvhungu
<i>Coleochloa setiflora</i>	Rufuri

Source: Field Data (January 2012)

Mubvumira (*Kirkia ancuminata Oliv*) was mentioned useful by 59 (81%) of the respondents. Chifumuro (*Dicoma anomala Sond*) was mentioned useful by 64 (88%) of the respondents. Musambasi (*Lannea edulis Engl*) was mentioned useful by 56 (78%) of the respondents. Gavakava (*Aloe*) was mentioned useful by 69 (95%) of the respondents, Zimbani (*Lippia javanica Spreng*) which was mentioned useful by 50 (69%) of the respondents, Mutsubvu (*Virtex payos merril*) was mentioned useful by 68 (94%) of the respondents, Mukute (*Syzygium guineense DC*) was mentioned useful by 59 (81) of the respondents, Muhacha (*parinari curatelli*) was mentioned useful by 54 (75%) of the respondents, Tsangamidzi (*Zingiber officinale*) was mentioned useful by 72 (100%) of the respondents, Muvhungu (*Acacia Karoo Hayne*) was mentioned useful by 51 (70%) of the respondents and Rufuri (*Coleochloa setiflora*) was mentioned useful by 35 (49%) of the respondents. These percentages of the mentioned the plants are of paramount importance as their use-values will be shown in detail in the medicinal plant use analysis section forthcoming.

4.4 Economic Benefits derived from Medicinal plants

From the findings some species were said to have more economic value than other species mainly because of the multiple uses and treatment properties which some plants have over others. This will be shown immediately below.

Kirkia ancuminata Oliv specie was mentioned by 55 (93%) of the respondents was reported to have high economic value. *Dicoma anomala Sond* was mentioned by 53 (81%) of the respondents was also reported to have high economic value. *Lannea edulis Engl* was reported to have much economic value as 45 (80%) of the respondents mentioned this specie. *Aloe* was reported to have little economic value as 41 (59%) of the sampled population mentioned the little economic benefits derived from this plant. *Lippia javanica Spreng* was mentioned by 41 (80%) of the respondents to have much derived economic value. *Virtex payos merril* was reported by 53 (78%) of the respondents to have much economic significance and value. *Syzygium guineense DC* was mentioned by 43 (72%) of the respondents to have much economic value. *parinari curatelli* was mentioned by 27 (50%) of the respondents to have little economic value. *Zingiber officinale* was reported by 72 (100%) of the respondents to have high economic value. *Acacia Karoo Hayne* was reported by 37 (70%) to have much economic value. *Coleochloa setiflora* was reported by 23 (62%) much to have little economic

The economic analysis section goes more into detail examining the main reasons as to why some species have more economic benefits more than other, which will make this understanding enhanced.

4.5 Trading Markets for traditional medicines

Medicinal plants are very important to the rural community members in Zindi village. There are many small market places where the community supplies traditional medicines namely Murara, Mutare, Nyanga, Rusape and Harare. Murara is the most accessible market place 3 kilometres to Zindi village as it is in the same ward 3 area. Murara market provides medicines, fruits such as banana's avocados, sweet potatoes, water melons, pine apples and thus is a renowned market area where the community accesses these market products. As there is a road network from the Murara market there are buses which travel to Mutare, Rusape, Nyanga and Harare which carry these medicines and are supplied to the other market places. However, there seems to be no huge pharmaceutical companies that are supplied by this community which resultantly makes the major recipients of these medicines local people and the other smaller markets in the district.

4.6 Cultural and Spiritual benefits derived from Medicinal plants

From the findings, in Mutasa medicinal plants are very important resource to the community as they provide medicines, food, shade, firewood and fruits. All of the respondents pointed out that medicinal plants are very important as they help in spiritual ceremonies as they have been used and still continue to be used in the *Shona* traditional culture when speaking to ancestors, warding off evil spirits, healing the sick and protecting people's homesteads against evil spirits.

Dicoma anomala Sond, was reported by 76% of the respondents to have high cultural value. *parinari curatelli* was reported by 80% of the respondents to have high spiritual and cultural value. *Acacia Karoo Hayne* was reported by 72% of the respondents to have high cultural value. *Syzygium guineense* DC was reported by 75% of the respondents to have high cultural value. This knowledge of cultural values provided by people in Zindi village shows that biodiversity is very important culturally to the community which results in many community members valuing these species because of their traditional, cultural and spiritual values. The

analysis section forthcoming further examines the cultural and spiritual benefits derived from these species.

4.7 Findings on the increased extent of use and value of medicinal plants in Zindi village

88% of the respondents mentioned that the crisis in Zimbabwe has facilitated majority of rural dwellers to be dependent more upon traditional medicines as access to hospital or clinic medicines became more difficult. In Mutasa district this reliance has exerted pressure on the environment which has consequentially led to the deterioration of medicinal plant and other plant species. Many respondents highlighted the period from 2007 to 2008 as the hardest period as it had a negative impact on the Zindi community in terms of economic, health and social spheres of human life, as people were incapacitated to visit the health service delivery and the health service delivery was also at the verge of collapse which made the rural folk rely more on traditional medicines. From the research findings it was evident that there was a sharp increase in the use and value of medicinal plants because of the crisis in Zimbabwe, as many respondents mentioned the importance medicinal plant medicines.

4.8 Findings on the major threats to Medicinal Plants in Zindi Village

The major findings from the study revealed that deforestation, land clearing, agricultural activities, forest fires, economic trading on forest products such as firewood and fruits were the major threats to medicinal plants and other biodiversity. 90% of the respondents claimed that deforestation (increased demand for fuel-wood and medicines) was a threat, 80% of the respondents reported that land clearing was also a major threat, agricultural activities also were also mentioned by 86% of the respondents, forest fires were mentioned by 60% and 70% mentioned that economic trading forest products has been a negative increasing the threat to medicinal plants as people are making a living out of these plants resulting in the over harvest of the environment to supply and sale at markets. However, 3% of the respondents who were traders did not agree to this point as they argued that people in this locality conserve the species as they derive benefits from them so it is in their interest to protect these species.

4.9 Findings on the Conservation of Medicinal plants in Zindi village in Mutasa

According to 90% of the respondents the village heads and traditional leader play a huge role in the managing of the community's resources. As such the chiefs, councillors and village officials ensure that the environment is protected and that fines are paid by those who are seen deliberately felling down trees that have multiple uses. A majority of the respondents highlighted that growing of trees with medicinal value and other species which give benefits in agricultural fields is encouraged in the community. Also in terms of sustainable harvesting a majority of the sampled population mentioned that when harvesting fruit and medicines the tree without damaging the tree itself. 80% of the respondents revealed that the community does not engage in stumping of trees to ensure regrowth. This finding is a very important initiative as this area has high rainfall which helps ensure the regrowth and reduces endangerment of species. 90% of the sampled population mentioned that budding, barking and pruning of medicinal plant with medicinal attributes with the help from traditional healers and others who have herbal knowledge. This has greatly helped in the protection of biodiversity in Mutasa district.

From the group discussions with government officials, they mentioned that in terms of protection of biodiversity in the area, a permit is required for economic trade and harvesting of trees and non-timber products. This permit which is obtainable from Mutasa district council required for the sale of fuel-wood and for harvesting trees and helps in maintain the plant population in the district. Dry wood may be harvested for firewood, and individuals may only cut those trees they intend to use. 70% of the interviewed mentioned that building fireguard to curb the effects of wild fires was very important in order to reduce the destruction of biodiversity.

In Mutasa district Environment Management Agency, Campfire Groups and village authorities were the most mentioned institutions that help in the protection of biodiversity. It was evidenced from the discussions that the Environmental Management Agency provides environmental management technical support raises awareness against environmental degradation and enforces environmental management laws and policies. A majority of the respondents reported the importance of Campfire initiatives in the Zindi village as it called for the community to utilise its resources sustainably. The respondents mentioned that they exists five Campfire groups which are based in schools and in Zindi village they have an

office at Zindi Primary school. The respondents also mentioned that despite the presence of these groups the ability of these groups functioning has been constrained as a result of lack of finance and coordination but they still remain very vocal about the protection of the community's environment resources. An overwhelming majority of the respondents mentioned that the community has its own traditional system through village leaders which ensures that medicinal plants and other species are protected such as raising awareness on sustainable harvesting, pruning, budding and heavy fines on those who burn or deliberately fell trees of high value in the community. These village authorities ensure that if a person is seen cutting down a tree they are fined cash, goats or chickens. Village heads ensure that the village's environment is not harmed deliberately so as to ensure that the environment keeps sustainably generating these plant resources.

4.10 Analysis of Findings

The 11 medicinal plants explored in this study show that medicinal plants are widely used as the findings show. Each plant has numerous and multiple uses. In particular, *Kirkia ancuminata Oliv*, *Dicoma anomala*, *Syzygium guineense DC*, *Zingiber officinale*, *Acacia Karoo Hayne* and *Lannea edulis Engl* seem to be at the top end of use in Zindi village.

The study shows that medicinal plants have numerous and multiple uses among the community in Zindi village. As shown in the other ethnobotanical studies that plants represent direct inputs to satisfy different household needs for food, medicine, shelter, fuel, firewood and so on. In relation to plant medicine there is a long history of indigenous people dependence on herbal medicines worldwide for their primary health care needs (Chigora, Masocha and Mutenheri, 2007).

In the context of this study, the extent increase of medicinal plant use-values were explored since the deepening crisis in Zimbabwe. As highlighted earlier, medicinal plants such as *Kirkia ancuminata Oliv*, *Dicoma anomala Sond*, *Lannea edulis Engl*, *Aloe*, *Lippia javanica Spreng*, *Vortex payos merril*, *Syzygium guineense DC*, *parinari curatelli*, *Zingiber officinale*, *Acacia Karoo Hayne* and *Coleochloa setiflora* are used widely in Zindi village. Their medicinal uses, plant parts, availability and use-values are analysed immediately below.

Kirkia ancuminata Oliv from the field data collected were said to be used to treat malaria, stomach ailments. *Kirkia ancuminata Oliv* specie provides firewood for the people in Zindi

and its wood is used by crafts man to make for bowls and spoons. *Dicoma anomala* Sond plant from the discussions was recorded to treat stomach aches, ward off evil spirits and treat sterility. The root of this plant was said to have powerful healing properties which signified that this plant has High use value. *Lannea edulis* Engl specie was also recorded to have much use value as it had numerous functions among the people in Zindi village. This specie was recorded to treat diarrhoea and cholera. This specie also provides berry like fruits for the people which people eat. Therefore this species was recorded by a large number of respondents to have high use value in Zindi village as it provided both food and medicines to the community. *Aloe* is used in the Zindi village to treat tuberculosis and skin damages and was mentioned by many respondents to be effective in treating skin damages among the people. Therefore a decoction of the leaf of this specie is said to be very effective in treating tuberculosis. This effectiveness of its healing properties makes the plant have a high use and value. Tuberculosis is a very serious life threatening disease in Zimbabwe and in Zindi village in particular. The respondents provided that there is a high belief amongst the people in Zindi that when a person is diagnosed of tuberculosis there is a high chance that the person is HIV positive.

Lippia javanica Spreng in Zindi village this plant was mentioned to treat coughs, colds, malaria, and herbal tea substitute. The leaf of *Lippia javanica* Spreng specie is said to have a mint flavour that is makes it very effective in treating coughs, colds and flu. The multiple uses recorded for this plant made it evident that it has a much use and value. *Virtex payos merril* mentioned to have properties that are used to treat colds and tuberculosis using its leaves. This species also provides edible fruit which are enjoyed by the community and thus was recorded to have high use and value. A small percentage of the respondents in the discussions recorded that this specie is also used for treating tuberculosis as some people smoke the dried leaves of this plant. *Syzygium guineense* DC is used to treat diarrhoea and is used for planting hocks in homesteads against evil spirits using bark and leaves. Respondents also mentioned that this trees specie provides edible fruits which showed that this specie has much use and value. *parinari curatelli* was recorded to be used for cultural cleansing and prayers. The plant parts that are used for this tree are its leaves and the whole tree. *Zingiber officinale* specie has high use-value as it is used treat stomach ailments, flue, and colds. *Acacia Karoo* Hayne was mentioned to treat diarrhoea and was also used for cultural healing amongst the community and was said to have medium use-value as some respondents didn't

feel it has very high use-values although it was important. *Coleochloa setiflora* plant was mentioned by a very few respondents and was said to be used to treat pneumonia among the people in Zindi and this low recording made it have low use and value status on the list.

Therefore from the findings above, it is evident that medicinal plants are used widely and have numerous uses the lives of the people in Zindi village. This knowledge of plant uses reflects that the people have rich ethnobotanical knowledge of the plants and their uses. 90% of the respondents showed that roots were the most used plant part, followed by leaves which were mentioned by 72% and barks were mentioned by 65% of respondents as major plant parts used to treat numerous diseases among the community in Zindi village. Plants with the highest recordings were classified to have high use-values. The community’s knowledge on these plants made this classification less complex.

4.11 Analysis of the Economic benefits derived

This section provides the economic benefits derived by the Zindi community from the medicinal plant species. Economic value of medicinal plants refers to the estimated monetary value participants derive sale of herbal medicines. Some species were said to have more economic value than other species mainly because of the multiple uses and treatment properties which some plants have over others. The information on the economic benefits of medicinal plant information was acquired mostly from the traditional healers who were more knowledgeable about the sale of medicines made from these species. From the interview questionnaire three categories were provided which showed the economic value of these species namely Very much {1}, Much {2} and Little {3}. Plants with more treatment properties and uses were more valued economically than others. This is shown and explained below as some species were recorded to have more economic value derived more than others.

Table 4 showing Economic benefits derived from *Kirkia ancuminata Oliv*

Economic benefits from <i>Kirkia ancuminata Oliv</i>	Number	Percent
Very much	55	93
Much	4	6.78
Total	59	100.00

This tree has high use-value as it has multiple uses curing malaria, stomach ailments. 59 respondents mentioned that they knew economic benefits derived from this plant. In Zindi village, malaria and stomach ailments are very common and following the collapse of the health service delivery this specie became more important in treating these diseases. The table above shows that 93% of the respondents mentioned that this specie has high economic value and while 7% mentioned that it has much economic benefits as it provides hard wood which is used to make traditional crafts which makes it a very important tree among the people and increases its market price. As it will be shown in the next sections, deforestation is a major threat to the environment fuel wood is a major source of energy used by the people in Zindi. Hence this specie provides hardwood which is preferred by many people in Zindi which makes it have a high economic value.

Table 5 showing Economic benefits derived from *Dicoma anomala Sond*

Economic benefits from <i>Dicoma anomala Sond</i>	Number	Percent
Very much	53	81.54
Much	12	18.46
Total	65	100.00

As depicted from the table above, 65 respondents noted that this specie had economic benefits derived from it. 82% of these recorded that this specie has very much economic benefits and 18% mentioned that it had much economic benefits derived from this plant. This was so because this specie has multiple purposes in stomach ailments, diarrhoea, cholera and as such due to the high uses the price of the plant is high. The root of this specie provides different treatments to the people in Zindi village. This specie has high cultural significance as significance which makes it very popular as it is used to ward off evil spirits in people bodies and their homesteads. The word ‘Chifumuro’ is ‘Shona’ word which means “to reveal’. It becomes clear that this species is used traditionally to reveal any evil spirits that people have. As such it is because of the multiple uses of this plant that it receives great popularity among the people in Zindi and makes it receive a higher demand and a high market price.

Table 6 showing Economic benefits derived from *Lannea edulis Engl*

Economic benefits from <i>Lannea edulis Engl</i>	Number	Percent
Very much	9	16.07
Much	45	80.36
Little	2	3.57
Total	56	100.00

This shrub is used medicinally for treating diarrhoea and other stomach ailments among the young and old. 56 respondents mentioned that this specie had economic benefits. 16% recorded that very much economic benefits, 80% mentioned much economic benefits derived and 4% stated that this specie has little economic benefits. As such, it is evident that this specie has much economic benefits as an overwhelming majority of 80% mentioned this. In terms of usage the root of this plant provides the medicinal attributes used to treat stomach related diseases. Many respondents highlighted that this specie in the cholera outbreak times in 2009 was very useful as it was continually used to treat and reduce the effects of cholera. Therefore because of the medicinal attributes derived from this plant, the medicines made from this plant have a significant market value as it is in demand in the community.

Table 7 showing Economic benefits derived from *Aloe E*

Economic benefits from <i>Aloe</i>	Number	Percent
Very much	8	11.59
Much	19	27.54
Little	41	59.42
Not at all	1	1.45
Total	69	100.00

This is a very common and available plant in the Zindi community because of its medicinal uses as shown by 69 respondents knowing about this specie's economic benefits. In the Zindi area there are many diseases that are prevalent which make this medicinal plant very useful. *Aloe* is very useful in the Zindi village as it is used to treat dermatological diseases among the young, youth and older people. However ironically despite its importance of this specie and its practical value, it has little economic value as the majority of these respondents agreed that

this specie has a little economic value. According to many respondents many children who have skin diseases are applied the substance that comes from this plant. Among children this specie is said to have properties that treat measles and is very effective in doing so. This species is also said to have properties that treat tuberculosis. As such medicine made from this plant is of high use among the people in Zindi village. However as mentioned above, it is very ironic that this specie has low economic value as it is very important plant used widely in Zindi. It can perhaps be teased out that if a plant is common and used widely among community, it does not necessarily mean it has high use-values among people as shown in the case of *Aloe* specie which is used widely but has low economic value.

Table 8 showing Economic benefits derived from *Lippia javanica Spreng*

Economic benefits from <i>Lippia javanica Spreng</i>	Number	Percent
Very much	6	11.76
Much	41	80.39
Little	4	7.84
Total	51	100.00

This specie has much use values in the community as it is used as herbal medicine used to treat coughs, colds and flu. 80% of the respondents mentioned that this specie provides much economic benefits, while 12% recorded it to have high economic value and 8% mentioned it has little economic values. It is evident that this specie has much economic value as 80% mentioned it so. The leaf of this specie is said to have a mint flavour that is makes it very effective in treating coughs, colds and flu. According to many respondents with the high standards of living people use the leaf as a tea substitute as some people cannot afford to buy tea leaves. According to some respondents this plant is also used as a remedy for fevers, malaria and other diseases. It becomes clear that because of the multiple uses provided by this shrub, the market price for medicines made from this plant tend to be high.

Table 9 showing Economic benefits derived from *Virtex payos merril*

Economic benefits from <i>Virtex payos merril</i>	Number	Percent
Very much	53	77.94
Much	15	22.06
Total	68	100.00

68 respondents reported the estimated economic benefits derived from this tree specie. 78% of these respondents noted that this plant has very much economic value and 22% mentioned that this tree has much economic benefits. This was so because the fruit that comes from this plant is sold in many markets and roadsides. The fruit of this has a sweet flavour and is eaten by many young and old in Zindi which makes it receive significant economic value in the area. It is as a result of the income derived from the sale of the fruit and the medicinal use in treating tuberculosis which makes this tree plant very popular and therefore justifies its high economic value.

Table 10 showing Economic benefits derived from *Syzygium guineense DC*

Economic benefits from <i>Syzygium guineense DC</i>	Number	Percent
Very much	11	18.64
Much	43	72.88
Little	5	8.47
Total	59	100.00

59 respondents mentioned about knowing the monetary values derived from sale of medicines made from this plant. This specie is a fast growing tree that provides both fruit and medicinal attributes to the people in Zindi village and other parts of the Eastern Highlands in Zimbabwe. This specie is known to be used by the people in Zindi as a remedy for stomach ailments and diarrhoea. According to respondents the bark of this tree has the medicinal attributes that are used to treat these ailments. It becomes clear that this tree has significant economic value as it provides both fruit and properties known to treat stomach ailments. This therefore justifies why 78% of the 59 respondents recording it much economic benefits and 19% mentioning that this specie has very much economic values.

Table 11 showing Economic benefits derived from *parinari curatelli*

Economic benefits from <i>parinari curatelli</i>	Number	Percent
Very much	1	1.85
Much	26	48.15
Little	27	50.00
Total	54	100.00

54 respondents mentioned about the estimated monetary values derived from the sale of medicines made from this specie. This tree is known to provide fruits which help in times of drought. In times of drought this specie provides income to the traders who sell these fruits in the community as it bears fruit even in harsh dry seasons. Ironically, this specie has very little economic value as mentioned by 50% as people are reluctant to buy the fruits of this specie as they are widely available. 48% of the respondents mentioned that this specie has much economic value, as the fruit that comes from this tree is used to make local cheap beer which is sold at the local growth point at a cheaper price. Some respondents also mentioned that the seeds of this plant are used by some of the traders to make cooking oil which can be sold at a small scale. As such although this specie was said to have little economic benefits according to many respondents its usefulness can be seen as it is used to make alcoholic beverages and cooking oil which can be sold and people get some income.

Table 12 showing Economic benefits derived from *Zingiber officinale*

Economic benefits from <i>Zingiber officinale</i>	Number	Percent
Very much	72	100
Total	72	100.00

This plant is a very common plant in used for many medicinal purposes. In Zindi this plant has multiple uses such curing stomach pains, cough, flue and bodily functions. 100% of the respondents noted that this specie has very much economic benefits derived from the sale of the roots of this plant. The respondents pointed out that some people chew the root of this plant and some boil it in water and drink it to treat stomach ailments, flue and colds. As mentioned earlier traditional medicines are cheaper and accessible to many rural people

hence their use and economic value in the markets is shown by their uses. It is because of the various uses of this plant that makes it popular and increases its demand in the market.

Table 13 showing Economic benefits derived from *Acacia Karoo Hayne*

Economic benefits from <i>Acacia Karoo Hayne</i>	Number	Percent
Very much	15	28.30
Much	37	69.15
Little	1	1.89
Total	53	100.00

This is a popular specie that is used widely by people in this area. It has cultural importance because of its use as a mediating role between the ancestors (*kuteketera*) and the local traditional people. It is also known to treat stomach ailments and diarrhoea. 70% of the 53 respondents mentioned this plant to have much economic value and 28% mentioned this specie to have very much economic value. This tree specie has been used medicinally for many years according to an overwhelming number of respondents. This specie's bark is used to treat diarrhoea, cholera and other stomach ailments which is the major reason why it has significant economic value among the people in Zindi. It can perhaps be said that, the multiple treatment properties that are derived from this plant, makes this specie very important and valued among the people in Zindi.

Table 14 showing Economic benefits derived from *Coleochloa setiflora*

Economic benefits from <i>Coleochloa setiflora</i>	Number	Percent
Very much	4	10.81
Much	23	62.16
Little	10	27.03
Total	37	100.00

This specie was reported by only 37 respondents in relation providing economic benefits. Of these 37 respondents, 62% mentioned the specie has much economic value, while 27% mentioned it has little economic value and 11% mentioned it had very much economic value. This specie was said to have properties that could be used to heal and treat pneumonia. *Coleochloa setiflora* specie was recorded not to have high economic value as many

respondents did not mention it as being found and demanded by many people in the community.

From the foregoing discussion the people in Zindi village were very much knowledgeable about medicinal plant uses. It is clear that medicinal plants are important as some community members rely on the exploitation and sale of these species as a source of income. Some species had higher economic value than other species mainly because of the multiple uses and treatment properties than others. Three categories were provided to categorise the economic value of these species namely, Very much {1}, Much {2} and Little {3}. Plants with more treatment and uses were more valued economically than others.

4.12 Analysis of the Cultural and Spiritual benefits derived from Medicinal plants

From the previous section, it is evident that in Mutasa medicinal plants are very important natural resource to the community as they provide medicines, food, shade, firewood and fruits. These plants are very important as they are used in religious ceremonies and as such have spiritual value. 86% of the respondents mentioned that these plants had very much cultural significance while 14% mentioned that these plants had much significant cultural values which showed their importance culturally. Culturally the plants are used in the *Shona* tradition when speaking to ancestors, warding off evil spirits, healing the sick and protecting people's homesteads against evil spirits.

Dicoma anomala Sond has cultural significance in among the people as it is used to cleanse people and their homesteads. This specie is used to reveal the bad spirits that are on people so that they can be healed. As such this specie has high cultural significance among many people in Zindi village as it is used to reveal bad evil spirits which helps in reversing the effects of evil doings done by the evil spirits.

parinari curatelli is an important tree which was cited by many respondents that are aware of cultural issues. Respondents mentioned that traditionally this tree was used widely in this area, where people who want to conduct spiritual prayers are said to go under the tree and make their prayers or sacrifices to the ancestors and also its leaves are believed to have some cultural power they are used by many to ward off evil spirits. This tree is said to have fruit which helps in times of drought and usually there is a myth that when this tree bares fruit it signifies drought so this specie has very high cultural significance to the people. According to

some respondents there is a church called Independent African church which started a long time ago and this church conducted its sermons under this tree which shows that it has a very high importance both to the traditional people and even Christians.

Acacia Karoo Hayne: This tree is also of great cultural importance as it is used by traditional healers in ancestral ceremonies where they use this tree to speak to the ancestors when smoking this plant and snuff to reverse the effects made by an evil spirit

Syzygium guineense DC: The barks from this tree are usually used culturally to plant hocks in family homesteads to protect people against evil spirits. According to respondents traditionally this specie has been used to help protect people against evil doers' doings.

It therefore becomes evident that species such as *Dicoma anomala Sond*, *parinari curatelli*, *Acacia Karoo Hayne*, *Syzygium guineense DC*, have high cultural and spiritual values in that in Zindi village as they are used in warding off evil spirits, healing the sick, mediating with ancestors and protecting people's homesteads against evil spirits.

4.13 Analysis of the extent of increase of use and value of medicinal plants in Zindi village

Table 15 showing Extent of increase in use and value of medicinal plants

Extent of increase in use and value of Medicinal plants	Number	Percent
Significant	9	12.50
Highly significant	63	87.50
Total	72	100.00

88% of the respondents agreed that life has been tough since 2008 following the high inflationary environment and fall in the economy and health service delivery. Absence of health delivery coupled with high costs of medicines is the major contributory factor that has led to the over use and degradation of the environment's species. According to the respondents, diseases such as malaria, cholera, diarrhoea, HIV and Aids and tuberculosis among others have resulted in the heavy reliance of traditional medicines use by the community. Over use of these medicines and absence of supporting systems for sustainable use of these plants has been witnessed. Therefore, it can be perhaps said that the use of these

plants has increased because of the medicinal supplements derived from these plants and the increased need for firewood derived from these plants.

According to one traditional healer interviewed, *“In my own opinion as a traditional healer who helps people with their health, spiritual and cultural needs the use of traditional medicines has increased very much since the period of 2007 as life has become difficult for many people which has resulted in traditional medicines being heavily relied upon which has witnessed the increased harvest of these plants in an unsustainable manner as the high costs of clinic and hospitalised medicines is beyond the reach of many. Also with high standards of living people rely on the forest firewood for energy which has caused the uncontrolled cutting down of trees for firewood and sale of this wood for income by other people in the community”*.

Another community member who was interviewed said that, *“The dependency and use of medicinal plants has increased in this area as a result of the economic and health collapse being faced by the country which has led to the reliance of people on the forest as it is their only heritage and source of food, medicine and firewood. This reliance has caused the harming of the environment as the species are being over used with little regard for the next year or season”*.

From the research findings it is evident that there has been a high increase in the use of medicinal plants because of the crisis in Zimbabwe. Many respondents agreed that crisis period in Zimbabwe has had a negative impact on the Zindi community as people's capacity to access social and health amenities were constrained as many were hindered by economic ability. This reliance on traditional medicines has consequentially resulted in the increased sale of traditional medicines by traditional healers and in the local markets 2008 and is still increasing as the crisis is still deepening.

4.14 Total Use Values

According to Reyes-Garcia et, al (2006) the total plant use value can be understood as the sum of of cultural, practical and economic values. Their index calculates the total use value as $Ve = CVe + PVe + EVe$. Ve is equal to the total use value, CVe is the cultural value of ethnospecies that have cultural virtue according to respondents (Turner, 1988), PVe is the practical value which shows the different number of plant uses and $EEve$ shows the estimated monetary benefits derived from medicinal plants. For this study the species with the “high

total use value were represented by $10 > Ve > 5$ and those with low total values were represented by $5 < Ve < 1$.

Calculating Total use-values of Medicinal Plants in Zindi Village

Table 16 showing Cultural, Practical and Economic values of *Kirkia ancuminata Oliv*

Range	Cultural Value		Practical Value		Economic Value	
	Number	Percent	Number	Percent	Number	Percent
No value given (=0)	13	18	7	10	13	18
Little (=2)	50	69	0	0	0	0
Much (=6)	5	7	25	34	4	7
Very much (=10)	4	6	40	56	55	93
Total	72	100	72	100	72	100

$CVe = (50 * 2 / 72) = (1.4) + 5 * 6 / 72 = (0.41) + 4 * 10 / 72 = (0.55)$ therefore $CVe = 2.36$

$PVe = (25 * 6 / 72) = (2.08) + (40 * 10 / 72) = (5.55)$ therefore $PVe = 7.64$

$EVe = (4 * 6 / 72) = 0.33 + (55 * 10 / 72) = 7.63$ therefore $EVe = 7.96$

Total use-values of *Kirkia ancuminata Oliv* = $2.36 + 7.64 + 7.96 = 17.96 / 3 = 5.98$

Table 17 Cultural, Practical and Economic values of *Dicoma anomala Sond*

Range	Cultural Value		Practical Value		Economic Value	
	Number	Percent	Number	Percent	Number	Percent
No value given (=0)	18	25	10	14	0	0
Little (=2)	4	6	0	0	0	0
Much (=6)	10	14	40	55	12	18
Very much (=10)	40	55	22	28	53	82
Total	72	100	72	100	65	100

$CVe = 4 * 2 / 72 = (0.11) + 10 * 6 / 72 = (0.83) + 40 * 10 / 72 = (5.5)$ therefore $CVe = 6.44$

$PVe = 40 * 6 / 72 = (3.33) + 22 * 10 / 72 = (3.05)$ therefore $PVe = 6.38$

$EVe = 12 * 6 / 72 = (1) + 53 * 10 / 72 = (7.36)$ therefore $EVe = 8.36$

Total use-values of *Dicoma anomala Sond* = $6.44 + 6.38 + 8.36 = 21.18 / 3 = 7.06$

Table 18 Cultural, Practical and Economic values of *Lannea edulis Engl*

Range	Cultural Value		Practical Value		Economic Value	
	Number	Percent	Number	Percent	Number	Percent
No value given (=0)	36	50	17	23	16	22
Little (=2)	30	42	10	14	2	3
Much (=6)	4	6	30	42	45	63
Very much (≥ 10)	2	3	15	21	9	12
Total	72	100	72	100	72	100

$CVe = (2 \cdot 10/72) = (0.27) + (4 \cdot 6/72) = (0.33) + (30 \cdot 2/72) = (0.83)$ therefore $CVe = 1.43$

$PVe = (15 \cdot 10/72) = (2.08) + (30 \cdot 6/72) = (2.5) + 10 \cdot 2/72 = (0.27)$ therefore $PVe = 4.85$

$EVe = (9 \cdot 10/72) = (1.25) + (45 \cdot 6/72) = (3.75) + (2 \cdot 2/72) = (0.05)$ therefore $Eve = 5.05$

Total use-values of *Lannea edulis Engl* = 1.43 + 4.85 + 5.05 = 11.33/ 3 = 3.77

Table 19 Cultural, Practical and Economic values of *Aloe*

Range	Cultural Value		Practical Value		Economic Value	
	Number	Percent	Number	Percent	Number	Percent
No value given (=0)	47	65	12	16	4	5
Little (=2)	25	35	40	55	41	57
Much (=6)	0	0	12	17	19	26
Very much (=10)	0	0	8	12	8	12
Total	72	100	72	100	72	100

$CVe = (25 \cdot 2/72) = (0.69)$ therefore $CVe = 0.69$

$PVe = (8 \cdot 10/72) = (1.11) + (12 \cdot 6/72) = (1) + (40 \cdot 2/72) = (1.11)$ therefore $PVe = 3.22$

$EVe = 8 \cdot 10/72 = (1.11) + (19 \cdot 6/72) = (1.58) + (41 \cdot 2/72) = (1.13)$ therefore $Eve = 3.82$

Total use-values of *Aloe* = 0.69 + 3.22 + 3.82 = 7.73/ 3 = 2.57

Table 20 Cultural, Practical and Economic values of *Lippia javanica Spreng*

Range	Cultural Value		Practical Value		Economic Value	
	Number	Percent	Number	Percent	Number	Percent
No value given (=0)	42	58	25	35	21	29
Little (=2)	25	35	5	7	4	6
Much (=6)	5	7	35	49	41	57
Very much (=10)	0	0	7	9	6	8
Total	72	100	72	100	72	100

$CVe = (5 \cdot 6/72) = (0.41) + (25 \cdot 2/72) = (0.69)$ therefore $CVe = 1.1$

$PVe = 7 \cdot 10/72 = (0.97) + (38 \cdot 6/72) = (3.16)$ therefore $PVe = 4.13$

Economic Value = $18 \cdot 10/72 = (2.5) + (32 \cdot 6/72) = (2.66)$ therefore $Eve = 5.16$

Total use-values of *Lippia javanica Spreng* = 1.1 + 4.13 + 5.16= 10.39/ 3 = 3.46

Table 21 Cultural, Practical and Economic values of *Virtex payos merril*

Range	Cultural Value		Practical Value		Economic Value	
	Number	Percent	Number	Percent	Number	Percent
No value given (=0)	31	43	9	12	4	6
Little (=2)	10	14	8	11	0	0
Much (=6)	26	36	10	14	15	20
Very much (=10)	5	7	45	63	53	74
Total	72	100	72	100	72	100

$$CVe = (5 \cdot 10/72) = \mathbf{0.69} + (26 \cdot 6/72) = \mathbf{2.08} + (10 \cdot 2/72) = \mathbf{0.27}$$

$$PVe = (45 \cdot 10/72) = \mathbf{6.25} + (10 \cdot 6/72) = \mathbf{0.83} + (8 \cdot 2/72) = \mathbf{0.22}$$

$$EVe = (53 \cdot 10/72) = \mathbf{7.36} + (15 \cdot 6/72) = \mathbf{1.25} = \mathbf{8.61}$$

Total use-values of *Virtex payos merril* = 0.27 + 0.22 + 8.61 = 9.1/3 = 3.03

Table 22 Cultural, Practical and Economic values of *Syzygium guineense DC*

Range	Cultural Value		Practical Value		Economic Value	
	Number	Percent	Number	Percent	Number	Percent
No value given (=0)	18	25	6	8	13	18
Little (=2)	4	6	6	8	5	7
Much (=6)	10	14	45	63	43	60
Very much (=10)	40	55	15	21	11	15
Total	72	100	72	100	72	100

$$CVe = (40 \cdot 10/72) = \mathbf{(5.55)} + 10 \cdot 6/72 = \mathbf{(0.83)} \text{ therefore } CVe = \mathbf{6.38}$$

$$PVe = (15 \cdot 10/72) = \mathbf{(2.08)} + (45 \cdot 6/72) = \mathbf{(3.75)} \text{ therefore } PVe = \mathbf{5.83}$$

$$EVe = (11 \cdot 10/72) = \mathbf{(1.52)} + (43 \cdot 6/72) = \mathbf{(3.58)} + (5 \cdot 2/72) = \mathbf{(0.13)} \text{ therefore } Eve = \mathbf{5.23}$$

Total use-values of *Syzygium guineense DC* = 6.38 + 5.83 + 5.23 = 16.84 /3 = 5.61

Table 23 Cultural, Practical and Economic values of *parinari curatelli*

Range	Cultural Value		Practical Value		Economic Value	
	Number	Percent	Number	Percent	Number	Percent
No value given (=0)	14	19	21	29	18	25
Little (=2)	0	0	25	35	27	37
Much (=6)	10	14	21	29	26	36
Very much (=10)	48	67	5	7	1	2
Total	72	100	72	100	72	100

$$CVe = (48 \cdot 10/72) = \mathbf{(6.66)} + (10 \cdot 6/72) = \mathbf{(0.83)} \text{ therefore } CVe = \mathbf{7.49}$$

$$PVe = (5 \cdot 10/72) = \mathbf{(0.69)} + (21 \cdot 6/72) = \mathbf{(1.75)} + (25 \cdot 2/72) = \mathbf{(0.69)} \text{ therefore } PVe = \mathbf{3.13}$$

$EVe = (1*10/72) = (0.13) + (26*6/72) = (2.16) + (27*2/72) = (0.75)$ therefore $Eve = 3.04$

Total use-values of *parinari curatelli* = 7.49 + 3.13 + 3.04 = 13.66/3 = 4.55

Table 24 Cultural, Practical and Economic values of *Zingiber officinale*

Range	Cultural Value		Practical Value		Economic Value	
	Number	Percent	Number	Percent	Number	Percent
No value (=0)	50	69	0	0	0	0
Little (=2)	20	18	0	0	0	0
Much (=6)	2	3	20	28	0	0
Very much (=10)	0	0	52	72	72	100
Total	72	100	72	100	72	100

$CVe = (2*6/72) = (0.16) + (20*2/72) = (0.55)$ therefore $CVe = 0.71$

$PVe = 52*10/72 = (7.22) + (20*6/72) = (1.66)$ therefore $PVe = (8.88)$

$EVe = 72*10/72 = (10)$ therefore $Eve = (10)$

Total use-values of *Zingiber officinale* = 0.71 + 8.88 + 10 = 19.59/3 = 6.53

Table 25 Cultural, Practical and Economic values of *Acacia Karoo Hayne*

Range	Cultural Value		Practical Value		Economic Value	
	Number	Percent	Number	Percent	Number	Percent
No value given (=0)	19	26	22	30	19	26
Little (=2)	2	3	5	7	1	2
Much (=6)	11	15	35	49	37	51
Very much (=10)	40	56	10	14	15	21
Total	72	100	72	100	72	100

$CVe = (40*10/72) = (5.55) + (11*6/72) = (0.91) + (2*2/72) = (0.05)$ therefore $CVe = 6.51$

$PVe = 10*10/72 = (1.38) + (35*6/72) = (2.91) + (5*2/72) = (0.13)$ therefore $PVe = 4.42$

$EVe = 15*10/72 = (2.08) + (37*6/72) = (3.08) + (1*2/72) = (0.02)$ therefore $Eve = 5.18$

Total use-values of *Acacia Karoo Hayne* = 6.51 + 4.42 + 5.18 = 16.11/3 = 5.37

Table 26 Cultural, Practical and Economic values of *Coleochloa setiflora*

Range	Cultural Value		Practical Value		Economic Value	
	Number	Percent	Number	Percent	Number	Percent
No value given (=0)	33	46	39	54	35	49
Little (=2)	20	28	7	10	10	14
Much (=6)	10	14	18	25	23	32
Very much (=10)	9	12	8	11	4	6
Total	72	100	72	100	72	100

$CVe = (9*10/72) = (1.25) + (10*6/72) = (0.83) + (20*2/72) = (0.55)$ therefore $CVe = 2.63$

PVe= $(8*10/72) = (1.11) + (18*6/72) = (1.5) + (7*2/72) = (0.19)$ therefore PVe= **2.8**

EVe= $(4*10/72) = (0.55) + (23*6/72) = (1.92) + (10*2/72) = (0.27)$ therefore Eve= **2.74**

Total use-values of *Coleochloa setiflora* = 2.63 + 2.8 + 2.74= 8.17/ 3 = 2.72

Therefore the Total use value of the 11 medicinal plants under study is species with the “high total use value were represented by $10 > Ve > 5$ and those with low total values were represented by $5 < Ve < 1$.”

Total use-values of *Kirkia ancuminata Oliv* = 5.98; Total use-values of *Dicoma anomala Sond* = 7.06; Total use-values of *Lannea edulis Engl* = 3.77; Total use-values of *Aloe* = 2.57; Total use-values of *Lippia javanica Spreng* = 3.46; Total use-values of *Virtex payos merril* = 3.03; Total use-values of *Syngium guineense DC* = 5.61; Total use-values of *parinari curatelli* = 4.55; Total use-values of *Zingiber officinale* = 6.53; Total use-values of *Acacia Karoo Hayne* = 5.37 and Total use-values of *Coleochloa setiflora* = 2.72.

Therefore from the above it can be depicted that *Kirkia ancuminata Oliv*, *Dicoma anomala Sond*, *Syngium guineense DC*, *Zingiber officinale*, *Acacia Karoo Hayne* have “high total use-values” and *Lannea edulis Engl*, *Aloe*, *Lippia javanica Spreng*, *Virtex payos merril*, *parinari curatelli* and *Coleochloa setiflora* have “low total use-values”.

4.15 Conclusion

In conclusion it is evident that the residents in Zindi village showed much ethnobotanical knowledge of the plants economic, practical and cultural uses and their values. It was shown that there has been an increase in the use and value of medicinal resulting from the crisis in Zimbabwe. This reliance on traditional medicines has resulted in the over use and exhaustion of other species. The preservation of medicinal plants and their conservation is therefore important as there is continued reliance on medicinal plant resources for primary healthcare by the Zindi community. In relation to what measures can be taken, the respondents agreed that environment awareness programme should be made to the traditional leaders, traditional healers and the community at large to safeguard such a rich heritage of medicinal plants, propagation of medicinal plants through a community nursery, fining those seen wantonly harming the environment and revamping of Campfire Groups. The different total use-values of the 11 medicinal plants under study were calculated and shown.

5 CHAPTER 5: DISCUSSION OF STUDY RESULTS

5.1 INTRODUCTION

As shown in the findings chapter, the study elicited a wide variety of responses. The main thesis advanced in this study is that there has been a sharp increase in the use and value of medicinal plants which perhaps justifies the need for their conservation as these species help communities with their health needs. The study has identified some issues that are noteworthy. These are detailed immediately below.

As mentioned earlier in Chapter 3, this research made use of random sampling in order to obtain a group of participants who were to represent the wider population in Mutasa, Zindi village. According to Gomez-Beloz (2002), a distinct advantage of working with a random sample of respondents is that the study population is not limited only to village healers as every person has varying degrees of plant use knowledge. In relation to ages of the participants as shown in Table 1, participants were divided into cohorts of 25-30, 31-40, 41-50 and 51-65. The age of the respondents ranged from 25 years to 65 years. The youngest of the respondents was 25 years of age who had acquired plant use knowledge through oral teachings from his grandfather who was a traditional healer in Zindi village. The oldest of the respondents was 65 years old and she was very knowledgeable about medicinal plants and their numerous uses in Zindi village. What appears to be apparent is that the older people were more knowledgeable about medicinal plants and were respected by the other colleagues which showed that the community valued the knowledge imparted to them by these older experienced people. This correlates strongly with findings by Voeks and Leony (2004) in their study on medicinal plant erosion in Eastern Brazil. They showed that increasing age was the best predictor of medicinal plant knowledge as older people interviewed in their study had time to assimilate knowledge about medicinal plant and healing properties than younger people. The breakdown of the respondents is as follows: 42 (58%) community members, 17 (24%) traditional healers and 13 (18%) government stakeholders and NGO staff working in the district were interviewed. From the total sample of 72 participants in the study, 30 respondents who showed high plant use knowledge were consolidated to form focus group discussions participants.

As shown before, 58% of the respondents were women and 42% were men. This distribution tends to suggest that women were more knowledgeable about plant use and their value in the

case study area. This is also shown by Liwewe (2010) who suggested that traditionally women tend to be the primary users and managers of natural resources based on their gender roles. Similarly, Voeks and Leony (2004) found out that in Brazil women were considerably more knowledgeable about the local healing of flora than men and most people in areas depend women to diagnose illness and supply the sundry plant treatments for what ails them.

5.2 Use of traditional medicine in Zindi Village

In terms of plant use, it was shown that *Kirkia ancuminata* Oliv, *Dicoma anomala* Sond, *Lannea edulis* Engl, *Aloe*, *Lippia javanica* Spreng, *Virtex payos merril*, *Syzygium guineense* DC, *parinari curatelli*, *Zingiber officinale*, *Acacia Karoo* Hayne and *Coleochloa setiflora* were mentioned to be widely in the study area. As shown earlier, this study draws immensely from Reyes-Garcia et. al, (2004) conceptual framework which understood the total plant use value as the sum of cultural, practical and economic values. Drawing from this framework, the importance medicinal plants can be shown as assist communities reaching their health, practical and daily needs. *Kirkia ancuminata* Oliv, *Dicoma anomala* Sond, *Syzygium guineense* DC, *Zingiber officinale*, *Acacia Karoo* Hayne have “high total use-values” and *Lannea edulis* Engl, *Aloe*, *Lippia javanica* Spreng, *Virtex payos merril*, *parinari curatelli* and *Coleochloa setiflora* have “low total use-values”.

Kirkia ancuminata Oliv, *Zingiber officinale* and *Virtex payos merril* plants provide very high economic benefits to the community. This reason behind was that these species have provide wild fruits and medicines which treat ailments, such as diarrhoea, colds, coughs, flu, cholera and as such due to the high uses the price of the plant is high. Previous research by Campbell, et al (1997) on the use of traditional medicine in Zimbabwe showed that rural people obtain economic value from medicinal plants. From their study tree and woodland provide a variety of products and services for household economy.

It was also evident that plants such as *Lannea edulis* Engl, *Lippia javanica* Spreng, *Syzygium guineense* DC, *Acacia Karoo* Hayne, plants have much economic use values, while *parinari curatelli*, *Aloe*, *Coleochloa setiflora* have little economic benefits. *Dicoma anomala* Sond, *parinari curatelli*, *Syzygium guineense* DC and *Acacia Karoo* Hayne have high cultural and spiritual values in that in Zindi village as they are used for cultural purposes such as warding off evil spirits, healing the sick, when speaking to ancestors and protecting people’s

homesteads against evil spirits. It can thus be seen that cultural values of medicinal plants do not necessarily correspond with economic values. Some species such as have low economic values *parinari curatelli*, have high cultural and spiritual values but have not very high economic values. This tended to be the case because some species are used frequently culturally in traditional ceremonies but are rarely sold in the local markets. Seemingly plants such as *Kirkia ancuminata Oliv*, *Zingiber officinale* and *Virtex payos merril* with high economic values have very little or no cultural values attached to them. This finding was also shown by Reyes-Garcia, et al, (2006), that the cultural value of species does not necessarily correspond with its practical or economic value. In their study some species such as *Swietenia macrophylla* and *Cedrela odorata* are culturally significant but are rarely used and were logged almost to extinction. This was partially explained by the fact that some species are used frequently culturally but are rarely sold.

According to interviewed traditional healers in the study, the local people in Zindi village are increasingly reliant on wild medicinal plants for primary healthcare needs due to their known effectiveness in treating various ailments. These results correlate strongly with the findings made by Maroyi (2011) who conducted ethnobotanical survey of medicinal plants used by the people in Nhema communal area, Zimbabwe. This study documented the importance of indigenous plant resources in Nhema communal area, particularly the significance of medicinal plants in primary healthcare provision. This study showed the importance of the biodiversity of plants used for medical purposes as well as in their wide range of medicinal applications.

There is substantial evidence that shows that in Zindi village there are numerous market places where the community supplies traditional medicines namely Murara, Mutare, Nyanga, Rusape and Harare. Murara is the most accessible market place nearest to Zindi village and other markets supplied include Mutare, Rusape, Nyanga and Harare. What tends to be apparent is that in Zindi village there seems to be no huge pharmaceutical companies that are supplied traditional medicines by this community, which resultantly makes the major recipients of these medicines local people and smaller markets within the district.

Threats to medicinal plants in Zindi village

Various threats to medicinal plants and other biodiversity were mentioned by the respondents. Deforestation mentioned by 90% of the respondents is a major threat to the

environment and other biodiversity in Zindi village. According to the respondents the increased need for firewood as an energy source has caused the wanton destruction of trees and shrubs in the area as people require firewood for cooking, construction and poles for households. This increased demand for fuel wood and medicines has led to the destruction and endangerment of many species as there are poor conservation practices. The consequent result of these poor conservation practices in the Zindi area are the unsustainable harvesting of plants which results in exhaustion of these species and harms the environment. Moreover with the increased need for income acquired through the sale of medicines, firewood and fruits, medicinal plants overharvesting is increased which consequently becomes a threat.

80% of the respondents reported that land clearing was another major factor that was mentioned to have been a major threat to biodiversity in Zindi area. As the community is agricultural based, many people are subsistence farmers who derive their income from agricultural production. Poor farming activities such as burning are a threat contributing to endangerment of biodiversity. Lack of fertilisers was a major challenge mentioned that amongst the causes the burning of fields so as to increase biomass. Burning of the fields which kills the biodiversity was reported by 60% of the respondents as a threat to the ecosystem. However there was indication that not all people burn the fields as some are aware of the negative effects burning and presence of fines for harming the environment makes some community find alternatives to fertilizers such as manure and mulching instead of burning the fields. Land use and clearing activities were also mentioned as a major threat, to the environment by 80% of the respondents. These negative land use activities were facilitated by poor agricultural activities in the area which were harming the environment.

These results correlate strongly with the findings obtained by Kelbessa, Bekele, and Yinagar (2008) in their ethnobotanical study of medicinal plants in Mana Angetu District, south-eastern Ethiopia. Their study showed that various factors such as deforestation, agricultural expansion, fire, overgrazing, drought and trading charcoal and firewood were considered as main threats for medicinal plants. Similarly, Reyes and Garcia (2006) finding showed that forest fires have a negative impact on the environment as they destroy plant species and the whole ecosystem. Interviews with traditional healers revealed that economic trading forest products has been a negative increasing the threat to medicinal plants as people are making a living out of these plants resulting in the over harvest of the environment to supply and sale at markets.

5.3 Conservational Aspects

As mentioned before, it is now widely accepted that natural resources are used for economic, practical (day to day), cultural and spiritual purposes. Rural people more than ever before have identified the benefits of natural resources and the economic value of species has now become known in rural areas. As such, this contributory force has consequently resulted in the exploitation of natural resources. As this study has shown, medicinal plants use and values have significantly increased which justifies efforts to ensure their conservation. 88% of the respondents agreed that life has been increasingly difficult since 2008 following the high inflationary environment, fall of the economy and health service delivery.

In relation to conservation issues, 90% of the respondents mentioned importance of village heads and traditional leaders in the managing of the community's resources. The community has its own traditional system through village leaders which ensures that medicinal plants and other species are protected such as raising awareness on sustainable harvesting, pruning, budding and heavy fines on those who burn or deliberately fell trees of high value in the community. The efforts to conserve medicinal plants in Zindi were observed to be fairly good. The chiefs, councillors and village officials ensure that the environment is protected and that fines are paid for those who are seen deliberately felling down trees that have multiple uses. 80% of the respondents revealed that the community does not stump trees and other species so as to ensure regeneration of species. This according to the respondents helps greatly as the area receives high rainfall which helps ensure the regrowth and reduces endangerment of species. An overwhelming number of respondents mentioned that the community engages in budding, barking and pruning of medicinal plants with the help from traditional healers and others who have herbal knowledge in order to ensure generation and sustainability of these species. This according to respondents has greatly helped in the protection of biodiversity in Mutasa district.

Village heads, councillors and traditional healers have a mammoth task of ensuring that plants with high medicinal plant use and endangered species are not to be deliberately harmed. These village authorities do this by ensuring that if a person is seen cutting down a tree they are fined cash, goats, chickens. As most of these plants are found in the natural forest where some people dwell people are cautioned by village heads to use these plants in a

sustainable manner. Efforts made by traditional leaders to protect the environment are seen in the community meetings where leaders support the protection of these species by encouraging the community to practice seeding, pruning, budding and also sustainable harvesting of these plants.

According to one of the respondents *“Village leaders ensure that in community meetings we promote sustainable harvest of species for instance when harvesting a Chifumuro (**Dicoma anomala** Sond) or Musambasi (**Lannea edulis** Engl) species we are supposed to take roots without killing the tree and if we have water we can water after taking roots or urinate to promote regrowth to occur. The community is also encouraged to practice afforestation, barking, budding of plants to reduce endangerment of these species.”* This perhaps shows the importance of village leaders in conservation of medicinal plants and other biodiversity.

In Zindi village there exist various institutions supporting environmental protection. The Environmental Management Agency Mutasa it provides environmental management technical support raises awareness against environmental degradation and enforces environmental management laws and policies. As mentioned earlier, EMA plays a huge role in the conservation of species but the crisis made its operations slacken although from 2010 it started being more effective again through awareness campaigns in the district. Similarly, the presence of the Communal Areas Management Programmes for Indigenous Resources (CAMPFIRE) cannot be overlooked. The basic aim of CAMPFIRE approach is to ensure sustainable management and utilisation of natural resources for the benefit of the local communities. In Mutasa there are five Campfire groups which are based in schools. These Campfire groups disseminate information about environmental laws as well as support and encourage the community to sustainably utilise their natural resources by minimizing deforestation, veldt fires and wanton destruction of biodiversity. It becomes clear that Zindi village has institutions that support the protection of medicinal plants and conservation of other biodiversity.

5.4 Initiatives taken to conserve biodiversity in Mutasa Zindi village

An overwhelming majority of the respondents mentioned that the village heads and traditional leader play a huge role in the managing of the community's resources. Customary law provides that village leader have authority over the area they are mandated to protect. As

such the chiefs, councillors, village officials and traditional healers enforce that the environment is protected and that the harm on the environment is lessened. These villages leader do this by fining are those who are seen deliberately felling down trees that have multiple uses and those who burn areas with trees and shrubs that are endangered or scarce.

Respondents in the focus group discussions also mentioned that the community is also encouraged by the community leaders to build fireguards to curb the effects of wild fires that were recorded to happen in the hot dry season. As the area receives very high rainfall the area is characterised by high temperatures which causes fires in hot season. Campfire groups in the community encourage the community to build fireguards in areas were there are useful plants so as to ensure that plants generation may not be harmed.

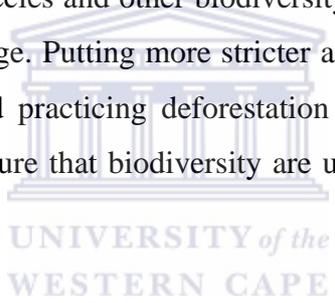
Efforts in curbing deforestation are hampered by the presence of a regulatory framework that states that those intending to sale firewood are required to have a permit obtainable from Mutasa rural district council offices. This permit gives people the right to sale firewood and sustainably harvesting trees. However in Zindi village dry wood is allowed to be harvested for firewood and individuals may only cut those trees they intend to use to ensure sustainability of important species in the community. These measures greatly help in conserving medicinal plants and other biodiversity.

As shown earlier, traditional healers play an important role in the protection of medicinal plants. It was mentioned by the respondents that traditional healers encourage people in the community to grow of trees with medicinal value and other species which give benefits such as shade, food, medicines and fruit in agricultural fields. It was also shown that traditional healers and leaders in Zindi have received training from Zinatha and Ministry of Health on the propagation of medicinal plants. This training of traditional leaders coupled with other traditional practical knowledge passed through generation to generation has enriched the community to protect and value biodiversity. Knowledge about these species provided by traditional healers and leaders according to respondents helps the community learn how to grow species with high use-values or multiple uses as they help the community with medicines, fruits, shade and wood fuel. The traditional leaders and healers therefore play a huge role in educating the community on sustainable conservation measures that can be taken to protect medicinal plant through practicing growing medicinal plants, budding, barking and

pruning of medicinal plant with medicinal attributes to ensure sufficient growth of these species.

5.5 More measures that can be taken to conserve and protect medicinal species

From the discussion and interviews there was consensus that raising awareness on sustainable conservation measures of medicinal plants and other species was very important. Respondents recorded that the Campfire approach needs to be revamped as it can play a huge role in the protection of plants in the community as the jurisdiction of protecting these species is placed under the local hence efficiency is enhanced. From the discussions there were suggestions of establishing medicinal plant propagation under a community nursery with help of traditional healers and herbalist. According to stakeholders interviewed, planting of medicinal plants will help relieve the pressure on wild plants as well as provide a response to shortages of plant stocks in the interim. Providing alternative energy sources was also mentioned as many medicinal species and other biodiversity provide hardwood which makes them susceptible to firewood usage. Putting more stricter and stringent measures that punish those seen burning, clearing and practicing deforestation was also mentioned as a useful measures that can be used to ensure that biodiversity are used and in a safe and sustainable manner.



It was therefore shown from the above that medicinal plants are an important resource to Zindi village. From the respondent’s opinion, medicinal are greatly helping saving lives of people in Zindi community as indicated in the table below. 94% mentioned that medicinal plants agreed this fact that medicinal plant were greatly helping the community reach health needs and the other 6% of respondents mentioned that these plants were of much significant in treating and saving lives.

Table 27 showing respondents response whether medicinal plants help save lives in Zindi village

Medicinal plants Help save lives	Number	Percent
Very Much	68	94.44
Much	4	5.56
Total	72	100.00

This indicates medicinal plants are greatly helping the community save lives which justifies conservation of these plants as they are being widely for purposes of their medicinal, economic and cultural values.

5.6 Conclusion

In conclusion this chapter provided the discussion and the results of the study by showing the results that came from the data collection. This chapter captured the uses of medicinal plants in the study area and discussed the results in relation to other studies that have been undertaken in the similar field. Importantly discussed, were also the threats to medicinal plants and conservational aspects. This continued reliance on traditional medicines has led to the over use of medicinal plants and consequently in the increased sale of these medicines by traditional healers and some community member in the local markets. There was consent from the respondents that medicinal plants and other biodiversity in Mutasa District are under threat from poor conservation practices and unsustainable utilisation. The crisis in Zimbabwe has necessitated this reliance as a majority of the rural dwellers to rely more on traditional medicines as many cannot afford the high clinic and hospital medicines being given that these rural people do not have a consistent and reliable income as they are mainly subsistence farmers. The preservation and conservation of medicinal plants becomes important as there is an increased reliance on medicinal plant resources for primary healthcare by the Zindi community.

6 CHAPTER 6: CONCLUSION

6.1 INTRODUCTION

The aim of this study was to explore the conservation and extent of increase in use-value of medicinal plants in rural eastern Zimbabwe. The first chapter introduced the study by providing the background and contextualisation of the study. Chapter two of the study focused on review of literature on development, environment, sustainability and ethnobotanical studies undertaken in numerous countries. This chapter also provided the theoretical and conceptual framework. Chapter 3 provided information of the case study area and the methodology employed for this study. Chapter 4 provided the research findings and analysis of results. Chapter 5 provided discussion of the results of the study.

Finally, this concluding chapter consolidates several issues that have emerged from the study. This chapter is presented in three main sections. The first section briefly revisits the aspects of sustainability. The discussion conceptualises the economic, environmental and social approaches of sustainability in relation to the conservation and use-values of medicinal plants in rural Zimbabwe. Secondly the findings, analysis and discussion of the study are shown. Lastly, the chapter concludes with a section that highlights the future of medicinal plants in Zimbabwe which shows the possibilities, and what more can be done in the conservation of medicinal plants in Zimbabwe.

6.2 SUSTAINABILITY IN THE ZIMBABWEAN CONTEXT

The relevance of sustainability within the context of this study tends to be important as it informs regulation of medicinal plant use, their conservation and management. In relation to development issues in Zimbabwe sustainability of natural resources can be contextualised when discussing natural resources and medicinal plants management. The importance of medicinal plants in development was also shown by Srivasta, Lambert and Viemeyer (1996) who noted that medicinal plants can be viewed as a possible bridge between sustainable economic development, affordable health care and conservation of biodiversity. It is in this regard, that medicinal plants and other environmental species are found to be very central and important to the development of communities.

6.3 Medicinal plants significance in Zimbabwe

Zimbabwe has a wide variety of plant and animal genetic resources which contribute significantly to national and household economies. These species account for a significant proportion of the Gross Domestic Product and directly support livelihood of about 65% (2003 est.) of the country's population. Zimbabwe's Gross domestic Product comes directly from the country's natural resources which include forests, wildlife, aquatic life and agriculture. However despite this importance, these are being depleted at an alarming rate due to their increased importance, unsustainable utilisation and poor conservation practices (Shumba, 2003).

Campbell, et. al (1997) in their study on the use of traditional medicines in Zimbabwe, showed that many rural people obtain economic value from the sale of traditional medicines. From their study tree and woodland provide a variety of products and services for household economy. Rural people more than ever before have identified the benefits of natural resources and the economic value has now become known. As this study has also shown, medicinal plants use and value has significantly shot up which justifies any efforts aimed at conserving and protecting these species. Conservation and sustainable use of these species have been well documented throughout this thesis. In relation to Zimbabwe medicinal plants are a very important natural resource used by urban and rural folk as traditional medicines for health requirements. Medicinal plants have varied uses including providing wild foods, wild medicines and other wild goods. A large number of uses for wood, including for timber, energy and construction materials are derived from the medicinal plants and other biodiversity. Medicinal plants have become very important to aid the health service delivery and treating of various diseases. As such the importance of medicinal plants in rural households in Zimbabwe cannot be under looked as these rural households are heavily dependent on the vegetation around them for traditional medicines (Gelfand et. al, 1985).

6.4 SUMMARISED RESULTS OF THE STUDY

The medicinal use of plant species in the Zindi village was documented in this study. The local community had rich knowledge of medicinal plants and has various management conservation practices. The data compiled and collected in this study show the economic, cultural and practical importance of the 11 plants contributing to satisfying different

household needs. This study showed the wide usage of the medicinal plants in the Zindi village, particularly in primary healthcare and day to day use.

In terms of use-values it was shown that *Kirkia ancuminata* Oliv, *Dicoma anomala* Sond, *Lannea edulis* Engl, *Aloe*, *Lippia javanica* Spreng, *Virtex payos merril*, *Syzygium guineense* DC, *parinari curatelli*, *Zingiber officinale*, *Acacia Karoo Hayne* and *Coleochloa setiflora* were mentioned to be widely used in the study area.

Kirkia ancuminata Oliv, *Zingiber officinale* and *Virtex payos merril* plants have high economic use values. This was the case because these species have multiple purposes for wild fruits, and medicines which treat ailments, such as diarrhoea, colds, coughs, flu, and cholera. From the findings it was evident that plants such as *Lannea edulis* Engl, *Lippia javanica* Spreng, *Syzygium guineense* DC, *Acacia Karoo Hayne* plants have much economic use values, while *parinari curatelli*, *Aloe*, *Coleochloa setiflora* have little economic significance as compared to the other medicinal plants.

Dicoma anomala Sond, *parinari curatelli*, *Syzygium guineense* DC and *Acacia Karoo Hayne* were mentioned to have high cultural and spiritual values in that in Zindi village as they are used for cultural purposes such as warding off evil spirits, healing the sick, mediating in spiritual ceremonies and protecting people's homesteads against evil spirits. It was shown that the cultural values of medicinal plants do not necessarily correspond with economic values. Plants such as *Kirkia ancuminata* Oliv, *Zingiber officinale* and *Virtex payos merril* with high economic values have very little or no cultural values attached to them. Seemingly, a specie as *parinari curatelli*, has a low economic value, but has a high cultural and spiritual value.

6.5 Extent of increase in use and values of medicinal plants in Zindi Village

As already noted, the main aim of this study was to show the extent of increase in medicinal plant use-value since the Zimbabwean crises and the different use values among men and women. In Mutasa district as in other places in Zimbabwe, there has been a shortage of drugs, health practitioners and equipment at the hospitals and clinics. Communities more than ever before rely more heavily on traditional medicines. The major diseases that affect the people in the district include Diarrhoea, TB, HIV and Aids, cholera and Malaria. The majority of dwellers in Mutasa have been seen to depend more upon traditional medicines as

access to hospitalised medicine has become more difficult and beyond the reach of many. In Mutasa district this reliance coupled with unsustainable uses there has been consequently increased pressure and deterioration of medicinal plant and other plant species.

From the study's findings (see Chapter 4) it was shown that the total use-values of medicinal plants had significantly shot up more since the 2008 crisis. Drawing from the use value index by Reyes and Garcia (2006) which measured the use value of as the sum of economic, practical (day to day use) and cultural value of medicinal plants, the use values of medicinal plants have significantly increased in Zindi village. Total use-values of *Kirkia ancuminata Oliv* = 5.98; Total use-values of *Dicoma anomala Sond* = 7.06; Total use-values of *Lannea edulis Engl* = 3.77; Total use-values of *Aloe* = 2.57; Total use-values of *Lippia javanica Spreng* = 3.46; Total use-values of *Virtex payos merril* = 3.03; Total use-values of *Syzgium guineense DC* = 5.61; Total use-values of *parinari curatelli* = 4.55; Total use-values of *Zingiber officinale* = 6.53; Total use-values of *Acacia Karoo Hayne* = 5.37 and Total use-values of *Coleochloa setiflora* = 2.72. Therefore, *Kirkia ancuminata Oliv*, *Dicoma anomala Sond*, *Syzgium guineense DC*, *Zingiber officinale*, *Acacia Karoo Hayne* have "high total use-values" and *Lannea edulis Engl*, *Aloe*, *Lippia javanica Spreng*, *Virtex payos merril*, *parinari curatelli* and *Coleochloa setiflora* have "low total use-values". As such by measuring the economic, practical and cultural values of medicinal plants using the use-value index the extent of use and value of medicinal plants was shown.

6.6 Major Threats to Medicinal Plants in Zindi Village

Traditional medicinal plants and other biodiversity in Mutasa District are under threat from poor conservation practices and unsustainable utilisation resulting from the Zimbabwean crisis. As noted by Mavi and Shava, (1997), despite the intensified drive towards conservation, it is still difficult to prevent local people from destroying the plants around them. In Zindi village this is true as the community continues to destroy the environment around them through various ways. For instance these ways include but are not restricted to: land clearing resulting from resettlement is harming the environment; poor agricultural practices and activities such as burning are a threat contributing to endangerment of biodiversity; Deforestation (increased demand for fuel wood and medicines); Economic benefits being derived from sale of medicines, firewood and fruit are increasing the threat to

medicinal plants as people are making a living out of these plants resulting in the over harvest of the environment to supply and sale at markets.

6.7 Conservation of Medicinal plants

In many parts of Zimbabwe major steps have been taken towards conserving the environment in many parts of Zimbabwe. These strides include discouraging cutting down indigenous trees and encouraging the local people to plant indigenous trees for domestic use (Mavi and Shava, 1997). In Zindi village EMA, Campfire groups and community leaders play a huge role in promoting conservation of the environment biodiversity. Environmental Management Agency provides environmental management technical support raises awareness against environmental degradation and enforces environmental management laws and policies. The Communal Areas Management Programmes for Indigenous Resources (CAMPFIRE) in Mutasa provides for establishment of Campfire groups which disseminate information about environmental laws as well as support and encourage the community to sustainably utilise their natural resources by minimizing deforestation, veldt fires and wanton destruction of biodiversity. Community village heads, chiefs, councillors and traditional healers play huge role of ensuring that plants with high medicinal plant use are not endangered. They ensure this through, fining those seen harming the environment. They also encourage the community to practice safe and sustainable harvesting practices and also to practice growing of trees with medicinal value in their gardens, barking and budding of plants to reduce endangerment of these species.

6.8 THE FUTURE OF MEDICINAL PLANTS IN ZIMBABWE

The study has identified some issues that are note-worthy and might be able to enhance or even create new possibilities for conservation of medicinal plants in rural Zimbabwe. The stakeholder in Zindi village identified that raising awareness on sustainable conservation measures of medicinal plants among people and policing of available communal laws through Campfire approach is a very important and necessary stride that needs to be implemented in the locality to ensure the regeneration and sustainability of medicinal plants for the present and the future generation. Stakeholders also mentioned the need for medicinal plant propagation under nursery with help of traditional healers and encouragement of growing of medicinal plants in people's fields to ensure increase of medicinal plant diversity. The respondents also noted the need for providing alternative energy sources as many medicinal

species and other biodiversity provide hardwood which makes it susceptible to firewood usage. The stakeholders in Zindi village also mentioned the need for putting more stricter and stringent measures that punish those seen harming the environment to ensure that they biodiversity is used and in a safe and sustainable manner and wanton destruction of biodiversity is reduced.

6.9 Conclusion

In summation, this concluding chapter aimed at consolidating several issues that emerged from the study. This chapter was presented in three main sections. The first section briefly revisits the aspects of sustainability. The second section briefly revisited the findings, discussion and results of the study. Lastly the chapter concluded with a section that highlights the future of medicinal plants in Zimbabwe which shows the possibilities and what more can be done in the conservation of medicinal plants in Zimbabwe drawing from the views and insights of stakeholders and community members interviewed. From the study, it was shown that in Zindi village there wide use of medicinal plants which was shown in the total use-values of medicinal plants. It was also shown that in Zimbabwe various steps have been taken towards conserving the environment in many parts of Zimbabwe. These strides include discouraging cutting down indigenous trees and encouraging the local people to plant indigenous trees for domestic use, reducing veldt fires and wanton destruction of biodiversity. As such the importance of medicinal plants cannot be overlooked, as they are a very important resource to the rural people and their conservation is of paramount importance as people derive economic, practical, cultural, spiritual and health needs from these species.

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8 APPENDICES

Appendix 1: Structured Interview guide for Community Members and Government Stakeholders

Introduction

This research is conducted for collection of data which will be used for **academic research only**. This research seeks to explore the Conservation and Use-values of medicinal plants in Rural Eastern Zimbabwe. The main objective is to find the different use values of medicinal plants in this area and the extent to which the importance of these plants has increased since the 2008 political and economic crises in Zimbabwe. The information provided in this research will be treated with utmost care and complete confidentiality.

Interview Schedule

Place	
Name of Interviewee	
Tel No: (Contact purpose only)	

UNIVERSITY of the
WESTERN CAPE

Section A: Basic Demographics

1. Name:

2. Age: 0-21 22-39 40-60 61 and above

3. Sex: Male Female

4. Marital Status: Married Single Widow Divorced

5. What is the highest level of education completed

No formal schooling Primary school completed

High school completed University completed

6. Do you live in this locality? Yes 1 No 2

7. Category:

'Traditional healer'	Community member	Other
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Section B: Plant Use Knowledge

8. Can you tell me at least 8 of the names of useful medicinal plants mentioned below that you know that can be found in this area?

- Mubvumira (*Kirkia ancuminata Oliv*)
- Chifumuro (*Dicoma anomala Sond*)
- Musambasi (*Lannea edulis Engl*)
- Gavakava (*Aloe*)
- Zimbani (*Lippia javanica*)
- Mutsubvu (*Virtex payos merril*)
- Mukute (*Syzygium guineense DC*)
- Muhacha (*parinari curatelli*)
- Tsangamidzi (*Zingiber officinale*)
- Muvhungu (*Acacia Karoo Hayne*)
- Rufuri (*Coleochloa setiflora*)

9. How available are these species in this community
 Common 1 Frequent 2 Occasional 3 Rare 4

Plant	Availability
1. Mubvumira (<i>Kirkia ancuminata Oliv</i>)	
2. Chifumuro (<i>Dicoma anomala Sond</i>)	
3. Musambasi (<i>Lannea edulis Engl</i>)	
4. Gavakava (<i>Aloe</i>)	
5. Zimbani (<i>Lippia javanica</i>)	
6. Mutsubvu (<i>Virtex payos merril</i>)	
7. Mukute (<i>Syzygium guineense DC</i>)	
8. Muhacha (<i>parinari curatelli</i>)	
9. Tsangamidzi (<i>Zingiber officinale</i>)	
10. Muvhungu (<i>Acacia Karoo Hayne</i>)	

11. Rufuri (<i>Coleochloa setiflora</i>)	
--	--

12. What are the different uses of these Medicinal Plants

Plant	Use Value	Plant part Used
Mubvumira (<i>Kirkia ancuminata Oliv</i>)		
Chifumuro (<i>Dicoma anomala Sond</i>)		
Musambasi (<i>Lannea edulis Engl</i>)		
Gavakava (<i>Aloe</i>)		
Zimbani (<i>Lippia javanica</i>)		
Mutsubvu (<i>Virtex payos merril</i>)		
Mukute (<i>Syzygium guineense DC</i>)		
Muhacha (<i>parinari curatelli</i>)		
Tsangamidzi (<i>Zingiber offinale</i>)		
Muvhungu (<i>Acacia Karoo Hayne</i>)		
Rufuri (<i>Coleochloa setiflora</i>)		

13. How much economic benefits are derived from these plants per harvest

Very much 1 Much 2 Little 3 Not at all 4

Plant	Amount USD(\$)
Mubvumira (<i>Kirkia ancuminata Oliv</i>)	
Chifumuro (<i>Dicoma anomala Sond</i>)	
Musambasi (<i>Lannea edulis Engl</i>)	
Gavakava (<i>Aloe</i>)	
Zimbani (<i>Lippia javanica</i>)	
Mutsubvu (<i>Virtex payos merril</i>)	
Mukute (<i>Syzygium guineense DC</i>)	
Muhacha (<i>parinari curatelli</i>)	
Tsangamidzi (<i>Zingiber offinale</i>)	
Muvhungu (<i>Acacia Karoo Hayne</i>)	
Rufuri (<i>Coleochloa setiflora</i>)	

14. What are the names of markets that you sell these plants?

.....

15. According to your knowledge do these medicinal plants play a role in your culture?

Yes	No
-----	----

16. If yes, please briefly explain how these medicinal plants are used for these cultural activities?

.....

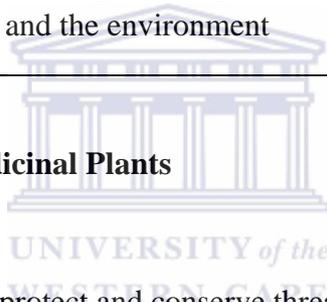
17. To extent has the importance and reliance of these plants increased since 2008 on a scale from 1 to 5 where 1 means “not at all” and 5 means “significant importance”

1	2	3	4	5
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18. How would you rate these following questions? **Very much (1), Much (2), a little (3) Not at all (4).**

I have access to medicinal plants in this community	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
Medicinal plants have helped community reach health requirements and save lives				
Protection of medicinal plants will help community to develop				
Community members work together to protect and conserve these species and the environment				

Section C: Conservation of Medicinal Plants



19. How does the community protect and conserve threatened or endangered medicinal plants in this locality?

.....

20. According to your knowledge what medicinal plant management strategies in terms of utilisation or cultivation exist in this community?

.....

21. Briefly explain the extent to which the crisis has increased the dependency and use of these medicinal plants?

.....

22. Which factors are there that enable or constrain the protection of medicinal plants in this community?

.....
.....
.....
.....
.....

23. In your own view what more can done to conserve and protect medicinal species?

.....
.....
.....
.....

Thank you very much for your time and cooperation!!!!!!!!!!!!!!!!!!!!





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Telephone : (021) 959 3858/6 Fax: (021) 959 3865

E-mail: pkippie@uwc.ac.za

Letter of Consent:

I....., have had the opportunity to ask any questions related to this study, and received satisfactory answers to my questions, and any additional details I wanted.

I agree to take part in this research.

I understand that my participation in this study is voluntary. I am free not to participate and have the right to withdraw from the study at any time, without having to explain myself.

I am aware that this interview might result in research which may be published, but my name may **be/not** be used. (Circle appropriate).

I pledge to abide by the requirements to keep within the focus group information that comes out in the focus group discussion of which I am a participant.

I am aware that information discussed in this focus group discussion will be used in a research that may be published.

I understand that if I don't want my name to be used that this will be ensured by the researcher.

I may also refuse to answer any questions that I don't want to answer.

Date: _____

Participant Name: _____

Participant Signature: _____

Interviewer Name: _____

Interviewer Signature: _____

If you have any questions concerning this research, feel free to call Kudakwashe Matongo on (+2785581679) or by email on kaymatongo21@gmail.com. Alternatively, you may write to my supervisor Professor Olajide Oloyede on jide.oloyede@gmail.com for any further questions.

Appendix 2 for Guidelines for Focus Group Discussion

Section A

Date.....

Venue.....

Duration.....

Any observations worth noting.....

Section B: Medicinal Plant Uses

- What medicinal plant species are predominantly used for health care purposes in this area?
- Which species are used for cultural purposes? Why?
- Which species have high economic value? Why?
- Has the use of these species increased since the health crisis in 2008?

Section C: Conservation of Medicinal Species

- What measures are there in place that facilitates sustainable use of medicinal plants?
- How can these measures be complemented to ensure sustainable use and value of medicinal plants?



Comments

Briefly explain how according to your view biodiversity in this area be conserved more in this area?

.....

.....

.....

Thank you very much for your time and cooperation!!!!!!!!!!!!!!!!!!!!!!