AN ETHNOBOTANICAL STUDY OF THE CULTURAL VALUE AND PRESERVATION STATUS OF *ADANSONIA DIGITATA* (BAOBAB SPECIES) AMONG VHAVENDA OF SAGOLE COMMUNITY IN THE LIMPOPO PROVINCE, SOUTH AFRICA

by

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DECLARATION

I, Matsheremane Godfry Mathaba, declare that: “An ethnobotanical study of the cultural value and preservation status of *Adansonia digitata* (baobab species) among Vhavenda of Sagole community in the Limpopo Province, South Africa” is my own work, and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references and that, this work has not been submitted before forany other degree at any other institution.

_____ _____

Matsheremane Godfry Mathaba Date

DEDICATION

To my siblings, Lawrence, Spencer, Cedric, Reneilwe, Retshepilwe, and my mother Engelinah.

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ABSTRACT

The baobab tree (*Adansonia digitata*), with more than 300 cultural and ethnobotanical uses in Africa has been identified as one of the most important savanna trees to be conserved, domesticated and valorised on the continent. A decline in baobab populations due to overexploitation could have a significant negative effect on African livelihoods. Therefore, it is important to determine potential strategies for the conservation of this tree species. The study aimed to explore the cultural significance and ethnobotanical use, as well as conservation of baobab trees by the Sagole community in the Vhembe District of the Limpopo Province, South Africa. Furthermore, the conservation efforts of this community and the provincial government were also elucidated.

In the Sagole community 40 local community members, aged 20 years and older, were selected via convenience sampling. A semi-structured questionnaire was employed to collect information on the cultural significance of baobab trees to members of this community. Research questions focussed specifically on identifying folk taxonomy, the transfer of species-specific information to younger generations, and cultural taboos pertaining to the baobab. It has been discovered that young people of Sagole are not well versed in the cultural value pertaining to baobabs. Furthermore, members of the community and the village head (chief) have limited knowledge related to taboos associated with this species. Thus, when individuals transgressed a taboo related to this tree species there is no formal punishment.

Sagole community members use baobab trees for various purposes such as food and medicine. The species is used medically to cure various ailments. Most inhabitants in the community harvest this tree. The most common plant parts harvested for cultural use are the fruits, bark, roots and leaves. However, community members have limited knowledge about the taboos related to harvesting of this majestic tree.

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LIST OF ABBREVIATIONS

UNESCO	United Nations Educational, Scientific and Cultural Organization
WEHAB	Water Energy Agriculture and Biodiversity
FAO	Food and Agricultural Organisation
PSSC	Potential Species of Special Concern
IUCN	International Union for Conservation of Nature
CITES	Convention of International Trade in Endangered Species
CSSC	Combat Service Support Centre
EIA	Electronic Industries Association
PNCO	Pre Non-Commissioned Officer
SANBI	South African National Biodiversity Institute
ITCZ	Inter Tropical Convergence Zone
LRG	Land Research Group
LTSS	Land Type Survey Staff
SALDRU	South African Labour and Development Research Unit

CHAPTER 1

INTRODUCTION

1.1 GENERAL INTRODUCTION

Baobabs (*Adansonia* species) are important for many rural people in Africa, because they are revered for their spiritual presence, and provide products on which people rely, such as shelter, food, fibre and medicine. For this reason, baobabs are often protected and adult trees are seldom cut down (Ndabikunze et al., 2011), and thus referred to as the tree of life in Africa (Mwihomeke et al., 2009). Despite this, there is growing concern about the persistence of baobabs in many landscapes (Venter & Witkowski, 2010).

Every component of the baobab serves a beneficial purpose. The leaves are freshly eaten as vegetables or used in dried form for the preparation of foods such as sauces and broths (Randler, 2008). Potentially beneficial uses may also exist in the medical, cosmetic and food industries. In medicine, the baobab's seeds are traditionally used to treat fever, or as an astringent on inflamed wounds (Kakati & Doulo, 2012). The cosmetic applications of baobab oils and extracts are rapidly expanding. The most valuable component is the fruit pulp, which contains high amounts of vitamin C, calcium, iron, potassium, amino and fatty acids, and antioxidants (Manfredini). The pulp is usually either eaten fresh or used as a base in the manufacturing of beverages (Chirwa et al., 2006). The seeds are used in food manufacturing as binders, pressed as cooking oil bases, or in the production of coffee. A number of African species are used locally for their wood, fruit, seeds or gum, but only few are economically important (Bobo & Weladji, 2011).

1.1.1 Cultural icons

A cultural icon can be a symbol, logo, picture, name, face, person, building or other highly valued image. It is easily recognized and generally represents an object or idea with great cultural significance to a wide cultural group (Solovan et al., 2013). Both within and outside its distribution area the baobab is a majestic icon in the African landscape. Commonly known as the 'upside-down tree', it looks as though it

has been planted on its head with its roots sticking up into the air, and as such produces a rather bizarre silhouette (Sidibe & Williams, 2002). No tree in Africa embodies the spirit of Africa more than the baobab with its bulbous branches and gnarled bark. Otherwise known as Africa's 'big tree', the baobab is revered in African culture for many different reasons (Lange, 2010).

In ancient times kings, elders and leaders would hold meetings under huge baobabs to discuss matters of great importance (Heuzé et al., 2013). Not only did the trees provide shelter, but the tribal leaders also believed that the spirit of the baobab would always help them make wise decisions (Chadare et al., 2009). Today leaders and decision-makers, from all corners of the globe, come to the Limpopo Province of South Africa to take advantage of the province's unique conference settings. “Perhaps they know the secrets of the baobab too” (Mucina & Rutherford, 2006).

1.1.2 Ethnobotanical use of indigenous plant species

People have always depended on plants for food, shelter, building material and medicine (Leakey, 1999). This dependence continues today throughout the developing world, especially for inhabitants of rural areas. This dependence stems mostly from low socio-economic conditions. However, cultural preference also plays a significant role (Ambrose-Oji & Mughogho, 2007).

Baobab products are sold primarily in local and informal markets (Osman, 2014). Products commonly sold include leaves (fresh and dried), fruits, craft products and bark (fibre) products. As such, the species is a source of revenue for local households. There is, however, little documentation of the trade in baobab products (Pettigrew, 2012). The oil, used in cosmetics, and bark fibre for rope are exported to Europe, but the quantity and monetary value of shipments are unknown (Heuzé et al., 2013). The many baobab products used locally, and their unique properties, offer considerable market opportunities, including food and beverages, botanical remedies, as well as nutraceuticals and natural cosmetics. However, the potential will be realised only if the decline of the tree population can be halted and reversed (Martin, 1995).

1.1.3 Preservation of indigenous plant species

Indigenous plants are species that are native to a particular area (Ndabikunze et al., 2011). South Africa has close to 22 500 indigenous species, making it one of the most diverse countries in terms of its flora. It is important to conserve indigenous species because they have evolved to cope with particular conditions, circumstances or situations (Kakati & Doulo, 2012).

The Department of Environmental Affairs has given the assurance that concrete measures are being put in place to protect the country's rare indigenous plant species from extinction (Heuzé et al., 2013). Furthermore, South Africa is party to several international conventions that aim to conserve and protect valuable species, and achieve sustainable use of natural resources (Ndabikunze et al., 2011). Some of these international agreements include the Convention on Biological Diversity, and Convention on the International Trade in Endangered Species (CITES) of Wild Fauna and Flora (Venter & Witkowski, 2010).

1.1.4 *Adansonia digitata*

1.1.4.1 Taxonomic classification

Depending on the reference consulted, there are eight or nine species of baobabs, six natives to Madagascar, one or two native to mainland Africa, and one each to Australia and the Arabian Peninsula (Wickens & Lowe, 2008; Sillitoe et al., 2010). The African species belong to the family Malvaceae, subfamily Bombacoideae, and genus *Adansonia.* Globally the family includes about 30 genera, six tribes, and about 250 species (Zimmermann, 2010).

1.1.4.2 Age

The Baobab is a strange looking tree that grows in low-lying areas. It can grow to enormous sizes. Carbon dating indicates that they may live to be 3 000 years old (Fenner & Thompson, 2005), making them among the oldest known angiosperm trees (Venter & Witkowski, 2010). *Adansonia digitata*, as the baobab is known in scientific circles, is one of the trees in Africa with the longest lifespan (Ndabikunze et al., 2011). Some baobabs in the Limpopo Province are already over 3 000 years old, but on average baobab trees, particularly those in the northern parts of the Limpopo Province, are between 300 and 500 years old. Near Sagole, in the northeast of the

Limpopo Province, there is a baobab specimen that is 3 000 years old, and measures 43 m in circumference at its base (Mabogo, 1990).

1.1.4.3 Morphological description

The mature baobab tree is the largest succulent plant in the world (Kakati & Doulo, 2012). All Baobabs are deciduous trees, ranging in height from 5 to 20 m (Kelly, 2000). One ancient hollow Baobab tree in Zimbabwe is so large that up to 40 people can shelter inside its trunk. The trunk is shiny, and pinkish-grey or sometimes copper-coloured (Blench, 2007) (Figure 1.1). The main stem of larger baobab trees may reach enormous proportions of up to 28 m in girth (Kelly, 2000). The trunk is normally smooth, but can often be variously folded and seamed from years of growth (Bobo & Weladji, 2011). The bark is 50-100 mm thick (Deacon & Deacon, 1991). The trunk can store thousands of litres of water, and elephants have been known to tear them apart to get to the moist wood (Dreyfus et al., 1999). Morphologically baobab species differ slightly from one another (Kier et al., 2005), but the most spectacular one is *A. grandidieri*, which reaches a staggering height of 40 m, only bearing branches at the very top of the tall, thick trunk (Sidibe & Williams, 2002).

Figure 1.1 A baobab tree in Sagole community.

The leaves are hand-sized and divided into 5-7 finger-like leaflets (Zimmermann, 2010). Being deciduous, the leaves are dropped between May and August, and appear again from late September to early October (Fenner & Thompson, 2005).

The large, pendulous flowers (up to 200 mm in diameter) are white and sweetly scented (Figure 1.2 A, B). Flowers emerge in the late afternoon from large round buds, on long drooping stalks, from October to December (Bobo & Weladji, 2011). The flowers fall within 24 hours, turning brown and smell quite unpleasant (Wickens, 1982). Baobabs in South Africa have their peak flowering season in November, and can carry from 10 up to a 1 000 flowers per tree at a time (Dreyfus, 1999).

The fruit is a large, egg-shaped capsule (often 120 mm in size), covered with yellowish-brown hairs (Zimmermann, 2010) (Figure 1.2 C). The fruit consists of a hard, woody outer shell with a dry, powdery substance inside that covers the hard, black, kidney-shaped seeds (Sidibe & Williams, 2002) (Figure 1.2 D). The off-white, powdery substance is rich in ascorbic acid (Deacon & Deacon, 1991). Baobab fruits can be powdered and added to food or drink as a supplement (Wickens, 1982). The fruit, which grows up to 30 cm long, contains tartaric acid and vitamin C, and can either be sucked, or soaked in water to make a refreshing drink. They can also be roasted and grounded to make a coffee-like beverage (Fenner & Thompson, 2005).

A

B

C 

D 

Figure 1.2 Flowers (A, B) and fruits (C, D) of *Adansonia digitata* (Nordeide et al., 1996).

1.1.4.4 Distribution

Baobab trees prefer a high water table, but are very sensitive to waterlogging and frost (Patrut et al., 2010). It is restricted to hot, dry woodlands on stony, well-drained soils, in frost free areas that receive low rainfall (Nordeide et al., 1996).

The distribution area is large and this species can be found in most of sub-Sahara Africa's semi-arid and sub-humid regions (Patrut et al., 2010) (Figure 1.3). Baobab populations in West Africa are isolated from those in East Africa by a major and not fully explained gap, which includes the Central African Republic (Ndabikunze et al., 2011). Baobabs are widely distributed in belts across Africa. They also occur in western Madagascar, India, Sri Lanka and Australia (Sidibe & Williams, 2002). It has been introduced to tropical and subtropical areas outside Africa, and has been successfully cultivated there. Quite often, and especially in western Africa, its distribution is associated with human settlements (Wickens, 1982).

In southern Africa, the baobab tree is found in areas of South Africa, Botswana, Namibia, Zimbabwe, Mozambique, and other tropical African countries where suitable habitat occurs (Baum, 1995). In South Africa it is naturally found only in the warm parts of the Limpopo Province (Sidibe & Williams, 2002). In the Limpopo Province they are found between the Limpopo River and the Soutpansberg mountain range (Baum, 1995).

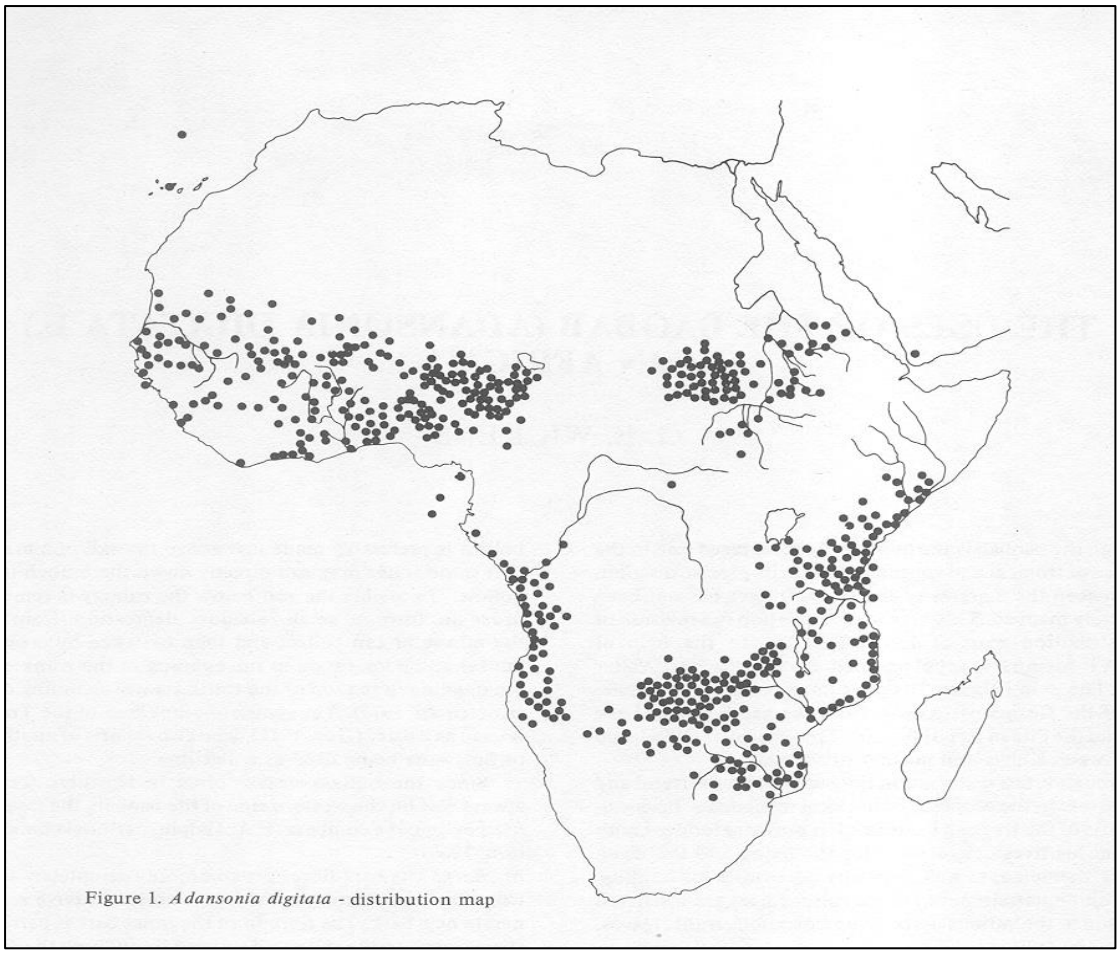

Figure 1.3 African and Arabian distributions of *Adansonia* species (Chadare et al., 2009).

1.1.4.5 Cultural use

Baobab trees are an excellent resource for those living near them, by providing food via the fruits and seeds, freshwater via the rainwater trapped in the trunks, medicine via the leaves, fibre for textiles, and dyes (Nnam & Obiakor, 2003). Large baobab trees can be used to store thousands of litres water for use during the dry season (Patrut et al., 2010). There are many medical applications; for example, water extracted from the fruits can be used to treat dysentery, stomach pains and diarrhoea (Al-Qarawi et al., 2003).

The baobab tree is not known as the tree of life, for good reason (Alves, 2012). It can provide shelter, clothing, food, and water for animal and human inhabitants of the African savanna regions (Ndabikuze et al., 2011). The baobab tree can be used for fibre rope and medicine, while the pulp can be used for cosmetics (Gruenwald &

Galizia, 2005). The bark and leaves are also useful in the treatment of fever, and are reported to have an anti-filamentary effect (Diop et al., 2005).

1.1.4.6 Etymology

Because this tree has such as wide distribution, many cultures reside within its distribution range. Thus it is not surprising that more than 53 vernacular names are attributed to it (Watt & Breyer-Brandwijk, 1962). A small sample is represented in Table 1.1.

Table 1.1 Vernacular names of *Adansonia* (Nordeide et al., 1996).

Language	**Country**	**Names**	**Meaning**
English	South Africa	Baobab	Upside down tree
Venda	South Africa	Muvhuyu	The big tree
Sotho	South Africa	Seboi	The big tree
Tsonga	South Africa	Shimuwu	The big tree
Ndebele	Zimbabwe	Umkhomo	Amazing tree
Gujarati	India	Sumpura	Tree of life
Portuguese	Mozambique	Majoni ya mbuyu	Extraordinary tree

1.1.4.7 Ecosystem services

An old baobab tree can create its own ecosystem (WEHAB Working Group, 2002), as it supports the life of countless creatures, from the largest of mammals, such as elephants, to the thousands of tiny creatures scurrying in and out of its crevices (Masola et al., 2009). The shade of large trees has made it suitable for socializing; often groups of people gather underneath it to discuss community issues (Dweck, 1997). Elephants browse the leaves and strip the bark for food and moisture. Baboons feast on its fruits, and birds and bees nest in the holes of the trunk, since most of the old trees are hollow inside (Alves, 2012). Fruit bats and bush babies pollinate the flowers that only last for 24 hours before falling to the ground to become

food for various antelope species. Mature baobab trees are usually hollow, providing living space for many animals (Dreyfus *at al*., 1999).

1.2 PROBLEM STATEMENT

The cultural value and preservation of biodiversity is a major concern in South Africa. Biodiversity, especially indigenous plant species, have been used and are still used for food, medicine, fodder and other purposes (Stein, 1993). According to Rankoana (2001), the demonstrated significance of a large number of plant species to the community necessitates the need for proper preservation measures of the resources to ensure continued availability. Thus it is the community's responsibility to preserve the natural resources on which they depend for livelihood. Recently, the South African Government has taken initiatives in the protection and conservation of the natural vegetation, to allocate rangers to most areas of the Limpopo Province. Despite this, there is growing concern about the perseverance of the species in many landscapes. Mabogo (1990) showed that those plant species most valued are also the ones most often being over-exploited.

1.3 SIGNIFICANCE OF THE STUDY

The significance of the study was defined by a number of aspects. The selection of baobab species in the Limpopo Province, this species is important in the livelihood of Vhavenda in Vhembe District of the Limpopo Province.

The study selected the Sagole community in the Vhembe District of the Limpopo Province. This community was selected because of the prevalence of this species in this area. Furthermore, an ethnobotanical study conducted by Mabogo (1990), showed that this community possess an immense cultural knowledge of their environment. This study was further motivated by Mabogo (1990), who noted the dependency on indigenous plant species by rural communities to fulfil their basic livelihood needs.

The present study was designed to examine the cultural value and the preservation status of baobab species as used by the community of Sagole in the Limpopo Province. The proposed study will make a contribution to the understanding of the

preservation status of baobab as a protected plant species with multiple uses in the culture of Sagole community.

1.4 PURPOSE OF THE STUDY

The study explored the cultural value and ethnobotanical use of baobab species by the Sagole community in the Vhembe District of the Limpopo Province, and preservation efforts of this community and the provincial government. The study examined the cultural value of the *Adansonia digitata* species in Sagole community. It also identified the ethnobotanical use of the species, and elucidated its preservation by the members of Sagole community and the Limpopo Provincial Government.

Data presented in chapter four of this study are analyses of responses per the questions:

A. In terms of cultural aspects, following broad questions were asked:

- Does folk taxonomy apply to *Adansonia digitata*?
- Is there generational transfer of information, and if so, what is the extent of that information?
- Are there any cultural taboos that apply to this species?

B. In terms of the ethnobotanical use, the following broad questions were asked:

- Is there ethnobotanical use of this species by Sagole community members?
- Does the Sagole community have people who practice agronomy?
- Is this species used by Sagole community members for ornamental purposes?
- Which method is used by the Sagole community for harvesting this species?

C. In terms of preservation status, the following broad questions were raised:

i. Does the Sagole community have any preservation measures that apply to this species?
ii. What is the provincial government stance on this species?

1.5 CHAPTER OUTLINE

Chapter two gives the outline of the literature review of the cultural value, ethnobotanical use and conservation of the baobab. However, in the literature review there is an overview on what other scholars have researched about the cultural value, ethnobotanical and preservation of the baobab. Chapter three presents the context in which the study was conducted and the research methods adopted for data collection and presentation. Chapter four presents the research results. This chapter gives an outline of the cultural value, ethnobotanical use and preservation of the baobab by the Vhavenda of Sagole community. Chapter five presents a discussion of the study results, supported by relevant literature about the uses and preservation status of *Adansonia* in other parts of Africa and the world.

CHAPTER 2

LITERATURE REVIEW

2.1 CULTURAL VALUE

2.1.1 Folk taxonomy

Vernacular names not only have information attached to it, but are also descriptive in nature. The naming of useful plants is an old and basic human urge (Zimmermann, 2010). The names of plants are of value in avoiding descriptive phrases to refer to objects and render communication easier (Pettigrew, 2012). This information is often precise and helps infer certain character related details, such as appearance, shape, size, habitat, habit, smell, taste, colour, utility and other peculiar characters of plants (Osman, 2014). These folk names reflect a broad spectrum of information on local uses, ecology, physiology, and anatomy amongst others (Lange, 2010).

A local name often describes some characteristic feature of the plant or plant parts in which communities have an interest (Singh, 2008). Principles of ethnobotanical nomenclature are usually developed for species that have attained high utilitarian and cultural significance (Bobo & Weladji, 2011). Vernacular names assigned to plant species often carry etymology, which may relate to specific therapeutic effects or morphological features, as well as to mythological and historical connotations (Rankoana, 2001).

In Mali, rural populations differentiate between three types of *Adansonia* through the colour of their bark (Sidibe et al., 1996). Those with black bark are said to have mild tasting fruits; those with red bark have the most delicious fruits; while those with grey/white bark are used for fibre production rather than as food sources (Solovan et al., 2013).

2.1.2 Information transfer

While it is widely acknowledged that the degradation of the natural environment entails a loss of cultural and linguistic diversity, studies such as Kier et al. (2005) suggest that language loss, in turn, has a negative impact on biodiversity conservation. There is a fundamental linkage between language and traditional

knowledge related to biodiversity (Carter et al., 2003). Indigenous communities have elaborate and complex classification systems for the natural world, reflecting a deep understanding of their local environment (Randler, 2008). This environmental knowledge is embedded in indigenous names, oral traditions and taxonomies, and can be lost when a community shifts to another language (ICOMOS, 2002).

Ethnobotanists and ethnobiologists recognize the importance of indigenous names, folk taxonomies and oral traditions to the success of initiatives related to endangered species recovery and restoration (Galvin, 2009). A study on ancestral sayings of the Maori (New Zealand) revealed new pertinent information concerning plant growth, soils and nutrients, ecological niches and ecological communities, as well as landscape processes (Randler, 2008). The study demonstrates that efforts to preserve biodiversity can greatly benefit from engaging local communities on the one hand and anthropologists and linguists on the other hand; the former can share their unique traditional ecological knowledge, while the latter can serve as a bridge between traditional knowledge and eco-science (Carter et al., 2003). The study further considers the safeguarding of traditional knowledge and the indigenous languages used to transmit such knowledge, as yet underused, but promising tools for the conservation and sustainable management of biodiversity.

2.1.2.1 Legends surrounding the baobab

There are many legends about how the tree came into being. One is about the god *Thora* who didn`t like the baobab in his garden, and so he threw it down where it landed on earth upside down, yet still growing (Mucina & Rutherford, 2006). Another story is that the gods became so angry by the beautiful baobab`s conceit that they turned it upside down to teach it a lesson (Solovan et al., 2013). In time, the tree became stronger and helped the African people thrive, as they too grew more resilient (McKewon, 2002).

Through the ages and across the African continent, people have told many versions of this legend (Osman, 2014). Yet the story always comes back to the unique circumstances of the tree, and its willingness to give so generously to the African people (Zimmermann, 2010). It is also claimed that on the day of creation, each animal was given a tree to plant and that the hyena planted the baobab upside-down

and, as a result, it should never have grown, but it did grow, and today the species dot the African landscape (Eromosele et al., 1991). There is common a legend that if one washes a baby boy in the juices subtracted from the bark of the tree, the boy will become strong and steadfast, and as results most Africans see the tree as an icon for strength (Patrut et al., 2010). This tree is bronze, to show that is unique. If one bathes in the properties of a bronze baobab, he/she will become strong in the work he/she is doing (Mabogo, 1990).

2.1.2.2 Cultural associations

Africa is rich with cultural associations. This extraordinary tree is surrounded by myths and legends (Zimmermann, 2010). Many virtues have been attributed to the baobab tree (Lange, 2010). Its presence is believed to be a good omen. Some ethnic groups in several West African countries think the baobab tree can guarantee the everlasting continuation of descendants. It acts as a ceremonial focus for hunters and others (Toure et al., 1998). Cultural associations with baobabs have their origins in food, medicinal and other uses (Bobo & Weladji, 2011). Furthermore, the mythical origins of some tribes can be traced back to ancestral baobab trees (Sidibe & Williams, 2002). For example, the species has been accepted as the national tree for the Republic of the Congo, and has been used on stamps of several African countries; the Yoruba of South Nigeria often include the name for baobab in their village name; in the Matabeleland of Zimbabwe more than one tribal group venerate the baobab trees (Alves, 2012). Thus the mythical origins of some tribes can be related to ancestral baobabs (Eromosele et al., 1991).

2.1.3 Cultural taboos

Cultural taboos are defined as a vehement prohibition of an action based on the belief that such behaviour is either too sacred or too accursed for ordinary individuals to undertake, under threat of supernatural punishment. Such prohibitions are present in virtually all societies (Shaw, 1992). Cultural taboos have many functions that include, amongst others, norms (Alves, 2012). Norms are the agreed upon expectations and rules by which a culture guides the behaviour of its members in any given situation. Of course, norms vary widely across cultural groups (Frier & Bagnall, 1994).

The value of cultural taboos associated with baobab species is to preserve the species for future use by members in the communities (Solovan et al., 2013). Cultural taboos are the ideas about what is good, right, fair, and just in terms of the use and preservation of baobab species. However, this idea of what is acceptable is not always universally held. For example, uninformed people disagree, however, on the prescribed methods of harvesting baobab trees to sustain it and for future use (Bobo & Weladji, 2011).

2.1.3.1 Loss of cultural information to new generations

In societies that are in transition, new generations may be less aware of heritage, while trying to sort through their feelings and thoughts related to their cultural heritage (Randler, 2008). Culture is diverse and is always changing. However, there is a disconnect between the old and the new generations in terms of transferring cultural information related to cultural values and ethnobotanical use of baobab trees (McKewon, 2002). This breakdown in information transfer will lead to a loss of cultural identity amongst community members (Osman, 2014). This cultural loss of identity will in the long-term affect young people's ability to carry on traditional values associated with their own historical brand of culture (Bobo & Weladji, 2011).

2.2 ETHNOBOTANICAL USE OF BAOBAB SPECIES

2.2.1 Ethnobotanical use

The plant has numerous medicinal and non-medicinal uses in Africa (Zimmermann, 2010). This value is underscored by villagers who often plant baobab seedlings within their own courtyards and nurture them until they are 2-3 m tall, before transplanting them along the edges of cultivated fields (Mwihomeke et al., 2009).

2.2.1.1 Medicine

According to Sidibe and Williams (2002), baobab bark is used internally as a refrigerant, antipyretic and antiperiodic. Baobab bark is harvested to make traditional medicine in various African communities to cure ailments such as skin problem and diarrhoea (Adewusi & Afolayan, 2010). Powdered leaves are used to treat excessive perspiration (Kier et al., 2005). Externally, young leaves are used, crushed into a poultice, for painful swellings. Fruit pulp is used with buttermilk to treat diarrhoea and

dysentery (Wickens, 1982). Fruit pulp extract is also applied as eye-drops in cases of measles (Sillitoe et al., 2010). The baobab seeds are used as medicine (a substitute for quinine as a prophylactic) to cure malaria (Osman, 2014), and are also used to help reduce fever related to malaria (De Caluwe et al., 2010). A mash prepared from the dried powdered roots is given to malaria patients as a tonic (Adewusi & Afolayan, 2010).

2.2.2 Domestic food uses and local processing

2.2.2.1 Leaves

Baobab leaves are used throughout the African continent. Young fresh leaves are cut into pieces and cooked in a sauce (Osman, 2014). In Mali, the use of the leaves in a sauce is usually in association with seeds of *Parkia biglobosa*, onion, okra, pepper, ginger, sometimes meat, but more often fish (Pettigrew, 2012). The sauce is used with a thick porridge made from millet, sorghum or maize, but also for couscous and rice (Nordeide et al., 1996). In Northern Nigeria, the leaves are used in a soup called *miyan kuka* of the Hausa and ground leaves are boiled in salt water to be used as a leafy vegetable (Yazzie et al., 1994). Sometimes leaves are dried and powdered and used as condiment in Mali (Kings, 2002). The powder is called *lalo* in Mali, and is sold in many village markets in Western Africa (Nordeide et al., 1996). There is a marked seasonality in the use of leaves. For example, in southern Mali, 26% of rural households use baobab leaves in the rainy season, and 56% in the dry season. According to Palmer and Pitman (2002), in Zimbabwe baobab leaves are used as a “vegetable” that substitute the commercially grown leafy vegetables such as cabbages and lettuce.

There are no major reports on the preservation status and quality of powdered leaves (Kakati & Doulo, 2012). Research attests that baobab leaves are an important source of iron and other minerals, and that the bioavailability of the minerals requires further study (Bobo & Weladji, 2011).

2.2.2.2 Fruit pulp

The pulp is either eaten fresh or added to gruels (Bobo & Weladji, 2011). When the fruit is ripe, the pulp is removed from the fibres and seeds by kneading in cold water, the resulting emulsion is sieved, and added to thick grain preparations to make

thinner gruels (Pettigrew, 2012). It can also be ground to make a refreshing drink with a pleasing wine-gum flavour. In Tanzania, it is used to aid fermentation of sugar cane for beer making (Patrut et al., 2010). The cattle owning Fulani and Hausa of northern Nigeria mix the pulp emulsion and milk to make a palatable drink (Von Carlowitz, 1991).

Fruit pulp aid the growth of lactic acid bacteria, which are beneficial, and serve to preserve many fermented foods (Sillitoe et al., 2010). The addition of baobab fruit pulp to fermented soy product inhibits the growth of pathogenic bacteria such as *Salmonella*, *Baccilus* and *Streptococcus* in the food product (Adewusi & Afolayan, 2010).

The pulp can be stored for fairly long periods for use in soft drink production in airtight containers. Storage is improved by the use of sodium met-bisulphite (Solovan et al., 2013). The pulp can be frozen if powdered (Obizoba and Amaechi, 1993). Baobab powder mixtures are commonly available in many public markets of Mali, but quality can be poor (Palmer & Pitman, 2002).

2.2.2.3 Seeds

In Madagascar seeds are used as a thickening agent in soups, but they can be fermented and used as a flavouring agent, or roasted and eaten as snacks (Palmer & Pitman, 2002). Frequently, baobab seeds are grounded with peanuts, water and sugar to make a sauce taken with porridge (Dovie et al., 2001). In Burkina Faso baobab seeds can be eaten fresh or may be dried and ground into flour which can either be added to soups and stews as a thickener, or roasted and ground into a paste, or boiled for a long time, fermented and then dried for use (Coe, 2013). Seeds are also a source of cooking oil but this is not widespread, although there has been interest in expanding such use due to deficits of vegetable oils. Oil is extracted by pounding the seeds (Sauvee, 1999). Fermentation of powdered seeds increases protein digestibility (Heuzé et al., 2013). It also reduces the trypson inhibition activity six fold, but increases tannin content (Addy et al., 1995).

2.2.3 Other uses

2.2.3.1 Fibre

Fibre from the inner stem bark is strong and widely used in Africa for making rope, basket nets, snares, fishing lines and weaving (Palmer & Pitman, 2002). To obtain the fibre, the bark of the baobab tree has to be removed (Sauvee, 1999). Fibre from disintegrated wood has been used for packing. Other fibres used as rope is obtained from the root bark (Dovie et al., 2001). Danthu et al. (1995) noted that baobab trees are able to generate new bark.

2.2.3.2 Dye

In East Africa the roots are crushed to make a soluble red dye. The green bark is also used as a dye and for decoration (Dovie et al., 2001).

2.2.3.3 Fuel

The dead wood is a poor source of fuel. However, fruit shells are used as fuel in Tanzania (Alves, 2012).

2.2.3.4 Animal browse and feed

The leaves of baobab are routinely browsed, especially in the agrosylvi pastoral systems in the Sahel. The high tannin content of the leaves has a significant effect on in *vivo* dry matter digestibility (Alves, 2012). The optimal dry matter degradation in sheep feed is at a level less than 30% of the browse, and browse digestibility of the leaves is 47% (Toure et al., 1998). Since the tannin level is more than twice the critical level, the amount of baobab leaves in the browse has to be kept to a reasonable level; however, an emollient present in the leaves may cause acceleration in the ruminant digestive tract (Osman, 2014). Shells from the fruits and the seedcake, left after pounding to extract seed oil, are also used as animal feed (Wickens, 1982).

The use of trees as cattle feed is extremely important in savanna areas, especially in the arid zones, where animals obtain much of their feed in the form of pods and leaves (Alves, 2012). Hollow trees provide reservoirs of fresh water that are used by nomads, particularly in the western part of the Sudan to hydrate their cattle (Kakati & Doulo, 2012).

2.2.3.5 Potash

In Madagascar, potash is the only food ingredient made from incinerated roots (Chadare et al., 2009).

2.2.4 Harvesting

2.2.4.1 Leaves

The age of trees when leaves can be harvested for processing into leaf powder is variable and depends essentially on localised conditions (Ambrose-Oji & Mughogho, 2007). In general, leaf exploitation could start before the sixth year when site conditions are favourable (Toure et al., 1998). Women traditionally start harvesting when leaves start to develop and the period varies according to agro-ecological zones. For example, in the South Sudanian zone, young leaves are available only in March (Bobo & Weladji, 2011), but, in the more humid zones of the Bouake zone in the Ivory Coast leaves are available throughout the year. Here bulk harvesting of leaves is mainly done between September and October (Esenowo, 1991).

Trees with good-tasting leaves are cut regularly to prevent the development of branches and fruits, and to improve the food quality of leaves (Heuzé et al., 2013). According to Danthu et al. (1995), the tools used in harvesting leaves are sickle (96%), dole (81%) and hand (18%). Some farmers estimate that dole is better because it can only cut un-lignified shoots and small branches, and sprouting is therefore fast (Palmer & Pitman, 2002). Others indicate that the sickle is the best because it gives a clean cut without the damage that the dole tends to cause (Zimmermann, 2010). Harvesting of leaves is constant during the vegetative period, but there are no data relating to production or production related to harvesting frequency and intensity (Esenowo, 1991).

The harvesting tools are well adapted to their respective season of use. The dole is used when the petiole is fresh and easy to cut, while the sickle is used towards the end of the harvesting season when the petiole is lignified (Heuzé et al., 2013). Harvesting by hand picking is done less since it is difficult to climb a baobab tree (Kings, 2002). It is not easy to note the end of the adolescence period of baobab in Sudanian zone because of intensive pruning of trees for leaf production (Zimmermann, 2010).

2.2.4.2 Fruits

In South Africa, baobabs start to flower at 16-17 years, while in Zimbabwe, the first flowering has been suggested at 22-23 years (Sauvee, 1999). This high diversity could be attributed to climatic differences (Nkana & Iddi, 1991). Arum (1989) estimated that, an average mature fruiting baobab produces 200 kg of fruit per season (Alves, 2012). The first fruits are ripe in December, and harvesting goes on until April in southern Africa (Palmer & Pitman, 2002). Baobab fruit harvesting is twice a year in the Bouake Region of Ivory Coast (Lange, 2010). Here young men use a dole commonly for fruit harvesting, but sometimes fruits are harvested by striking them to the ground or picking them by hand (Danthu *et al*., 1995).

2.2.4.3 Bark

Baobab bark is harvested by stripping from the outer surface of the lower trunk using an axe. If done properly, the bark can be harvested again in 2-5 years. However, it takes 6-10 years for the bark to return to the pre-harvest condition (Piearce et al., 1994). The fibre from the inner bark is particularly strong and durable. Thus it comes as no surprise that it is widely used throughout the distribution range of the tree for making rope, cordage, harness straps, strings for musical instruments, baskets, nets, snares, fishing lines and cloth (Chadare *et al*., 2009).

2.3 PRESERVATION OF BAOBAB TREES

2.3.1 Community-based preservation methods

2.3.1.1 Local management

Humans influence the viability of baobab populations in a variety of ways (Swanapoel, 1993). Some practices are beneficial, such as transplanting and seedling protection, as well as the unintentional dispersal of seeds through garbage disposal on fields, while others are detrimental, such as ploughing fields or allowing livestock to graze where seedlings have established (Esenowo, 1991).

In Burkina Faso and Nigeria, rural people plant baobab seedlings around their homesteads or on their agricultural plots (Von Carlowitz, 1991). In Madagascar, Nigeria and Mali the species are not often planted from seed, but seedlings are transplanted to field edges or close to homesteads. Young seedlings require a high

degree of protection, including fencing to exclude livestock grazing (Ramesh et al., 1992). Baobab trees near habitation are protected and nurtured in Mali (Lange, 2010). Here tend to receive more water than those trees scattered in the savanna (Danthu et al., 1995).

2.3.2 Institutional preservation

2.3.2.1 Main threats

According to Baum and Oginuma (1994), 10% or more than 8 700 trees of the world's baobab species are threatened with extinction, and another 1 000 trees are critically endangered. Globally, the two biggest threats against the tree species are commercial logging and climate change (Palmer & Pitman, 2002).

2.3.2.2 Protection efforts

There are several strategies that individuals, communities and governmental bodies are using in order to protect endangered species (Bobo & Weladji, 2011). In some extreme cases, organizations or governments have purchased land to preserve the species found there (Danthu et al., 1995). Incentives such as property tax breaks for landowners who conserve individual trees or wooded lots have been successful in South Africa, as has establishing community provided funds aimed at planting new trees and replacing those lost to storms and disease (Osman, 2014).

Community education is a primary protection effort because landowners who understand the cultural value of species are more likely to take care of them (Baum & Oginuma, 1994). In this regard, in 1998, three large preservation organizations, Botanic Gardens Conservation International, Fauna & Flora International, and the World Conservation Monitoring Centre started the Global Trees Campaign to save threatened and endangered species (Lange, 2010). The campaign provides information to communities to support the sustainable use of trees, and take action to preserve species (Patrut et al., 2010).

2.3.3 Legislation

2.3.3.1 Protecting trees of national significance

The baobab species was declared a protected tree under the Forest Act 84 of 1998 in South Africa (Osman, 2014). This Act states that everyone has the constitutional

right to have the environment protected for the benefit of present and future generations. South Africa is home to more than 25 000 indigenous species of trees and shrubs, some of which are threatened because of their rarity, as well as the pressure of commercial and subsistence use (Von Carlowitz, 1991). However, more than 70 tree species have been declared national champion trees by the Department of Agriculture, Forestry and Fisheries, which means they are fully protected under the National Forests Act 84 of 1998 (Pettigrew, 2012). Under the declaration, species listed as protected may not be cut, disturbed or damaged and their products may not be owned, transported, exported or sold without a licence (Piearce et al., 1994).

Listing certain species as protected is not primarily aimed at preventing the use of a species, but to ensure sustainable use through licensing control measures (Ambrose-Oji & Mughogho, 2007).

2.3.3.2 Legislation pertaining to baobab conservation

On the 31st May 2004 the then South African President, Thabo Mbeki signed the Biodiversity Bill. The Bill provides for the management and conservation of South Africa's biodiversity through biodiversity planning and monitoring the protection of threatened ecosystems and species, the control and management of alien and invasive species, the regulation of bioprospecting, fair and equitable benefit sharing and the regulation of permits.

South Africa is home to many indigenous species such as the baobab tree; some of which are threatened because of their rarity, as well as the pressure of commercial and subsistence use (Toure et al., 1998). *Adansonia digitata* is regarded as a Red Data Species, and is legislative protected in South Africa (Kakati & Doulo, 2012). The government is working with local communities to protect and restore these unique trees (Osman, 2014). It is essential that baobab trees are preserved for their intrinsic value as unique elements of biodiversity, as well as for their historic value (Swanapoel, 1993).

2.4 THEORETICAL FRAMEWORK

Ethnobotanical authors such as Cotton (1996), Martin (1995), as well as Schultes and Von Reis (1995) argued that the theoretical and methodological approaches in a multidisciplinary study such as ethnobotany depend primarily upon the researcher's principal discipline, whether it be botany, anthropology, pharmacology, geography or other sciences. They added that no single theoretical framework and methodology can encompass the diverse areas of study within the field of ethnobotany. Therefore, the general orientation of the present study was based on the botanical and cultural anthropological orientations, namely; the utilitarian theory and the cultural ecological theory.

The utilitarian theory, according to Cotton (1996), involves the collection of information about the uses and management of different plants, and includes the identification of information of useful species, and the elucidation of methods used in the production and processing of these plants. The theory postulates that human beings depend on the natural environment for their survival by exploiting a variety of plant species for food, protection, and health care.

The cultural ecological theory focuses on the balance between human and nature by investigating into the ecological effects of human activity upon biodiversity and other natural resources use (Cotton, 1996). The present study adopted the two theories to explore the cultural significance of baobab species and the indigenous knowledge systems of preserving the species for future use from the perspective of Anthropology.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 STUDY AREA

3.1.1 Location

Sagole community is located in an area along the northern border of South Africa in the Limpopo Province (Figure 3.1). The area borders Zimbabwe to the north, with Botswana approximately 27 km to the west, at the confluence of the Shashe and Limpopo Rivers (Ritchken, 1995). The nearest town is Musina, approximately 48 km southeast. The Mapungubwe National Park a World Heritage Site is 5.36 km west of the study area. The area falls within longitude 290 27' 00"E to 290 47' 00"E and latitude 220 5' 00"S to 220 18' 00"S and 22° 31' 50.7'' S, 30° 40' 53.2'' latitude (Land Type Survey Staff, 1988).

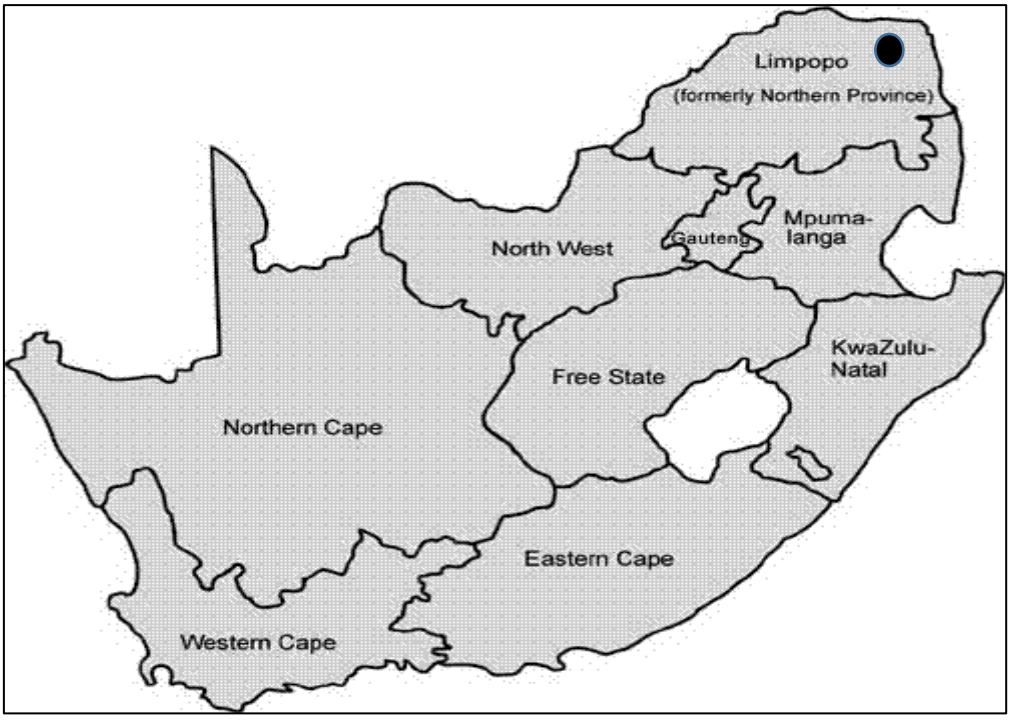

Figure 3.1 Location of Sagole Community (dot) within South Africa (Ritchken, 1995).

Sagole community falls within Mutale Local Municipality. Mutale Local Municipality is one of four local municipalities comprising Vhembe District Municipality (Ritchken, 1995). It is situated in the far north eastern corner of the district (Figure 3.2). It has a

population of 131 781, spread over 150 villages. The total land cover of the Municipality is 23 757 8212 hectares. The Kruger National Park forms the eastern boundary of Mutale Local Municipality, with the Limpopo River forming the north eastern boundary. The municipality's strategic location affords it many opportunities for tourism development (Ramphele, 1991).

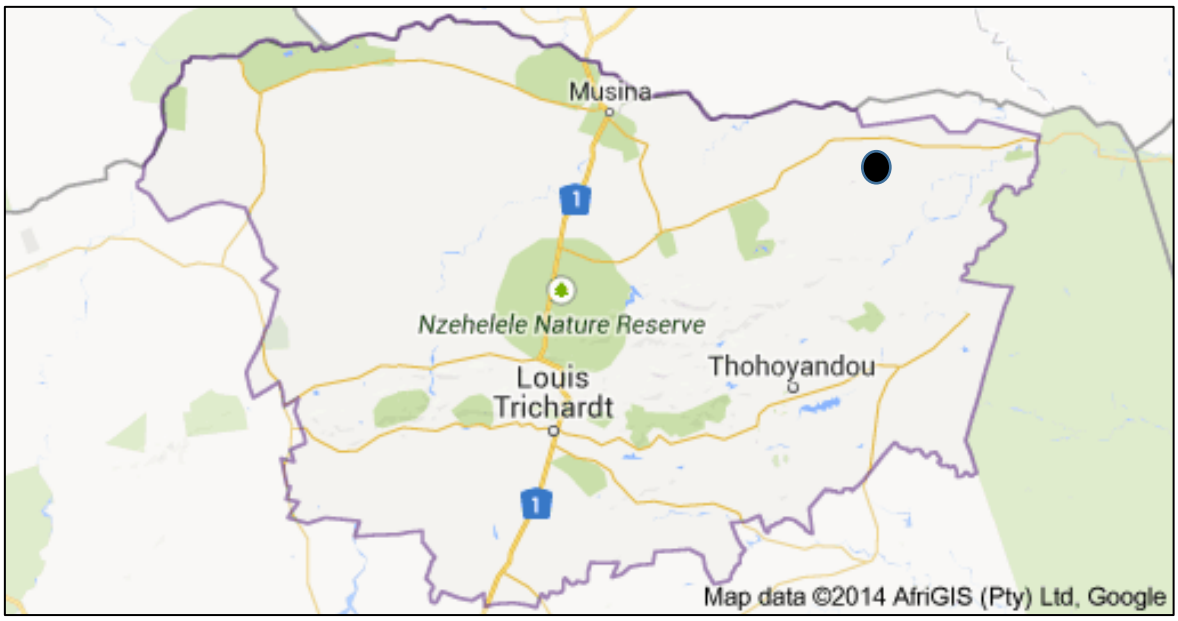

Figure 3.2 Location of Sagole Community (dot) within the Vhembe District (Land Type Survey Staff, 1988).

According to Land Type Survey Staff (1988), Mutale Local Municipality (Figure 3.3) shares borders with the Musina Local Municipality and Zimbabwe on the north, Mozambique on the east, Makhado Local Municipality to the west and Thulamela Local Municipality to the south. The municipality is accessed via the R525 road linking the Kruger National Park to other local municipalities within the Vhembe District. It can also be accessed via the P277/1 road, which links Thohoyandou to Mutale (Ritchken, 1995).

Figure 3.3 Map of Limpopo Province, indicating the location of the Mutale Local Municipality (Kellner & Els, 2008).

3.1.2 Vegetation

3.1.2.1 Potential species of special concern

Potential Species of Special Concern include all those plants listed in terms of the International Union for Conservation of Nature, Convention of International Trade in Endangered Species, and both national and provincial legislation that may occur in the area of study (Mucina & Rutherford, 2006). If any of these species occur on the site, they should be given the status of Confirmed Species of Special Concern (CSSC) (Kellner & Els, 2008). The number of Potential Species of Special Concern (PSSC) includes an estimated 450 species that are listed individually by the IUCN Red Data List, the South African National Biodiversity Institute (SANBI), the Forest Act, and the Provincial Nature Conservation Ordinance (PNCO) 16 of 1974. In addition, the Pre-Non-Commissioned Officer lists eight plant families and six plant genera that are afforded blanket protection throughout the province (Hilton, 1996). The taxa with many data deficient species include specifically the

Mesembranthemaceae family, as well as members of the Amaryllidaceae, (Amaryllids), Iridaceae (Irises), Orchidaceae (Orchids) and Apocynaceae (Lianas), as well as members of the genus *Aloe* (Low & Rebelo, 1996).

3.1.3 Climate

3.1.3.1 Limpopo Province

The climate of the Limpopo Province varies spatially from being arid in the west through semi-arid and temperate areas in central zones to semi-arid in the east, with a few sub-humid pockets in the centre. Three wind systems have a strong influence on the basin's climate (Van Der Walt, 2008a). These are the tropical cyclones from the Indian Ocean, the South easterly wind systems that bring rainfalls from the Indian Ocean, and the Inter Tropical Convergence Zone (ITCZ), which in some years moves sufficiently far southwards to influence rainfall in the northern parts of the basin (Thomas & Christen, 2002).

The mean annual temperature recorded at the Macauville weather station, situated at the Musina Agricultural Research station, is 22.5ºC. The extreme maximum and minimum temperatures measured were 43.5ºC and -3.8ºC, respectively. The mean daily maximum temperature for January (summer) is 33.5ºC and for July (winter) 24.9ºC. The mean daily minimum for January is 21.3ºC and for July 6.9ºC. Frost may occur from June to August. Evaporation from free water surfaces is in excess of 2 500 mm per year over most of the area (Barker et al., 2006). Cloud cover is the highest during December, January and February (summer), with July, August and September (Spring) the sunniest months. The relative percentage air humidity at 08:00 is the highest from February to July, resulting in dew precipitation in the cool autumn (March-April) mornings (Van Der Walt, 2008a).

Air temperatures across the basin show a marked seasonal cycle, with the highest temperatures recorded during the early summer months and lowest temperatures during the cool, dry winter months. Rainfall is also highly seasonal, falling predominantly as intense convective thunderstorms during the warmer summer months (Rabie & Day, 1992). The severe droughts observed during the early 1990s and the exceptional floods during 2000 in the Limpopo Valley illustrate the extreme

variability of rainfall and runoff in the basin. This variation has significant effects on aquifer recharge (Van Der Walt, 2008b).

3.1.3.2 Vhembe District

The climate is semi-arid with a mean annual rainfall ranging from 350 to 400 mm. Rainfall is highly variable and usually falls during the summer months. Extended periods of below average rainfall occur. Temperatures sometimes rise to 45°C in summer. The winters are mild and frost very seldom occurs (Budlender & Latsky, 1991).

The mean daily temperature ranges from 10°C in June to 29°C in October/November. There are cold winter nights in June and July, with hot (>30°C) afternoons in summer (Budlender & Latsky, 1991). The average potential means annual evaporation ranges between 1800 mm and 2400 mm in the northeast. The highest evaporation occurs from October to January, and the lowest in June (Van Der Walt, 2008a). At the Albasini Dam south of the Soutpansberg mountain, evaporation rates vary between 1000 and 1500 mm/a, only occasionally exceeding the latter amount during drought periods. In contrast, north of the Soutpansberg, evaporation rates measured at the Nzhelele, Luphephe and Mutshedzi Dams vary between 1500 and 2000 mm/a with up to 2500 mm/a being experienced during major droughts as in 1991/92. Drought extended periods of below average rainfall is common (Cock, 1991).

The mean annual rainfall is approximately 348 mm per annum. The mean annual rainfall for the Goeree weather station, situated at 22° 15' S; 29° 40' E; 614 m a.s.l. is 278 mm, with a potential minimum of 154 mm during dry years and a potential maximum of 451 mm per annum during wet years (Thomas and Christen, 2002). The rainy season is predominantly from November to March when about 83% of the total annual rainfall occurs. The driest months are from May to September, when less than 7 mm of rain per month is recorded (Budlender & Latsky, 1991). The maximum rainfall measured at the Macauville rainfall station over a 24 hour period was 112 mm in March. The highest monthly maximum rainfall recorded was 212 mm in December (Van Der Walt, 2008b).

Water is one of the most critical environmental factors playing a role in the ecology of the region and determines the land use potential and utilisation options of these arid areas (Fouche, 2005). In the Vhembe area the environment is semi-arid. Rainfall is strongly seasonal, occurring mainly during summer (October to March), with peak rainfall during December and February (Van Der Walt, 2008c). The rainfall type is orographic with convectional thunderstorms; summer moist South East trade winds along the Limpopo Valley from the Indian Ocean during the wet season (October to March) when the Inter Tropical Convergence Zone is located over northern Zimbabwe (Van Der Walt, 2008c).

3.1.4 Ethnography

3.1.4.1 Demography

The Vhembe District is one of the five Districts in Limpopo Province of South Africa. It is the northernmost district of the country and shares its northern border with the Beitbridge District in Matabeleland South, Zimbabwe. Vhembe consist of all territories that were part of the former Venda Homelands (Bantustan). However, two districts of the former Tsonga homeland of Gazankulu, in particular, Hlanganani and Malamulele were also incorporated into Vhembe, hence the ethnic diversity of the district. According to Census (2011a), 800 000 of Vhembe residents speak Venda as their mother language, 400 000 speak Tsonga, and 27 000 speak Northern Sotho. Table 3.1 indicates the gender composition of the Vhembe District. The table shows that females are fewer less than males in the area (Census, 2011a).

Table 3.1 Gender population in Vhembe District.

Gender	Population	Percentage
Male	704 559	54.4
Female	590 509	45.6

According to Census (2011a), the number of households in the Thulamela Local Municipality are 156 594, in Makhado 134 889, Musina 20 042, and Mutale 23 751.

The Thulamela Local Municipality has the highest number of households, followed by the Makhado, Musina and Mutale municipalities (Census, 2011b) (Figure 3.4).

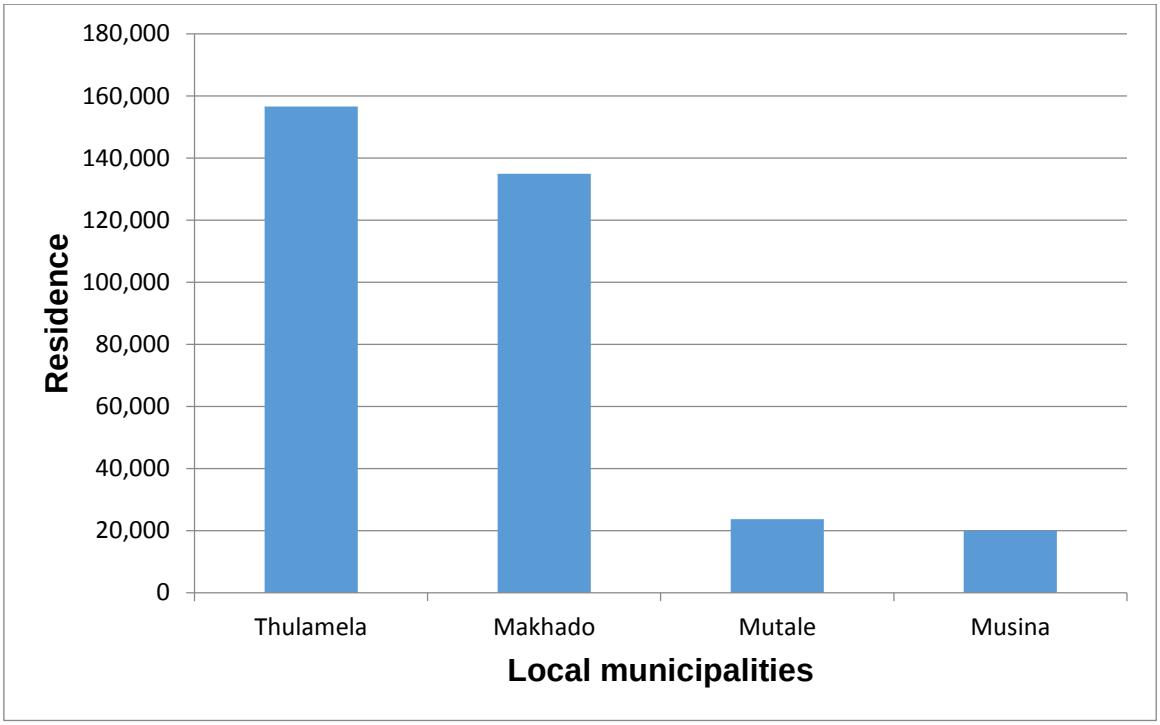

Figure 3.4 Demographical data of sub-district populations (Census, 2011b).

Table 3.2 shows that 3.3% is people of age 19 and younger are household heads, people of age 20-24 is 4.6%, people aged 25-39 is 19%, people of 40-64 is 57%, and people of 65 and above is 19.0% (Census, 2011b). The difference of birth and death is 18 416, which is the total number of population growth. The number of birth and death in the district hospitals; however, do not necessarily depicts number of district population since some of the people might be from other districts and provinces in South Africa or other countries (Bradshaw et al., 2012).

Table 3.2 Age of household heads (Census, 2011b).

19 years and younger	20-24 years	25-39 years	40-64 years	65 years old
3.3%	4.6%	19.8%	57.8%	19.0%

Table 3.3 shows the social determinants of health in Vhembe District. There is 18.6% unemployment in Vhembe, and 17.7% of traditional and informal dwelling, shacks and squatter settlement. There are also 14.9% of households without access to improved sanitation that can lead people to unhealthy life. There are also 8.0% of households who are without access to piped water, 20.9% of households don't have access to electricity, and 85.75% of households are without refuse removal by local authority/private company in Vhembe District (Census, 2011a).

The district is largely rural, and households are mostly headed by females. Males migrate to urban areas to find work. The area is faced with infrastructural backlogs for water, sanitation and electricity which impact negatively on the health of these communities. The poor road infrastructure influences reasonable response times for vehicles such as ambulances, mobile clinics and police vehicles (Bradshaw et al., 2012).

Table 3.3 Social determinants of health in Vhembe District (Census, 2011a).

Indicator for Basic Services	Percentage
Unemployed	18.6%
Traditional and informal dwelling, shacks and squatter settlement	17.7%
Households without access to improved sanitation	14.9%
Households without access to piped water	8.0%
Households without access to electricity for lighting	20.9%
Households without refuse removal by local authority/private company	85.7%

3.1.4.2 Study population

3.1.4.2.1 Historical evidence

The history of the Vhavenda began with their migration from central Africa southwards to South Africa, where by the 9th century they had established the Mapungubwe Kingdom (Willgoose & Riley, 1994). King Shiriyadenga was the first king of Mapungubwe and the Venda, who subsequently united to form the Vhavgona/Vhavenda (Letsoalo, 1987). King Shiriyadenga was succeeded by a vast dynasty of chiefs, namely Mudzanani, KhuruKhuru Nembilwi, Netshivhale, Netshisaulu, Makahne, Mutele, Nethengwe, Netshamanyatsha and Nevhutanda (Cross & Rutsch, 1995). However, the migration of many other people in the 13th century implied a decline of the Vhavenda traditional authorities as they were forcibly overpowered (Budlender & Latsky, 1991).

According to Benso (1979), from the 18th century, the presence of other people, specifically Europeans, directly threatened the traditional and ancestral legacy of the Vhavenda. Much of their land was seized through a series of violent confrontations, and transformed into land for farming (Letsoalo, 1987). When the constitution of the Union of South Africa was established in 1910, European colonizers replaced traditional local authorities in the area with white governors, as was reflective of the all-white union government (Cross & Rutsch, 1995). A major change in the life or the Vhavenda people was the introduction of the Land Act in 1913, which established that 13% of the land would be reserved for the majority native Africans (those reserves later came to be known as Bantustans or Homelands), whilst the remaining 87% was for the benefit of the white minority (Land Research Group, 1995). The election of the Nationalist government led by D. F. Malan in the 1948 further consolidated the division of land, benefits and rights along racial lines (Land Type Survey Staff, 1988).

Apartheid progressed with fierce racial policy; namely the Group Areas Act of 1951 reserved the majority of land for whites, and relocated non-whites to reserves. The Bantu Homelands Act in the same year declared the reserves as independent nations (Delius, 1983). This decree stripped blacks of their citizenship, and forced them to become residents in their homelands. The Vhavenda people were one such group who used traditional chiefs to govern their designated territory (Glazweski et

al., 1991). The Group Areas Act ensured blacks required a passport to enter the rest of the country, or were only allowed limited access into the country as menial labourers for whites (McIntosh, 1995). This arrangement meant many of those who remained in the homelands were very much isolated from the everyday laws of the apartheid government (Cock, 1991).

3.1.4.2.2 Cultural setting

3.1.4.2.2.1 Social and cultural life

The culture of the Vhavenda is fascinating; steeped in mysticism and vivid legend. One pervading theme is that water is always an important concern in hot, seasonal climates, but a resource in which Venda is unusually abundant (Blacking, 2001). Lakes, rivers, waterfalls and lush forests all form sacred sites, while legends abound of *zwidutwane*, or water sprits, and snakes who live at the bottom of dark pools or lakes (Whitaker et al., 2003). Many Vhavenda ceremonies and rituals still hold great importance, with the most famous being the python, or *domba*, dance performed by young female initiates (Kirkaldy, 2002). Naked, but for jewellery and a small piece of cloth around their waists, the teenage girls form a long chain, swaying and shuffling as the "snake" winds around a fire to the sound of a beating drum another sacred object in Venda often for hours on end (Ritchken, 1995). The chances of seeing it performed are limited. The genuine thing is most common during spring. Heritage day around the end of August or the beginning of September is a good time for celebrations (Hellman & Ramsey, 2004).

The Vhavenda share many cultural characteristics with East African people. These include a ban on the consumption of pork, extensive male initiation rituals, which begin with the *Thondo*, followed by the *morundu* initiation school where circumcision occurs (Van De Wiel & Gaigher, 2005). This ritual aims to train men in the ways of self-discipline, endurance, and proper tribal customs and conduct. The Vhavenda also engage in female initiation, which undergoes three phases; *vhusha*, *tshikanda*, and the *domba* (Acocks, 1988). This initiation process plays out through the course of the females' lives, the first beginning shortly after their first menstruation, and the last two before marriage. These rituals are meant to prepare women for their roles as wives and mothers (Nemudzivhadi, 1998).

3.1.4.2.2.2 Venda belief system

The Venda culture is built on a vibrant mythical belief system, which is reflected in their artistic style (Van De Wiel & Gaigher, 2005). Water is an important theme to the Venda and there are many sacred sites within their region where the Venda conjure up their ancestral spirits (Van Nieuwenhuizen, 1984). They believe *zwidutwane* (water spirits) live at the bottom of waterfalls. These spiritual beings are only half-visible; they only have one eye, one leg, and one arm. One half can be seen in this world and the other half in the spirit world. The Venda would take offerings of food to them because the *zwidutwane* cannot grow things underwater (Behr, 1988).

One of the most sacred sites of the Venda is Lake Fundudzi. It is said that one can sometimes hear the *tshikona* song although no one appears to be there (Blacking, 2001).

3.1.4.3 Language

Venda is also known as Luvenda or Tshivenda, which is originated from the Bantu language. Interestingly, it is also related to Niger and Congo languages. It is one of the 11 official South African languages (Wessmann, 1988). Approximately 650 000 Tshivenda speakers live in the northern parts of South Africa's Limpopo Province. Those that speak Tshivenda have a royal family line, and adhere to strict traditions that relate to this connection (Van De Wiel & Gaigher, 2005).

Some of the people that reside in Venda are from different places in South Africa, from Zimbabwe, Botswana and Namibia. The dominant people who speak Venda are those from the Vhembe District. The district is a complex area where people from neighbouring countries migrate to and end up speaking Venda language, whilewhere some still use their birth language. Other languages (Figure 3.5) spoken in Venda are Tsonga, Sepedi, Sesotho, Afrikaans, and other foreign languages, such as English (Chidley, 1985).

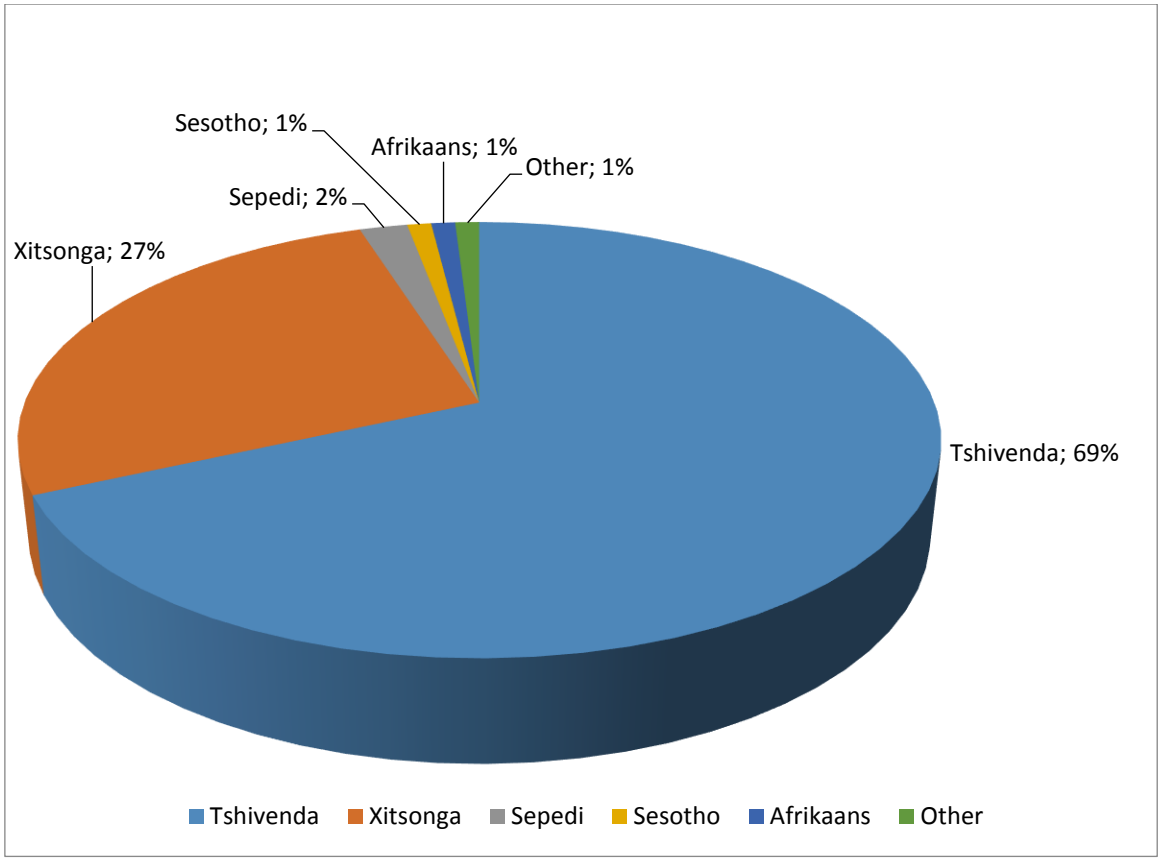

Figure 3.5 The main languages spoken in Venda (Rabie & Fuggle, 1992).

3.1.4.4 Social setting

3.1.4.4.1 The livelihood of the community

The community depends on a subsistence economy. Here people rely on the natural vegetation and springs for livestock feeding. The traditional subsistence economy is dependent on rainfall (Rabie & Fuggle, 1992). Gathering of vegetable and fishing all depend on the availability of rain. The economy is also dependent on paid labour and, to a lesser degree, on ploughing and livestock. Each individual, grouped or single parent household is given a small plot of about 0.5 hectare. Pieces of land are dispensed by the headman (chief) of the village (Hellman & Ramsey, 2004).

People who originate from other communities (outside Mutale and Vhembe Municipalities) pay a tribute of R1 000 in cash. In the past it was in the form of livestock, usually one head of cattle. In 2004 there were no community gardens (Hellman & Ramsey, 2004), the situation might have changed in the meantime. Agricultural fields are dispensed by the chief (Rabie & Day, 1992).

According to the National Forest Act, 1998 (Act No. 84 of 1998), there is a minority of households that plough every year despite the poor harvests. The most common rain-fed crops grown in the community are; maize, peanuts, groundnuts and beans (Hellman & Ramsey, 2004). Dry season and crops drought resistant cereals such as sorghum and a variety of millet are cultivated. Cropping pattern is by tilling and sowing in the fields, which takes place seasonally depending on the availability of rain. Seeds are scattered in the fields according to extensive indigenous knowledge of the type of soil and crops that should be planted (Rabie & Day, 1992).

Vhavenda are semi-pastoralists and practice animal husbandry and agriculture. A person's livestock represents his capital and is valued as a medium of exchange. Apart from meat, cattle and goats also provide milk (sheep milk is used only for medicinal purposes). Plumes from the tails of cattle are used as a framework for bangles and ankles for womenfolk. Stock farming, of both cattle and goats, is widespread with no more than one quarter of households keeping livestock. Most cattle herds are 5 to 20 head, with similar sizes for goats (Chidley, 1985). All land within the *Tshiombo* Valley is officially classified as communal land, and under the control of the tribal authorities (Acocks, 1988). The governance for Vhembe district is both tribal and elected local government. The district relies on subsistence farming which is mostly dependent on rain. The district has very high unemployment rate of almost 24%, the deprivation index is high at 3.6. According to the (Land Type Survey Staff, 1988), 12% of households live with an annual income below R4 800 or less than R400 per month (Cock, 1991). The number of livestock has been dwindling. Many people are discouraged from raising livestock due to unpredictable rainfall and the resulting lack of fodder and water for their livestock. For alternative income many people engage in cash labour in the neighbouring towns of Thohoyandou, Messina and Masisi (Acocks, 1988). Others are also teachers, nurses, and police officers. Villages are settled within reach of municipal services such as water, sanitation, electricity and waste removal (Chidley, 1985). Through population increases some villages have expanded in the Mutale Municipality so much that ploughed fields have been turned into residential areas (Mucina & Rutherford, 2006). Labour migration from Sagole is mainly to Messina, Tshipise and the Tshikondeni mine on week days, with smaller numbers going to Thohoyandou (Hellman & Ramsey, 2004).

Agricultural potential land adjacent to the Mutale River is well-suited to the production of crops under irrigation, but the climatic conditions are also capable of supporting dry land agriculture and livestock farming (Acocks, 1988). Sizeable quantities of crops and fruits such as tomatoes, avocados, bananas, mangoes, litchis and nuts are sold to local hawkers and markets and to processing industries in Johannesburg (SALDRU, 1994). The proportion of produce sold is low, as dry land cropping only supplements household incomes, and rarely forms a principal source of livelihood (Land Research Group, 1995).

3.2 RESEARCH METHODOLOGY

3.2.1 Population and sample

The study population was Vhavenda residing in the Sagole community, Mutale Municipality in the Vhembe District. Here baobab trees are most prevalent. The sample size was 40 local community members. Non-random sampling was used to select the study participants. Convenience sampling was used to select men and women aged 30 years and above to constitute a study sample. Two employees in the Big Tree Tourism Centre formed part of the study sample. Traditional health practitioners were also recruited through convenience sampling to participate in the study. Participation in the study was limited to the practitioners who are resident in the Sagole community.

3.2.2 Research design

The study is qualitative, exploratory enquiry into the cultural value and preservation of *Adansonia digitata*. In qualitative research, the information obtained from participants is not expressed in numerical form. William (1998) defined qualitative research as a system of inquiry that seeks to build a holistic, largely narrative, description to inform the researcher's understanding of a social or cultural phenomenon.

3.2.3 Data collection and analysis methods

3.2.3.1 In-depth interviews

The in-depth interviews were used to provide detailed information about the cultural value and preservation status of baobab trees. The researcher interacted with the respondents throughout the study to collect data. This type of interaction was used for the researcher to achieve the same level of knowledge and understanding as the study respondent. The interviews involved face-to-face interaction between an interviewer and interviewees, to build the kind of intimacy that is common for mutual self-disclosure. The interviews were conducted by the researcher in the interviewees' households. The interactions were tape-recorded for best analysis of data transcripts.

3.2.3.2 Data analysis

According to Robson (1994), data analysis is the process of finding the right data to answer the question, understanding the processes underlying the data, discovering the important patterns in the data, and then communicating the results to have the biggest possible impact. Content analysis was used to analyse data. The researcher was able to identify availability of certain words and phrases, and further develop themes and sub-themes. This method of analysis was helpful in the analysis of data as it quantifies and analyses the presence, meaning and relation of words and concepts, and then make differences. This means that data were explored under common themes and then compiled into units of meaning of full codes. Later these codes were the basis for further analysis.

CHAPTER 4

STUDY RESULTS

4.1 DEMOGRAPHIC INFORMATION OF PARTICIPANTS

The study interviewed different gender in the Sagole community. Figure 4.1 indicate that the females interviewed were slightly more (55%) than interviewed males (45%).

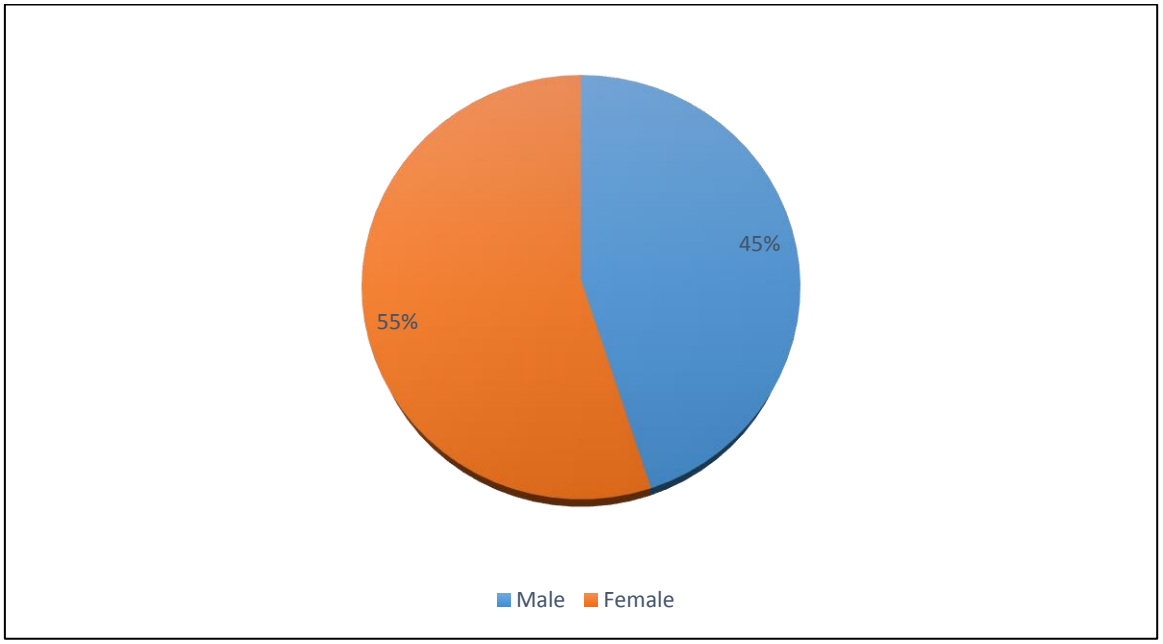

Figure 4.1 Gender of participants.

Figure 4.2 indicates that 6 different age groups were interviewed in Sagole community about the ethnobotanical study of cultural value and preservation status of *A. digitata* in the Sagole community. The results indicate that older participants, those older than 60 years (32%), were the most targeted group in the study, as it was noted that they are the most knowledgeable about culture and ethnobotanical use of the baobab. However, middle aged (46-60, 38%) and people under 25 years (5%) were interviewed in order to determine their level of knowledge about the cultural value and use of *A.digitata*, seeing that they are the ones most exposed to modern trends.

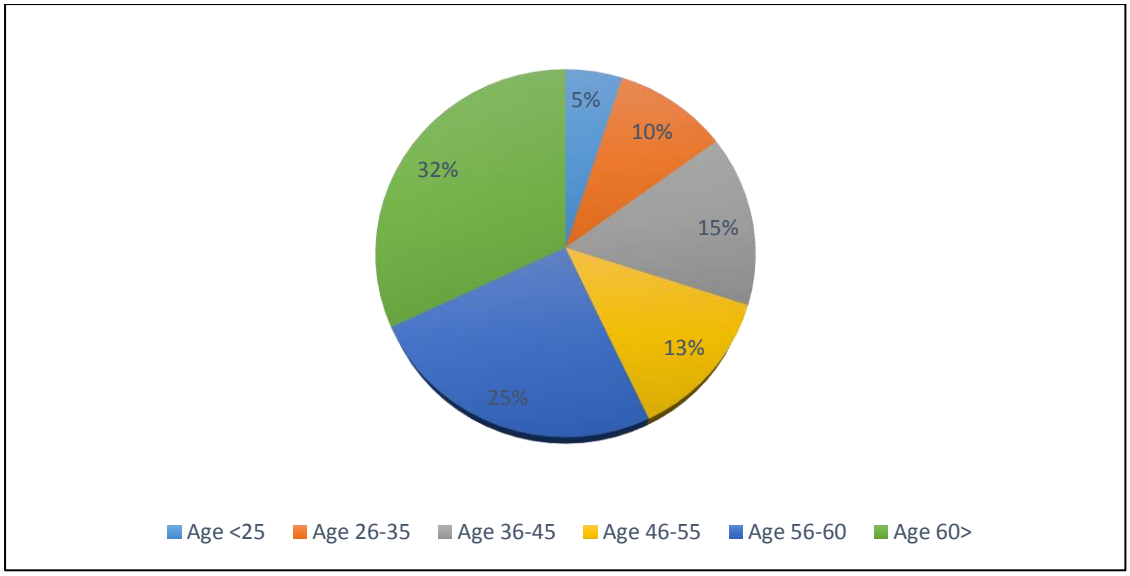

Figure 4.2 Age of participants.

Figure 4.3 indicates that the participants were from different educational levels. Most of the participants that were selected for interview had a primary level of education (37%). However, participants who had secondary education constituted 26% of those interviewed, while participants with no formal education formed 22% of the interviewee cohort. In the study it was found that participants with a tertiary education in the community were not many (15%).

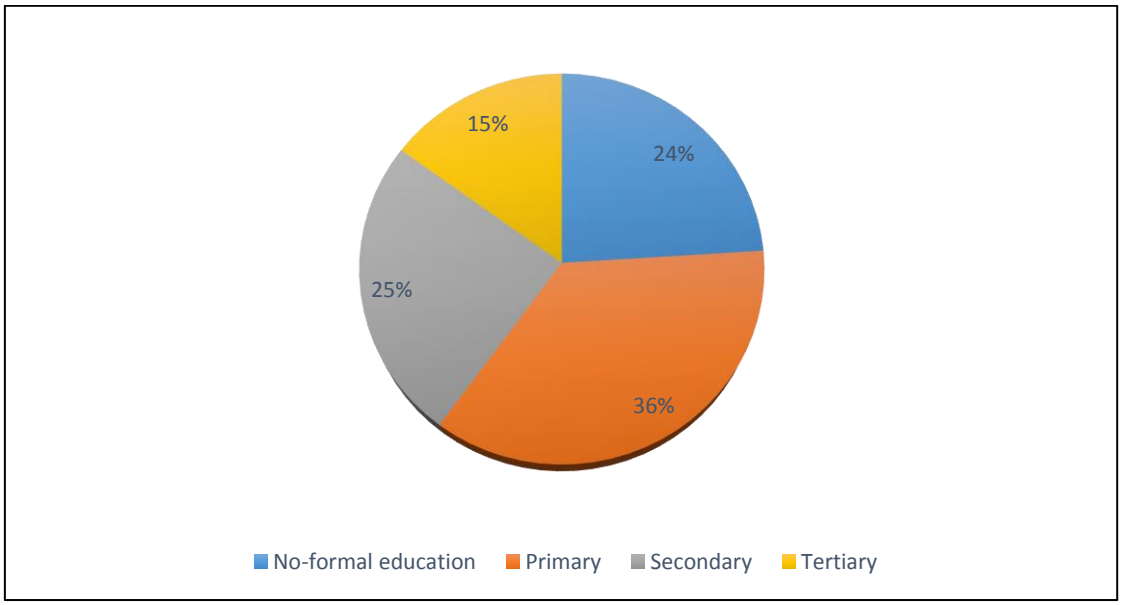

Figure 4.3 Participant's educational standard.

Figure 4.4 indicates the occupation of the participants in the Sagole community. Most (55%) of the participants in the study are unemployed, while 30% of the participants are employed in the formal sector. However, a low percentage (15%) of interviewees is self-employed.

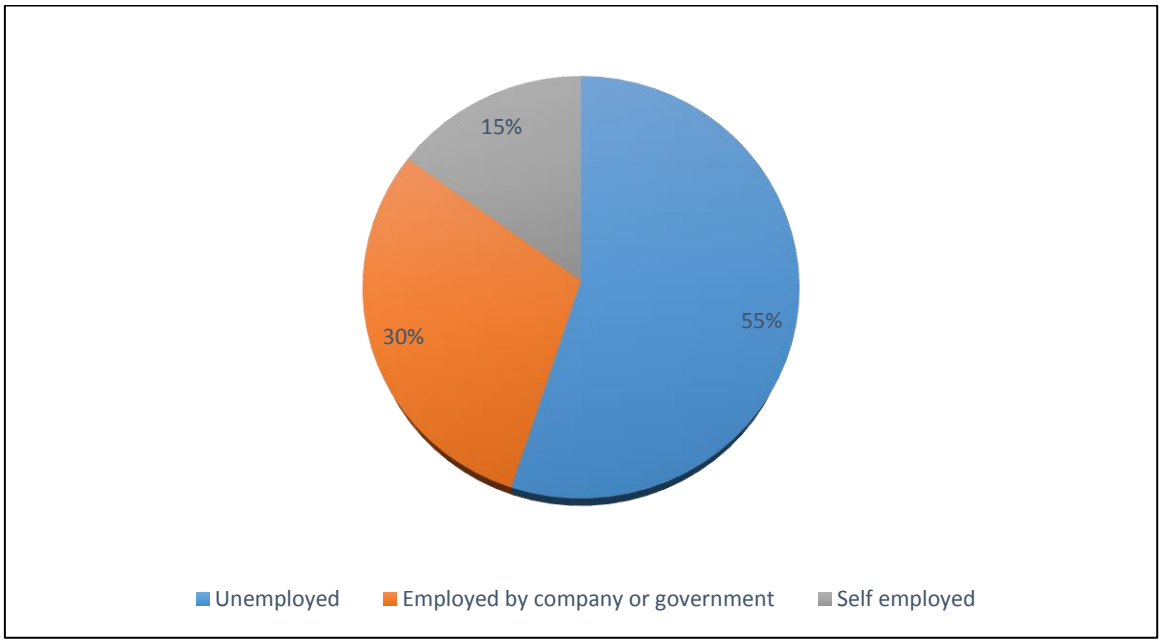

Figure 4.4 Participant's occupation.

Figure 4.5 indicates the income of the participants in the community. The results indicate that the largest percentage (35%) of interviewees earned between R 1000 and R 2000 per month in the community (Figure 4.5). Very few (18%) earned more than R 5000 per month. Ten percent earned less than R 1000 per month.

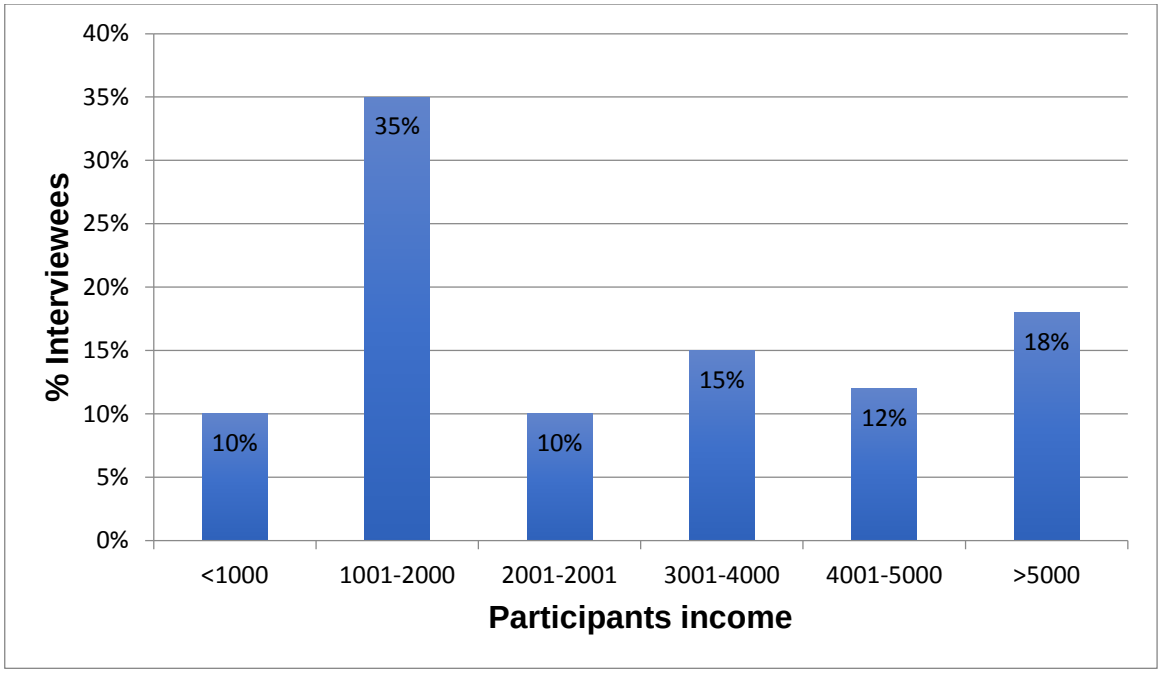

Figure 4.5 Participants income per month.

Figure 4.6 indicates the number of members per household. The majority (42%) of households had between 4 and 6 members. This was followed by 25% of households who had 7-9 members. Eighteen percent of households contained more than 10 members, while 15% had between 1 and 3 members.

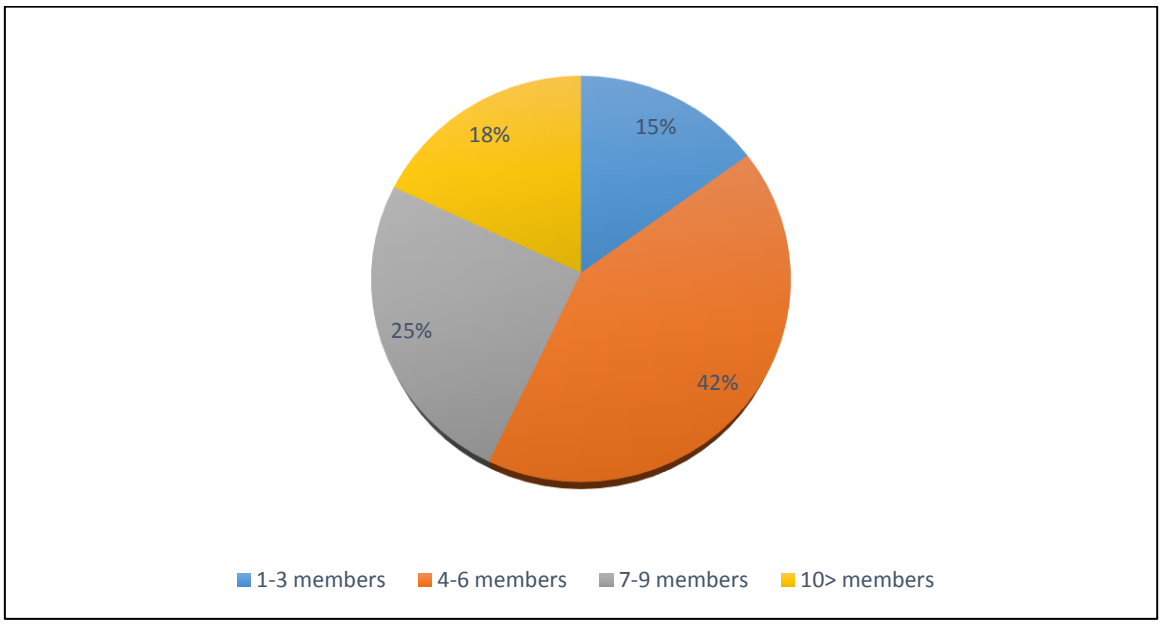

Figure 4.6 Number of members per household.

The study interviewed participants about how long they have lived in the Sagole community in order to understand whether participants are still new or are being the rooted members of the community. This would give credence to the data obtained. Figure 4.7 indicates that the vast majority (60%) of those interviewed lived more than 20 years in the community. Twenty percent lived between 16 and 20 years in Sagole. Only a small minority (8%) resided less than 10 years in the community.

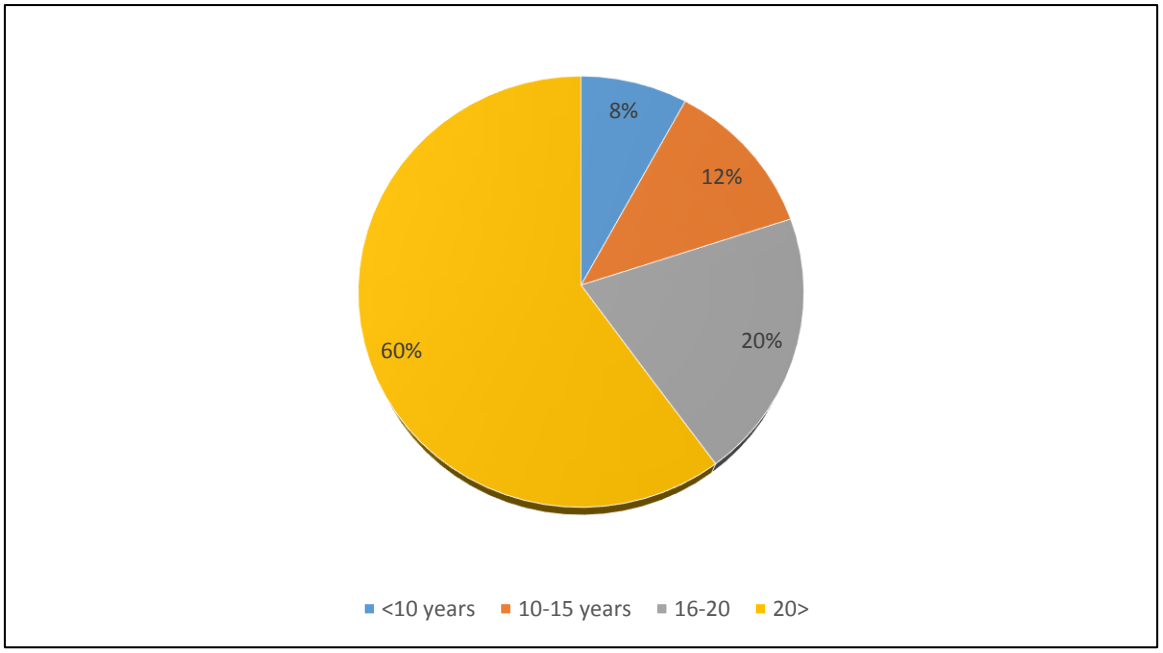

Figure 4.7 Numbers of years' participants lived in the community.

Figure 4.8 indicates the percentages of the interviewed participants who noted that traditional culture was still strongly practiced (or not) in Sagole. Results show that a significant majority (80%) of participants believe that the traditional culture of the community is not strong, and that people in the community no longer value their culture.

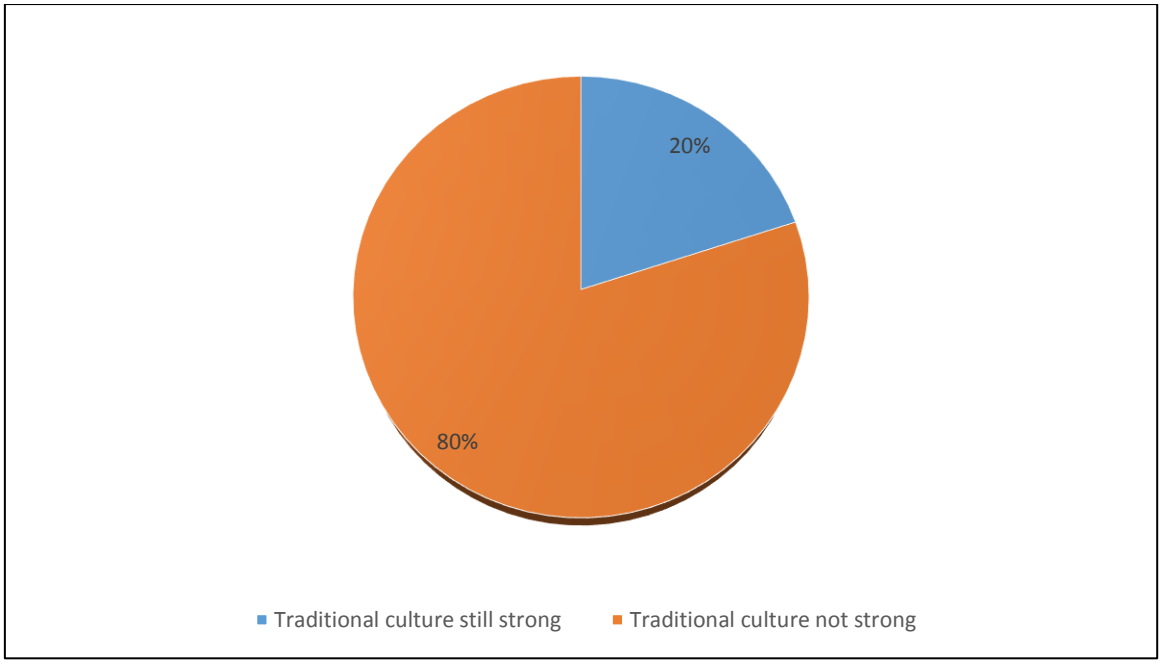

Figure 4.8 Traditional culture of the community.

4.2 CULTURAL VALUE

4.2.1 Folk taxonomy

4.2.1.1 Common names and their meaning

Nearly all (99%) the participants know the common name for *A. digitata* as *muvhuyu* in Tshivenda and baobab in English, and its meaning; the big tree.

4.2.2 Transfer of information

4.2.2.1 Ancient stories

Forty five percent of respondents are aware of ancient stories associated with *A. digitata*. In this regard, community elders are the most knowledgeable section of the population with respect to cultural stories. It is predominantly these elders that inform the younger generations regarding different culturally-bound stories related to the baobab tree (Figure 4.9). Typical stories that elders tell, are for example that during ancient time's baobab trees were used to hide during wars, and also that people used baobab boles to store water. Thirty percent of the younger generation knew these two stories. In another example, the elder would tell that during ancient times people were venerating trees as their God. Fifty percent of the younger generation knew this story. Another typical story related to the fact that during ancient times,

Bushmen were using baobab trees as “caves” during the night. Forty percent of the younger generation knew this story.

Figure 4.9 Gathering of people to share information. (www.acronymfinder.com/Transfer-Of-Information-(training-session)-(TOI)

4.2.2.2 Value of ancient stories

Sixty percent of the informants believed that the value of ancient stories relating to *A. digitata* is to preserve culture, while 25% believed the stories teach valuable life lessons (Figure 4.10). In contrast 15% believed that their value lies in entertainment.

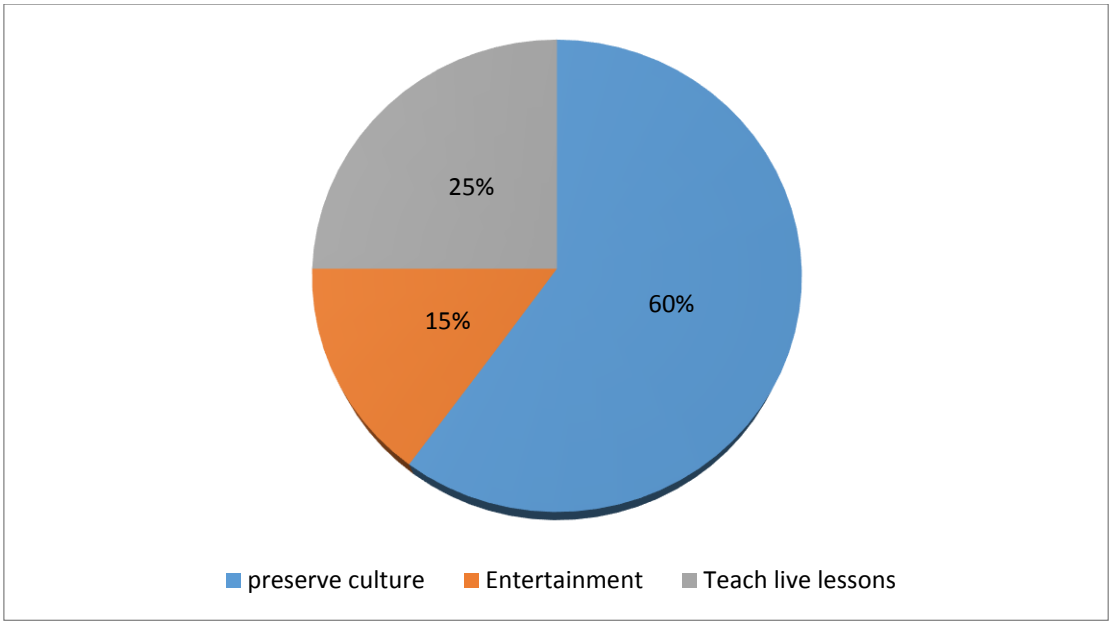

Figure 4.10 Value of ancient stories related to *Adansonia digitata*.

4.2.3 Cultural taboos

4.2.3.1 Taboos related to *Adansonia digitata*

Only 30% of the informants knew about taboos that relate to *A. digitata*. Those that knew about the taboos indicated, for example, that if a pregnant woman consumes the fruit of the baobab she will suffer during childbirth. The foetus will grow abnormally and the mother will have difficulties during child-birth.

4.2.3.2 Value of taboos

Respondents who knew the taboos associated with *A. digitata* believed that the value of taboos is to preserve culture (60%), while 25% of respondents believed that the value of taboo is to teach life lessons, and 15% those believe this value of taboos is for entertainment (Figure 4.11).

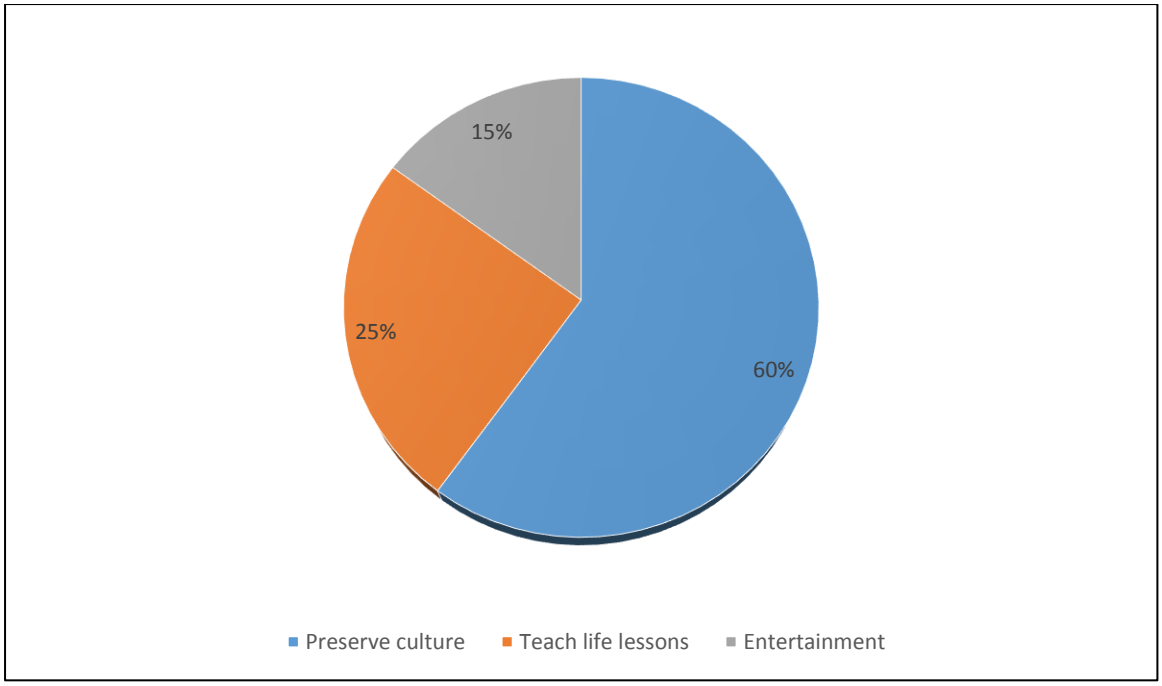

Figure 4.11 Value of taboos related to *Adansonia digitata*.

4.2.3.3 Transgression of taboos

The study found that the village head (Chief) is not well informed about cultural taboos related to *A. digitata.* Consequently, it was noted that when an individual transgress a taboo related to *A. digitata* he/she will not suffer any consequences from the traditional leaders or the village head of the community. Only 25% of the participants knew about any consequences related to the transgression of a taboo related to baobab. These people indicated that people who transgress taboos related to the baobab will encounter bad luck, and women will suffer during child birth.

4.2.3.4 Institutional practice of taboos

In Sagole community institutional/cultural rules and regulations apply to *A. digitata*. Although community members were aware of these rules and regulations, some do transgress them with impunity. This is notwithstanding the fact that traditional leaders (mostly elders) in the community know about taboos related to this species, and have transmitted the knowledge to younger community members.

4.3 CULTURAL USE

4.3.1 Extent of use

The majority of respondents in the Sagole community utilise *A. digitata* for a variety of uses. People use *A. digitata* mostly for food (55%) and medicine (35%). Ten percent of community members use it for a source of fibre used in making ropes and washing baskets. There was no evidence of the use of the species for ritual purposes. All of the respondents were aware of the cultural use of baobab tree. They were aware of the values of the different plant parts such as the leaves, bark and fruit.

4.3.2 Medicine

The respondents (35%) use different baobab materials for medicine to cure various ailments. The respondents indicated that they harvest roots, bark and leaves to make decoctions. These decoctions are used to treat ailments such as stomach-ache (30%), skin problems (20%), haemophilia (nose bleeding) (18%), diarrhoea (15%), fever (12%) and malaria (5%). This ethno-medicinal knowledge resides mainly with respondents older than 55 years.

The bark, roots and leaves were identified as sources of medicine to cure existing disease. Eighty five percent of respondents indicated the following processes. A decoction of the roots is orally administered to tread such as fever. Fresh baobab leaves provide an edible vegetable similar to spinach which is also used medicinally to treat kidney and bladder disease, asthma, insect bites, and several other maladies. Perhaps the most common medicinal use of baobab fruit pulp in traditional medicine is to treat diarrhoea.

4.3.3 Food

Fifty percent of the respondents know that *A. digitata* has value as a food source. The material used mostly for domestic food is leaves (35%), used for making cabbage and spinach. Fruits as a source of food were identified by all respondents. The people use fruit pulp to make an indigenous cooking soda, which they utilize as a condiment in vegetables and gruels (Figure 4.12). The seed are used to make oil and yoghurt, which are sold locally for income generation. The seeds are also used to make coffee. Participants furthermore grill baobab seeds to make oil.

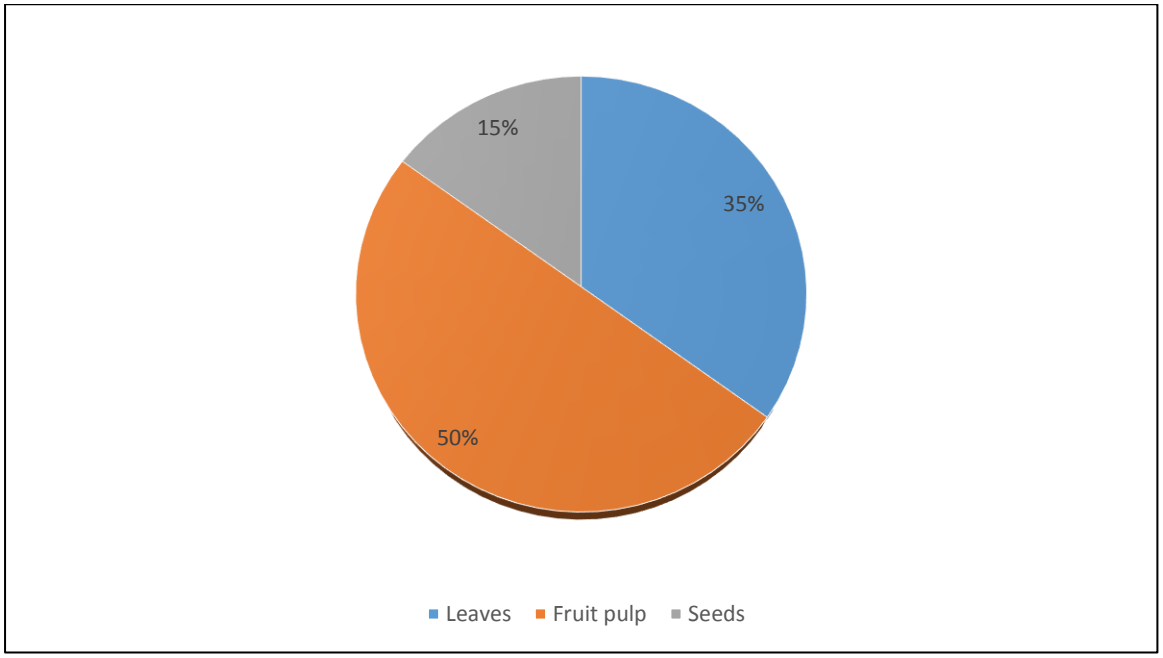

Figure 4.12 Plant parts harvested for domestic use.

4.3.4 Harvesting

Thirty five percent of the respondents indicated that they harvest bark for making traditional medicine, while 20% mentioned that they harvest roots for medicinal purposes, and fruits (45)% for food (Figure 4.13).

Participants identified various methods of harvesting baobab parts. The methods of harvesting the bark, leaves, roots and fruits are different. Respondents use stones and sticks to harvest the fruits, and axes to harvest the roots and bark. The bark is

harvested by cutting from the states of the matured species. Only a hand-full of bark is harvested. A hand-full of the leaves is collected for medicinal purpose, and a reasonable number, usually two 5 kg is collected as vegetative material. Only the desired parts (the tender leaves) are gathered, leaving the tree to reach maturity. The roots are harvested by digging and collected a hand-full and replacing the soil after harvesting. The respondents stated that everyone in the community is allowed to collect baobab fruits irrespective of gender. The fruits are collected from the ground after being shed. There is no taboo on striking the fruits down with a stick.

The harvesting methods are informed by cultural use of the harvested plant material. Traditional health practitioners asserted that the harvesting of sources of medicine is restricted to thin roots collected from opposite sides of the plant, after which soil is replaced.

Figure 4.13 Woman carrying harvested *Adansonia digitata* fruit. (www.independent.com/.../harvesting-baobab-tree-life)

4.4 PRESERVATION

4.4.1 Community members

Seventy percent of respondents indicated that they protect baobab trees, because it is their heritage. This is done by not allowing people to kill them via over harvesting of the leaves, roots or bark. All participants were aware of the role of the local chief in the management of the baobab species in the community. Management of the use of baobab trees is also exercised to a certain degree by the chief-in-council. Customary laws are passed when the need arises to protect and preserve endangered species that are culturally and economically important. The chief appointed rangers to monitor the correct harvesting of baobab trees so as to avoid damage from the harvesters of roots and bark. The chief also encourages people to protect these trees by becoming the eyes and ears of the community, guarding against interlopers. Harvesters of bark and roots in the community are being warned not to excessively harvest them, and also not harvest continuously from the same tree because it will lead to the death of the trees. The study found that young people are ill-informed about preservation of this tree species. None of the respondents knew that *A. digitata* is listed as an endangered species in the Red Data List.

4.4.2 State institutions

The provincial Department of Environmental Affairs visit the Sagole community regularly to monitor the status of baobab trees. The department protect these species because it is seen as an iconic symbol of the Limpopo Province. The environmental officers know that this tree species is Red Data-listed.

CHAPTER 5

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 CULTURAL VALUE

5.1.1 Folk taxonomy

5.1.1.1 Common names and their meaning

The study found that nearly all interviewed people (of all ages) in the Sagole community know the common name of *A. digitata* and its meaning. From the literature it is clear that when an entity, in this case *A. digitata*, plays a significant role in the community, either culturally or ethnobotanically, it will be well-known. This is borne out in studies such as Kakati (2012) for Madagascar where *A. digitata* is a common tree that is ingrained into the culture of various communities, and where nearly all Madagascans know its vernacular name and meaning. In contrast, Brady (2011) found that only old people knew this tree species vernacular name and meaning in Tanzania. Here this majestic tree plays a very minor role in the lives of communities. It thus stands clear that the more local communities know about this tree, the easier it would be to implement conservation management plans.

5.1.2 Transfer of information

5.1.2.1 Ancient stories

This study found that most respondents, especially the younger generations, are not well informed about cultural ancient stories that relate to the baobab. This phenomenon is not unique, as Zimmermann (2010) found a similar trend Zambia, which is in contrast to what Bobo and Weladji (2011) found in Madagascar, where most people were highly aware of ancient stories focussing on the baobab. Thus it is clear that in societies where a traditional lifestyle is still evident and storytelling is still a strong cultural occurrence, that transfer of information between the old and new generation would take place. Our results are most probably the result of a society in transition between an old traditional lifestyle (older generation who know about ancient stories) and a modern western-orientated lifestyle (younger generation who is not that informed about culturally-bound stories). This leads to a disconnection between generations, in addition to the loss of valuable cultural identity and

ecological information. Possible remedial actions include, amongst other, the scientific documentation of the stories of baobab before they disappear.

5.1.2.2 Value of ancient stories

This study found that 60% of respondents believe that the value of ancient stories relating to *A. digitata* is to preserve culture. This group of respondents were mostly the elderly. The 25% of interviewees, who noted that ancient stories teach valuable life lessons, were again from the older generation. Thus it comes as no surprise that the 15% who believed that their value lies in entertainment, stemmed from the younger generation. This data is in line with Patrut et al. (2010) who found that it was generally the older people in Zambia who treasured ancient stories of the baobab for their cultural value. This same phenomenon was also found by Alves (2012) in Zimbabwe and Nigeria. The fact that it is generally the older generation, those older than 60 years, that are still the holders and ones who value ancient cultural stories, creates a long term cultural deficit in communities. These stories are very much culturally-bound and the value they bring to communities not only defines individuals, but societies in general. Their loss would inflict irreparable cultural damage to the fabric of traditional communities. Instituting culturally-bound story-telling and focussing on their value to society at a very young age, in for example day care centres would go a long way to arrest this alarming trend.

5.1.3 Cultural taboos

5.1.3.1 Taboos related to *Adansonia digitata*

Depending on how close a community is associated with a cultural icon, such as the baobab tree, will determine how well-informed they are in terms of culturally-bound taboos (Patrut et al., 2010). This is borne out in studies such as Pettigrew (2012) who found that various communities in Senegal still have a close and personal bond with the baobab tree. People in these communities were also very knowledgeable about taboos that relate to *A. digitata*. In contrast, Lange (2010) found that in Mali people are not well informed about the taboos related to *A. digitata*. Here communities did not form a close association with this iconic African tree.

Because the majority (70%) of the interviewed people in the Sagole community were not well-informed about the taboos related to *A. digitata*, it would seem that they,

especially the younger generation, do not have a close and personal bond with the baobab tree. Ultimately, this leads to a loss of cultural identity in a community if people are not knowledgeable about culturally-bound taboos. The fact that only 30% of people (generally older people) knew about a taboo related to the baobab, and then only knew about one taboo, namely that if a pregnant woman consumes the fruit of the baobab she will suffer during childbirth, and it will also affect the health of her unborn child, is alarming. This makes the scientific documentation of these taboos the more pressing. This study feeds into this initiative.

Furthermore, it is suggested that an awareness campaign in the Sagole community should be launched in educating people about taboos related to *A. digitata*. It could be easily done via the distribution of pamphlets to every household. A similar effort has paid dividends in the Ivory Coast. Here Alves (2012) found that the chief and knowledgeable old people organised an awareness campaign in educating people about cultural values and taboos related to species surrounding their villages, such as the Cinnamon and Camphor trees. In this awareness campaign they visited households where they met uninformed people. After this campaign people were very aware of cultural taboos and their values.

5.1.3.2 Value of taboos

If people are uninformed about taboos in their mist, then is not surprising that they will know little about its value (Osman, 2014). This is showed in studies such as those of Adewusi and Afolayan (2010) and Kakati and Doulo (2012). Pettigrew (2012) found that in the areas of Mali people are not well informed with the values of taboos related to *A. digitata*, but the again these people were not culturally close to this tree species. In contrast Galvin (2009) found that in Cameroon people are very knowledgeable of the value of taboos that relate to *A. digitata*, because these people's lives were intimately intertwined with this tree species. The fact that so few people (30% of Sagole interviewees) knew about taboos that relate to the baobab would indicate that they were not well informed on the value that taboos bring to society. This necessitates workshops by youth organisations that emphasize the life values taboos bring to individuals.

It is suggested that the chief and elders take the lead and organise cultural events in the Sagole community, with the aim of sharing culturally-bound information. Bobo and Weladji (2011) found that in Madagascar such events organised by elders occurred in order to educate uninformed people on the importance of cultural values, especially of cultural icons such as the baobab. Such events in the Sagole community will be very helpful to the people in the community, because the chief and the new generations are currently uninformed of cultural taboos related to *A. digitata.* It would be an opportunity to inform them about the taboos, and also to value those taboos as to preserve culture.

5.1.3.3 Transgression of taboos

If people are unaware about cultural taboos then it is very easy for them to unintentionally transgress them, a situation prevailing in Sagole. The fact that even the village head (Chief) is also not well informed about cultural taboos that relate to *A. digitata* is cause for alarm. Thus it comes as no surprise that it was noted that when an individual transgress a taboo related to *A. digitata* he/she will not suffer any consequences from those in charge of the community. All of this stems from the fact that, especially the younger generation, has lost their cultural and spiritual connection to this iconic African species. In the long term this could negatively affect the ethnobotanical use of this majestic tree.

Due to the decline in traditional values in Africa, the issue of transgressing taboos is all too common. Finding solutions for this phenomenon is not easy. However, Solovan et al. (2013) noted that in Cameroon when people transgressed taboos related to Almond trees, village heads played a decisive role. They were the ones implementing some form of punishment, usually in the form of paying fines, which resulted in the desired effect. In addition, there was also an active programme by older people to transfer information about taboos to the younger generations. This had the effect of younger people starting to believe in taboos and understand their value to the community. Thus if the authoritive structures (chiefs and elders) could be strengthened in the Sagole community together with active programmes of information transfer, and the implementation of some form of punishment, it could

lead to a situation where taboos and their values are recognised as essential for community cohesion and well-being.

5.1.3.4 Institutional practice of taboos

The study found that the majority of the interviewed people in the Sagole community were not well informed about rules and regulations that govern their interaction with the baobab. This also goes for the chief in the community. Lange (2010) found a similar trend in Mali, where people were also not well informed about institutional practices of taboos related to *A. digitata*. Here baobab trees do not play a major cultural role in the life of Malians. In Madagascar, where this tree is still regarded as a cultural icon, Heuzé et al. (2013), however, found that people were very educated about institutional practices of taboos that relate to the baobab. Thus it comes as no surprise that they mostly adhered to these rules and regulations. It is clear that significant education needs to be done in the Sagole community regarding the cultural and ecological value of this tree species to the people before a sense of attachment will develop. It is only when this attachment develops, that issues such as taboos and their values, which aids in the management and conservation of these trees, can be re-instituted and regulated.

In every community elders carry the responsibility to conserve the culture of their community, and to transfer information in heritage related issues to new generations in the community. In this regards, it is proposed that meetings be held with the current chief to inform him about the value of institutional practices of taboos. It is only once he is informed that workshops can be organised with community members. Through workshops cultural ownership can be taken by the Sagole community that would ultimately lead to the long term preservation of this iconic tree.

5.2 CULTURAL USE

5.2.1 Extent of use

The study found that the majority of respondents in the Sagole community use *A. digitata* for food, medicine, and non-food uses such as for making ropes and washing baskets. This is in line with Masola et al. (2009) who found a similar trend in Madagascar. In contrast, Ndabikunze et al. (2011) found that Aboriginal people in

Australia are not well informed on the possible uses of this tree species. Thus it clear that the use and extent of use very much correlate with the intimacy between people and tree.

The baobab is mainly used for food. The fruits, flowers, leaves, shoots, roots of seedlings and even the tree roots are edible. The leaves can be used either fresh, as a cooked vegetable, or dried and powdered as a functional ingredient (thickener) of soups and sauces. The flowers, shoots and roots of seedlings are eaten (Lange, 2010). The fruits, called monkey-bread, contain a white, mealy, acidic tasting nutritious flesh that can be eaten as a sweet, used to make refreshing drinks and ice-creams, or used to adulterate and curdle milk. The seeds yield an edible and pleasant tasting oil, and oil extraction results in an oil meal. The bark is used for fibre or as firewood. The roots, that are boiled and eaten in times of famine, contain tannins that provide a useful red dye (Galvin, 2009). In the Sahel, black bark and red bark baobabs are preferred for their fruits, while dark leaf types are mainly used as a leaf vegetable and grey bark types are used for fibre (Kier et al., 2005). Burning baobab fruit pulp produces an acrid smoke used to deter insects troublesome to livestock (Adewusi & Afolayan, 2010). Baobab trees provide fodder for animals: young leaves, fruits, seeds and the oil meal are consumed by livestock (Ndabikuze et al., 2011).

It is consequently clear that it is mostly the older people in the Sagole community that are well informed on the use of *A. digitata*. It is also these people who still have a close connection to their natural environment. In contrast, younger people in the Sagole community lack knowledge on the use of this majestic tree.

5.2.2 Medicine

The study found that 35% of respondents in the Sagole community use baobab material as traditional medicine to cure various ailments. In this regard, this tree species is very important, especially to older people. This figure of 35% is significantly lower than what other studies report. For example, Coe (2013) found in that in Zimbabwe 80% of people use the baobab for traditional medicine. Similarly, Masola et al. (2009) found that in Madagascar 85% use this tree species as a source

of medicine. However, Osman (2014) found that most people in Tanzania were very uninformed on the use of the baobab for medicine. It is thus clear that the use of this tree is not universal, and varies from culture to culture and from geographical area to geographical area. This absence of ethnomedicinal use and accompanied knowledge by middle aged and young people is in fact a blessing in disguise that arrests potential over use of this species. Furthermore, it is known that harvesting of baobab bark is very destructive due to the soft fibrous content of this stem, which could easily rot away. The same applies to the harvesting of its roots.

5.2.3 Food

The study found that 85% of respondents in the Sagole community uses of *A. digitata* for food. Respondents indicated that they cook the fresh leaves as a vegetable, or dried and crush them for later use. The leaves are rich in vitamin C, sugars, potassium tartrate, and calcium (Alves, 2012).

The study found that respondents in the Sagole community use the seeds of *A. digitata* for making yoghurt. The use of the seeds is a widespread phenomenon in the distribution area of *Adansonia digitata*. For example, Chadare et al. (2009) found that in Burkina Faso baobab seeds are eaten fresh, or may be dried and ground into a flour that can be added to soups and stews as a thickener. In Zimbabwe people use seeds to make a juice, and in Cameroon they roast it for use as a coffee substitute (Kakati & Doulo, 2012). Ndabikunze et al. (2011) furthermore found that baobab seed oil has a nearly perfect balance of palmitic acid, oleic and linoleic fatty acid, making it ideal for skin cosmetics. The widespread use of baobab seeds is not surprising, seeing that Solovan et al. (2013) found that all baobab food products, including the seeds, deliver exceptional nutrition, including extraordinary levels of fibre, electrolytes and antioxidants (Table 5.1). The powder of the baobab fruit is vitamin and mineral-packed (Pettigrew, 2012). Harvesting of its fruits and leaves for domestic food purposes is a non-destructive and sustainable practise that should be encouraged in the Sagole community.

Table 5.1 Nutritional analysis of baobab fruit pulp (mg/100g) (Randler, 2008).

Protein	2.3
Lipids	0.27
Soluble and insoluble Fibres	52.0
Carbohydrates	75.6
Ascorbic acid (Vitamin C)	280-300 (to compare: 51 in oranges)
Calcium	293 (to compare: 125 in milk)
Potassium	2.31
Phosphorus	96-118

5.2.4 Harvesting

Thirty five percent of the respondents harvest bark for medicine, while 20% indicated that they harvest roots for medicine and 45% harvest fruit for food. This multi-use of baobab is a well-known phenomenon in African and Madagascar, but percentages vary from region to region. For example, Brady (2011) found that in Burkina Faso 40% of people harvest baobab roots to make traditional medicine, while 25% indicated that they harvest bark for medicine, and 35% harvest the fruit for food. In contrast Heuzé et al. (2013) found that in Mali 75% of people harvest baobab fruit for food.

This study found that baobab trees are multi-used in the Sagole community. This makes this tree extremely valuable in primary health care for community members, via its use as a medicine and source of nutrients. The sustainable utilization of this species can only be encouraged in an area where there is a dire lack of medical institutions, and where high poverty levels impact negatively on the acquisition of high valued food sources.

5.3 PRESERVATION

5.3.1 Community members

The majority 70% of respondents in the Sagole community indicated that they protect baobab trees because they see it as heritage. The village heads also encourage people to protect baobab trees in the community. This is very similar to

what Masola et al. (2009) found in Zimbabwe and Madagascar, where 88% of people protect baobab trees. This protection can take many forms. For example, in Madagascar community members erect fences around trees to protect them from livestock grazing. Furthermore, limiting harvesting pressure and prohibiting destructive harvesting methods are also seen as a form of protection, as was observed in Sagole. Here the above-mentioned actions are supplemented by actions from the chief and traditional leaders who do not allow interlopers to harvest bark and roots for fear of killing these trees.

5.3.2 State institutions

The study found that the provincial Department of Environmental Affairs visit the Sagole community every few months to check on baobab trees. This shows that this majestic tree receives intensive monitoring from the provincial government in the community. Indeed, it is deemed so important that it features on the provincial emblem. In this regard environmental officers have erected fences around very old trees to protect them. These efforts are commendable; however, more can be done to inform community residents of the Red Data status of this tree species, and what this classification means.

5.4 CONCLUSION

In conclusion, this study has shown that baobab food products are important for rural populations; they contribute substantially in required nutrients. The study also revealed that there are still many ways in which the cultural value, ethnobotanical use and conservation of baobab species can improve. There is a diversity of forest food resources and medicine that are integrated in the eating habits of villagers, and that can help to improve their nutritional status if used in the correct way. Improving traditional processing and preservation techniques will add value to the end products, which can consequently be more beneficial from a nutritional point of view

In general, the results clearly indicate that in the Sagole community this majestic tree is not closely associated with the new generations and chief, as they were very much uninformed about cultural issues related to this tree species. Only the older

generation still had a cultural relationship. This disconnect can be traced back to a society in transition from a traditional way of lifestyle to a western-orientated lifestyle, and the consequent uncoupling of generations. Ultimately this will lead to a terrible loss of cultural information and cultural identity in the Sagole community.

The people in the Sagole community utilise *A. digitata* for variety of uses, which also leads to some efforts on the part of the elderly to conserve this tree species. These efforts complement those of the provincial Department of Environmental Affairs. The community use this baobab tree for medicine, but people have not enough knowledge in making medicine. However, old people practice agronomy of this species, but it is not something continued. Furthermore, many of the community members conserve this species and the government also conserve it, officers know this tree is a Red Data listed species.

5.5 RECOMMENDATIONS OF THE STUDY

The study therefore recommends as follows:

Awareness should be further created on the various uses and benefits of the baobab plant through the various extension in the Vhembe district, religious as well as socio-cultural groups within the district should be involved in demystifying the plant so that the general erroneous belief held about the plant can be corrected, more research into various processing methods to which the plant can be subjected as recommended, with the outcome of such research adequately communicated through the cultural value of the legend of baobab. In the Sagole community lack of disconnection between the older and newer generations lead to lack of cultural identity of the Vhavenda of Sagole community. However, there are people that have no knowledge of the ethnobotanical use of this species.

There is a great need to increase the availability of planting seedling material of baobab. This requires collection of seed. However, determination of ideal sampling strategy is limited by lack of knowledge of genetic variability. Inevitably a species occurring as single, widely spaced trees, with no large forest stands, requires individual collections to be maintained and documented as such. At present, lack of

provenance investigations means that seed available as planting stock relates only to the species and this is likely to include seed of poor quality and/or unsuitable provenances. Until seeds are more widely collected and made available, selection of suitable planting material can be based on no more than informed guesses. Since numerous problems can arise from attempts to develop a regular planting schedule based on imported seed, the clear solution is to develop and expand local seed production areas.

5.6 RESEARCH QUESTIONS ANSWERED

To answer the research questions posed in section 1.4 of this dissertation:

A. In terms of cultural aspects:

i. Does folk taxonomy apply to *A. digitata*?

Answer: Yes, it applies across gender and age.

ii. Is there generational transfer of information, and if so, what is the extent of that information?

Answer: Yes. But it is limited.

iii. Are there any cultural taboos that apply to this species?

Answer: Yes, there are, but mostly young people do not know about hem and also willingly transgress them with impunity.

B. In terms of ethnobotanical use:

i. Is there ethnobotanical use of this species by Sagole community members?

Answer: Yes. The community use baobab trees mainly for medicine and food, but people have limited knowledge in making medicine.

ii. Does the Sagole community have people who practice agronomy?

Answer: Yes. Old people practice agronomy of this species, but it is not something continued by the younger generation.

iii. Which method is used by the Sagole community for harvesting this species?

Answer: Various methods are used in harvesting, which depend on the material to be harvested.

C. In terms of preservation status:

i. Does the Sagole community have any preservation measures that apply to this species?

   Answer: Yes. Much of the community members conserve this species by replanting seedlings.

ii. What is the provincial government stance on this species?

   Answer: The provincial government also conserve it through monitoring efforts; officers know this tree is a Red Data listed species.

5.7 AREAS OF FUTURE RESEARCH

It is not clear why there is a much lower use of baobab leaves in southern Africa compared to West Africa. Baobab diseases are still not well understood. There has been isolating and identifying fungi found on baobab trees, but this study still has a long way to go. Comparative studies from other parts of the baobab distribution would be extremely useful to understand the extent of observed variation, as from this study we now know so much more about baobab cultural value, ethnobotanical use and conservation of Sagole community in Mutale municipality in Vhembe district.

In addition the following can be looked at:

- Dietary preferences of community members as related to the various parts of the baobab tree.
- Disease aetiology as offered by traditional health practitioners.
- Political control exerted by traditional leaders to ensure the sustainable use of resources, such as the baobab.

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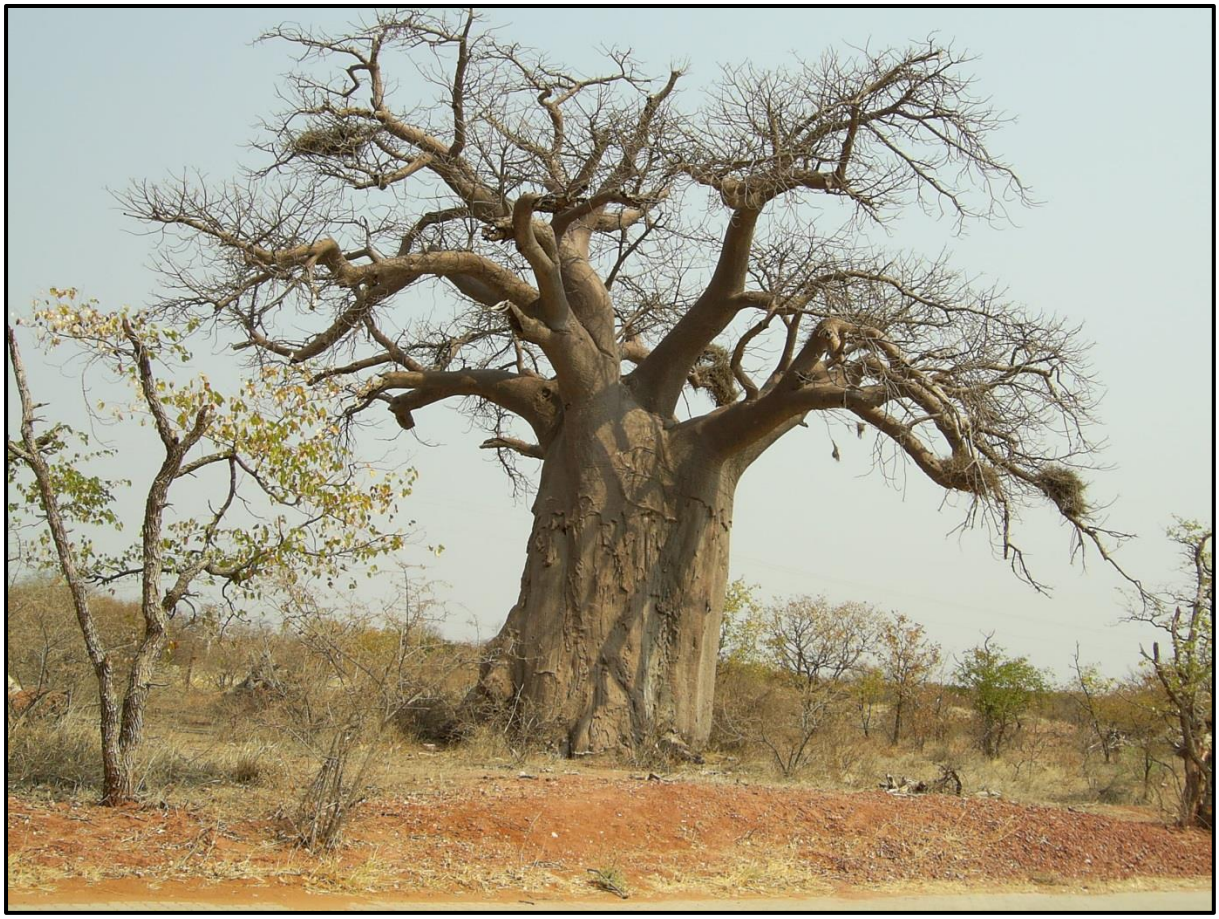
APPENDIX 1: QUESTIONNAIRES

Can you identify this tree? What is it?



1. Demographic information

1. Gender

1	Male	2	Female

2. Age

1	<25	2	26-35	3	36-45	4	46-55	5	56-60	6	>60

3. Level of education

1	No formal education	2	Primary	3	Secondary	4	Tertiary

4. Employment

1	Unemployed	2	Employed by company or government	3	Self employed	4	Other (specify)
Other:							

5. Income per month

1	<1000	2	1001-2000	3	2001-3000	4	3001-4000	5	4001-5000	6	>5000

6. Size of household

1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	>7

7. How long (in years) have you lived in this community?

1	<10	2	10-15	3	16-20	4	>20

8. Is traditional culture still strong in this community?

1	Yes	2	No	3	Do not know (no opinion)

SECTION A: Cultural value of Baobab (*Adansonia digitata*)

2. Folk taxonomy

9. What is the common name(s) of the baobab tree?

a	Do not know	
b	Common name(s)	Language
1		
2		
3		

10. What does it mean?

a	Do not know
1	
2	
3	

3. Transfer of information										
11	Are there ancient stories about the baobab (folk tales) that is shared between parents and children?									
	1	Yes	2	No	**If no, go to questions 16 & 17**					
12	If yes, do you know what it is?									
	1	Yes	2	No						
13	If yes, do you know what it is?									
14	If no, are there some other people in the community that can still tell stories about the baobab?									
	1	Yes	2	No	**If no, go to Section 4 (Cultural taboos)**					
15	If yes, who are they?									
	1	Common community members	2	Elders	3	Chiefs	4	Traditional healers	5	Others
	Others:									
16	What is the value of these ancient stories?									
	1	Entertainment	2	Preserve culture	3	Teach live lessons	4	Do not know	5	Other reason
	Other reason:									

4. Cultural taboos												
17	Are there any cultural taboos about this species?											
	1	Yes	2	No	3	Do not know	**If answered 2 or 3, then go to Section B (Ethnobotanical use)**					
18	If yes, what are they?											
	1	Women harvesting	2	Child harvesting	3	Impotent men harvesting	4	Other				
	Other:											
19	What is the value of cultural taboos on baobab?											
	1	Entertainment	2	Preserve culture	3	Teach live lessons	4	Do not know	5	Other reason		
	Other reason:											
20	If there is taboo, what would happen?											
	1	The person will have bad luck	2	Community at large will suffer	3	Nature will cause damage (lightning, flood, crop failure etc.)	4	Other reason				
	Other reason:											
21	What is the reaction of the community when a taboo is ignored?											
	1	Pay damage	2	Punished (How?)	3	Other						
	Other:											
	Form of punishment:											
22	Are these taboos still strongly practices or sometimes or not at all											
	1	Strongly	2	Sometimes	3	Not at all						

Section B: Cultural use of *Adansonia digitata*

1. Cultural use										
1	Have you used a baobab tree?									
	1	Yes	2	No	**If no, then go to question 3**					
2	If yes, for what purpose?									
	1	Medicine	2	Ornamental	3	Cultural/ritual purpose(s) (define)	4	Food	5	Other

	Other:												
	Define Cultural/ritual purpose(s)												
3	Are there other community members that use it?												
	1	Yes	2	No	3	Do not know							
4	What are the domestic food uses and local processing												
	1	None	2	Do not know	3	Leaves	4	Fruit pulp	5	Seeds	6	Other	
	Other:												
5	Are there domestic non-food uses, other than medicine?												
	1	Yes	2	No	3	Do not know							
	If yes, what are they?												
	1	Fibre	2	Dye	3	Fuel	4	Seed shell	5	Other			
	Other:												
6	Are there any traditional medicine made?												
	1	Yes	2	No	3	Do not know							
	Indicate for what ailment(s):												

2.Harvesting									
7	Are you aware of any traditional way of harvesting this species?								
	1	Yes	2	No	**If no, then go to section 5 (Conservation)**				
	If yes, explain?								
8	Is everyone allowed to harvest this species?								
	1	Yes	2	No	3	Do not know			
	If no, who is allowed?								
	1	All	2	Specific gender (define)	3	Elders	4	Traditional healers	5	Other(s):
	Specify gender: Male or Female (circle correct one)								
	Other(s)								

9	Are there any taboos that restrict harvesting this species?								
	1	Yes	2	No	3	Do not know			
	If yes, explain:								
10	Which part(s) are harvested and for what are they used?								
	1	Bark	2	Roots	3	Fruit	4	Other (specify)	
	Other:								
	Use(s)								

3. Preservation by community of baobab trees						
11	Do the community protect the baobab tree?					
	1	Yes	2	No	3	Do not know	**If no or do not know, go to section 6**
	If yes, explain why and how?					
	Why:					
	How					

4. Preservation of government (LEDET)									
12	Does the government visit this place? **If no, then go to question 18**								
	1	Yes	2	No	3	Do not know			
	If yes, how often?								
	1	Monthly	2	Half yearly	3	Annually	4	Other (specify)	
	Other:								
13	Which department is visiting this community for this species?								
	1	Dept. of Arts & Culture	2	Dept of Env Affairs	3	Dept. of GHGSTA	4	South African Heritage Resource Agency	5	Other
	Other:								

14	Do you know about red data plant species			**If no, then end of question session**
	1	Yes	2	No
15	If yes, did you know that the baobab is a red data species?			
	1	Yes	2	No

The University of Limpopo thank you for your time and sharing your knowledge.

APPENDIX 2: PARTICIPANTS INFORMED CONSENT FORM

Dear participants,

My name is Matsheremane Godfry Mathaba (student number: 200902198), and I am a Masters student (in Anthropology) at the University of Limpopo, Limpopo Province. To complete my studies, I am expected to conduct a research study and cite a report on my findings.

Founded that many plant species that are continuously used are threatened to extinction, I am interested in learning about the baobab plant species that are in your community. In short, the study will seek to document the Ethnobotanical use, harvesting methods and preservation status of baobab plant species in your community. In order to find approaches that can be implemented to ensure sustainable use of these baobab plants.

Please note that your participation in this study is entirely voluntary and you can refuse to participate or stop at any time without prejudice. You can also withdraw your consent at any time, before, during or at the end of the interview. Most important, please note that the results of this study will be processed in to a report but will not include any information that identify you as a participant, you are thus guaranteed to remain anonymous.

PARTICIPANTS CONSENT FORM:

I hereby, confirm that Mr MG Mathaba has informed me, about the nature and conduct of the study. I have also received, read, and understood the information about this study. I am aware that the information will be recorded and that the results will be anonymously processed in to a study report. Furthermore, I have had sufficient opportunity to ask questions and declare myself prepared to participate in the study.

Name of participant	Signature	Date
_____	_____	_____
Name of researcher	Signature	Date
_____	_____	_____

APPENDIX 3: LETTER OF DATA COLLECTION

University of Limpopo

Private Bag X1106, Sovenga, 0727, South Africa

Tel: (015) 268 2224, 083 399 1787 Email: Martin.potgieter@ul.ac.za

Dear participants,

Please note that Godfry Matsheremane Mathaba (student number: 200902198), is a Masters student (in Anthropology) at the University of Limpopo, Limpopo Province. To complete his studies, he is expected to conduct a research study and cite a report on his findings.

Founded that many plant species that are continuously used are threatened to extinction, he is interested in learning about certain plant species that are used in your community. In short, the study will seek to document the use, management strategies and threats of Baboabs in your community. In order to find approaches that can be implemented to ensure sustainable use of those plants.

Please note that participation in this study is entirely voluntary and interviewees can refuse to participate or stop at any time without prejudice. Participants can also withdraw their consent at any time, before, during or at the end of the interview. Most important, please note that the results of this study will be processed in to a report but will not include any information that identify participants, which will remain anonymous.

Regards

Prof MJ Potgieter

Co-supervisor

University of Limpopo

APPENDIX 4: ETHICAL LETTER

University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 2212, Fax: (015) 268 2306, Email:noko.monene@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE CLEARANCE CERTIFICATE

MEETING:	**02 September 2015**
PROJECT NUMBER:	**TREC/128/2015: PG**
PROJECT:	
Title:	An ethnobotanical study of the cultural value and preservation status of *adansonia digitata* (Baobab Species) among VhaVenda of Sagole Community in the Limpopo Province
Researcher:	Mr MG Mathaba
Supervisor:	Dr SA Rankoana
Co-Supervisor:	Prof MJ Potgieter
Department:	Sociology & Anthropology
School:	Social Science
Degree:	Masters in Anthropology

PROF TAB MASHEGO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: **REC-0310111-031**

Note:
i) **Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee.**
ii) **The budget for the research will be considered separately from the protocol.**
PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

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