



A study of ethnoveterinary medicine in the North West Province, South Africa

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ABSTRACT

Ethnoveterinary medicine (EVM) is a component of Indigenous Knowledge Systems derived from African Traditional Medicine (ATM) and used for animal health care in African communities. The introduction of Western veterinary medicine during colonisation of Africa led to a decline in use and loss of some of this valuable knowledge. However, Western veterinary medicine is expensive and inaccessible to poorly resourced and remote farmers. Among these farmers, the use of ethnoveterinary medicine is dominant. The South African government recognises the value of traditional healing, especially as a primary health care solution and supports the integration of the Western and traditional health care systems. Through the National Indigenous Knowledge Systems Office (NIKSO), the government also promotes EVM, its preservation and its integration into the development of higher education curriculums. Exploratory surveys to document and preserve knowledge of ethnoveterinary medicine have been conducted in some parts of South Africa. However, vast areas of the country still remain unexplored. Furthermore, the success of any government proposed integration endeavours depends on the perceptions of different stakeholders in the veterinary field. Although many studies have been conducted to evaluate the perceptions of ATM among Western-trained human-health practitioners, such studies among Western-trained animal health practitioners (WTAHPs) have been neglected. The purpose of this study was to document knowledge of EVM in the previously unexplored Mahikeng Local Municipality and to determine perceptions of EVM among state veterinarians and animal health technicians (AHTs) in the North-West Province. A mixed method research design was adopted to address the two objectives. Qualitative research methods were used to collect and analyse ethnoveterinary knowledge among indigenous farmers in four villages in Mahikeng Local Municipality while quantitative methods were used to collect and analyse data obtained from Western-trained animal health practitioners to determine their perceptions of EVM. The qualitative approach generated a wealth of highly trusted Batswana ethnoveterinary medicine knowledge systems, including ethnodagnostic methods, medicinal plants and non-plant remedies, surgical and metaphysical procedures. A total of thirty-one ethnoveterinary medicinal plant species, three non-plant remedies and nine procedures were documented. Among the medicinal plants recorded, *Senna italica* (sebetebete) emerged as a plant of cultural importance in the study area, with the highest frequency in terms of recurrence and multiple animal treatment health indications. Culturally significant medicinal plants among Batswana for the treatment of coughs, retained placenta, *gala*, fractures and diarrhoea were

also determined. In addition, the concern for the loss of EVM knowledge through time, due to modernisation and disinterest of the younger generation was also exposed. This study revealed a need for further ethnoveterinary exploratory surveys conducted in other unexplored areas of the North West Province for purposes of knowledge preservation. On the other hand, the quantitative approach revealed that most state WTAHPs were aware of EVM and that a moderate majority agreed with the use of EVM by farmers. However, most of WTAHPs were not sure of the effectiveness of ethnoveterinary medicine and perceived EVM as lacking a scientific base which shows a lack of appreciation of the value of EVM. The study also found that there is moderate support in terms of integration of EVM into veterinary and para-veterinary curriculums. The findings of the study revealed the need for integration of EVM into the curriculum of veterinary and para-veterinary education in order to promote EVM. Such integration will be a step towards decolonisation of South Africa's educational system and also assist in the preservation of knowledge. Overall, it is therefore recommended that urgent documentation of ethnoveterinary medicine knowledge be done in other parts of the country. Furthermore, promotional activities are also recommended in order to improve perceptions among WTAHPs for the purpose of decolonising the minds and also to prevent the impact of negative perceptions on government suggested integration processes.

DEDICATION

This dissertation is dedicated to my late mother, Nyadzani Thilili Dorah Ndou nee Mashau. Your approval of and pride in me has always driven me to reach for my dreams and the stars. Though you will not physically see this finished work, I know you have been with me in spirit throughout this journey. I will love you always beautiful Nwa-Mashau.

DECLARATON

I, **Rendani Victress Ndou**, declare that the dissertation hereby submitted for the degree of Master in Indigenous Knowledge Systems at the North-West University is my own original and independent research work. The dissertation was carried out under the supervision of Prof. S. A. Materechera, Prof. M. Mwanza and Dr W. Otang-Mbeng. This dissertation or any part of it has not been previously submitted by me for any degree or examination at another Faculty or University. The research work reported in this dissertation does not contain any person's data, pictures, graphs or other information unless specifically acknowledged as being sourced from those persons.

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As the candidate's supervisors, we agree to the submission of this dissertation.

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Dr. W. Otang-Mbeng (Co-Supervisor)

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LIST OF ABBREVIATIONS AND ACRONYMS

AEVM	African Ethnoveterinary Medicine (coined by the researcher)
AHTs	Animal Health Technicians
ATM	African Traditional Medicine
AVMA	American Veterinary Medical Association
CBD	Convention on Biological Diversity
DST	Department of Science and Technology
ER&D	Ethnoveterinary Research and Development (ER&D)
EU	European Union
EVM	Ethnoveterinary Medicine
EVPs	Ethnoveterinary practitioners
FAO	Food and Agriculture Organisation (FAO)
HPI	Heifer Project International
IK	Indigenous knowledge
IKS	Indigenous Knowledge Systems
ILO	International Labour Organisation
MENA	Middle East and North Africa
NIKSO	National Indigenous Knowledge Systems Office
RRA	Rapid Rural Appraisal
READ	Department of Rural, Environment & Agricultural Development
SAPPO	South African Pork Producers' Organisation
SAVC	South African Veterinary Council
THPA	Traditional Health Practitioners Act 35 of 2004
THPs	Traditional Health Practitioners
UN	United Nations
UNESCO	UN Educational, Scientific and Cultural Organisation
Vets	Veterinarians
WHO	World Health Organisation
WIPO	World Intellectual Property Organisation
WTAHPs	Western-trained Animal Health Practitioners (coined by the researcher)

CONFERENCES

Sections of this manuscript have been presented at the following conferences:

- Ndou, R.V, Materechera, S, Otang-Mbeng, W & Mwanza, M. 2016. A review of ethnoveterinary medicine and the treatment of reproductive disorders. Paper presented at the South African Association for Animal Health Technicians, North West Provincial Congress, 27-29 July 2016, Christiana, North West Province, South Africa.
- Ndou, R.V, Materechera, S, Otang-Mbeng, W & Mwanza, M. 2016. A review of ethnoveterinary medicine and the treatment of reproductive disorders. Paper presented at the 14th annual congress of the Southern African Society for Veterinary Epidemiology and Preventive Medicine, 24-26 August 2016, Cape Town, Western Cape Province, South Africa.
- Ndou, R.V, Materechera, S, Otang-Mbeng, W & Mwanza, M. 2017. Perceptions of ethnoveterinary medicine among veterinarians and animal health technicians in the North West Province. 20th Indigenous Plant Use Forum, 9-12 July 2017, Pretoria, Gauteng Province, South Africa.

CHAPTER 1

INTRODUCTION AND OBJECTIVES OF THE STUDY

Ethnoveterinary medicine (EVM) consists of traditional or indigenous knowledge (IK), skills, practices and beliefs used for animal health management in communities and is a component of traditional medicine practised in many countries in the world (McCorkle, 1986). Traditional medicine is defined by the World Health Organisation as “Diverse health practices, approaches, knowledge and beliefs incorporating plant, animal and/or mineral-based medicines, spiritual therapies, manual techniques and exercises applied singularly or in combination to maintain well-being, as well as to treat, diagnose or prevent illness (WHO, 2000).”

The knowledge and practices differ from region to region and is passed from generation to generation through different forms of teaching, but the most common mode is oral transfer (Bolson *et al.*, 2015; Mathias, 2004; McCorkle, 1986). The great cultural and botanic multiplicity in the world has led to diverse practices resulting in a general classification of traditional medicine either as Chinese, Indian or African (Abdullahi, 2011). African EVM is derived from African traditional medicine (ATM). Knowledge and the practice of African ethnoveterinary medicine were developed by our forefathers for animal health care through trial and error and then passed from generation to generation (van Veen, 1997). In many regions of Africa, EVM is extensively and effectively used for livestock primary health care (McCorkle & Mathias-Mundy, 1992). The practice of ethnoveterinary medicine is more prevalent in remote poor resourced livestock farming communities, this is because the ingredients for making remedies are readily available, easy to administer and also less expensive alternatives to modern medicine (Bolson *et al.*, 2015; Mathias, 2004; McCorkle, 1986; Phondani *et al.*, 2010; Tabuti *et al.*, 2003).

In recent years, there has been growing global interest in EVM practices, which has led to extensive research worldwide, especially in Asia and Africa (Katerere & Luseba, 2010; Luseba & Van der Merwe, 2006; Masika *et al.*, 2000; Soyelu & Masika, 2009; van Veen, 1997). This interest could be attributed to three main factors as follows: interest by Western countries in alternative medicines; the embracing of cultural heritage by many African countries after liberation from colonial rule; and the discovered limitation and hazardous nature of some modern medicines and practices, including the emergence of drug-resistant microorganisms (Sofowora, 1982). All these factors prompted the review of traditional

medicinal practices (Luseba *et al.*, 2007; McCorkle & Mathias-Mundy, 1992; Mubarack *et al.*, 2011; Sofowora, 1982; Stein *et al.*, 2005).

South Africa has a wealth of knowledge of ethnoveterinary medicine (EVM) which remains undocumented (McGaw & Eloff, 2008). Knowledge and the practice of ethnoveterinary medicine, like most indigenous knowledge, is lost gradually through time because it is passed on orally from generation to generation without documentation. Furthermore, acculturation and modernisation have also contributed to this information loss. Therefore, there is an urgent need to preserve valuable traditional knowledge (Katerere & Luseba, 2010; McGaw & Eloff, 2008). Studies have been conducted, especially in Limpopo and Eastern Cape Provinces to document knowledge and the practice of EVM in some districts (Dold & Cocks, 2001; Katerere & Luseba, 2010; Luseba & Tshisikhawe, 2011; Luseba & Van der Merwe, 2006; Masika & Afolayan, 2003; Masika *et al.*, 1997; Masika *et al.*, 2000; Mwale & Masika, 2009; Soyelu & Masika, 2009). A study by Van der Merwe *et al.* (2001) provided a detailed list of medicinal plants used by Setswana-speaking people of Madikwe in the North West Province. Though the study was conducted in a relatively small area of the Province, it provided evidence that EVM practices are common among communities of the Province.

The rich ethnic and botanical diversity in South Africa calls for further exploration of the country's knowledge of EVM as a potential resource for development (McGaw & Eloff, 2008). Additionally, the South African government has affirmed its support for the protection and preservation of indigenous knowledge by establishing the National Indigenous Knowledge Systems Office (NIKSO) (Swanepoel & van der Westhuizen, 2009). The success of any endeavour of this Office depends on the attitude and perceptions of different stakeholders. In the South African animal health sector, veterinarians and animal health technicians would be critical in the process of integration of modern medicine with EVM and preservation of EVM. Therefore, their perceptions of these practices should be established and EVM promotional activities implemented if necessary. This research aimed to study ethnoveterinary medicine knowledge and how the knowledge is perceived within the North West Province. The objectives of the study were to:

1. Explore and document indigenous knowledge and practices used for animal health care by ethnoveterinary practitioners within Mahikeng local municipality; and

2. Determine awareness and perceptions of ethnoveterinary practices among government Western-trained animal health practitioners (WTAHPs) in the North West Province.

Retention of the valuable knowledge on ethnoveterinary medicine has been under threat for decades after the introduction of Western veterinary medicine, which also led to the development of negative perceptions towards indigenous practices. However, a worldwide paradigm shift has resulted in the recognition of the value of “old” practices, especially as alternative treatments. This shift has also been exacerbated by the colossal limitation of some modern medical drugs. Therefore, this study will contribute to the preservation of indigenous knowledge of South Africa. In addition, Toyang *et al.* (1995) in their review of ethnoveterinary medicine in Cameroon, argue that orthodox animal health professionals do not promote indigenous practices because they lack the appreciation of the role IK play in animal health management. The South African government encourages the integration of IK into curriculum development in institutions of higher learning (Republic of South Africa, 2004; Swanepoel & van der Westhuizen, 2009). Such move will support the destigmatisation of EVM and also expand treatment options for farmers, especially those in remote areas of the country. In addition, the role of veterinarians and animal health technicians in the evolution is essential; thus perceptions of these practices should be established. The study will provide an indication of whether intervention should be recommended to improve awareness and perceptions. This study will be guided by the following research questions:

1. Which medicinal plant species, non-plant remedies and procedures are used for the treatment and prevention of animal health problems by ethnoveterinary practitioners in villages within the Mahikeng Local Municipality?
2. What methods of traditional remedy preparations and administration are used for animals in villages within Mahikeng Local Municipality?
3. What ethnodagnostic methods are used to diagnose ailments in animals in villages within Mahikeng Local Municipality?
4. What medicinal plants are culturally significant for the treatment of particular animal ailments within Mahikeng Local Municipality?
5. What are the perceptions of ethnoveterinary medicine practices among state veterinarians and animal health technicians in the North West Province? and

6. What are the factors that influence awareness and perceptions of ethnoveterinary medicine among state veterinarians and animal health technicians?

The study is divided into six chapters as follows: Chapter 1 provides the general introduction, justification and purpose of the study. Chapter 2 provides the general orientation of the study by explaining the synthesis, scope and settings of the research. The Chapter also outlines the research design and underpinnings of the study. Chapter 3 focuses on the conceptual and theoretical framework that informed the study. The theory base of ethnoveterinary medicine is also discussed in this Chapter through the literature review. Chapters 4 and 5 constitute the core of the study. Chapter 4 provides a description of the qualitative approach used to document EVM within Mahikeng Local Municipality. Chapter 5 provides a description of the quantitative approach used to determine perceptions of EVM among Western-trained animal health practitioners in the North West Province. Chapter 6 presents the integration of the findings of the study, conclusion as well as recommendations. The next chapter is the general orientation of the study.

CHAPTER 2

GENERAL ORIENTATION OF THE STUDY

2.1 Introduction

The purpose of this chapter is to provide the rationale, rigour, and setting of the study. The rationale is provided through an account of why and how this study was conceived. Rigour is shown through an explanation of indigenous research underpinnings and the overall research design of the study. Finally, the setting of the study is provided through an overview of the study area and its people.

2.2 The researcher's positionality and genesis of the research topic

According to Foote and Bartell (2011), "the positionality that researchers bring to their work, and the personal experiences through which positionality is shaped may influence what researchers may bring to research encounters, their choice of processes, and their interpretation of outcomes". In the current study, the researcher's personal past experiences and her positionality in issues of traditional healing, led to the undertaking of this study.

This study is strongly based and motivated by the personal experiences and interest of the researcher. The researcher is an African Muvenda woman whose father is an African Traditional healer. She is a qualified Western-trained veterinarian who has been practising since 2000. In the course of her career as veterinarian, she has occasionally come across farmers who regularly inform her about traditional medicinal practices they use on animals and their effectiveness. In her earlier years in the profession, she considered such claims with a high level of skepticisms, to the point of discouraging such practices among farmers. Her reaction to the claims could be attributed to the following: 1) The Eurocentric teaching in most South African universities did not give space for "untested and primitive" indigenous knowledge (Mokgobi, 2012); and 2). In addition, the researcher was never involved in her father's traditional healing practices during her youth. The above factors resulted in the researcher's perception of traditional medicine as, ineffective, dangerous and an utter waste of time. This perception was despite her being raised by a traditional healer.

However, as the researcher grew older and witnessed the effectiveness of her father's traditional medicinal practices (many stories can be recounted here), her mindset changed and

her mind became decolonised about African traditional healing. With her new state of mind, she began exploring her father's traditional healing knowledge and was amazed by the wealth of knowledge he possessed, which unfortunately, was not documented. In addition, the researcher also realised that with the demise of her father, her family and community would lose his knowledge. It also became apparent that the situation was not unique to the researcher alone, as there is countless valuable undocumented knowledge that is lost through generations in different parts of South Africa when elders join their ancestors. The researcher began to develop strong convictions that in this era of African renaissance, Africans should embrace their traditional practices and assist in the preservation of their indigenous knowledge.

As a veterinarian, the researcher had the desire to learn African ancestral epistemologies for animal health care and also explore how other professionals in her field have experienced and perceived these practices. The researcher also wanted to review and absorb knowledge documented by other researchers in this field of research. All these, she planned to do, not only to continue in her decolonisation journey, but also to inspire others in her profession (veterinary and para-veterinary) and even farmers to remove the blinds that cover our eyes and recognise the wealth in the knowledge of African indigenous healing. The conception of this research topic is consequently, a result the researcher's experiences and the desire to explore EVM knowledge and also to determine perceptions of EVM among Western-trained animal health practitioners. The researcher's positionality is that of an African woman who is a Western-trained animal health practitioner but also recognises the value of traditional healing.



2.3 Phrasing of the research topic

The objectives of this study (in their diversity) resulted in a study that was double-themed, this because the two objectives could have been separate studies targeting very different demographic groups. The double-themed nature of the study led to problems in terms of formulating a precise topic that would be inclusive of both objectives. The topic "A study of ethnoveterinary medicine in the North West Province, South Africa" is extremely broad and does not properly define the study. However, it was the only title that could encompass both objectives without being too long and possibly misleading. Therefore, this delineation describes the scope of the study through boundaries delimitating as follows:

A study to document knowledge of ethnoveterinary medicine was conducted in only four villages within Mahikeng Local Municipality. This is because the study population was large enough for the researcher to collect sufficient qualitative data. Though the study area was not reflected in the topic, it is still within the North West Province. The study area of the North West Province, as defined by the topic, applies only to the second objective. In the study of perceptions of ethnoveterinary medicine among Western-trained animal health practitioners (WTAHPs), the study targeted WTAHPs employed by the North West provincial Department of Rural, Environment & Agricultural Development (READ). Therefore, due to a small study population, the whole Province became the study area. This was done in order to enable the generation of a sample size substantial enough to warrant undertaking the study and also to produce publishable findings. To encompass the study areas of both objectives, “North West Province” was used in the title of the study. The findings of the two studies (objectives) are linked in chapter 6.

2.4 Indigenous knowledge research underpinnings of this study

This study is underpinned by the South African Indigenous Knowledge Systems (IKS) Policy of 2004 (Republic of South Africa, 2004), *Ubuntu* philosophy (Mbiti, 1969) and the indigenous research paradigm (Hart, 2010). The IKS policy contains guidelines for researchers to prevent the exploitation of intellectual properties rights of indigenous communities. The policy guided the conduct of the researcher during the documentation of knowledge of ethnoveterinary medicine. All participation was through consensual agreements and in addition, for benefit sharing, some participants were considered for inclusion as authors in future publications emanating from the study.

The *Ubuntu* philosophy as stated by Mbiti (1969) stipulates as follows: “I am, because we are; and since we are, therefore, I am.” The philosophy was further explained by Nkondo (2007) who described it as, “a way of life that constitute the roots of African belief systems and culture”. As an African, *Ubuntu* is one of the teachings of this researcher’s culture, even though the study was conducted in a culture that is different from hers; the principles of *Ubuntu* remained the same. The philosophy was the foundation for all interactions with all participants in the study. The researcher applied the principles through respect of all, acknowledgement of the importance of every participant, giving as she received and receiving gracefully what is given (knowledge shared).

The indigenous research paradigm as described by Hart (2010) also guided the researcher through the documentation of knowledge of ethnoveterinary medicine within the communities sampled. The indigenous research paradigm is underpinned by indigenous ontology, epistemology, methodology and axiology (Hart, 2010). The researchers' positionality in this study (as described in section 2.2), shows that her reality (ontology) includes indigenous worldviews that are cognitively or perpetually entrenched (indigenous epistemology). The selection of the methodology and adoption of the axiology were influenced by the indigeniety of the researcher. The whole study was viewed as a learning process for the researcher and promotional effort for EVM that would contribute to the integration process in the field of veterinary. Therefore, the methods selected for the study were done in a manner that allowed the researcher to be who she is and the opportunity to learn from participants. As a result, knowledge gained during the study could be used by the researcher to treat animals (on her own) and also to teach others.

Indigenous research values (axiology) served as a cornerstone for this study, thus resulting in respectful and culturally sensitive interactions with participants. These values guided the entire research process, including choosing the research methods, researcher's conduct during interviews and handling of data collected. These values included, among others, respect for participants, elders and other members of the community, non-intrusive observation, honouring them by paying deep attention to what is communicated, being non-judgmental to ideas presented and to honour the data collected. One of the most important values was allowing indigenous people to make inputs on the study and also to approve the research. This was achieved through presenting the research proposal to traditional healers at a meeting on African Traditional Medicine & Healing Practices in the North West Province (26 May 2016).

2.5 Research design

The objectives of this study, which sought not only to explore and document knowledge, but also to determine perceptions and awareness, informed the adoption of a mixed method research design. A mixed research method is both a method and methodology for conducting research that involves collecting, analysing, and integrating quantitative and qualitative research in a single study or a longitudinal programme of inquiry (Creswell, 2013). In this study, the qualitative research approach provided descriptive data obtained through semi-structured interviews. Whilst, the quantitative approach (using a Within-stage research

model) provided mainly quantitative descriptive data which was statistically analysed. The findings of the two approaches were then integrated in the final chapter of the study.

2.6. Overview of the study area

The North West Province lies in the north of South Africa. It is bordered by Botswana, the Kalahari Desert to the west, Gauteng Province to the east and the Free State to the south. It covers a surface area of 104 881.67km² and has a total population of 3 509 953 (33.47 per km²). The North West Province is divided into four district municipalities, which are further subdivided into 18 local municipalities. The four district municipalities of the North West Province are: Bojanala Platinum District Municipality; Dr Kenneth Kaunda District; Dr Ruth Segomotsi Mompati District; and Ngaka Modiri Molema District Municipality. Bojanala Platinum District Municipality covers a surface area of 18 333km² and comprises five local municipalities as follows: Kgetleng rivier; Madibeng; Moses Kotane; Moretele; and Rustenburg. Dr Kenneth Kaunda District Municipality covers a surface area of 14 642km². It is made up of three local municipalities as follows: Tlokwe/Ventersdorp; City of Matlosana; and Maquassi Hills (North West Province, 2013),.

Dr Ruth Segomotsi Mompati District Municipality covers a surface area of 43 700km². It is made up of five local municipalities as follows: Naledi; Greater Taung; Kagisano-Molopo; Mamusa; and Lekwa-Teemane. Ngaka Modiri Molema District Municipality covers a surface area of 28 206km² and is home to Mahikeng (previously Mafikeng), the capital of the Province. The District is situated centrally within the North West Province and shares an international border with Botswana. The District is made up of five local municipalities which are: Mahikeng; Ratlou; Ramotshere Moiloa; Ditsobotla; and Tswaing. Most economic activities in the North West Province are concentrated in the southern region between Potchefstroom and Klerksdorp, as well as Rustenburg and the eastern region (North West Province, 2013). Mining is the major contributor to the economy of the North West and represents almost a quarter of South Africa's mining industry as a whole. The North West Province is well-known for cattle farming, especially in areas around Stella (North West Province, 2013).

2.6.1 The people of the North West Province and their culture

According to Republic of South Africa (2012), the Province has a total population of 3 509 953 at 33.47 per km² and 1 062 015 households at 10.13 per km². The Province comprises of

the following population groups: 89.80% Black Africans; 7.28% Whites, 2.03% Coloured; Indians or Asians represent 0.59% and the rest constitute a non-specified other at 0.30%. Though all the 12 official languages are spoken in the Province, including Sign language, Setswana is the main language, followed by Afrikaans and English (Republic of South Africa, 2012). The main ethnic group in the North West Province are the Batswana people who speak Setswana as their mother-tongue (which is closely related to Sesotho). In fact, Batswana people are, sometimes, referred to as the Western Sotho (Pilane, 2002). It is believed that the Basotho people, to whom Batswana belonged, came from Central Africa in the vicinity of the Great Lakes of East Africa, moved southwards and entered South Africa in the 19th Century (Schapera, 1977 as cited by Pilane (2002)). At present, the principal Tswana tribes are: the Bakgatla; Bakwena; Balete; Bangwato; BaNgwaketse; Barolong; Batawana; Batlokwa; Bahurutshe; and Batlhaping (Schapera, 1977 as cited by Pilane (2002)).

According to Pilane (2002), Batswana people live according to Batswana cultural laws and customs. Batswana believe that people originated from their ancestor called Lowe and that people who pass away (ancestors), can still assist them. Furthermore, they believe that an ancestor is the dead man or woman who has acquired a new status and though he/she is physically separated from the rest of his/her community, he/she is still one with it, participating in its councils and determining all its successes or misfortunes (Pilane, 2002). Batswana people still obey and honour their traditional culture, which also includes witchcraft and traditional healing (Pilane, 2002). They learn how their ancestors lived and performed certain duties like the treatment of the sick and do the same. If someone is ill, some of the Batswana believe that he is bewitched and to avoid witchcraft, they usually call a traditional doctor to strengthen or protect their family with medicinal charms. Pilane (2002) further states that though many cultural aspects of most South African ethnic groups have disappeared, due to colonisation and urbanisation, some cultural practices still persist that give indigenous South Africans their unique identities. Within Batswana communities, indigenous music, dance, keeping of cattle, ritual ceremonies and traditional medicinal practices still exist (Pilane, 2002).

2.6.2 The role of livestock farming in the North West Province

Livestock production in the North West Province, just like in the rest of South Africa, is a significant contributor to food security, and provides many social and economic attributes to the country (Scholtz & Palmer, 2013). Livestock farming is by far the largest agricultural sector in the country (Goldblatt, 2010). It is estimated that about 38 500 commercial farms

and intensive units and an estimated 2 million small-scale/communal farmers are contributors to livestock farming in South Africa (Scholtz & Palmer, 2013). Though commercial livestock farming enterprises contribute more to gross domestic product (GDP) of the country, small-scale farmers also add greatly to the economy through production and job creation (Moerane, 2013). Most small-scale farmers are African rural farmers whose animals serve a purpose beyond economic gains. Rural farmers also keep their animals for own consumption, insurance for emergencies or unexpected events, collateral for borrowing, draught/traction, and for consumption (Dovie *et al.*, 2006). However, in a study by Schwalbach *et al.* (2001), small-scale farmers in the North West Province were found to be more commercially-orientated than other farmers in Southern Africa.

Agriculture is the second most important economic activity in the North West Province, with the eastern (wetter) region of the Province largely supporting livestock and crop farming, while the central and southern regions are dominated by wheat and maize farming (Spickett *et al.*, 2011). Livestock and game farming occur in the semi-arid western region of the Province (Spickett *et al.*, 2011). According to the Republic of South Africa (2017), livestock production in the North West Province is estimated at 1 816 million cattle. Out of this number, 548 000 are found in communal or small-scale farming, 114 000 in dairy herds and 1 154 million in commercial farms. With so much livestock farming activities in the North West Province, veterinary service delivery is an essential need for the farmers.

2.6.3 Veterinary service delivery in the North West Province and the space for ethnoveterinary medicine

In the North West Province, just like in the rest of South Africa, veterinary service delivery to farmers is provided by government, private practices and welfare organisations. The service is rendered by members of the veterinary team which includes veterinarians (vets) and para-veterinarians (para-vets) (South African Veterinary Council, 2017). The para-vets profession comprises of animal health technicians (AHTs), veterinary nurses and veterinary technologists. The veterinary team is regulated by the South African Veterinary Council which has a statutory duty to determine scientific and ethical standards of professional conduct and education as per the Veterinary and Para-Veterinary Professions Act, 1982 (South African Veterinary Council, 2017).

Most private and welfare veterinary sectors are situated closer to towns or cities which hinders deliverance of services to remote areas (Moerane, 2013). Though there are an

estimated 300 rural private veterinarians in the field in South Africa, their services are mainly utilised by commercial farmers (Moerane, 2013). The reason why private veterinarians are mainly utilised by commercial farmers is because the fees charged by private veterinarians are too high for poor farmers (Luseba & Van der Merwe, 2006). Therefore, most service delivery to rural farms is through State Veterinary Services (SVS). In the North West Province, State Veterinary Services is a Directorate divided into two sub-directorates in the Department of Rural, Environment & Agricultural Development (READ). The sub-directorates are Animal Health and Veterinary Public Health (Republic of South Africa, 2017). The Animal Health sub-directorate is subdivided into four district municipalities with their own governances and report to the provincial head office. District municipalities are further subdivided into a total of twenty state veterinary areas as shown in Figure 2.1 (Republic of South Africa, 2016). State veterinary areas have veterinarians and animal health technicians who are employed to provide veterinary extension, consultative and animal disease control services to livestock farming communities and other animal owners.



Figure 2.1: Map of the North West Province State Veterinary (SV) areas (Republic of South Africa, 2016)

Post-democratic elections of 1994, the new ANC-led government introduced policies to address socio-economic disparities of the past. These included, among others, strategies to improve livestock productivity through improvement of diseases control measures and extension services to poor resourced farmers (North West Province, 2011). Recent livestock farmer intervention for this purpose in the Province includes the launching of the Governmental Primary Animal Health care programmes with the aim of providing veterinary service to remote areas through mobile clinics (North West Province, 2013). These types of programmes have worked to a large extent but there are still gaps in service delivery in some parts of the district.

With all the veterinary resources mentioned above, it could be argued that South Africa has sufficient veterinary service provision and thus, there might not be a need for indigenous methods for animal care. However, it should be noted that the surge of service delivery protests in South Africa (Alexander, 2010), though not directly linked to the agricultural sector, is a symptom that not all is well with all government service delivery programmes. In addition, programmes that are free or require very low cost to farmers are sustainable (Alexander, 2010) and could be an indication that poor farmers might be expected to pay higher cost for such services in the future. Furthermore, according to (Moerane, 2013), there is still poor veterinary service delivery, especially towards poor rural farmers in the country, which makes ethnoveterinary medicine a sustainable alternative to Western veterinary medicine.

2.7. Summary of chapter

This chapter has provided the general orientation of the study. It has also provided the direction, boundaries of the study as well as cornerstones that form the basis of the study. The next chapter is the literature review.

CHAPTER 3

LITERATURE REVIEW

3.1 Introduction

The main purpose of a literature review is to show that the researcher has read enough secondary literature and is able to show the cognisance of what is happening in the field that is being studied (Hofstee, 2006). The literature review also exposes gaps in the literature that shows the significant of the present study and its contribution to the body of knowledge (Hofstee, 2006). In addition, Randolph (2009) states that “conducting a literature review is a means of demonstrating an author’s knowledge about a particular field of study, including vocabulary, theories, key variables and phenomena, and its methods and history”. Randolph (2009) further explains that conducting a literature review also informs the student of influential researchers and research groups in the field.

This literature review does not only expose gaps in the literature but also contextualises the study and reports and organise the secondary data. This researcher conducted an extended review that includes ethnoveterinary-related topics in South Africa and worldwide. The first section of this chapter provides a discussion of the conceptual and theoretical framework that informed the study. The second section focuses on the definition of ethnoveterinary medicine and the position of ethnoveterinary medicine within indigenous knowledge systems of South Africa. A review of ethnoveterinary research and development (ER&D) in South Africa is also done in this chapter. The review then takes a detour to expose the shortcomings of studies on perceptions of ethnoveterinary medicine among Western-trained animal health practitioners worldwide in line with the second objective of the study.

3.2 Definition of important concepts and terms

African ethnoveterinary medicine (AEVM)	Coined by the researcher, the term differentiates ethnoveterinary medicinal practices by Africans from all others outside the African continent. This term was inspired by the term African traditional medicine (ATM) as defined by Republic of South Africa (2008a).
African traditional healing	Health care applied by indigenous people and is not part of the Western health systems but based on African Traditional medicine.
African Traditional	The body of knowledge that has been developed and accumulated

Medicine (ATM)	by Africans over tens of thousands of years, which is associated with the examination, diagnosis, therapy, treatment, prevention of, or promotion and rehabilitation of the physical, mental, spiritual, or social wellbeing of humans and animals” (Republic of South Africa, 2008a).
Ancestral epistemology	African traditional knowledge developed from time immemorial and transmitted through generations through different forms of teaching, especially through undocumented oral transfer.
Animal health	The wellbeing of an animal, specifically referring to the absence of physical infirmities.
Community	A group of any size, whose members occupy a specific geological area with shared governance, and in most instances, have common cultural values and history.
Culture	Ideas, customs and social behaviour shared by an ethnic group or a particular society.
Decolonisation	The liberation of a country from the colonisation authorities to achieve independence. Decolonisation also includes freeing the people from the colonisers’ worldview and their systems.
Ethnoveterinary medicine	Ethnoveterinary medicine (EVM) consists of traditional or indigenous knowledge (IK), skills, practices and beliefs used for animal health management in communities (McCorkle, 1986).
Eurocentric training	A worldview that is centered on European culture, history and systems of knowledge while excluding and disregarding all other worldviews
Indigenous knowledge systems	Knowledge systems that are part of the indigenous mechanism of survival in their environment and this was done through development of strategies to solve problems in agriculture, biodiversity conservation; human health care; management of wealth; community development and poverty alleviation (World Health Organization, 2000).
Integration	For the purpose of this study, integration means formal collaboration between African and Western medical models (Mokgobi, 2012).
Perceptions	Perception is defined as human’s primary form of cognitive contact with the world around him/her (Efron, 1969).
Positionality	For the purpose of this study, positionality is defined as a researcher’s position/opinion of the topic studied that is determined by the researcher’s personality and past experiences which influences the view and interpretation of the results.
Preservation of Indigenous knowledge	These are efforts that are made (including documentation) to preserve indigenous knowledge, thereby, preventing its loss

systems through time.

Western-trained Animal Health Practitioners (WTAHPs) Coined by the researcher, the term refers to any qualified veterinarian and para-veterinarian trained in institutions of higher learning, either in South Africa, or in the world. The term was inspired by the term Western-trained health care practitioners which refers to people in the medical field (Mokgobi, 2012).

3.3 Conceptual framework

Vaughan (2008) defines conceptual framework or conceptualisation of a study as a written or visual presentation that explains either graphically, or in narrative form, the main things to be studied: the key factors, concepts or variables and the presumed relationship among them. This study investigated ethnoveterinary medicine (EVM) within Mahikeng Local Municipality and perceptions of ethnoveterinary medicine among Western-trained animal health practitioners (WTAHPs) in the North West Province. Ethnoveterinary medicine is an indigenous knowledge system that is part of African traditional medicine and which is part of our cultural heritage developed by our fore-fathers. On the other hand, Western-trained animal health practitioners are the custodians of Western veterinary medicine, which is modern medicine, influenced by technological advances, and has a Eurocentric approach to healing and teaching (Chitindingu *et al.*, 2014). In many indigenous communities of South Africa, though both systems (Western veterinary and ethnoveterinary medicine) are important to the people, the two systems are practised independent of each other.

An integrated approach to animal health care will open up treatment options for farmers which is more cost effective and locally available (Swarup *et al.*, 2015; Wanzala *et al.*, 2005). It is, therefore, suggested that the combination of Western veterinary and ethnoveterinary medicine will be a much more sustainable solution to animal health problems. However, in order for the two systems to work together and achieve positive results, the following need to be in place; decolonisation the mind of WTAHPs, development and enforcement of policies that support and direct the integration and a paradigm shift in South African veterinary education. The conceptual framework of this study is graphically represented in Figure 3.1.

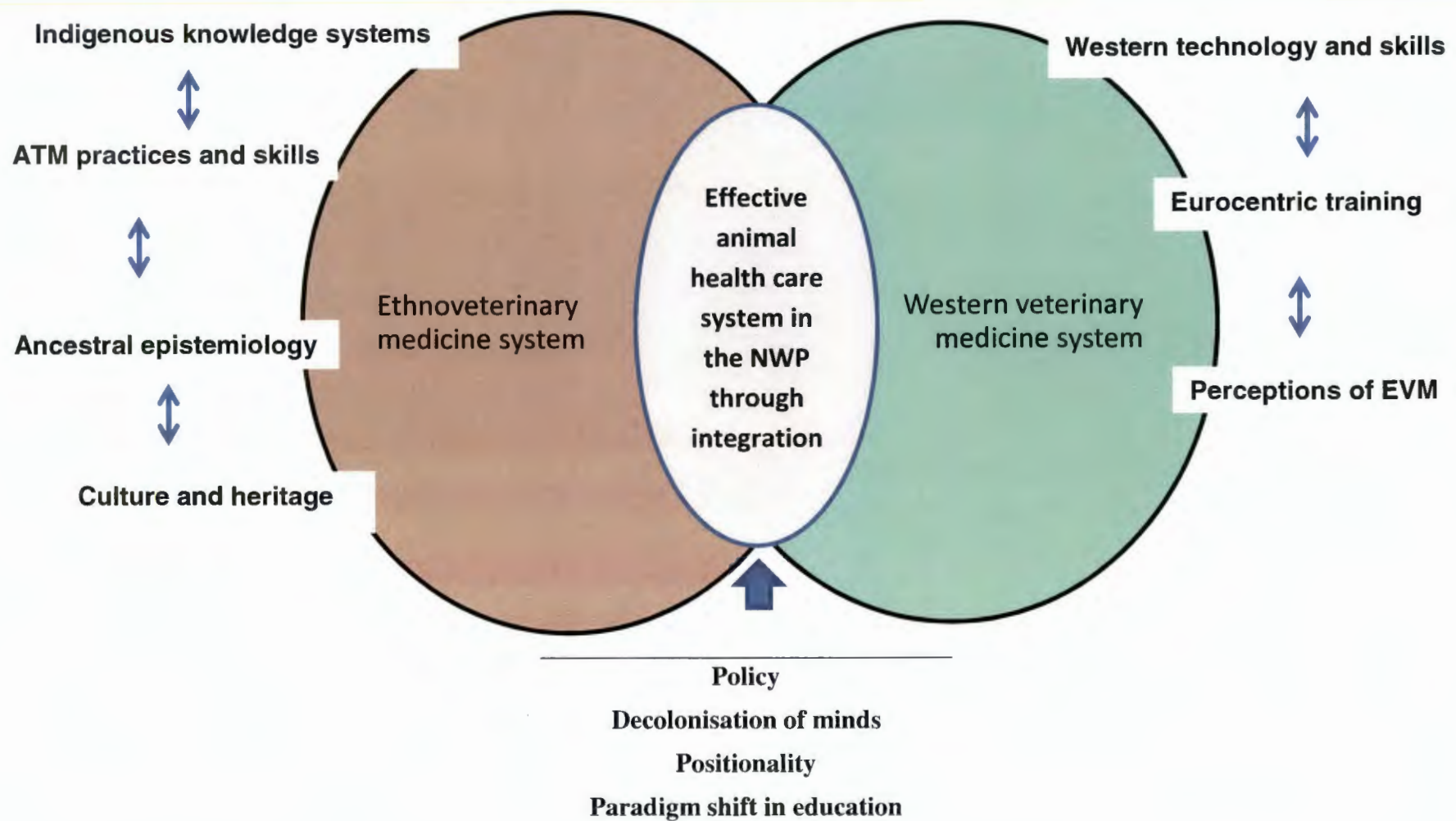


Figure 3.1: Graphical representation of the conceptual framework of this study

3.4 Theoretical framework

Research activity in the field of ethnoveterinary medicine throughout Africa, is low compared to other ethnobotanical studies (McGaw & Eloff, 2008; van Wyk & van Staden, 2002). It is also noteworthy that the theoretical framework used by scholars in previous ethnoveterinary studies conducted in South Africa is either not well-defined or not mentioned. These approaches, though effective in documenting knowledge, failed to reveal the indigenesness of the whole research process and to reveal how the research put African knowledge bearers central to their knowledge and experiences.

After reading through different theories, the researcher decided to adopt the views expressed in 'Decolonising the mind' and 'Afrocentricity' theories for this study. The researcher concurs with the views expressed in these theories and believes that President Mbeki's call for African Renaissance can only be achieved by Africans in all spheres of life, who have discover their African-self in all their undertakings in life. Africans have to lead Africa's renovation and this ideology is even more essential for scholars in indigenous knowledge research.

Ngugi wa Thiong'o, in the Decolonising the mind theory, states that "the effect of a cultural bomb is to annihilate a people's belief in their names, in their languages, in their environment, in their heritage of struggle, in their unity, in their capacities and ultimately, in themselves"(Wa Thiong'o, 1994). These were the reality of Africans during the colonisation, where the culture bombs were detonated to incapacitate the African mind and, therefore, the African being. The theory of decolonising the mind, therefore, enabled the researcher to consider this study as a platform for change in South Africa and its communities. There is a need of change the mindset of South Africans in order for them to start acknowledging and respecting indigenous methods of livestock health care for their value and their contribution to modern science. If Africans decolonise their minds, they will cease to see their past as a wasteland and identify themselves as Africans with African achievements. And, in the spirit of decolonising the mind, a paper on the review of ethnoveterinary medicine was presented at the South African Association for Animal Health Technicians, North West Provincial Congress in Christiana town, 2016 and the national Southern African Society for Veterinary Epidemiology and Preventive Medicine (SASVEPM) in Cape Town, 2016, to promote EVM among Western-trained animal health practitioners (WTAHPs) The findings of this study will also be presented at the same conferences in 2018.

Asante's theory of Afrocentricity (the renowned Afrocentric flavour) has a strong ideology which maintains that "African people should re-assert a sense of agency in order to achieve sanity and that the theory of Afrocentricity is a revolutionary shift in thinking proposed as a constructural adjustment to black disorientation, decenteredness and lack of agency. Afrocentrists should ask the question, "What would African people do if there were no white people?" (Asante, 2011). The theory proposes that an African scholar studying indigenous knowledge must be an Afrocentrist. This researcher interpreted Afrocentrist to mean a person who knows his/her African self, would be able to put central to the research, African participants and also that, the research methods would acknowledge the African centrality.

The theory also inspires researchers to immerse themselves in their own culture and that of communities where the research will be conducted. Afrocentricity views research as a participation process with indigenous communities, where the community contributes to the indigenisation of research methods. The theory further states that if the community is central in their research, this will rejuvenate their African pride in their indigenous systems and, as a result, they and the researcher will become agents of change of mind-sets of other Africans.

3.5 Introduction of ethnoveterinary medicine

The term ethnoveterinary medicine (EVM) was first coined and defined by McCorkle (1986) as traditional or indigenous knowledge, skills, methods, practices and beliefs used for herd health management in communities. The development of the term was an enhancement of ethnoveterinary vocabulary and also an attempt to distinguish ethnoveterinary research from the "old" veterinary anthropology (McCorkle, 1986). Indigenous research into animal traditional healing was then termed ethnoveterinary research and development (ER&D) (McCorkle, 1986). Ethnoveterinary research is now considered a "new" science that studies a practice that has been present from time immemorial (Wanzala *et al.*, 2005).

The African history of traditional animal health care is at most not documented but could be assumed to have begun with the domestication of animals by Africans. The practices continued as the only veterinary care for a very long time (Wanzala *et al.*, 2005). However, many traditional medicinal practises were abandoned following the introduction of modern medical care in Africa (McGaw & Eloff, 2008). In fact, during the colonisation era African countries, traditional healing practices were labelled as "magico-religious", superstitious or unsubstantiated and even banned from use by the colonisers (Mathias, 2004; Raikwar & Maurya, 2015). The banning and labeling led to a decrease in the practices and subsequent

gradual knowledge lost from generation to generation among indigenous people (Toyang *et al.*, 1995; van Veen, 1997). However, the practice of ethnoveterinary medicine did not disappear completely; it is still practised in some communities in different regions of Africa. Nevertheless, there has been a recent revival of interest in traditional healing worldwide, which had led to research and developments in the field of ethnoveterinary medicine.

3.6 Worldwide revival of interest in ethnoveterinary medicine

At the 30th World Health Assembly in 1977, a resolution was adopted urging interested governments to integrate their traditional systems of medicine into their national health delivery systems (World Health Organization, 1977). The revived interest in EVM followed the renewed interest in traditional practices in human health, where disciplines previously considered at the fringes of Western medicine, such as acupuncture, manipulative and osteopathic medicine, as well as herbal and holistic medicine are increasingly accepted in western societies (van Veen, 1997). The resolution of the 30th World Health Assembly, resulted in the recognition and subsequent appreciation of people's traditional healthcare for animals (Swarup *et al.*, 2015; World Health Organization, 1977).

This led to a paradigm shift due to a growing realisation among international livestock developers and policy planners that high cost healthcare and husbandry practices, borrowed from developed nations, cannot cater to the needs of livestock raisers in developing countries (Swarup *et al.*, 2015). The problem was compounded by factors such as the misuse and side effects of modern drugs, shrinking financial resources and reluctance of private veterinarians to settle in rural areas (Swarup *et al.*, 2015). The growing consumer demand for organic food products, also provided important motivation for the emergence and recognition of EVM as a cost-effective animal healthcare option not only in developing countries, but also in developed countries (Swarup *et al.*, 2015). Consequently, the resolution of the 30th World Health Assembly brought not only the appreciation of EVM animal health care and husbandry practices, but also attracted scientific and academic attention to EVM since then.

Wanzala *et al.* (2005) surmise with citation from McCorkle (1998) that ethnoveterinary medicine, which was once considered a poor man's affairs, sinful, out-dated and witchcraft, has currently emerged as very fertile fields that are really promising to benefit the entire population in the world. Wanzala *et al.* (2005) further state that the realisation comes in the wake of hard economic times, when people's purchasing power is too low to cope with ever rocketing medical expenses. In fact, the revival of interest in ethnoveterinary

medicine and human traditional healing is not the only “trending” topic; revival of interest has seen been in all indigenous knowledge systems.

3.7 Positioning African ethnoveterinary medicine (AEVM) in African Indigenous Knowledge Systems (AIKS) and African Traditional Medicine (ATM)

Indigenous Knowledge can be broadly defined as “the knowledge that an indigenous (local) community accumulates over generations of living in a particular environment” (Semali & Kincheloe, 2002). According to the World Health Organisation (2000), indigenous knowledge is part of the rural poor mechanism of survival in their environment and this was done through, development of the strategies to solve problems in agriculture, biodiversity conservation; human health care; management of wealth; community development and poverty alleviation.

In recent years, the value of IK has been recognised by international bodies, including the Convention on Biological Diversity (CBD), the World Intellectual Property Organisation (WIPO), the International Labour Organisation (ILO), the Food and Agriculture Organisation (FAO), the World Health Organisation (WHO), the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and the United Nations Commission on Human Rights. These organisations now lobby for the protection and conservation of IK (Gorjestani, 2004). The South African government, through the Department of Science and Technology (DST), has established the National Indigenous Knowledge Systems Office (NIKSO) within the department, for the purpose of Indigenous knowledge protection and preservation (Swanepoel & van der Westhuizen, 2009).

One of these indigenous epistemologies (that are being protected and preserved) is African traditional medicine (ATM). The Draft Policy on African Traditional Healers defines African traditional medicine as:

The body of knowledge that has been developed and accumulated by Africans over tens of thousands of years, which is associated with the examination, diagnosis, therapy, treatment, prevention of, or promotion and rehabilitation of the physical, mental, spiritual, or social wellbeing of humans and animals” (Republic of South Africa, 2008a).

African traditional healing philosophy is underpinned by *Ubuntu* and has a holistic approach that considers good health or ill health as resulting from the working together of processes of the physical body, mind, emotions and spirit (Republic of South Africa, 2008a). Additionally, in ATM, “the equation of good health or ill health also includes the interaction

and relationship between nature, the cosmos and human beings” (Republic of South Africa, 2008a). African ethnoveterinary medicine (AEVM), which is a component of African traditional medicine, as obvious in the above definition of ATM may not include all the sophisticated details (e.g., use bones and the spirits of ancestors to diagnose) of its human healing counterpart, especially in South Africa, however, many of its elements are derived from there (McCorkle & Mathias-Mundy, 1992; Wanzala *et al.*, 2005). In South Africa, ethnoveterinary practitioners generally diagnose animal diseases by observation and post-mortem signs (Masika *et al.*, 1997; Van der Merwe, 2000). The diagnosis is mostly followed by treatment with medicinal plants for treatment, though other remedies are non-plant based which may include insects and organic material (Maphosa & Masika, 2010; Masika *et al.*, 1997; Moyo & Masika, 2009; Van der Merwe, 2000).

According to Lindley (1938 as cited by Wanzala *et al.* (2005), the discovery of medicinal uses of plants was through different process, including trial and error mechanisms (including deliberate experimentation to help select those remedies that work); observation of self-medication in animals treat (zoopharmacognosy); and borrowing medicinal knowledge from visiting traditional medical specialists from other communities. All these processes have led to the medicinal plants indigenous knowledge systems for healing of both human and animals in Africa (Wanzala *et al.*, 2005). In South Africa, the recognition of African traditional medicine has resulted in many developments, including legislative framework that seeks to regulate, protect, define and promote healing practices.

3.8 Legislative framework of traditional healing in South Africa

Most African countries, including South Africa, have a mixed system of health care, which comprises of an orthodox medical system and a variety of non-conventional therapies that include traditional medicine (Meissner, 2009). People utilise the services of traditional healers for a variety of reasons, ranging from physiological illness to metaphysical issues such as spirits (Mokgobi, 2012; World Health Organization, 2000). It is believed that about 70-80% of the South African population consult with traditional healers (Hopa *et al.*, 1998; Mbatha *et al.*, 2012; Peltzer *et al.*, 2008). Consumers of traditional healing are largely black people in both rural and urban areas of South Africa, who find the healing practices more holistic and accessible (Hopa *et al.*, 1998; Mokgobi, 2012). Additionally, according to Hopa *et al.* (1998), the high costs of Western medicine and fierce competition by other high priority areas of national development for scarce resources from the national government, have resulted in adequate Western health services for the people of South Africa.

The South African government, in its effort to develop policies and legislation to regulate and promote indigenous traditional medicine, established a 'Directorate of Traditional Medicine' in 2006 within the Department of Health and a 'Traditional Practitioners' Counsel' in 2007 (Republic of South Africa, 2008a). Through consultation with various stakeholders, including non-governmental organisations, research institutions, traditional healer representatives and private sector organisations, legislation for traditional medicines were developed (Pefile, 2005). The South African traditional healing legislative framework includes the Constitution of the Republic of South Africa, 1996, the Traditional Health Practitioners Act 22 of 2007 ("the THPA") and the draft policy on African Traditional Medicine for South Africa 2008 (African National Healers Association, 2014; Mbatha *et al.*, 2012; Mokgobi, 2012; Peltzer *et al.*, 2008).

The Constitution of the Republic of South Africa, 1996, declares that people have the right to choose their own cultures and beliefs, and to be protected against unfair discrimination on the basis of these beliefs (Hassim *et al.*, 2007; Mbatha *et al.*, 2012; Republic of South Africa, 1996). However, requires of the people regardless of their different religions, customs, cultures and beliefs, to respect fundamental human rights. Though the government has a duty to promote and maintain a high standard of professional ethics in health care, it does however do not distinguish between different systems of health care services (Hassim *et al.*, 2007). In essence, the constitution gives the citizen the right to choose their own health care, but that all health care should be state regulated to ensure quality service to the people (Hassim *et al.*, 2007). The Western medicine health care has for a long time been well regulated by Acts such as, Health Professions Act 56 of 1974, Mental Health Care Act 17 of 2002 and National Health Act 61 of 2003. After the democratic elections of 1994, processes were undertaken to develop policies and legislation to regulate and promote indigenous traditional medicine which, led to the development of the Traditional Health Practitioners Act 35 of 2004 ("the THPA") (Hassim *et al.*, 2007; Pefile, 2005).

According to the African National Healers Association (2014), the bill for the THPA was drafted and tabled before Parliament in 1994 and passed into law in November 2004. This Bill became the Traditional Health Practitioners Act 35 of 2004. The THPA was, however, declared invalid in August 2006 by the Constitutional Court of South Africa because of some faults in the consultative process. The Act's invalidity was, however, suspended for 18 month to give stakeholders the opportunity to correct the discrepancies and apply for a new Act (African National Healers Association, 2014). After recommended

consultative processes had been conducted, Bill 20 of 2007 was passed and signed in Parliament on 7 January 2008 and became what is today referred to as Act 22 of 2007: the Traditional Health Practitioners Act, 2007 (African National Healers Association, 2014). The purpose of THPA is to: establish the Interim Traditional Health Practitioners Council of South Africa; provide for a regulatory framework to ensure the efficacy, safety and quality of traditional health care services; and provide for the management and control over the registration, training and conduct of practitioners, students and specified categories in the traditional health practitioners profession (Republic of South Africa, 2008b).

The draft policy on African Traditional Medicine for South Africa was proposed by the Department of Health of South Africa in 2008 (Republic of South Africa, 2008a) and gazetted for public comments. This was the result of work done by the Presidential Task Team on African Traditional Medicine (ATM), which was appointed in 2006 (Republic of South Africa, 2008a). The draft policy provided a basis for defining the scope of practice for traditional health practitioners (THPs). It also gave an estimation of the number of THPs in the country (Public Health Association of South Africa, 2015).

3.9 Integration of traditional and Western health systems in South Africa

After the collapse of the apartheid regime in the 1990s, the health care policy of South Africa was reformulated to include traditional healing in the mainstream health care as discussed above. Integration of traditional and Western health systems is referred to as the formal collaboration between African and Western medical models (Mokgobi, 2012). According to the (World Health Organization, 2002), there are three types of health systems in the world. The first type is the integrative health system where traditional medicine has been fully integrated into the health care system (Adjei, 2013). An example of an integrative health system is the case of China, where traditional Chinese medicine and Western medicine are practised alongside each other at every level of the health-care service to the extent that health insurance covers both traditional Chinese medicine and Western medicine (World Health Organization, 2013). Other countries that practise the integrative health system are Korea, Sri Lanka, India, Australia and Vietnam (Adjei, 2013). The second type of health system is the inclusive health system, where traditional medicine is recognised but partially integrated into the national health system, though they work on policy, research education and regulation (Adjei, 2013). Countries practising this system include Ghana, the United Kingdom, the United States of America, Canada, Norway, Germany, Japan, Nigeria, Indonesia and the United Arab Emirates (Adjei, 2013). The third is the tolerant health system,

where the national health care system is based entirely on Western medicine, but some practices of traditional medicine are tolerated by law.

On paper, South Africa seems to be practising the inclusive integrative health system with many initiatives in the form of legislative framework as discussed in section 3.9 (Pefile, 2005). However, according to Mokgobi (2014), the practical reality is that the country seems to be practising a tolerant health system. This is because the initial momentum to achieve an integrative state of health system has since stagnated with no practical application of integration, which has resulted in a state of confusion among stakeholders (Mokgobi, 2012). According to Felix (2017), the delay in regulating traditional medicine, which also delays the complete integration in South Africa, is mainly due to lack in national priority to categorise traditional medicine.

Integrative health care also includes integration of traditional medicine into education. Countries such as China, the Republic of Korea, India and Vietnam have successfully integrated traditional medicine into higher education and offer traditional medicine qualifications at university level (World Health Organization, 2013). According to Mokgobi (2012), Ghana also has in place, a post-graduate diploma that exposes doctors to traditional medicine. A study by Chitindingu *et al.* (2014) provides evidence of the integration of both traditional medicine (TM) and complementary and alternative medicine (CAM) in the curriculums of South African medical schools. However, it is concluded in the study that even though the integration is there “on paper”; there is insufficient commitment by medical schools in South Africa to truly incorporate TCAM into their curriculums. However, a few TCAM practices are briefly mentioned the curriculums of these schools. There is a need for medical schools in South Africa to ensure that traditional medicine (TM) and complementary and alternative medicine (CAM) are included in their curriculums. The study by Chitindingu *et al.* (2014) further urges South African medical schools to ensure TCAM has a prominent role to play in their curricula taking into consideration the social, political and policy context of the country.

South Africa’s higher education system has gone through many processes post-1994 in quest of transformation and with the goal of redressing the inequalities of the apartheid regime. The development of Education White Paper 3 of 1997 (Department of Education 1997), the Higher Education Act of 1997 and the National Plan for Higher Education of 2001 are part of the transformative processes (Badat, 2009). Higher education institutional mergers

were a result of transformative-initiatives that occurred around the early 2000s. But with all the changes that have occurred post-1994 in higher education, the question that one may ask is why the outcry by students (in the recent “#tagfeesmustfal” protest) for the decolonisation of South Africa’s higher education?

According to the news report by Evans (2016), students maintain that decolonised education is not the same as transforming education, that the current curriculum dehumanises black students (Evans, 2016). In essence, students are of the opinion that the apartheid education models with Eurocentric approaches are still in place in institutions of higher learning. In addition, although students acknowledge that politicians have done their part to bring transformation, however, the efforts have not addressed the plight of students and their experience in institutions of higher learning. The suggested solutions to this problem are diverse and each student would agree that in their different fields, decolonisation of their education will take different forms. What may be applicable to humanities education may not necessarily be appropriate for veterinary and para-veterinary education. However, the general consensus is that there is an urgent need for a paradigm shift in the South African education system.

3.10 Ethnoveterinary Research and Development (ER&D)

The terms ethnoveterinary medicine (EVM) and ethnoveterinary research and development (ER&D) were introduced into academic and scientific fields in the 1980s by McCorkle in 1986 (Swarup *et al.*, 2015; Wanzala *et al.*, 2005). Before this, any publication on EVM and ER&D were under the field of Veterinary Anthropology and, in most cases, “hidden in grey literature” (McCorkle, 1986; Swarup *et al.*, 2015). Ethnoveterinary research and development was first defined as the systematic investigation of folk beliefs and practices in veterinary medicine (McCorkle, 1986). However, later, McCorkle (1995) redefined it as “the holistic interdisciplinary study of local knowledge and its associated skills, practices, beliefs, practitioners and social structures pertaining to the healthcare and healthful husbandry of food, work, and other income-producing animals, always with an eye to practical development applications within livestock production and livelihood systems, and with the ultimate goal of increasing human well-being *via* increased benefits from livestock raising”. Though the revival of ER&D started in the 1970, the 1980s is regarded as a revolutionary period of the present day EVM. During that era, a substantial amount of publications were produced and conferences organised on EVM. Research and development on ethnoveterinary medicine continues till present (Swarup *et al.*, 2015).

3.10.1 Ethnoveterinary research and development around the world

“The era of treating ethnoveterinary medicine and any other ethnoknowledge system with suspicion and labelling it as a myth, superstition and witchcraft, is long gone” (Wanzala *et al.*, 2005). This statement applies to all communities of the world and evident by the amount of research activity and development on ethnoknowledge systems conducted worldwide. In the field of ethnoveterinary medicine, one of the highlights of such development, is that the American Veterinary Medical Association (AVMA), in its 1996 annual convention, recognises veterinary acupuncture and acutherapy, veterinary chiropractic, physical therapy, massage, homeopathic, botanical, nutraceutical, and holistic veterinary medicine as 'modalities to be offered in the context of a valid veterinarian/client/patient relationship' (van Veen, 1997).

On the research front, surveys to record indigenous animal health care practices and validation studies have been and are still conducted throughout the world. This is evident in the book entitled “Ethnoveterinary botanical medicine: Herbal medicines for animal health” by (Katerere & Luseba, 2010) which includes ethnoveterinary documentation reviews from around the globe. Those reviews include research done in India, Southeast Asia, North America, among the Native North American, South and Latin America, Southern Africa, Middle East and North Africa (MENA) Region, West Africa, China, European Union (EU) (Katerere & Luseba, 2010). The different authors of these reviews all admit that the work they presented was based on selected publications from these regions and, in some instances, certain countries of the regions. This selectiveness, indicates that even in each region of the world, trying to include all publications in such review would too much of a mammoth task to undertake because of the amount of publication already present.

In the same book, a review of the world's veterinary botanicals was also presented entitled “Inventory of traditional veterinary botanicals from around the world” by Iqbal and Jabbar (2010). The review by Iqbal and Jabbar (2010) document veterinary medicinal plants from around the world, totalling 451 plants representing 308 genera and 116 families from selected publications. Iqbal and Jabbar (2010) created table of medicinal plants categorised according to different ailments in animals from approximately 78 publications and citing a total of 222 related articles. The review highlights the amount of work that has been done worldwide in a relatively “new” field of research and concludes by emphasising the need for phytochemical and validation studies that would give support to the used of medicinal plants. The current ethnoveterinary research and development around the world varies from one

country to another. Countries such as China have far better established ethnoveterinary system than the other countries in the world. Therefore, the present review examines traditional Chinese veterinary medicine system in order to contrast it with what is happening in African countries, including South Africa.

The case of China

Chinese people are proud of their advances in ethnoveterinary medicine and have the right to be, because their development in EVM is comparable to none other (Lloret Nadal, 2009). According to Lloret Nadal (2009), while traditional Chinese veterinary medicine is still considered as an 'alternative' treatment in Europe and the USA, in China, more than half of veterinary clinics offer acupuncture and herbal medicine as part of their daily practice Lloret Nadal (2009). Furthermore, Lloret Nadal (2009) states that when the cause of illness cannot be identified, Western veterinary medicine treats only symptoms, whereas, traditional Chinese veterinary medicine searches for the true origin of what is affecting an animal, aiming to assist the animal to cure itself by correcting imbalance in its body. The integration of traditional and Western veterinary systems is impressive to an African (like this researcher) and shows that Chinese people have a holistic approach to health and health issues that acknowledge their ancestral wisdom.

In contrast, African countries have no documentation that shows the integration of Western and traditional medicine in veterinary practices. In fact, if there are Western-trained African animal health practitioners who are also ethnoveterinary practitioners, such evidence is not available in publications. Therefore part of the second objective of the study was to determine the presence of ethnoveterinary practitioners among Western-trained animal health practitioners.

3.10.2 Ethnoveterinary research and development in Africa

Africa is a continent full of diversity in terms of its people and their cultures, vegetation and landscapes. For these reasons, indigenous knowledge and practices vary among different cultures or regions of the continent. Therefore, African ethnoveterinary medicine (AEVM) in one country or even a region, is different from those in other regions or countries (Wanzala *et al.*, 2005). However, according to McCorkle and Mathias-Mundy (1992), the concept of diseases applies more or less, equally to animals and people in most cultures of the African continent, that the same herbs, compounds, manipulative techniques, magical procedures, are used in most instances, in animals as in humans.

The continent has a rich knowledge of traditional veterinary and application of the knowledge is done through medicinal plant treatment, surgery and herd management practices (McCorkle & Mathias-Mundy, 1992). African surgical skills include those for dehorning, castration cauterisation, wound management, obstetric and amputations (McCorkle & Mathias-Mundy, 1992). These skills and medicinal plant use have been documented in many publications reporting findings in different regions of Africa. However, ethnoveterinary research and development in Africa is not the same in different countries. Some countries, such as Cameroon, seem to have more online visibility than others. Some of these developments are discussed below.

The case of Cameroon

Cameroonian pastoralists depended solely on indigenous health practices before the introduction of Western veterinary medicine in Cameroon (Toyang *et al.*, 1995). According to Toyang *et al.* (1995), after six decades into colonisation of Cameroon in the 1940's, Western veterinary medicine was introduced in the country, which led to the ban of traditional animal health care practices in some areas of Cameroon. This meant that the knowledge and use of ethnoveterinary medicine declined (Toyang *et al.*, 1995). However, problems such as inadequate manpower and logistical inputs; scarce and erratic supply of veterinary drugs and supplies; high cost of veterinary drugs and supplies, plagued Western veterinary services, thus resulting in the exploration of other sustainable avenues for animal health management and EVM, which saw its revival in Cameroon (Toyang *et al.*, 1995).

Ethnoveterinary research and development in Cameroon has seen the publication of EVM exploratory surveys and the establishment of Ethnovet projects under the Hope Foundation Cameroon (Hope Foundation Cameroon, 2013) and Heifer Project International (HPI) (Toyang *et al.*, 1995). Though it is not clear when the Ethnovet project under Hope Foundation Cameroon started, together with rural farmers, their mission is to identify, preserve, document and share ethnoveterinary knowledge, thereby promoting it (HOFOCAM, 2013).

The other project, the Ethnoveterinary Medicine/Fulani Livestock Development project was initiated by Heifer Project International (HPI) in 1989 (Toyang *et al.*, 1995; van't Hooft, 2006). The project was a collaboration of HPI, Fulani elders and the founding members of the Cameroon Ethnoveterinary Association. The main motivation behind its establishment was to promote the use of ethnoveterinary remedies because of the frustration

experienced with having to depend on modern veterinary clinics as the sole providers of animal health care in Cameroon. The project has since then, been able to: document indigenous remedies for diseases for conditions affecting livestock in Cameroon; increase the use of effective indigenous remedies for animal health care; promote the identification and conservation of medicinal plant resources; and empower indigenous farmers to contribute to their own development (Toyang, undated).

Evidence of integration of Western veterinary medicine and traditional medicine by Western-trained animal health practitioners is not found in publications consulted in the course of this study. However, lack of evidence is likely caused by the absence of surveys that examined the integration processes for EVM. Ethnoveterinary projects in Cameroon are well published online. The lack of visibility of ethnoveterinary medicine development in South Africa is discussed below.

3.10.3 Ethnoveterinary research and development in South Africa

Southern Africa has the richest temperate flora in the world and encompasses a rich floristic diversity of approximately 24 000 taxa of 368 families, including more than 10% of the world's vascular plant flora on less than 2.5% of the earth's land surface area (Germishuizen & Meyer, 2003). South Africa's cultural diversity has resulted in the use of different plants for medical purposes (McGaw & Eloff, 2008). Studies have been conducted to document knowledge of EVM from indigenous people of South Africa. However, there is still a large portion of South Africa whose knowledge is still to be documented (McGaw & Eloff, 2008) and there is also a need to promote ethnoveterinary medicine in South Africa.

In addition, contrary to the situation that obtains in Cameroon, there seems to be lack of online visibility of available EVM projects that promote and protect EVM in South Africa. Available projects were mentioned by Swanepoel and van der Westhuizen (2009), who provided a description of the Jotello F. Soga Library of the Faculty of Veterinary Science, University of Pretoria (UP)'s role in locating, preserving and making accessible IK sources in the field of ethnoveterinary medicine. In the document, Swanepoel and van der Westhuizen (2009) make mention of a research programme entitled "Animal Health for Developing Farmers". Swanepoel and van der Westhuizen (2009) further allude to other surveys undertaken at the time through the "Animal Health for Developing Farmers" programme, including Luseba and Van der Merwe (2006) and Van der Merwe *et al.* (2001). This programme once existed at the Onderstepoort Veterinary Institute of the Agricultural

Research Council. Though the programme no longer exists (under this name), projects previously done under this name are now said to be within the Agricultural Research Council's corporate programme for Sustainable Rural Livelihoods (Swanepoel & van der Westhuizen, 2009).

However, an online search for ethnoveterinary medicine in the Agricultural Research Council, led to the discovery of a webpage for the Toxicology and Ethno Veterinary Medicine (TEVM) unit. The objective of the unit is to perform toxicological analyses of samples which includes animal organs, cadavers of small animals, biological fluids (urine, blood), and animal feed for any toxins, including those of ethnoveterinary medicine origin. According to Swanepoel and van der Westhuizen (2009), there are EVM preservation and promotional programmes in ARC, but the positioning of EVM with Toxicology paints a very unfavourable picture for the development of EVM in South Africa. However, there are still many positive developments in South Africa in the field of ethnoveterinary medicine, including occasional EVM-related articles in magazines such as farmers' weekly and the South African Pork Producers' Organisation (SAPPO) and also formal peer-reviewed publications of EVM surveys. The section below provides a review of literature on exploratory ethnoveterinary medicine in South Africa. The review focuses on the history, trends and uses of medicinal plants in EVM studies published in South Africa.

3.10.3.1 Historical perspective of exploratory surveys on ethnoveterinary medicine (EVM) in South Africa

Formal documentation of ethnoveterinary medicine in South Africa can be traced as far back to 1938 with the published documentation of medicinal plants as recorded by Gerstner (1938) in the book entitled "A preliminary checklist of Zulu names of plants with short notes: Bantu Studies". The book was revised in 1939 and 1941. The book was a recording of ethnobotanical surveys with the primary purpose of recording ethno-medicinal plants, however, information on some ethnoveterinary medicinal plants was also provided. In the present review of literature, this researcher unearthed some distinct trends with regard to EVM records. It was observed that in exploratory ethnoveterinary surveys in South Africa, there are essentially two categories of research that provided documentation on ethnoveterinary medicine, this researcher then classified into category A and B. Category A is ethnobotanical surveys with some mention of ethnoveterinary medicine while category B are surveys where documentation of ethnoveterinary knowledge is the main focus.

The publication in category B started with Masika *et al.* (1997) in an article entitled “Perceived causes, diagnosis and treatment of babesiosis and anaplasmosis in cattle by livestock farmers in communal areas of the central Eastern Cape Province, South Africa”. The total number of publications in category B is fifteen (15) and two of these are literature reviews by McGaw and Eloff (2008) and Maphosa *et al.* (2010). Below is a sequential historical perspective of exploratory surveys on ethnoveterinary medicine in South Africa. It is discussed according to the two categories, starting with category A.

Category A



Category A: 1930s-1970s

As mentioned above, Gerstner (1938) recorded ethnoveterinary medicine in South Africa in an ethnobotany survey. The book, and its subsequent editions, recorded treatment for animal diseases and conditions that include 20 plant species in 10 plant families. The highest number of plant species family is the Asteraceae. Some of the medicinal uses in the publication are not specific for diseases with quotes such as “Used medicinally for cattle”, but includes treatment for colic, scrofula and vermifuge for horses and lice, skin eruptions, tick infections and screw-worm on cattle.

The next publication was by Hulme (1954) entitled “Wild Flowers of Natal”. Five plant species in five plant families for the treatment of animals are recorded in the book. The use of medicinal plant includes treatment of cows with swollen udders after calving and also as tonics and purgatives in animals. A book by Watt and Breyer-Brandwijk (1962) entitled “The Medicinal and Poisonous Plants of Southern and Eastern Africa”, was published next. In the book, plants used for the treatment of animals, include 26 families and 37 plant species. The most recorded family is the Solanaceae. Overall, treatments include those for intestinal parasites, wounds and maggots and udder problems. Palmer and Pitman (1972), in their book entitled ‘Trees of Southern Africa’, mention *Cussonia spicata*, as treatment of hot fomentations in goats with paralysis of the hind quarters.

Category A: 1980s-1990s

In an article by Hutchings and Johnson (1986), *Dietes iridioides* is documented for the treatment and prevention of stomach ailments in goats and sheep. Roberts (1990), in his book entitled “Indigenous Healing Plants”, document treatment of ailments such as lice, skin eruptions, tick infections, screw-worm on cattle and retained placenta using three plant

species from three plant families. In the same year, Mabogo (1990), in a MSc Thesis entitled “The ethnobotany of the Vhavenda”, suggests 245 species of plants used for food, medicine, firewood, building, art, as sources of oils and dyes, for shade and as ornamentals by Vhavenda people. Among these, there are also plants that are specifically mentioned as useful in ethnoveterinary medicine, including eight (8) plant species belonging to six (6) plant families. Some of the plants are used as anthelmintic and for the treatment of black quarter.

In the book entitled “Zulu Medicinal Plants: An Inventory” by Hutchings *et al.* (1996), ethnoveterinary medicinal plants are documented, including 34 plant species belonging to 20 plant families. The most recorded family is Asteraceae. The treatments include those for equine intestinal parasites, gallsickness in cattle and blood scours’ in calves.

Category B

Category B: 1990s-2000s

The aforementioned publication by Masika *et al.* (1997) did not generate an inventory of plants used for the treatment of tick-borne diseases, but established the indigenous belief/perception about the cause of these diseases, indigenous diagnosis and methods of treatments. The study was conducted in seven districts in central Eastern Cape Province and targeted African livestock holders farming on communally-owned land in central Eastern Cape Province. It was found that most livestock owners relate the aetiology of tick-borne diseases to excessive grazing of lush green grass, which is thought to bring about the accumulation of bile in the body. Majority of livestock owners diagnose gallsickness and redwater on the basis of presenting signs and post-mortem findings. Furthermore, 89% of farmers in the study claimed to administer herbal remedies to treat the two tick-borne diseases. Most of these farmers (75 %) combined herbal remedies with conventional medicines and 25 % used herbal remedies only. Application of herbal remedies was reportedly aimed mainly at the removal of excess bile.

The next study and also a sequel publication of the above study was by Masika *et al.* (2000). The study revealed that the use of herbal remedies was still widespread since these remedies were cheap, locally available and convenient to administer. Most farmers interviewed (73 %), had used some form of herbal remedy before. After that, Van der Merwe *et al.* (2001), used the Rapid Rural Appraisal (RRA) methods to document the use of ethnoveterinary medicinal plants in cattle by Setswana-speaking people in the Madikwe area

of the North West Province of South Africa and forty-five plant species representing twenty-four families were recorded. The medicinal plants mentioned were used alone or in poly-herbal remedies for twenty-nine indications. The most important indications were retained placenta, diarrhoea, gallsickness, fractures, eye inflammation, general ailments, fertility enhancement, general gastrointestinal problems, heartwater, internal parasites, coughing, redwater and reduction of tick burden. Additionally, RRA was found to be a successful method of investigation for the study of ethnoveterinary medicine.

In the same year, Dold and Cocks (2001) documented a list of fifty-three plants used as veterinary medicines by stock farmers in Alice District in the Eastern Cape Province. These plants were used for the treatment of diseases, including, gallsickness (anaplasmosis), black quarter, internal parasites, mange, redwater (babesiosis), retained afterbirth, three-day stiffness and vaginitis. Masika and Afolayan (2003) conducted a study in the Eastern Cape and an ethnoveterinary medicinal plants inventory was generated that included 38 plant species belonging to thirty-one families. The plants were indicated for use in the treatment of gallsickness, redwater, heartwater, eye infection, retained placenta, foot rot, hastening oestrus, three day stiffness and intestinal parasites. Of the thirty-eight plants documented in the study, thirty-four of them are used for the treatment of babesiosis (redwater) and anaplasmosis (gallsickness). This is an indication of the importance or the higher prevalence of these diseases in the region.

Thereafter, Luseba and Van der Merwe (2006) used the Rapid Rural Appraisal methods to collect indigenous knowledge on animal healthcare of Xitsonga-speaking people of South Africa in the Greater Giyani Municipality. Farmers reported using nineteen plant species belonging to twelve families. The authors also reported that plants were used as alternatives to the more expensive medicines in most cases. However, the indigenous community also reported a preference to plant remedies for certain diseases since they perceived the plants to be more effective than Western forms of medicine.

Two years later, a review by McGaw and Eloff (2008) was published on ethnoveterinary use of Southern African plants and scientific evaluation of their medicinal properties. The review recorded over 200 plant species found to be used in EVM in South Africa, with extremely diverse treatment indications. That review was followed by the documentation of traditional remedies used for the treatment of cattle wounds and myiasis in Amatola Basin, Eastern Cape Province by Soyelu and Masika (2009). The survey revealed

that 13 medicinal plants belonging to eleven families were used. However, *Aloe ferox*, *Prunus persica* and *Phytolacca heptandra* were the most commonly used.

Mwale and Masika (2009), reported ethnoveterinary control of parasites, management and role of village chickens in rural households of Centane District in the Eastern Cape. Eighty-three percent of respondents interviewed in that study used medicinal plants to control both internal and external parasites in chickens. Moyo and Masika (2009) conducted a survey to document tick control methods used by resource-limited farmers in the control of cattle ticks in the Eastern Cape Province of South Africa. Ticks were reported to be a major problem causing diseases such as anaplasmosis, babesiosis and ehrlichiosis, as well as wounds that predisposed screwworm infestation, tick worry and teat damage. The main tick control methods were acaricides provided by government, however, 94.9% of farmers interviewed were of the opinion that the dip wash was not effective. In addition, some farmers also used plants, mainly the leaf of *Aloe ferox* and the bark of *Ptaeroxylon obliquum*.

Category B: 2010-till present

In 2010, a literature review by Maphosa *et al.* (2010) was published as a chapter in the book entitled “Ethnoveterinary botanical medicine: Herbal medicines for animal health” by Katerere and Luseba (2010). In the chapter, some medicinal plant families documented in the Southern Africa region were discussed. In the same year, Maphosa and Masika (2010) conducted a survey of ethnoveterinary uses of medicinal plants for the control of gastrointestinal parasites of goats in the Eastern Cape Province. The survey revealed twenty-eight plant species from twenty families that are commonly used in the treatment of gastrointestinal parasites in goats. The plant family, Asphodelaceae, was more frequently mentioned.

Three years later, Luseba and Tshisikhawe (2013) reported on medicinal plants used in the treatment of livestock diseases in Vhembe region, Limpopo Province. The study reported a total of thirty-four plant species belonging to twenty-two plant families used for forty-seven medicinal indications. The plant families that were commonly mentioned included Fabaceae, Asteraceae, Rubiaceae, Combretaceae and Euphorbiaceae families. After the publication by Luseba and Tshisikhawe (2013), no other articles were published until 2016.

In 2016, Sanhokwe *et al.* (2016) conducted a survey on medicinal plants used to control internal and external parasites in goats in Kwezi and Ntambethemba villages in the Eastern Cape Province. The survey revealed nine plant species belonging to eight families used to control parasites in goats. Asphodelaceae was the most frequently used plant family. In the same year, Ramovha and van Wyk (2016) reported on medicinal plants used for the treatment of redwater (Mali or babesiosis) in Vhembe District, Limpopo Province. Twenty medicinal plant species belonging to ten families were recorded, which were either used as single-plant or poly-plant remedies. This historical perspective confirms the need of further EVM exploratory surveys in South Africa. In addition, some trends in exploratory ethnoveterinary medicinal surveys (category B) were observed during the literature review and are discussed in the section that follows.

3.10.3.2 Trends in exploratory surveys in ethnoveterinary medicine (EVM) in South Africa

Certain trends in exploratory surveys were observed and examined in category B publications of South Africa. Two of these trends (the geographical locations and participants of ethnoveterinary surveys) are discussed below.

3.10.3.2.1 Geographical trend in exploratory research in EVM research in South Africa

In all the category B research discussed above (in section 3.10.3.1), the Eastern Cape Province had more activity in exploratory surveys in EVM than any other province. Category B research in the Province started with Masika *et al.* (1997). Since then, publications in the Province have continued (with some hiatus) till date. It is noteworthy to indicate that out of a total of thirteen (13) category B exploratory surveys on ethnoveterinary medicine (from 1997 till present), nine (69.2%) were conducted in the Eastern Cape Province.

Research in the Eastern Cape Province include those conducted by Dold and Cocks (2001); Maphosa and Masika (2010); Masika and Afolayan (2003); Masika *et al.* (1997); Masika *et al.* (2000); Moyo and Masika (2009); Mwale and Masika (2009); Sanhokwe *et al.* (2016); Soyelu and Masika (2009). Five of these studies were in the Amathole District Municipality in villages located in Victoria East, Keiskammahoek, Middledrift, Zwelitsha, Mdantsane, Peddie, Stutterheim and Alice. Eight out of nine studies conducted in the Eastern Cape Province were conducted through the University of Fort Hare in Alice, while the study by Dold and Cocks (2001) was done through Rhodes University in Grahamstown. This could

be an indication that the University of Fort Hare is the leading institution in exploratory surveys on EVM in South Africa.

The other four (4) exploratory studies (from the total of thirteen) were done in Limpopo (three studies) and the North West Provinces (one study). In Limpopo Province, the first was conducted by Luseba and Van der Merwe (2006) in Greater Giyani Local Municipality (in the Mopani District Municipality among Vatsonga), followed by Luseba and Tshisikhawe (2013) in villages in Mutale, Thohoyandou, Nzhelele and Pundamaria (in the Vhembe District Municipality among Vhavenda). The most recent study by Ramovha and van Wyk (2016) was done in the Vhembe District Municipality among Vhavenda people.

In the North West Province, the study by Van der Merwe *et al.* (2001) was the first of its kind. Though the study by Van der Merwe *et al.* (2001) is not recent, it is still an important work that exposed the wealth of knowledge among Setswana-speaking people who are the main ethnic group of the Province. This report on the geographical trend exposes a total lack of ethnoveterinary survey activities in Gauteng, Mmpumalanga, Western Cape, Northern Cape and Kwazulu Natal provinces. In addition to the geographical trend in terms of EVM surveys, the literature review also uncovered a trend in participants engaged in such surveys, which is discussed in the following section.

3.10.3.2.2 Trend of participation in exploratory EVM surveys in South Africa

In an effort to determine the demographic characteristics of indigenous people who were likely to be recruited as participants in this exploratory survey, the researcher observed that most participants who took part in previous studies were older in terms of age and majority of them were males (Luseba & Van der Merwe, 2006; Ramovha & van Wyk, 2016). However, the researcher also observed that there were very few traditional healers who participated in exploratory surveys on ethnoveterinary medicine in South Africa (this trend is examined in this section). Most ethnomedicinal surveys for human treatment, target both ordinary members of the community and traditional healers. In these studies traditional healers are the main source of ethnomedicinal knowledge (Appidi *et al.*, 2008; Erasto *et al.*, 2005; Grierson & Afolayan, 1999; Koduru *et al.*, 2007). In example is a study by Semenya *et al.* (2012) documents treatments as cited only by Bapedi traditional healers. The study, therefore, supports the supposition that traditional healers are accepted as the supreme holder of knowledge but not to the exclusion and discrediting of other knowledgeable members of communities who are not traditional healers.

On the contrary, in ethnoveterinary surveys, the trend is different from studies on ethnomedicinal practices. In most exploratory surveys on EVM, farmers participated more than traditional healers. Figure 3.2 shows that in a study by Luseba and Van der Merwe (2006), among Vatsonga people, approximately 200 farmers were interviewed either in groups or individually while only two traditional healers (1%) were involved in the study. Participants in the study also revealed that they seldom consulted with traditional healers for animal healthcare but use the services of traditional healers occasionally to either get help in finding lost animals or protect animals against witchcraft. Furthermore, most of the farmers (87 %) learned ethnoveterinary treatments from their relatives and other farmers and were generally willing to share with others. The authors of the study also observed and speculated that traditional healers do not share their knowledge as it is the source of their livelihood.

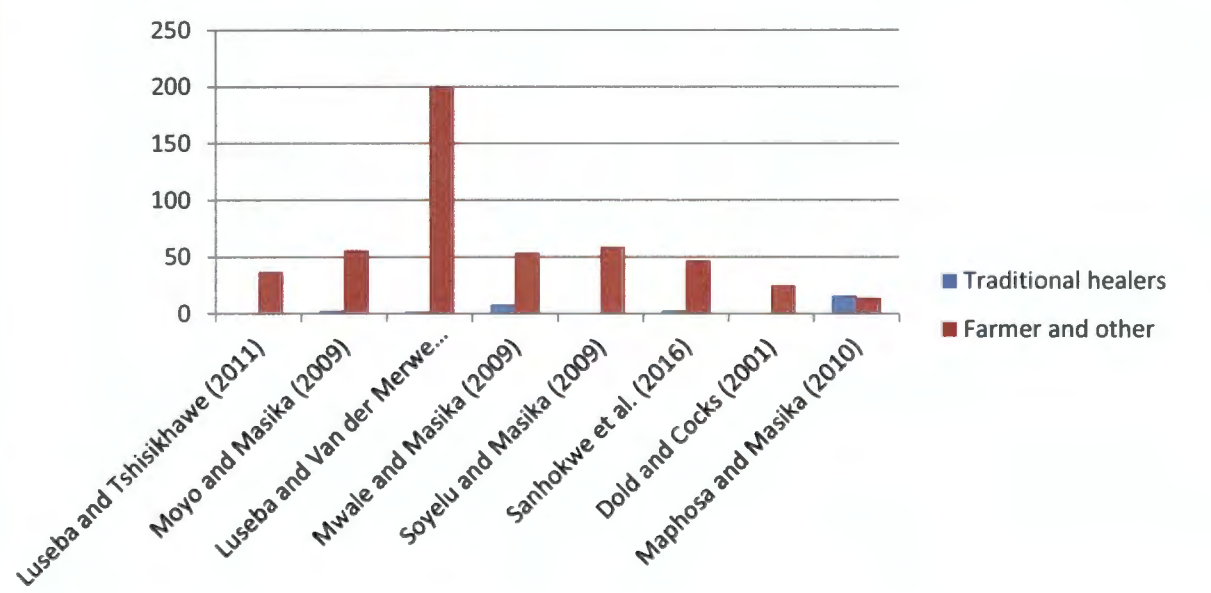


Figure 3.2: Number of traditional healers interviewed compared to the number of farmers plus other community members participating in ethnoveterinary surveys in South Africa

Masika *et al.* (1997) conducted a study involving a total of 343 participants. In the study, one herbalist was mentioned (according to van Wyk *et al.* (1997) traditional healers are referred to as herbalist in Xhosa culture). The herbalist mentioned in the study is referred to as “one of the herbalists who participated in the study”, an indication that more than one took part in the study. Though the total number of herbalists is not stated, in evaluating the document, it is obvious that the number was relatively low. In a study by Luseba and Tshisikhawe (2013) conducted in Vhembe District Municipality, thirty-seven (37)

participants were interviewed and no traditional healer participated. It is also stated in the article that traditional healers do not share their knowledge with farmers. Participants revealed that “Diviners” (traditional healers) are usually consulted for protection of livestock and their kraals but not for the treatment of animal diseases and this also reflects the views of the Vatsonga people in the study by Luseba and Van der Merwe (2006).

In a study conducted by Moyo and Masika (2009), in the Eastern Cape Province, a total of 59 farmers participated in the survey while three of them (5%) were herbalists. In the same Province, Soyelu and Masika (2009) interviewed fifty-nine (59) cattle farmers and the findings revealed no herbalist participated in study. Van der Merwe *et al.* (2001) interviewed 28 participants and conducted 2 group interviews in the Madikwe state veterinary area, North West Province. Farmers, extension officers, traditional healers and other knowledgeable individuals participated in the study. The findings did not reveal the number of traditional healers interviewed. Additionally, during the study, it was observed that traditional healers were not co-operative because they perceived that shared knowledge could be abused and that it could also weaken their professional advantage and affect their source of income (Van der Merwe, 2000).

In a study by Mwale and Masika (2009), sixty-two (62) chicken farmers were interviewed in Centane District in the Eastern Cape Province in order to document EVM practices used to control gastro-intestinal parasites in village chickens. In the study, participants included a total of eight “key informants” (who were retired livestock specialists), village councillors, and herbalists and their information was used to validate information from other chicken farmers. The article did not state the number of herbalists amongst the eight key informants. Dold and Cocks (2001) documented EVM in Alice District of the Eastern Cape Province. Twenty-five (25) interviews (household members) were conducted but no traditional healer was interviewed. Sanhokwe *et al.* (2016) conducted a study on medicinal plants in Chris Hani District Municipality, Eastern Cape Province. In the study, fifty (50) farmers and three (6%) herbalists were participants. Contrary to the trend, a study by Maphosa and Masika (2010) examined plants used for control of gastro-intestinal parasites of goats in the Eastern Cape Province. In the study, sixteen (16) herbalists and fourteen (14) goat farmers were interviewed. Among the studies mentioned above, the study by Maphosa and Masika (2010) is the only one where the number of traditional healers was higher than the number of farmers.

The disparities in the percentage of traditional healers to farmers participating in EVM studies in South Africa as demonstrated in Figure 3.2 (other studies, including Ramovha and van Wyk (2016), had traditional healers, together with farmers and other members of the communities participating, but did not mention the total number of participants, are not included in Figure 3.2). The disparities can be speculatively attributed to the following reasons that could have influenced participant recruitment processes in different studies.

In different surveys, the number of traditional healers was low in the study areas, thus leading to a small percentage participating in the overall sample. This could be explained by the fact that traditional healers make up only approximately 0.4% of the total population in South Africa (Truter, 2007). It could, therefore be concluded that, in farming communities where most EVM studies were conducted, the number of traditional healers was lower than the number of farmers. Another reason for the low number of traditional healers could be the fact that traditional healers are not willing to participate because they believe it will disadvantage their standing as main knowledge holders, thus affecting their income. This supposition is supported by Luseba and Tshisikhawe (2013); Luseba and Van der Merwe (2006); Van der Merwe *et al.* (2001) who share the same sentiment. Ramovha and van Wyk (2016) obtained contrary results in their study conducted in Vhembe District Municipality on the treatment of redwater. The authors argue that “Traditional healers are more collaborative and confident, willingly explaining and demonstrating the treatments (EVM).” In fact, they also observed that farmers are very reserved in terms of sharing EVM information and only pass on such information to a few trusted individuals, thus resulting in only a few farmers knowing the treatment of redwater.

The other reason for the low participation of traditional healers in EVM studies could be due to the fact that knowledge of traditional animal health care is held by livestock farmers and other members of communities, including livestock herders. This supposition is supported by Ramovha and van Wyk (2016), who observed that even though there are many skilled traditional healers for human ailments, there are no specialist veterinary traditional healers and farmers have become their own ethnoveterinarians. It could, therefore, be concluded that, in general, traditional healers concentrate in human healthcare and only those that have animals or those with interest in livestock farming would have substantial knowledge of traditional animal treatment and, therefore, participate in exploratory surveys on EVM.

Lastly, another reason for the low number of traditional healers who participated in EVM surveys could be due to the fact that different research teams generally have preference for farmers as knowledge holders since they are easier to approach than traditional healers. This is because, people generally have more reverence for traditional healers and their time, and therefore, are more hesitant to approach them for participation (the researcher's own contribution). Although the trends discussed in this section were noted during the examination of the literature on EVM in South Africa, the main objective of such examination was to produce an inventory of ethnoveterinary medicinal plants of South Africa (presented below).

3.10.3.3 Inventory of ethnoveterinary medicinal plants used in South Africa organised by anatomical systems or disease categories

This inventory was compiled from a review of publications on exploratory surveys (category B and one category A found on on-line search) of ethnoveterinary medical knowledge in South Africa. The main aim of the review was to learn and also report on the epistemological base of ethnoveterinary medical knowledge in South Africa. There are only two published reviews on ethnoveterinary medicine in South Africa and these were conducted by Maphosa *et al.* (2010) and McGaw and Eloff (2008). Those researchers did a magnificent work in terms of consolidating some of the surveys on EVM and report on the knowledge and practices of ethnoveterinary medicinal plants in the country. However, some publications in the category B were not included in both reviews. Furthermore, all surveys post-2010, are still to be reviewed. In addition, there is no South African review that categorises plant remedies according to body systems or the grouping of diseases as done by Iqbal and Jabbar (2010). This review integrates available literature on ethnoveterinary medicine in South Africa and categorises the use of medicinal plants according to body systems or grouping of diseases. This review will, hopefully, present a document that is comprehensive enough and easier to digest like the one done by Iqbal and Jabbar (2010).

3.10.3.3.1 Ethnoveterinary medicine for the treatment of gastrointestinal tract problems

This review categorises ethnoveterinary medicinal plants (EVMP) in South Africa used for gastrointestinal tract health problems into two groups as follows: gastrointestinal parasites (Table 3.1 section a); and other gastrointestinal problems such as diarrhoea, constipation, colic and general abdominal problems (Table 3.1 section b). The review found that the most commonly treated git problem is helminths (synonyms: gastrointestinal parasites, vermin,

internal parasites and intestinal parasites or worms), followed closely by diarrhoea. This review recorded fifty-one (51) medicinal plant species from thirty-one (31) families used for the treatment of internal parasites. The most documented plant species were from the Asphodelaceae family, followed by those in the Fabaceae family. Other plant families that are frequently mentioned include, Asteraceae, Hyacinthaceae and Lamiaceae. In addition, the review also recorded forty (40) medicinal plant species from twenty-two (22) families used for the treatment of other gastrointestinal problems, excluding gastrointestinal parasites by ethnoveterinary practitioners of South Africa. Among these, the most commonly family was Fabaceae, followed by Anacardiaceae, Euphorbiaceae and Asteraceae.

Table 3.1: Ethnoveterinary medicinal plants used by indigenous communities in South Africa categorised by anatomical systems or ailments as documented in the literature

Family	Plant	Common name	Province	Treatment indication and animals treated	Plant part used and preparation method
a. Medicinal plants used for the treatment of internal parasites/ helminths/ gastrointestinal parasites, vermin and intestinal parasites or worms					
Agapanthaceae	<i>Agapanthus praecox</i>	Umkondo(isiXhosa)	ECP*	Unspecified helminths: in goats	Leaf infusion (Sanhokwe <i>et al.</i> , 2016). Leaf infusion (Maphosa & Masika, 2010)
Anacardiaceae	<i>Harpephyllum caffru</i>	Umgwenya (isiXhosa)	ECP*	Gastro-intestinal parasites	Bark decoction(Maphosa & Masika, 2010)
Apiaceae	<i>Centella coriacea</i>	Inyongwana(isiXhosa)	ECP*	Unspecified helminths: in goats	Bark decoction (Sanhokwe <i>et al.</i> , 2016) Bark decoction: (Maphosa & Masika, 2010)
Apocynaceae	<i>Acokanthera oppositifolia</i>	Intlungunyemba (isiXhosa)	SA* ECP*	Tapeworm (Dold & Cocks, 2001) helminths: in goats (Sanhokwe <i>et al.</i> , 2016)	Root decoction (Dold and Cocks, 2001) Leaf decoction (Sanhokwe <i>et al.</i> , 2016) Leaf decoction: (Maphosa & Masika, 2010)
Araliaceae	<i>Cussonia spicata</i>	Umsenge (isiXhosa)	ECP*	Unspecified helminths: in goats	Bark infusion (Sanhokwe <i>et al.</i> , 2016). Bark infusion: (Maphosa & Masika, 2010).
Asphodelaceae	<i>Aloe arborescens</i>	Ikhala elincinci (isiXhosa)	ECP*	Gastro-intestinal parasites	Leaf decoction: (Maphosa & Masika, 2010)
Asphodelaceae	<i>Aloe ferox</i>	Ikhala elikhulu, Ikhhalana (isiXhosa)	ECP*	Gastro-intestinal parasites	Leaf infusion (Masika et al., 2000). Leaf infusion (Sanhokwe <i>et al.</i> , 2016) Leaf Decoction: (Maphosa & Masika, 2010)
Asphodelaceae	<i>Aloe greatheadii</i> var. <i>davyana</i>	Kgophane (Setswana)	NWP*	Intestinal parasites	Whole plant infusion (Van der Merwe <i>et al.</i> , 2001)
Asphodelaceae	<i>Aloe marlothii</i>	Mokgopa (Setswana)	NWP*	Intestinal parasites	Leaf infusion in drinking water (Van der Merwe, 2000)
Asphodelaceae	<i>Aloe tenuior.</i>	uMjingqa(isiXhosa)	ECP*	Tapeworms and intestinal parasites	Leaf sap in drinking water (Dold and Cocks (2001) citing Bizimana N, 1994)
Asphodelaceae	<i>Aloe zebrina</i>	Kgophane (Setswana)	NWP*	Intestinal parasites	Whole plant infusion (Van der Merwe, 2000)
Asphodelaceae	<i>Bulbine abyssinica</i>	Umaweni(isiXhosa)	ECP*	Gastro-intestinal parasites	Leaf decoction: (Maphosa & Masika, 2010)
Asphodelaceae	<i>Bulbine frutescens</i>	Utswelana (isiXhosa) (cat's tail)	ECP*	Gastro-intestinal parasites	Whole plant infusion: (Maphosa & Masika, 2010)

Asphodelaceae	<i>Bulbine latifolia</i>	Ingcelwana (isiXhosa) Uyakayakane (isiXhosa) Ingcelwane (isiXhosa)	ECP*	Unspecified helminths: in goats Internal parasites	Leaf decoction (Sanhokwe <i>et al.</i> , 2016). Leaf decoction: (Maphosa & Masika, 2010)
Asphodelaceae	<i>Gasteria bicolor</i>	Intelezi (isiXhosa)	ECP*	Gastro-intestinal parasites	Leaf infusion: (Maphosa & Masika, 2010)
Asteraceae	<i>Vernonia neocorymbosa</i>	Phathaphathane (Tshivenda)	Limpopo*	Anthelmintics for donkeys Intestinal worms	Leaf and root infusion (Mabogo, 1990)
Asteraceae	<i>Vernonia corymbosa</i>	Phathaphathane (Tshivenda)	Limpopo*	Worms in cattle	Root infusion (Luseba & Tshisikhawe, 2013)
Asteraceae	<i>Vernonia colorata</i>	Phathane (Tshivenda)	Limpopo*	Worms	Root decoction (Luseba & Tshisikhawe, 2013)
Capparidaceae	<i>Capparis sepiaria</i>	Intsihlo (isiXhosa)	ECP*	Gastro-intestinal parasites	Root infusion: (Maphosa & Masika, 2010)
Celastraceae	<i>Mystroxydon aethiopicum</i>	uMbomvane (isiXhosa)	KZN*	Worms in calves	Bark infusion (Dold and Cocks, 2001 citing Bizimana N 1994)
Celastraceae	<i>Elaeodendron transvaalensis</i>	Mulumanama (Tshivenda)	Limpopo*	Worms in cattle	Fruit infusion: (Luseba & Tshisikhawe, 2013)
Combretaceae	<i>Combretum molle</i>	Mugwiti (Tshivenda)	Limpopo*	Worm infestation	Leaf infusion (Luseba & Tshisikhawe, 2013)
Euphorbiaceae	<i>Ricinus communis</i>	Mokhura (Setswana)	NWP*	Internal parasites	Powdered seeds (Van der Merwe, 2000)
Fabaceae	<i>Acacia karroo</i>	uMnga (isiXhosa)	ECP*	Unspecified internal parasites in goats and sheep.	Bark decoction: (Dold and Cocks, 2001)
Fabaceae	<i>Elephantorrhiza elephantina</i>	Intolwane (isiXhosa)	ECP*	Unspecified helminths: in goats	Root decoction: (Sanhokwe <i>et al.</i> , 2016) Root decoction: (Maphosa & Masika, 2010)
Fabaceae	<i>Pterocarpus angolensis</i>	Vhangazi/Murhotso (Xitsonga)	Limpopo*	Intestinal worms	Bark decoction or infusion (Luseba & Van der Merwe, 2006)
Fabaceae	<i>Schotia latifolia</i>	Umnxgam (isiXhosa)	ECP*	Gastro-intestinal parasites	Bark decoction: (Maphosa & Masika, 2010)
Geraniaceae	<i>Pelargonium sidoides</i>	Uvendle (isiXhosa)	ECP*	Gastro-intestinal parasites	Tuber Decoction: (Maphosa & Masika, 2010)
Gunneraceae	<i>Gunnera perpensa</i>	Iphuzi (isiXhosa)	ECP*	Gastro-intestinal parasites in goats	Tuber decoction (Sanhokwe <i>et al.</i> , 2016) Tuber Decoction: (Maphosa & Masika, 2010)

Hyacinthaceae	<i>Albuca setosa</i>	Ingwebeba (isiXhosa)	ECP*	Unspecified helminths; in goats	Crush the tuber, boil and dose with a 500-mL bottle for helminths (Sanhokwe <i>et al.</i> , 2016)
Hyacinthaceae	<i>Urginea altissima</i>	uZabokwe iMfilisi. (isiXhosa)	ECP*	Intestinal parasites in cattle	Bulb decoction (Dold and Cocks, 2001)
Hyacinthaceae	<i>Urginea sanguinea</i>	Sekaname (Setswana)	NWP*	Helminthiasis	Bulb infusion with whole plant of <i>Aloe greatheadii</i> and <i>Aloe zebrina</i> (Van der Merwe, 2000) Bulb decoction with root of <i>Ximenia americana</i> var <i>microphylla</i> . (Van der Merwe, 2000) Tuber decoction: (Maphosa & Masika, 2010)
Hypoxidaceae	<i>Hypoxis argentea</i>	Inongwe yehashi (isiXhosa)	ECP*	Gastro-intestinal parasites	Leaves decoction (Maphosa & Masika, 2010)
Lamiaceae	<i>Leonotis leonurus</i>	Umfincamfincane (isiXhosa),	ECP*	Internal parasites	Leaves decoction (Maphosa & Masika, 2010)
Lamiaceae	<i>Ocotea bullata</i>	Unukani (isiXhosa)	ECP*	Gastro-intestinal parasites	Bark decoction (Maphosa & Masika, 2010)
Lamiaceae	<i>Teucrium trifidu</i>	Ubuhlungu bebhokhwe (isiXhosa)	ECP*	Gastro-intestinal parasites	Leaves infusion: (Maphosa & Masika, 2010)
Loganiaceae	<i>Strychnos decussata</i>	uMnonono (isiXhosa)	ECP*	Roundworms in cattle Internal parasites	Bark infusion: (Dold & Cocks, 2001)
Loganiaceae	<i>Strychnos henningsii</i>	Umnonono (isiXhosa)	ECP*	Gastro-intestinal parasites	Bark Decoction: (Maphosa & Masika, 2010)
Malvaceae	<i>Hibiscus malacospermus</i>	UmSongelwa (isiXhosa)	ECP*	Intestinal worms	Root decoction (Masika <i>et al.</i> , 2000)
Olacaceae	<i>Ximenia americana</i> , var. <i>microphylla</i>	Seretologa (Setswana)	NWP*	Helminthiasis in cattle	Root decoction with bulb of <i>Urginea sanguinea</i> (Van der Merwe, 2000)
Pedaliaceae	<i>Dicerocaryum eriocarpium</i>	Museto (Tshivenda)	Limpopo*	Worms in cattle	Aerial parts infusion (Luseba & Tshisikhawe, 2013)
Pittosporaceae	<i>Pittosporum viridifloru</i>	Umkhwenkwe (Cheese wood)	ECP*	Gastro-intestinal parasites	Bark infusion: (Maphosa & Masika, 2010)
Polygonaceae	<i>Rumex lanceolatus</i>	Idolo lenkonyane, Idlonyaya (isiXhosa)	ECP*	Internal parasites	Root decoction: (Maphosa & Masika, 2010)
Ptaeroxylaceae	<i>Ptaeroxylon obliquum</i>	Umthathi (isiXhosa)	ECP*	Gastro-intestinal parasites	Leaf decoction: (Maphosa & Masika, 2010)
Rhamnaceae	<i>Ziziphus mucronata</i>	Umphafa (isiXhosa)	ECP*	Gastro-intestinal parasites	Leaf infusion: (Maphosa & Masika, 2010)
Rhamnaceae	<i>Ziziphus zeyheriana</i>	Sekgalo-fatshe	NWP*	Internal parasites in cattle	Root-stock decoction (Van der Merwe, 2000)

Rutaceae	<i>Zanthoxylum capense</i>	(Setswana) Umlungumabele	ECP*	Gastro-intestinal parasites	Root decoction: (Maphosa & Masika, 2010)
Sterculiaceae	<i>Hermannia incana</i>	Mavulakuvaliwe (isiXhosa), Sweet yellow bells	ECP*	Gastro-intestinal parasites	Whole plant decoction: (Maphosa & Masika, 2010)
Tiliaceae	<i>Grewia occidentalis</i>	Umnqabaza (isiXhosa), Crossberry	ECP*	Gastro-intestinal parasites	Bark decoction: (Maphosa & Masika, 2010)
Vitaceae	<i>Rhoicissus tridentata</i>	Ntagaraga (Setswana)	NWP*	Internal parasites	Tuber decoction (Van der Merwe et al., 2001)
Zamiaceae	<i>Stangeria eriopus</i>	uMfingwani (isiXhosa)	Limpopo*	Internal parasites in livestock	Rootstock. (Dold & Cocks, 2001)

b. Medicinal plants used for treatment of other gastrointestinal problems including diarrhoea, constipation, colic and general abdominal problem.

Alliaceae	<i>Agapanthus praecox Willd.</i>	uMkhondo (isiXhosa)	ECP*	Diarrhoea in sheep and goats	Root decoctions: (Dold & Cocks, 2001)
Amaryllidaceae	<i>Boophane disticha</i>	iShwadi (isiXhosa)	ECP*	Constipation in cattle	Root (Dold and Cocks (2001) citing Chavunduka D.M. (1976))
Anacardiaceae	<i>Ozoroa paniculosa</i>	Monakane (Setswana)	NWP*	Diarrhoea	Bark or rootbark decoction: (Van der Merwe, 2000)
Anacardiaceae	<i>Protorhus longifolia</i>	uZintlwa (isiXhosa)	ECP*	Diarrhoea in cows	Bark decoctions (Dold & Cocks, 2001)
Anacardiaceae	<i>Rhus incisa</i>	uNongquthu (isiXhosa)	ECP*	Diarrhoea in cows	Bark infusions (Dold & Cocks, 2001)
Anacardiaceae	<i>Rhus lancea</i>	Moshabela (Setswana)	NWP*	Diarrhoea in calves	Root decoction (Van der Merwe, 2000)
Anacardiaceae	<i>Sclerocarya birrea</i>	Morula (Setswana)	NWP*	Diarrhoea in cattle	Bark infusion (Van der Merwe, 2000).
Asclepiadaceae	<i>Secamone filiformis</i>	Mbijela (isiXhosa)	ECP*	Diarrhoea in cattle	Stem infusion (Dold and Cocks, 2001)
Asparagaceae	<i>Asparagus falcatus</i>	Lufhaladzamakole (Tshivenda)	Limpopo*	Constipation in Cattle	Whole plant infusion (Luseba & Tshisikhawe, 2013)
Asphodelaceae	<i>Aloe marlothii</i>	Mokgopa (Setswana)	NWP*	Diarrhoea Constipation	Leaf infusion (Van der Merwe, 2000)
Asteraceae	<i>Brachylaena ilicifolia</i>	uMgqheba (isiXhosa)	ECP*	Diarrhoea in lambs	Leaves decoctions (Dold & Cocks, 2001)
Asteraceae	<i>Schkuhria pinnata</i>	Santhloko/ Lefero	NWP*	Calf diarrhoea	Aerial parts infusion (Van der Merwe, 2000)

Asteraceae	<i>Vernonia colorata</i>	(Setswana) Phathane (Tshivenda)	Limpopo*	Diarrhoea	Root decoction (Luseba & Tshisikhawe, 2013)
Balanitaceae	<i>Balanites maughamii</i>	Nulu (Xitsonga)	NWP*	Diarrhoea in cattle	Leaves infusion (Luseba and Van der Merwe, 2006).
Celastraceae	<i>Cassine transvaalensis</i>	Mojelemanane (Setswana)	NWP*	Diarrhoea	Bark decoction or infusion: (Van der Merwe, 2000)
Combretaceae	<i>Terminalia. sericea</i>	Mususu (Tshivenda)	Limpopo*	Diarrhoea (u tshuluwa) in cattle	Root decoction (mix with milk for calves) (Luseba & Tshisikhawe, 2013)
Combretaceae	<i>Combretum molle</i>	Mugwiti (Tshivenda)	Limpopo*	Gut conditions – Diarrhoea	Infusion (Luseba & Tshisikhawe, 2013).
Euphorbiaceae	<i>Jatropha curcas</i>	Nhlampfura (Xitsonga)	Limpopo *	Constipation	Seeds (Luseba and Van der Merwe, 2006),
Euphorbiaceae	<i>Jatropha zeyheri</i>	Xidomeja/ Mudomeja (Xitsonga)	Limpopo*	Diarrhoea	Root infusion with P. angolensis (Luseba and Van der Merwe, 2006),
Euphorbiaceae	<i>Ricinus communis</i>	Mokhura (Setswana)	NWP*	Constipation	Powdered seed (Van der Merwe, 2000)
Fabaceae	<i>Acacia karroo</i>	uMnga (isiXhosa) Mooka (Setswana)	ECP* NWP*	Diarrhoea in goats and cattle	Bark decoctions: (Dold & Cocks, 2001) Back infusion with back of Ozoroa paniculosa and roots of <i>S italica</i> (Van der Merwe, 2000)
Fabaceae	<i>Acacia tortilis</i>	Mosu (Setswana)	NWP*	Bloody diarrhoea in calves	Leaf and branch tip infusion (Van der Merwe, 2000)
Fabaceae	<i>Elephantorrhiza elephantina</i>	Mosetlhane (Setswana)	NWP*	Diarrhoea	Root-stock infusion or decoction (Van der Merwe, 2000)
Fabaceae	<i>Indigofera sessilifolia</i>	Khubalo (isiXhosa)	NWP*	Diarrhoea in calves	Roots (Dold and Cocks, 2001)
Fabaceae	<i>Peltophorum africanum</i>	Mosetla (Setswana)		Diarrhoea	Bark infusion or decoction with bark of <i>S. birrea</i> (Van der Merwe, 2000)
Fabaceae	<i>Senna italica</i>	Ximbangambangan a (Xitsonga)	Limpopo*, NWP*	Diarrhoea	Bark infusion (Luseba & Van der Merwe, 2006) Root infusion with bark of <i>O paniculosa</i> (Van der Merwe, 2000)
Fabaceae	<i>Elephantorrhiza burkei</i>	Gumululo (Tshivenda)	Limpopo*	Diarrhoea in cattle	Bark or leaf infusion (Luseba & Tshisikhawe, 2013)
Geraniaceae	<i>Pelargonium reniforme</i>	uVendle (isiXhosa)	ECP*	Diarrhoea in goats and cows	Root infusion with root of <i>Plumbago auriculata</i> (Dold & Cocks, 2001)
Hyacinthaceae	<i>Ledebouria revolute</i>	iKreketsana	ECP*	Diarrhoea in goats	Bulb infusion (Dold & Cocks, 2001)
Hyacinthaceae	<i>Urginea sanguinea</i>	Sekaname	NWP*	Intestinal diseases,	Bulb infusion with whole plant of <i>Aloe</i>

		(Setswana)			<i>greatheadii</i> and <i>Aloe zebrine</i> (Van der Merwe, 2000)
Loganiaceae	<i>Strychnos henningsii</i>	uMnonono (isiXhosa)	ECP*	Diarrhoea in cattle	Bark infusion (Dold and Cocks, 2001)
Oleaceae	<i>Olea europaea</i>	uMnquma	ECP*	Diarrhoea in goats	Bark infusion (Dold and Cocks, 2001)
Plumbaginaceae	<i>Plumbago auriculata</i>	uChithibunga (isiXhosa)	ECP*	Diarrhoea in cows	Root decoction with Pelargonium reniforme root (Dold and Cocks, 2001)
Rhamnaceae	<i>Ziziphus zeyheriana</i>	Sekgalo-fatshe (Setswana)	NWP*	Diarrhoea	Root-stock decoction (Van der Merwe, 2000)
Rosaceae	<i>Prunus persica</i>	iPesika (isiXhosa)	ECP*	Diarrhoea in lambs and kid goats	Leaf decoctions (Dold and Cocks, 2001)
Sapindaceae	<i>Hippobromus pauciflorus</i>	iLathile (isiXhosa)	ECP*	Diarrhoea in cattle	Bark decoction with bark of <i>Protorhus longifolia</i> (Dold and Cocks, 2001).
Solanaceae	<i>Solanum panduriforme</i>	Mohato (Setswana)	NWP*	Diarrhoea	Fruit sap (Van der Merwe, 2000)
Solanaceae	<i>Withania somnifera</i>	Mokukwane (Setswana)	NWP*	Diarrhoea	Root infusion (Van der Merwe, 2000)
Vitaceae	<i>Rhoicissus tridentata</i>	iChitibunga (isiXhosa)	ECP*	Diarrhoea in goats and sheep	Tuber decoction (Dold and Cocks, 2001)

c. Medicinal plants used for treatment of tick bone diseases by indigenous communities of South Africa

Amaryllidaceae	<i>Boophane disticha</i>	iShwadi (isiXhosa)	ECP*	Redwater in cattle	Bulb decoction (Dold and Cocks, 2001)
Anacardiaceae	<i>Ozoroa paniculosa</i>	Monokane (Setswana)	NWP*	Redwater in cattle	Bark and rootbark (Van der Merwe, 2000)
Anacardiaceae	<i>Protorhus longifolia</i>	uZintlwa (isiXhosa)	ECP*	Heartwater	Bark decoction with bark of <i>Hippobromus pauciflorus</i> (Dold and Cocks, 2001)
Anacardiaceae	<i>Rhus lancea</i>	Moshabele (Setswana)	NWP*	Gallsickness	Root decoction (Van der Merwe, 2000)
Anacardiaceae	<i>Sclerocarya birrea</i>	Mufula (Tshivenda)	Limpopo*	Redwater	Bark decoction (Ramovha & van Wyk, 2016)
Apiaceae	<i>Heteromorpha trifoliata</i>	UmBangandlela (isiXhosa)	ECP*	Redwater and gallsickness	Root infusion (Masika <i>et al.</i> , 2000)
Apiaceae	<i>Heteromorpha arborescens</i>	Muthathavhanna (Tshivenda)	Limpopo *	Redwater	Root infusion (Ramovha & van Wyk, 2016)
Apocynaceae	<i>Acokanthera oppositifolia</i>	Ntlungunyembe (isiXhosa)	ECP*	Heartwater in sheep and goats and redwater (Dold and Cocks 2001)	Leaf decoction (Dold and Cocks, 2001)
Apocynaceae	<i>Holarrhena pubescens</i>	Mukhathakhathana	Limpopo*	Redwater	Roots infusion or decoction (Ramovha & van Wyk, 2016)
Apocynaceae	<i>Tabernaemontana</i>	Muhatu	Limpopo*	Redwater	Roots infusion or decoction (Ramovha & van

Araliaceae	<i>elegans</i> <i>Cussonia spicata</i>	(Tshivenda) uMsenge (isiXhosa)	ECP*	Gallsickness	Wyk, 2016) Bark decoction (Dold and Cocks, 2001 citing Bizimana N. (1994)
Asparagaceae	<i>Asparagus laricinus</i>	Lesitwane (Setswana)	NWP*	Redwater	Tuber decoction (Van der Merwe, 2000)
Asphodelaceae	<i>Aloe ferox</i>	iKhala Khalakhulu Ikhallana Ad libitum	ECP*	Redwater in cattle ((Dold & Cocks, 2001; Masika <i>et al.</i> , 2000)	Leaf decoction (Dold and Cocks, 2001) Leaf juice (ad libitum) (Masika <i>et al.</i> , 2000)
Asphodelaceae	<i>Aloe hahnii</i>	Tshikhophatshik u	Limpopo*	Redwater	Roots infusion or decoction and leaf infusion (Ramovha & van Wyk, 2016).
Asphodelaceae	<i>Aloe marlothii</i>	Mokgopa (Setswana)	NWP*	Gallsickness	Leaf infusion (Van der Merwe, 2000)
Asphodelaceae	<i>Aloe tenuior</i>	uMjingqa(isiXhosa)	ECP*	Redwater	Leaf sap (Dold and Cocks, 2001 citing Bishop C. (1997))
Asphodelaceae	<i>Bulbine alooides</i>	iRooiwater (isiXhosa)	ECP*	Redwater	Roots decoction (Dold & Cocks, 2001)
Asteraceae	<i>Arctotis arctotoides</i>	uBushwa (isiXhosa)	ECP*	Heartwater in goats	Whole plant decoction (Dold & Cocks, 2001)
Asteraceae	<i>Schkuhria pinnata</i>	Santhloko, lefero (Setswana)	NWP*	Heartwater recovery	All plant parts infusion or decoction (Van der Merwe, 2000)
Asteraceae	<i>Vernonia mespilifolia</i>	uHlunguhlungu (isiXhosa)	ECP*	Heartwater in goats	Stems decoction (Dold & Cocks, 2001)
Celastraceae	<i>Mystroxydon aethiopicum</i>	uMbomvane (isiXhosa)	ECP*	Heartwater in cattle	Bark decoction. (Dold and Cocks, 2001)
Cornaceae	<i>Curtisia dentata</i>	uMlahleni (isiXhosa)	ECP*	Heartwater in cattle	Bark decoction with the bark of <i>Rapanea melanophloeos</i> . (Dold & Cocks, 2001)
Combretaceae	<i>Combretum Microphyllum</i>	Mukopokopo (Tshivenda)	Limpopo*	Redwater	Root infusion or decoction (Ramovha & van Wyk, 2016)
Combretaceae	<i>Terminalia sericea</i>	Mususu (Tshivenda)	Limpopo*	Redwater	Root-bark infusion (Ramovha & van Wyk, 2016)
Euphorbiaceae	<i>Jatropha latifolia</i>	Tshipfure (Tshivenda)	Limpopo*	Redwater	The fleshy root decoction (Ramovha & van Wyk, 2016)
Fabaceae	<i>Cassia abbreviata</i>	Mulumanamana (Tshivenda)	Limpopo*	Redwater	Bark infusion or decoction (Ramovha & van Wyk, 2016)
Fabaceae	<i>Elephantorrhiza burkei</i>	gumululo; tshisesana; tshisesevhafu (Tshivenda)	Limpopo*	Redwater	Fleshy root tuber decoction (Ramovha & van Wyk, 2016)

Fabaceae	<i>Elephantorrhiza elephantina</i>	Mosethlane (Setswana) Xixuvari (Xitsonga)	ECP* and Limpopo*	Heartwater	Root stock decoction (Van der Merwe, 2000) Aerial parts and bulb infusion (Luseba & Van der Merwe, 2006)
Fabaceae	<i>Philenoptera violacea</i> <i>Schrire</i>	Mufhanda (Tshivenda)	Limpopo*	Redwater	Bark decoction/infusion (Ramovha & van Wyk, 2016)
Fabaceae	<i>Pterocarpus angolensis</i> .	Vhangazi/ Murhotso (Xitsonga) Mutondo (Tshivenda)	Limpopo*	Gallsickness Redwater	Bark infusion (Luseba & Van der Merwe, 2006). Bark decoction/ infusion (Ramovha & van Wyk, 2016)
Fabaceae	<i>Rhynchosia komatiensis</i>	Murudamali (Tshivenda)	Limpopo*	Redwater	Root tuber decoction (Ramovha & van Wyk, 2016)
Fabaceae	<i>Schotia brachypetala</i>	Mulubi (Tshivenda)	Limpopo*	Redwater	Root bark decoction (Ramovha & van Wyk, 2016)..
Fabaceae	<i>Schotia latifolia</i>	uMgxam (isiXhosa)	ECP*	Redwater	Bark decoction (Dold and Cocks, 2001)
Fabaceae	<i>Senna italica</i>	Ximbangambangan a (Xitsonga) Sebete (Setswana) tshiḡuwaḡuwane; muḡuwaḡuwane (Tshivenda)	Limpopo NWP* ,	Gallsickness heartwater Red water	and Bark infusion (Luseba & Van der Merwe, 2006) Root Infusion or decoctions (Van der Merwe, 2000) Whole plant decoction or infusion (Ramovha & van Wyk, 2016)
Fabaceae	<i>Senna petersiana</i>	munembenembe; gonela (tshivenda)	Limpopo*	Redwater	Ground root powder infusion (Ramovha & van Wyk, 2016)
Geraniaceae	<i>Pelargonium reniforme</i>	iNtololwana, uVendle (isiXhosa)	ECP*	Heartwater	Root infusion (Dold & Cocks, 2001)
Hyacinthaceae	<i>Ledebouria revoluta</i>	iKreketsana (isiXhosa)	ECP*	Gallsickness	Leaf decoction. (Dold and Cocks, 2001 citing Smith A. (1888)
Hyacinthaceae	<i>Urginea sanguinea</i>	Sekaname (Setswana)	NWP*	Heartwater, gallsickness and redwater	Bulbs infusion (Van der Merwe, 2000)
Hypoxidaceae	<i>Hypoxis hemerocallidea</i>	Tsuku ya poo (Setswana)	NWP*	Heartwater	Corms decoctions (Van der Merwe, 2000)
Lamiaceae	<i>Leucas capensis</i> .	uPhiphiyo (isiXhosa)	ECP*	Gallsickness	Leaf decoction with Brachylaena ilicifolia leaves and Aloe ferox sap, (Dold and Cocks, 2001
Lamiaceae	<i>Marrubium vulgare</i> .	uMhlonyane	ECP*	Gallsickness	Leaf decoction (Dold & Cocks, 2001)

Lamiaceae	<i>Teucrium africanum</i>	(isiXhosa) uBuhlungu bebhokhwe	ECP*	Gallsickness heartwater	and Leaf decoction .(Dold & Cocks, 2001)
Loganiaceae	<i>Strychnos henningsii</i>	(isiXhosa) uMnonono	ECP*	Heartwater	Bark decoction (Dold & Cocks, 2001)
Malvaceae	<i>Grewia bicolor</i>	(isiXhosa) murabva	Limpopo*	Redwater	Stem branches are cut into sticks used a lashes in a ritual for treating redwater in cattle (Ramovha & van Wyk, 2016)
Myrsinaceae	<i>Rapanea melanophloeos</i>	uMaphipha	ECP*	Heartwater	Bark decoction (Dold & Cocks, 2001)
Oleaceae	<i>Olea europaea</i>	(isiXhosa) uMnquma	ECP*	Gallsickness	Leaf infusion with <i>Zanthoxylon capense</i> leaves, <i>Grewia occidentalis</i> leaves and <i>Aloe ferox</i> sap (Dold & Cocks, 2001)
Pittosporaceae	<i>Pittosporum viridiflorum</i>	UmKwenkwe	ECP*	Gallsickness	Bark decoction (Masika <i>et al.</i> , 2000)
Podocarpaceae	<i>Podocarpus latifolius</i>	(isiXhosa) UmKoba	ECP*	Gallsickness	Bark decoction (Masika <i>et al.</i> , 2000)
Rutaceae	<i>Zanthoxylum capense</i>	uMlungumabele	ECP*	Gallsickness	Leaf infusion with <i>Grewia occidentalis</i> , <i>Olea europaea</i> subsp. <i>africana</i> leaves and <i>Aloe ferox</i> sap. (Dold & Cocks, 2001).
Sapindaceae	<i>Hippobromus pauciflorus</i>	iLathile	ECP*	Heartwater	Bark decoction: with bark of <i>Protorhus longifolia</i> , (Dold & Cocks, 2001)
Thymelaeaceae	<i>Gnidia capitata</i>	iSidikili	ECP*	Heartwater	Root decoction (Dold & Cocks, 2001)
Tiliaceae	<i>Grewia occidentalis</i>	(isiXhosa) uMnqabaza	ECP*	Gallsickness	Leaves infusion with leaves of <i>Olea europaea</i> subsp. <i>africana</i> and <i>Zanthoxylon capense</i> and the sap of <i>Aloe ferox</i> . (Dold and Cocks, 2001)
Ulmaceae,	<i>Trema orientalis</i>	(isiXhosa) Pigeonwood (Eng.), Mukurukuru (Tshivenda)	Limpopo*	Gallsickness	Leaf infusion (Luseba & Tshisikhawe, 2013)
Vitaceae	<i>Cissus quadrangularis</i>	maswonona; malongekanyce; masungunuvhe (Tshivenda)	Limpopo*	Redwater	Succulent stems) infusion (Ramovha & van Wyk, 2016)
Vitaceae	<i>Rhoicissus tridentata</i>	Ntagaraga (Setswana)	NWP*	Heartwater and redwater	Tuber decoction (Van der Merwe, 2000)

d. Medicinal plants used for the treatment of respiratory diseases by indigenous communities of South Africa					
Asteraceae	<i>Schkuhria pinnata</i>	Santhloko/ Lefero (Setswana)	NWP*	Pneumonia	Aerial parts infusion or decoction (Van der Merwe, 2000)
Euphorbiaceae	<i>Croton gratissimus</i>	Moologa	NWP*	Pneumonia	Leaf decoction (Van der Merwe, 2000)
Fabaceae	<i>Elephantorrhiza elephantina</i>	Mosetlhane (Setswana)	NWP*	Coughing Pneumonia	Crushed root-stock infusion or decoction (Van der Merwe, 2000)
Fabaceae	<i>Senna italica</i>	Sebete (Setswana)	NWP*	Pneumonia	Roots infusion or decoction (Van der Merwe, 2000)
Plumbaginaceae	<i>Plumbago zeylanica</i>	Masegomabe (Setswana)	NWP*	Pneumonia	Roots decoction (Van der Merwe, 2000)
Solanaceae	<i>Solanum lichtensteinii</i>	Ndhulwani	Limpopo*	Respiratory Problems	Aerial parts infusion in airways (Luseba and Van der Merwe, 2006)
e. Medicinal plants used for mammary gland conditions by indigenous communities of South Africa					
Asclepiadaceae	<i>Sarcostemma viminalis</i>	uMbelebele	ECP*	Encouraging lactation	Stems, aerial parts infusions: (Dold and Cocks, 2001)
Ebenaceae	<i>Diospyros mespiliformis</i>	Ntoma (Xitsonga)	Limpopo*	Milk production	Bark mixed with hippopotamus fat topical application (Luseba & Van der Merwe, 2006)
Moraceae	<i>Ficus sycomorosa</i>	Muhuyu-lukuse (Tshivenda)	Limpopo*	Promote lactation	Fresh fruit topical (Mabogo, 1990)
Poaceae	<i>Cynodon dactylon</i>	Tshitanzhela (Tshivenda)	Limpopo*	Milk production	Leaves and stems decoctions (Mabogo, 1990)
f. Medicinal plants used for reproductive disorders by indigenous communities of South Africa					
Amaranthaceae	<i>Exomis microphylla</i>	uMvenyathi	ECP*	Endometritis and vaginitis	Leaf decoction (Dold and Cocks, 2001)
Amaryllidaceae	<i>Boophane disticha</i>	matubadifala	NWP*	Abortion	Bulb scales (Van der Merwe <i>et al.</i> , 2001)
Apocynaceae	<i>Carissa bispinosa</i>	Num-num Tshirungulu	Limpopo*	Dystocia	Bulb infusion (Luseba and Tshisikhawe, 2013)
Araliaceae	<i>Cussonia spicata</i>	uMsenge	ECP*	Retained placenta	Bark: Dold and Cocks, 2001; Masika <i>et al.</i> , 2000))
Asparagaceae	<i>Asparagus laricinus</i>	lesitwane	NWP *	Uterine infection	Tubers (Van der Merwe <i>et al.</i> , 2001)
Asparagaceae	<i>Asparagus suaveolens</i>	iMvane, lesitwane	ECP*, NWP*	Retained placenta Uterine infection	Root decoction (Dold and Cocks, 2001) tubers used for Uterine infections (Van der Merwe <i>et al.</i> , 2001)
Asphodelaceae	<i>Aloe marlothii</i>	Mokgopa	NWP*	Retained placenta Dystocia	Leaves are used for retained placenta, dystocia. (Van der Merwe <i>et al.</i> , 2001)
Asphodelaceae	<i>Aloe tenuior</i>	uMjingqa	ECP*	Retained placenta	Leaf decoction (Dold and Cocks, 2001)
Combretaceae	<i>Combretum paniculatum</i>	Mpfunta	Limpopo*	Fertility problems	Root bark decoction (Luseba and Van der Merwe, 2006)

Combretaceae	<i>Combretum molle</i>	Velvet bushwillow	Limpopo*	Breeding problems	Infusion (Luseba and Tshisikhawe, 2013)
Euphorbiaceae	<i>Croton gratissimus</i> <i>var. gratissimus</i>	Mugwiti	NWP*	Dystocia	
Fabaceae	<i>Acacia decurrens</i>	Moologa	NWP*	Fertility enhancement	Leaves and roots (Van der Merwe <i>et al.</i> , 2001)
Fabaceae	<i>Bolusanthus speciosus</i>	Indywabasi	ECP*	Hasterns oestrus	Bark decoction (Masika <i>et al.</i> , 2000)
		Nkohlwane	Limpopo*	Retained placenta	Root decoction: Luseba and Tshisikhawe, 2013)
Hyacinthaceae	<i>Urginea altissima</i>	uZabokwe iMfilisi	ECP*	Retained placenta	Bulb decoction (Dold and Cocks, 2001)
Hyacinthaceae	<i>Urginea sanguinea</i>	Sekaname	NWP*	Retained placenta	Bulbs infusion (Van der Merwe <i>et al.</i> , 2001)
Hypoxidaceae	<i>Hypoxis hemerocallidea</i>	Tsuku-ya-poo	NWP*	Fertility enhancement	Corns infusion (Van der Merwe <i>et al.</i> , 2001)
Lauraceae	<i>Cassytha filiformis</i>	Love vine, Luangalala	Limpopo*	Dystocia	Stem decoction: (Luseba and Tshisikhawe, 2013)
Malvaceae	<i>Hibiscus malacospermus</i>	UmSongelwa	ECP*	Retained placenta	Root decoction: (Masika <i>et al.</i> , 2000)
Oleaceae	<i>Olea europaea</i>	uMnquma	ECP*	Endometritis and vaginitis	Leaves, together with Cussonia spicata root (Dold and Cocks, 2001)
Pedaliaceae	<i>Dicerocaryum eriocarpum</i> <i>Dicerocaryum senecioides</i>	Dinda/Dindza Makanangwane and Makangwane Museto	Limpopo* NWP*	Dystocia	Leaves, together with Cussonia spicata root (Dold and Cocks, 2001) Aerial parts, roots, whole plant infusion used for dystocia as lubricant, drench for retained placenta (Luseba and Van der Merwe, 2006; Van der Merwe <i>et al.</i> , 2001; Luseba and Tshisikhawe, 2013)
Pedaliaceae	<i>Harpagophytum procumbens</i>	Lematla, Sengaparile	NWP*	Retained placenta	Fruit used for retained placenta (Van der Merwe <i>et al.</i> , 2001)
Rhamnaceae	<i>Ziziphus mucronata</i>	Mokgalo, Mukhalo, buffalo-thorn, umphafa	NWP*		Roots and leaves infusion (Vander Merwe <i>et al.</i> , 2001)
Salicaceae	<i>Salix L. spp.</i>	UmNcunube	ECP*	Retained placenta	Decoction or infusion a (Masika <i>et al.</i> , 2000)
Salvadoraceae	<i>Azima tetracantha</i>	iGceleya	ECP*	Dystocia	Root infusion (Dold and Cocks, 2001)
Sapotaceae	<i>Englerophytum magalismontanum</i>	motlatswa	NWP*	Fertility enhancement	Roots used for fertility enhancement (Van der Merwe <i>et al.</i> , 2001)
Solanaceae	<i>Solanum auritatum</i>	uMbangabanga	ECP*	Dystocia	Root decoction (Dold and Cocks, 2001)
Tiliaceae	<i>Grewia flava</i>	Moretlwa	ECP*	Fertility enhancement	Roots used for fertility enhancement (Van der Merwe <i>et al.</i> , 2001)
Tiliaceae	<i>Triumfetta sonderi</i>	Mokuku	NWP*	Retained placenta	Root bark (Van der Merwe <i>et al.</i> , 2001)

Urticaceae	<i>Pouzolzia mixta</i>	Mongololo	NWP*	Retained placenta	(Van der Merwe <i>et al.</i> , 2001)
Vitaceae	<i>Rhoicissus tridentata</i>	Ntagaraga	NWP*	Abortion	Tubers used for abortion (Van der Merwe <i>et al.</i> , 2001)
Zygophyllaceae	<i>Tribulus terrestris</i> L.	tshetlo	NWP*	Retained placenta	Whole plant (Van der Merwe <i>et al.</i> , 2001)

g. Medicinal plants used coditions of the musculoskeletal systems by indigenous communities of South Africa

Amaryllidaceae	<i>Boophane disticha</i>	iShwadi (isiXhosa)	ECP*	Fracture	Root topical application (Dold and Cocks, 2001 citing Quinlan T. (1998)
Amaryllidaceae	<i>Haemanthus albiflos.</i>	uMathunga(isiXhosa)	ECP*	Fracture	Bulb (Dold and Cocks, 2001)
Anacardiaceae	<i>Sclerocarya birrea</i>	Morula (Setswana)	NWP*	Fracture	Splints made by bark (Van der Merwe <i>et al.</i> , 2001)
Apocynaceae	<i>Acokanthera oppositifolia</i>	iNtlungunyembe (isiXhosa)	SA*	Swollen Limbs	Powdered leaves application (Dold and Cocks (2001), citing Watt J.M. and Breyer-Brandwijk M.G. (1962))
Arecaceae	<i>Phoenix reclinata</i> Jacq.	iSundu (isiXhosa)	ECP*	Foot rot	Root decoction mixed with <i>Arctotis arctotoides</i> leaves (Dold and Cocks, 2001)
Boraginaceae	<i>Ehretia rigida</i>	Morobe (Setswana)	NWP*	Fracture	Charred root skin pasteapplication (Van der Merwe <i>et al.</i> , 2001)
Caesalpinioidae	<i>Colophospermum mopane</i>	Mupani or Mutarani (Tshivenda) nxanafsi/ nshanats J (Xitsonga) Mopane	Limpopo*	Swollen limbs	Root decoction: (Madzibane & Potgieter, 1999)
Convolvulaceae	<i>Seddera sufruticosa</i>	Thobega	NWP*	Fracture	Charred root skin application on the fracture line (Van der Merwe <i>et al.</i> , 2001)
Fabaceae	<i>Acacia karroo</i> Hayne	Mookana (Setwana)	NWP*	Fracture	Bark, leaves (Van der Merwe <i>et al.</i> , 2001)
Rosaceae	<i>Prunus persica</i>			Fracture	Root topical application: (Quinlan T. (1998) as cited by Dold and Cocks (2001)

h. Medicinal plants used for the treatment of skin problems by indigenous communities of South Africa

Anacardiaceae,	<i>Rhus. lancea</i>	Karre(Eng.). Mushakaladza (Tshivenda)	Limpopo*	Lumpy skin disease	Lef decoction (Luseba & Tshisikhawe, 2013)
Asparagaceae	<i>Asparagus laricinus</i> Burch.	Lesitwane (Setswana)	NWP*	Sores	Tubers decoction (Van der Merwe, 2000)
Asparagaceae	<i>Asparagus suaveolens</i>	Lesitwane (Setswana)	NWP*	Sores	Tubers decoction mixed with <i>S. incanum</i> (Van der Merwe, 2000)

Asphodelaceae	<i>Aloe ferox</i>	Ikhala (isiXhosa)	ECP*	Wounds	Leaf infusion for lavage:(Soyelu & Masika, 2009)
Asphodelaceae	<i>Aloe greatheadii</i> var. <i>davyana</i>	Kgophane (Setswana)	NWP*	Burns	Fresh leaf topical application : (Van der Merwe, 2000)
Asphodelaceae	<i>Aloe marlothii</i>	Mokgopa (Setswana)	NWP*	Maggots	Crushed leaf (Van der Merwe, 2000)
Asphodelaceae	<i>Aloe zebrine</i>	Kgophane (Setswana)	Limpopo* NWP*	Wound and maggots Burns	Crushed leaves poultice (Luseba & Van der Merwe, 2006) Fresh leaf topical application: (Van der Merwe, 2000). Root decoction for lavage (Soyelu & Masika, 2009).
Asteraceae	<i>Haplocarpha scaposa</i>	Isikhali (isiXhosa)	ECP*		
Asteraceae,	<i>Tagetes minuta</i>	Khaki weed (Eng.), Mushushathuri (Tshivenda)	Limpopo*	Tick control in Cattle	Leaf application mixed with periperi (Capsicum frutescence): (Luseba & Tshisikhawe, 2013)
Caesalpinioideae	<i>Colophospermum mopane</i>	Nxanafsi or Nshanatsi (Xitsonga) Mopane	Limpopo*	Sores	Grounded leaf infusion application: (Mashabane <i>et al.</i> , 2001)
Combretaceae	<i>Terminalia sericea</i>	Konono (Xitsonga)	Limpopo*	Wounds	Leaf or root infusion application (Luseba and Van der Merwe, 2006)
Combretaceae,	<i>Terminalia sericea</i>	Silver cluster-leaf (Eng.), Mususu (Tshivenda)	Limpopo*	Ticks and wounds	Root decoction (Luseba & Tshisikhawe, 2013)
Ebenaceae,	<i>Diospyros lycioides</i>	Karoo bluebush (Eng.), Muthala (Tshivenda)	Limpopo*	Ticks in cattle	Leaf infusion application (Luseba & Tshisikhawe, 2013)
Euphorbiaceae	<i>Spirostachys africana</i>	Morekhane (Setswana)	NWP*	Sweating sickness	Wood infusion (Van der Merwe, 2000)
Euphorbiaceae,	<i>Synadenium cupulare</i>	Dead-man's tree (Eng.), Muswoswo (Tshivenda)	Limpopo*	Lumpy skin disease	Latex topically (Luseba & Tshisikhawe, 2013)
Fabaceae	<i>Acacia karroo</i>	Umnga (isiXhosa)	ECP*	Wounds	Powdered leaf application mixed with Madubula (Soyelu & Masika, 2009)
Fabaceae	<i>Calpurnia aurea</i>	Umbethu, Umhlahlampethu	ECP*	Maggots in sores	Leaf infusion (Soyelu & Masika, 2009)
Fabaceae	<i>Elephantorrhiza elephantina</i>	iNtololwana	ECP*	Mange in cattle	Roots decoction (Dold and Cocks, 2001)
Fabaceae	<i>Schotia latifolia</i>	Umgxam	ECP*	Wounds	Bark decoction: Decoction used as a wash for wounds

Hyacinthaceae	<i>Urginea sanguinea</i>	Sekaname (Setswana)	NWP*	Sores	Powdered bulbs are used with <i>A. laricinus</i> (Van der Merwe, 2000)
Lamiaceae	<i>Plectranthus ambiguus</i>	Irhajojo	ECP*	Wounds and maggots infested wounds	Leaf and stem infusio (Soyelu & Masika, 2009)
Meliaceae	<i>Turrae obtusifolia</i>	Mbhovane (?)	Limpopo*	Wounds in goats, sheep and cattle	Crushed leaves: Applied directly on the wounds (Luseba & Tshisikhawe, 2013)
Olacaceae,	<i>Ximenia americana</i>	Blue sourplum (Eng.), Muthanzwa (Tshivenda)	Limpopo*	Wounds in goats, sheep and cattle	Leaf and branch decoction (Luseba & Tshisikhawe, 2013)
Phytolaccaceae	<i>Phytolacca heptandra</i>	Umnyanja	ECP*	Maggot infested wounds	Leaf infusion/decoction (Soyelu & Masika, 2009)
Pittosporaceae	<i>Pittosporum viridiflorum</i>	Umkwenkwe	ECP*	Wounds	Root decoction (Soyelu & Masika, 2009)
Ptaeroxylaceae	<i>Ptaeroxylon obliquum</i>	Umthathi	ECP*	Wounds	Leaf decoction (Soyelu & Masika, 2009)
Rosaceae	<i>Prunus persica</i>	Ipesika (isiXhosa) Muberegisi (Tshivenda)	ECP*	Wounds and maggot infested wounds	Leaf infusion (Soyelu & Masika, 2009) Leaf juice (Luseba & Tshisikhawe, 2013)
Sapindaceae	<i>Hippobromus pauciflorus</i>	Ulatile	ECP*	Wounds	Leaf infusion : (Soyelu & Masika, 2009)
Solanaceae	<i>Solanum incanum.</i>	Tolwana (Setswana)	NWP*	Sores	Roots decoction (Van der Merwe <i>et al.</i> , 2001)
Solanaceae	<i>Solanum sodomium</i>	Umthuma (isiXhosa)	ECP*	Wounds	Leaf infusion (Soyelu & Masika, 2009)
Tiliaceae	<i>Grewia occidentalis</i>	Umnqabasa (isiXhosa)	ECP*	Wounds	Leaves and twigs infusion (Soyelu & Masika, 2009)
Vitaceae	<i>Cissus quadrangularis</i>	Nyangala (Xitsonga)	Limpopo*	Wound treatment, tick repellent, LSD	Aerial parts poultice (Luseba & Van der Merwe, 2006)

i. Medicinal plants used for the treatment of eye problems in animals by indigenous communities of South Africa

Asphodelaceae	<i>Aloe greatheadii</i>	Kgophane (Setswana)	NWP*	Eye infection	Leaf sap (Van der Merwe, 2000)
Asphodelaceae	<i>Aloe zebrine</i>	Kgophane (Setswana)	NWP*	Eye infection	Leaf sap (Van der Merwe, 2000)
Asteraceae	<i>Schkuhria pinnata</i>	Santhloko, Lefero (Setswana)	NWP*	Eye infection	Aerial parts infusion (Van der Merwe, 2000).
Clusiaceae,	<i>Garcinia livingstonei</i>	Mupimbi (Tshivenda)	Limpopo*	Eye problems in Cattle	Fresh leaf juice (Luseba & Tshisikhawe, 2013)

Combretaceae	<i>Combretum caffrum</i>	UmDubi(isiXhosa)	ECP*	Conjunctivitis	Leaf juice application (Masika <i>et al.</i> , 2000)
Dracaenaceae	<i>Sansevieria hyacinthoides</i>	iSkolokotho (isiXhosa)	ECP*	Conjunctivitis	Leaves sap (isifosamehlo) (Dold and Cocks, 2001)
Euphorbiaceae	<i>Phyllanthus burchellii</i>	Letsane (Setswana)	NWP*	Eye infection	Dried aerial parts ground powder infusion (Van der Merwe, 2000)
Euphorbiaceae	<i>Synadenium cupulare</i>	Mdleve (Xitsonga) Dead-man's tree (Eng.), Muswoswo (Tshivenda)	Limpopo *	Eye infection	Milky latex application (Luseba & Van der Merwe, 2006) Latex application (Luseba & Tshisikhawe, 2013)
Iridaceae,	<i>Gladiolus Dalenii</i>	Wild gladiolus (Eng.), Phende-phende (Tshivenda)	Limpopo*	Eye problems in goats, sheep and cattle	Bulb juice application (Luseba & Tshisikhawe, 2013).
Lamiaceae	<i>Leonotis leonurus</i>	UmFincafincane (isiXhosa)	ECP*	Eye inflammation	Leaf sap application:(Masika <i>et al.</i> , 2000)
Oleaceae	<i>Olea europaea</i>	uMnquma (isiXhosa)	KZN*	Eye infection	Eye lotion (Dold and Cocks, 2001 (Dold and Cocks (2001) citing Hutchings <i>et al.</i> , (1996)
Rosaceae	<i>Prunus persica</i>	Peach tree (E) Muberegisi (Tshivenda)	Limpopo *	Eye problems in cattle	Leaf juice application (Luseba & Tshisikhawe, 2013)
Rubiaceae	<i>Cephalanthus natalensis</i>	Strawberry bush (Eng.), Murondo (Tshivenda)	Limpopo *	Eye problem in cattle	Leave infusion (Luseba & Tshisikhawe, 2013)
Rubiaceae	<i>Hyperacanthus amoena</i>	Thorny gardenia (Eng.), Murombe (Tshivenda)	Limpopo*	Eye problems	Root juice topical application (Luseba & Tshisikhawe, 2013)
Sapindaceae	<i>Hippobromus pauciflorus</i>	Ulathile (uLwathile) (isiXhosa)	ECP*	Eye inflammation	Leaf decoction (Masika <i>et al.</i> , 2000)
Solanaceae	<i>Nicotiana tabacum</i>	Tabacco	NWP*	Eye infection	Topical leaf application in water. (Van der Merwe, 2000)
Solanaceae	<i>Solanum incanum</i>	Bitter apple (Eng.), Mututulwa muhulwane (Tshivenda)	Limpopo*	Eye problems in goats,sheep, and cattle	Fruit topical application: (Luseba & Tshisikhawe, 2013)

Ulmaceae	<i>Trema orientalis</i>	Pigeonwood (Eng.), Mukurukuru (Tshivenda)	Limpopo*	Eye problems in goats, sheep and cattle	Leaf infusion (Luseba & Tshisikhawe, 2013)
<i>j. Medicinal plants used for the treatment of general systemic infection or conditions by indigenous communities of South Africa</i>					
Anacardiaceae	<i>Rhus incisa</i>	uNongquthu (isiXhosa)	ECP*	Shock after accident	Root and bark decoctions (Dold & Cocks, 2001)
Asphodelaceae	<i>Aloe greatheadii</i>	Kgophane (Setswana)	NWP*	General ailments Blood cleaning	Whole plant infusion (Van der Merwe <i>et al.</i> , 2001)
Asphodelaceae	<i>Aloe zebrine</i>	Kgophane (Setswana)	NWP*	General ailments, Blood cleansing	Whole plant infusion (Van der Merwe <i>et al.</i> , 2001)
Boraginaceae	<i>Ehretia rigida</i>	Puzzle bush (Eng.), Mutepe/Murovhero vhe (Tshivenda)	Limpopo*		Root decoction (Luseba & Tshisikhawe, 2013)
Capparaceae	<i>Maerua angolensis</i>	Bead-bean tree (Eng.), Mutambanamme (Tshivenda)	Limpopo*	Eating problem drought tonic/	Leaf infusion (Luseba & Tshisikhawe, 2013)
Euphorbiaceae	<i>Croton gratissimus</i>	Moologa (Setswana)	NWP*	Tonic	Leaf decoction (Van der Merwe, 2000)
Euphorbiaceae	<i>Jatropha zeyheri</i>	Xidomeja/ Mudomeja (Xitsonga)	NWP*	General ailments	Roots infusion: Together with <i>P. angolensis</i> (Luseba & Van der Merwe, 2006)
Euphorbiaceae	<i>Pseudolachnostylis maprouneifolia</i>	Kudu berry (Eng.), Mutondowe (Tshivenda)	Limpopo*	Drought tonic	Bark infusion (Luseba & Tshisikhawe, 2013)
Euphorbiaceae	<i>Synadenium cupulare</i>	Dead-man's tree (Eng.), Muswoswo (Tshivenda)	Limpopo*	Black quarter	Strike with latex branch on the affected area (Luseba & Tshisikhawe, 2013)
Fabaceae	<i>Elephantorrhiza elephantina</i>	Xixuvari (Xitsonga)	Limpopo* NWP*	Appetite stimulant	Aerial parts and bulb infusion (Luseba & Van der Merwe, 2006)
Fabaceae	<i>Peltophorum africanum</i>	Mosetla (Setswana)	NWP*	Tonic	Rootbark infusion (Van der Merwe, 2000)
Fabaceae	<i>Pterocarpus angolensis</i>	Vhangazi/ Murhotso (Xitsonga)	Limpopo*	General illness Cattle not eating in	Bark infusion (Luseba & Van der Merwe, 2006) Bark infusion (Luseba & Tshisikhawe, 2013)

Fabaceae	<i>Senna petersiana</i>	Mutondo (Tshivenda) Munembenembe (Tshivenda)	Limpopo*	General illnesses in Goats	Leaf infusion (Luseba & Tshisikhawe, 2013)
Fabaceae	<i>Xanthocercis zambesiaca</i>	Nyala tree (Eng.), Mushato (Tshivenda)	Limpopo*	Eating problem	Bark infusion (Luseba & Tshisikhawe, 2013)
Hyacinthaceae	<i>Urginea sanguinea</i>	Sekaname (Setswana)	NWP*	General ailments	Bulb infusion: with whole plant of <i>Aloe greatheadii</i> and <i>Aloe zebrine</i> : (Van der Merwe et al., 2001)
Lauraceae	<i>Cassytha filiformis</i>	Love vine (Eng.), Luangalala (Tshivenda)	Limpopo*	Eating problems (tshiutwane) in cattle, goats and sheep.	Stem decoction with leaves of <i>D. eriocarpum</i> : (Luseba & Tshisikhawe, 2013)
Ochnaceae	<i>Ochna holstii</i>	Tshipfure (Tshivenda)	Limpopo*	Not eating (tshiuthwane) in cattle	Shoots infusion (Luseba & Tshisikhawe, 2013)
Pedaliaceae	<i>Dicerocaryum eriocarpum</i>	Museto (Tshivenda)	Limpopo*	Black quarter	Leaf infusion (Mabogo, 1990)
Rhamnaceae	<i>Ziziphus zeyheriana</i> Sond.	Sekgalo-fatshe (Setswana)	NWP*	General ailments	Root-stock decoction (Van der Merwe, 2000)
Rubiaceae	<i>Rothmania capensis</i>	Murathamapfene/ Murathambila (Tshivenda)	Limpopo*	Eating problem in Cattle	Decoction is administered in 2 litre bottle (Luseba & Tshisikhawe, 2013)
Vitaceae	<i>Rhoicissus tridentata</i>	Ntagaraga (Setswana)	NWP*	General ailments	Tuber decoction (Van der Merwe et al., 2001)

k. Medicinal plants used for the treatment of poultry diseases

Apiceae	<i>Centella asiatica</i>	Iphuzi	ECP*	Internal parasites	Whole plant decoctions (Mwale & Masika, 2009)
Apocynaceae	<i>Xysmalobium Undulatum</i>	Intsema	ECP*	Internal parasites	Whole plant decoctions (Mwale & Masika, 2009)
Asparagaceae	<i>Agave sisalana</i> <i>Perrine ex</i>	Iralibhomu	ECP*	Internal parasites	Whole plant infusion or decoctions (Mwale & Masika, 2009)
Asphodelaceae	<i>Aloe ferox.</i>	Ikhala	ECP*	Disease prevention and remedy for ticks and lice	Fresh leaves in drinking water (Dold and Cocks, 2001)
Asphodelaceae	<i>Aloe marlothii</i>	Mhangani (Xitsonga) Mokgopa (Setswana) Tshikhopha (Tshivenda)	Limpopo* NWP*	Internal parasites Newcastle, General ailments	Leaf infusion (Luseba and Van der Merwe, 2006) Fresh leaves infusion (Van der Merwe, 2000) Leaf juice infusion (Luseba & Tshisikhawe, 2013)

Asteraceae	<i>Helichrysum Splendidum</i>	Impepho	ECP*	External parasites	Ash smoke (Mwale & Masika, 2009)
Astereceae	<i>Tagetes minuta</i>	Unukayo	ECP*	External parasites	Leaves (Mwale & Masika, 2009)
Fabaceae	<i>Millettia grandis</i>	Umtiza	ECP*	Internal parasites	Leaf infusion (Mwale & Masika, 2009)
Gunneraceae	<i>Gunner perpensa</i>	Iphuzi lomlambo/ Igangashane	ECP*	Internal parasites	Leaf infusion (Mwale & Masika, 2009)
Verbenaceae	<i>Lippia javanica</i>	Inzininiba	ECP*	External parasites	Whole plant ash smoke (Mwale & Masika, 2009)

* ECP= Eastern Cape Province, NWP= North West Province, KZN= Kwazulu Natal Province, SA= Unspecified areas in South Africa, Limpopo= Limpopo Province

3.10.3.3.2 Ethnoveterinary medicine for the treatment of tick-borne infections

Tick-borne infections in livestock constitute a complex of several diseases. Their etiological agents may be protozoal, rickettsial, bacterial or viral and are transmitted by ticks. Tick-borne diseases are present throughout the world, but are most prevalent in tropical and subtropical regions (MerckVetManual, 2016). In South Africa, common tick-borne infections are babesiosis, heartwater and anaplasmosis. This review documents a total of fifty-five (54) plant species from twenty-eight (28) families used for the treatment of redwater, anaplasmosis and heartwater (Table 3.1 section c). The most commonly used plant family for the treatment of tick-borne diseases is Fabaceae and other families of importance include Anacardiaceae, Asphodelaceae, Asteraceae, Apocynaceae and Lamiaceae.

3.10.3.3.3 Ethnoveterinary medicine for the treatment of respiratory diseases

Respiratory diseases in livestock are among the most common worldwide (MerckVetManual, 2016). The common clinical signs of respiratory disease include fever, difficulty in breathing and in varying degrees, nasal discharge, depression, anorexia or no appetite and coughing (MerckVetManual, 2016). This review documents six (6) medicinal plant species used in the treatment of respiratory diseases in South Africa (Table 3.1 section d). The plants are from five (5) plant families with the Fabaceae family having more mention than the rest of the families. Treatment indications include pneumonia, coughing, nasal discharges and general respiratory problems.

3.10.3.3.4 Ethnoveterinary medicine for the treatment of reproductive disorders

Both the success and sustainability of livestock farming enterprises are affected by the reproduction of animals. Failure of animals to reproduce could be attributed to multiple etiologies that include, among others, infectious diseases, metabolic diseases, postpartum diseases and anatomical and physiological disorders (Walsh *et al.*, 2011). This review provided information on thirty-five (35) species of medicinal plants representing twenty-nine (29) families used for the treatment of reproductive disorders such as retained placenta, uterine infection, dystocia, mammary gland dysfunctions and fertility problems in animals (Table 3.1 section e and f). This review revealed no significant preference to plants families in the treatment of reproductive disorders (Table 3.1).

3.10.3.3.5 Ethnoveterinary medicine for the treatment of musculoskeletal conditions

Treatment indications of plants in this category include fractures, swollen limbs, footrot and paralysis (Table 3.1 section g). It is quite evident that fractures of the limbs are a common occurrence in livestock through observation of the numbers of times fractures are mentioned in this review. Out of ten (10) plants mentioned in this category of ethnoveterinary treatment, six (6) of these are used for the treatment of fractures. The plant family, Amaryllidaceae, is mentioned twice and is also the highest number of times a family is mentioned in this category.

3.10.3.3.6 Ethnoveterinary medicine for the treatment of skin problems

Wounds and myiasis are among the most disturbing health problems for South African farmers (Soyelu & Masika, 2009). In indigenous terminology, the term wounds is used to include sores, abscesses, warts and inflamed skin lesions (Luseba *et al.*, 2007). Other skin problems mentioned in this review for treatment with medicinal plants include ringworms, lice and mange (Table 3.1). The review documents thirty-three (33) medicinal plants from twenty-two (22) families used for the treatment different skin problems (Table 3.1 section h). Plants in the Fabaceae and Asphodelaceae families are more frequently mentioned.

3.10.3.3.7 Ethnoveterinary medicine for the treatment of eye infections

Eye infections are very common in animals and are generally caused by bacterial and virus infections, or foreign bodies such as dust or chaff. Eye infections are more prevalent during windy weathers. The clinical signs include redness, tearing and clouding of the cornea. In this review, the most mentioned medicinal plant families were Euphorbiaceae and Solanaceae (Table 3.1 section i). The total number of medicinal plants used for eye problems is nineteen (19) from fourteen (14) families.

3.10.3.3.8 Ethnoveterinary medicine for the treatment of general diseases and disorders

For the purpose of this review, general diseases and disorders refer to diseases which cause systemic infections and could not be categorised under any other body system. In addition, the definition also encompasses those conditions which ethnoveterinary practitioners treat through detoxifying. In Table 3.1 section j, plant treatments for blackquarter, anthrax, blood cleansing, shock after an accident, appetite stimulant or tonic and general ailments/illnesses are recorded. The review records a total of twenty-one (21) plant species from thirteen (13)

families used by ethnoveterinary practitioners for the treatment of general diseases and disorders with the Fabaceae family being the most frequently mentioned, followed by Euphorbiaceae. The most mentioned indication for plant remedies in this category are those used for general illnesses and/or ailments. General illnesses and/or ailments could mean any disease that presents with depression, fever and anorexia, possibly without other signs indicating involvement of a specific body system. Furthermore, these plants are possibly used to stimulate recuperation from other diseases.

3.10.3.3.9 Ethnoveterinary medicine for the treatment of poultry diseases

Diseases effecting chicken are varied just like those of other livestock. Most surveys on the ethnoveterinary medicine tend to overlook treatments for poultry. This could be attributed to the fact that even though village chickens contribute greatly to their livelihood, farmers do not generally put much economic value in home-grown chicken, especially if they are few. The other reason could be because researchers in this field overlook poultry as a significant livestock that contributes to the economy of communities. Most of the treatments mentioned in this review, are treatments for internal and external parasites of chicken from a survey by Mwale and Masika (2009) (Table.3.1 section k). In addition to treatments for internal and external parasites, other plant remedies are used for the treatment of enteritis and indigestion, Newcastle disease, Typhoid, ticks and lice. A total of ten (10) plant species from eight (8) families were recorded in this category. The Asphodelaceae and Asteraceae families are the most mentioned (Table 3.1).

3.10.3.3.10 Overall results of the inventory of ethnoveterinary medicinal plants used in South Africa

In this review, a total of 152 plant species were recorded from sixty-six (66) families for use in ethnoveterinary medicine. The most frequently used plant family was Fabaceae with a total of thirty-six (36) plant species documented for a variety of animal health indications, followed by Asphodelaceae with twenty-eight (28) plant species, Euphorbiaceae with seventeen (16) plant species, Asteraceae with fifteen (15) and Anacardiaceae with thirteen (13) plant species and. Other plant families with a high number of documented species included Hyacinthaceae, Combretaceae, Lamiaceae and Solanaceae. Figure 3.3 shows the frequencies of the number of times a plant family appeared in the literature for ethnoveterinary uses. However, the Figure excludes plant families whose frequencies are less than four (4).

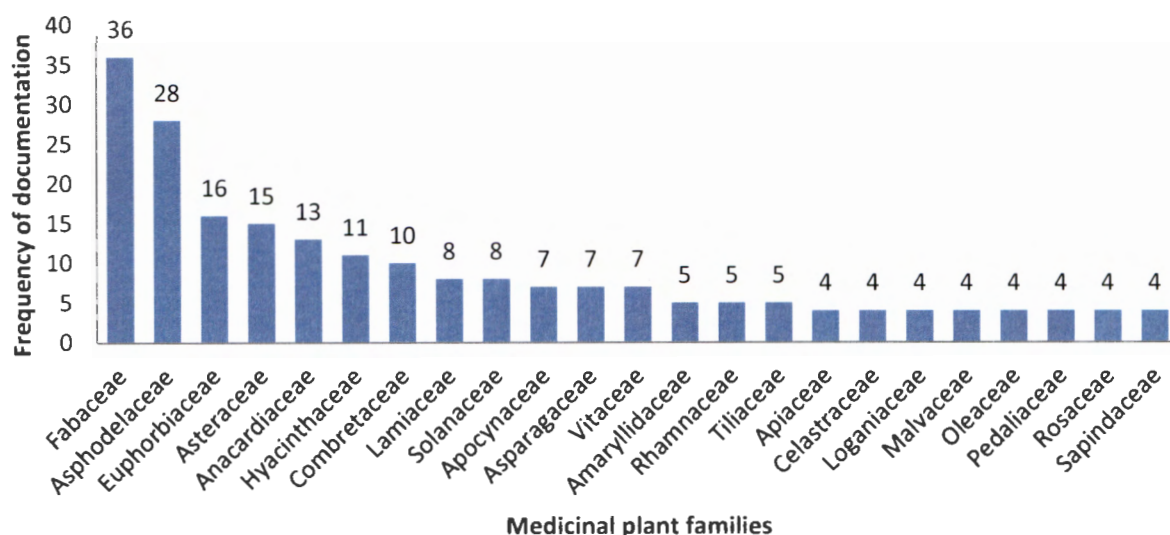


Figure 3.3: Frequency distribution of documented plant families used by ethnoveterinary practitioners in South Africa, excluding plant families with less than four recordings

A review by Maphosa *et al.* (2010) revealed that Asteraceae and Fabaceae were popular plant families used in animal health care in Southern Africa. The present review revealed similar findings. However, an analysis of the review conducted by McGaw and Eloff (2008) revealed that Fabaceae, Hyacinthaceae, Asphodelaceae, Lamiaceae, Asteraceae and Euphorbiaceae are the most commonly used plant families for use in ethnoveterinary medicine in South Africa. The findings obtained in the present review concur with those of McGaw and Eloff (2008). In fact, the most popular plant family in the review by McGaw and Eloff (2008) was also Fabaceae.

3.11 Perceptions of ethnoveterinary medicine among Western-trained animal health practitioners; what has been studied so far?

Perception is defined by Efron (1969) as human’s primary form of cognitive contact with the world around him/her. Furthermore, according to Kashyap (2016), perception is a process by which individuals organise and interpret their sensory organs in order to give meaning to their environment. Kashyap (2016) further states that people’s behaviour is based on their perception of what reality is, not on reality itself and that the world that is perceived, is the world that is behaviourally important. Perception is influenced by three factors as follows: the perceiver; the perceived; and the situation (Kashyap, 2016). Figure 3.4 shows the three factors together with the characteristics of the factors that affect an individual’s

perception. Furthermore, Kashyap (2016) states that the different characteristics of the factors can contribute to perception development, one at a time, or as a collective. It could, therefore, be deduced in the case of participants in this study that their perceptions with regard to ethnoveterinary are influenced by the above-mentioned factors and their characteristics.

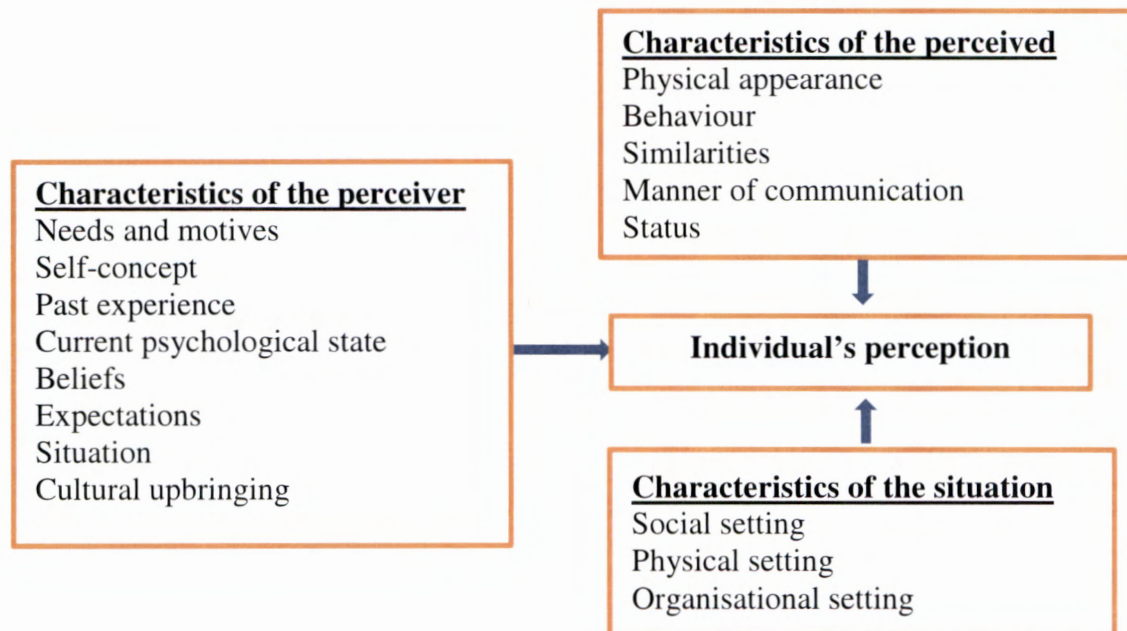
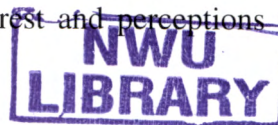


Figure 3.4: Factors and their characteristics that influence an individual's perception (Kashyap, 2016)

One of main objectives of this study was to investigate the perceptions of Western-trained animal health practitioners (WTAHP) regarding ethnoveterinary medicinal practices. A review of literature on the perceptions of ethnoveterinary medicine (EVM) among Western-trained animal health practitioners (WTAHP) revealed the non-existence of publication on this topic worldwide. The only published studies that could shed light on how ethnoveterinary medicine is perceived by WTAHP worldwide are those by Fielding (1997); Sabarinathan Nair *et al.* (1997) and (Jirli *et al.*, 1997).

Sabarinathan Nair *et al.* (1997) reported the findings of a survey on perceptions of veterinarians on ethnoveterinary medicinal practices in Pondicherry, Tamil Nadu and Kerala States, South India while the study by Jirli *et al.* (1997) tested the cognitive domain and acceptance levels of ethnoveterinary medicine by animal scientists. The study was conducted at the National Dairy Research Institute, Karnal, Haryana, an animal science institute under the Indian Council for Agricultural Research, and the Bihar Veterinary College, Patna, at the Rajendra Agricultural University, also targeting veterinarians. Lastly, Fielding (1997)

examined the current status of ethnoveterinary medicine in veterinary training and research institutions around the world and its implications by targeting veterinary institutions of higher learning worldwide. The study also determined the interest and perceptions towards EVM among employees of these institutions.



Interestingly, this researcher also discovered that a quote by Toyang *et al.* (1995) (cited severally by authors with reference to WTAHP perceptions) was just a passing statement made in the review of ethnoveterinary medicine in Cameroon and not based on a perception study. In the review, Toyang *et al.* (1995) maintained as follows: "Many orthodox veterinarians did not promote indigenous practices, because they did not appreciate the role which they played." The author makes reference to the attitude of orthodox (Western-trained) veterinarians towards EVM during colonisation in Cameroon which led to the banning of EVM after orthodox medicine was introduced in the 1940s. Due to the few studies on the perceptions of EVM among WTAHP, the statement has been used many times in publications and, at times, even misrepresented. In fact, this researcher could not find any study in Africa that has investigated the perceptions, opinions or attitudes of WTAHP towards EVM.

On the contrary, there are a number of studies in South Africa and other countries in Africa that have reported on the opinions, attitudes and perceptions of traditional healing among medical doctors and other health professionals. These include Adjei (2013), who, among other objectives, explored the perception about the efficacy of herbal medicine among medical professionals in Wassa Amenfi West District, Ghana. In South Africa, similar studies have been conducted. Hopa *et al.* (1998) examined the perceptions of integration of traditional and western healing in the new South Africa, while Mokgobi (2012) described the views of traditional healing by different medical professionals in South Africa and the implications for integration of traditional healing and Western medicine. (Peltzer & Khoza, 2002) investigated the attitudes and knowledge of nurses towards traditional healing, faith healing and complementary therapies in the Northern Cape Province, South Africa. Mngqundaniso and Peltzer (2008) investigated the collaboration between traditional healers and nurses in the treatment of sexually transmitted infections, including HIV/AIDS.

The availability of publications in perceptions of medical professionals about traditional healing, exposes gaps in ethnoveterinary research and development (ER&D) in South Africa, other parts of Africa and the rest of the world. Studies such as these, inform the integration process of traditional and modern medicine. These studies determine the need and

extent of interventional processes that would improve perceptions of traditional medicinal practices among medical or veterinary professionals if integration of modern medicine and traditional medicine is to be achieved.

3.12 Summary of chapter

This literature review exposed the knowledge gap in explorative surveys of ethnoveterinary medicine in South Africa. It showed a need to explore other parts of the country in order to close the gap. However, it is necessary to appreciate what other researchers have done so far. Authors such as Masika PJ and the team from the University of Fort Hare, who were pioneers in the new generation (category B) research since the 90's, and have continued to be active in EVM research through surveys and validation studies, should be honoured for the passion they have shown in this field. Their studies and those of others researchers have generated a theory base that showcases South Africa's rich and diverse culture in ethnoveterinary medicine. This researcher has learned a lot from their contributions.

Their studies have also proved that farmers, other members of communities, including traditional healers share knowledge of EVM. This researcher's experiences with farmers sharing their knowledge of EVM (as described in "the genesis of the topic") is therefore not unique to her alone and must have been experienced by other Western-trained animal health practitioners (WTAHP). How other WTAHPs in South Africa have perceived these practices, is an issue that could not be answered in this chapter as there are no publications on the perceptions of Western-trained animal health practitioners on EVM in South Africa or even in other parts of Africa. Lack of such studies exposed another gap in knowledge. The importance of understanding the perceptions of Western-trained animal health practitioners about EVM was discussed in section 3.11. The next two chapters focus on the personal contributions of this researcher towards ethnoveterinary research and development in South Africa, through the exploration and documentation of EVM and determination of perceptions of EVM among Western-trained animal health practitioners. The next chapter describes the exploratory survey of knowledge of ethnoveterinary medicine among ethnoveterinary practitioners within Mahikeng Local Municipality, North West Province, South Africa.

CHAPTER 4

AN EXPLORATORY SURVEY OF KNOWLEDGE OF ETHNOVETERINARY MEDICINE AMONG ETHNOVETERINARY PRACTITIONERS WITHIN MAHIKENG LOCAL MUNICIPALITY, NORTH WEST PROVINCE, SOUTH AFRICA

ABSTRACT

Knowledge of ethnoveterinary medicine (EVM) has been used by indigenous communities since time immemorial and was the only method of animal health care available before the introduction of Western medicine. Even though knowledge of EVM is still widely used in different regions of South Africa, retention of this valuable knowledge is threatened by acculturation and availability of Western medicine. However, recent renewed interest worldwide in ethnoveterinary medicine, as an alternative to Western medicine, led to exploratory surveys of EVM among indigenous communities of South Africa in order to document the knowledge as part of a preservation strategy. Nevertheless, the North West Province remains relatively unexplored with only one published survey conducted in a relatively small area of the Province. The aim of this study was to document knowledge of ethnoveterinary medicine in four villages within the Mahikeng Local Municipality, North West Province, as a contribution to the preservation of knowledge. A qualitative research approach was used in the study and target participants consisted of ethnoveterinary practitioners in Lokaleng, Mogosane, Lokgalong and Masutlhe villages. Snowball sampling was used in the study to recruit participants. Data was collected through semi-structured interviews and analysed through thematic data analysis. Herbarium specimens were prepared from medicinal plants collected during field walks with participants and sent to the South African National Biodiversity Institute (SANBI) for identification. Knowledge of ethnoveterinary medicine was documented in the study, including ethnodagnostic methods, medicinal plant use of thirty-one (31) plant species, three non-plant remedies and nine procedures. The procedures included obstetrics, surgical, fracture reduction and four metaphysical procedures. Among the medicinal plants recorded, *Senna italica* (sebetebete) emerged as a plant of cultural importance in the study area, with the highest frequency in terms of recurrence and multiple animal treatment health indications. Other plants with multiple indications included *Dicoma galpinii* (thlunye or thlonye) and *Drimia sanguinea*

(sekaname). The most common animal ailments treated using ethnoveterinary medicine were *gala*, retained placenta, blood cleansing and diarrhea. Furthermore, the study also determined consensus among participants in terms of culturally significant plants for the treatment of coughs, retained placenta, *gala*, fractures and diarrhea. In addition, the study also revealed other themes, including a concern for loss of ethnoveterinary medicine due to westernisation and also the high trust in ethnoveterinary medicine among participants. It is recommended that further ethnoveterinary exploratory surveys be conducted in other unexplored areas of the North West Province for purposes of knowledge preservation.

4.1 Introduction

African Ethnoveterinary medicine (AEVM) is a component of African traditional medicine (ATM) (Republic of South Africa, 2008a) and consists of indigenous knowledge (IK), skills, practices and beliefs used for animal health management (McCorkle, 1986). Animal health problems are diverse and contribute to production losses to farmers due to morbidity and mortalities (Moerane, 2013). Before the dawn of Western medicine, ethnoveterinary medicine was the only animal health solution for farmers (Gabalebatse *et al.*, 2013). However, during the colonial and apartheid era in South Africa, the colonising and apartheid authority sought to eliminate African traditional medicine, including EVM by labeling such practices as witchcraft and magic, and also imposing bans on such practices among indigenous communities (Mokgobi, 2012). Nevertheless, EVM has prevailed and has survived the test of time in many regions of South Africa (Dold & Cocks, 2001).

In many parts of South Africa, ethnoveterinary medicine is still used by farmers as an integral part of primary animal health care management (McGaw & Eloff, 2008). In fact, some farmers prefer the use EVM because they believe that EVM is more effective than Western veterinary medicine (Moreki *et al.*, 2010). The other reason for the preference of EVM is because it is readily available and also more cost effective than Western medicine (Ramovha & van Wyk, 2016). The factors mentioned above, and the quest by the West to find sustainable alternatives to Western medicine, has led to the revival of interest in ethnoveterinary medicine and the recognition of the value of EVM (McGaw & Eloff, 2008; Swarup *et al.*, 2015).

The revival of interest in ethnoveterinary medicine has led to many exploratory surveys conducted worldwide in order to document knowledge of ethnoveterinary medicine in an effort to preserve such knowledge. As previously mentioned, the South African

government, through the National Indigenous Knowledge Systems Office of the Department of Science and Technology, supports the preservation and promotion of indigenous knowledge, including EVM (Swanepoel & van der Westhuizen, 2009). However, as noted in chapter 3, there are very few surveys in South Africa that documented knowledge of EVM with most of such surveys conducted in the Eastern Cape Province (McGaw & Eloff, 2008).

In the North West Province, there is only one published survey that details ethnoveterinary medicinal plants used by communities of Madikwe (Van der Merwe *et al.*, 2001). Therefore, the aim of this study was to document ethnoveterinary medicinal practices in villages within the Mahikeng Local Municipality, North West Province, thus contributing to knowledge of ethnoveterinary medicine in South Africa. This survey addresses the following questions in relation to knowledge of ethnoveterinary medicine: medicinal plants, non-plant remedies and procedures used to treat and prevent animal health problems; preparation and administration of remedies; diagnosis of animal ailments; and medicinal plants culturally important in the area.

4.2. Methodology

4.2.1 The study area

This study was conducted in four villages within the Mahikeng Local Municipality, Ngaka Modiri Molema District Municipality, North West Province. The villages sampled were Lokaleng, Mogosane, Lokgalong and Masutlhe (Figure 4.1). The four villages are situated northwest of Mahikeng town and are under the traditional leadership of the Barolong Boo-Ratshidi. The Barolong are an ethnic group of the Batswana found in both South Africa and Botswana, under the rule of Kgosi Kgolo (Paramount Chief) Montshioa who is based in Mochudi, Botswana (Kgotleng, 2014).

The South African section of the Barolong (Barolong boo Ratshidi), settled in Mahikeng area during the early nineteenth century (1832), and through the leadership of Kgosi Molema Tawana, the town of Mahikeng was founded (Kgotleng, 2014). Mahikeng town is the headquarter of the Barolong Boo Ratshidi people and also the Capital of the North West Province (Kgotleng, 2014). According to Kgotleng (2014), Barolong boo Ratshidi, like any other Batswana ethnic group, has a strong farming history and presence. They depend on livestock for daily their needs such as milk, meat and draught power and also for important cultural ceremonies such as weddings and funerals. Kgotleng (2014) further states that livestock is a symbol of wealth, strength and stability to a Morolong.

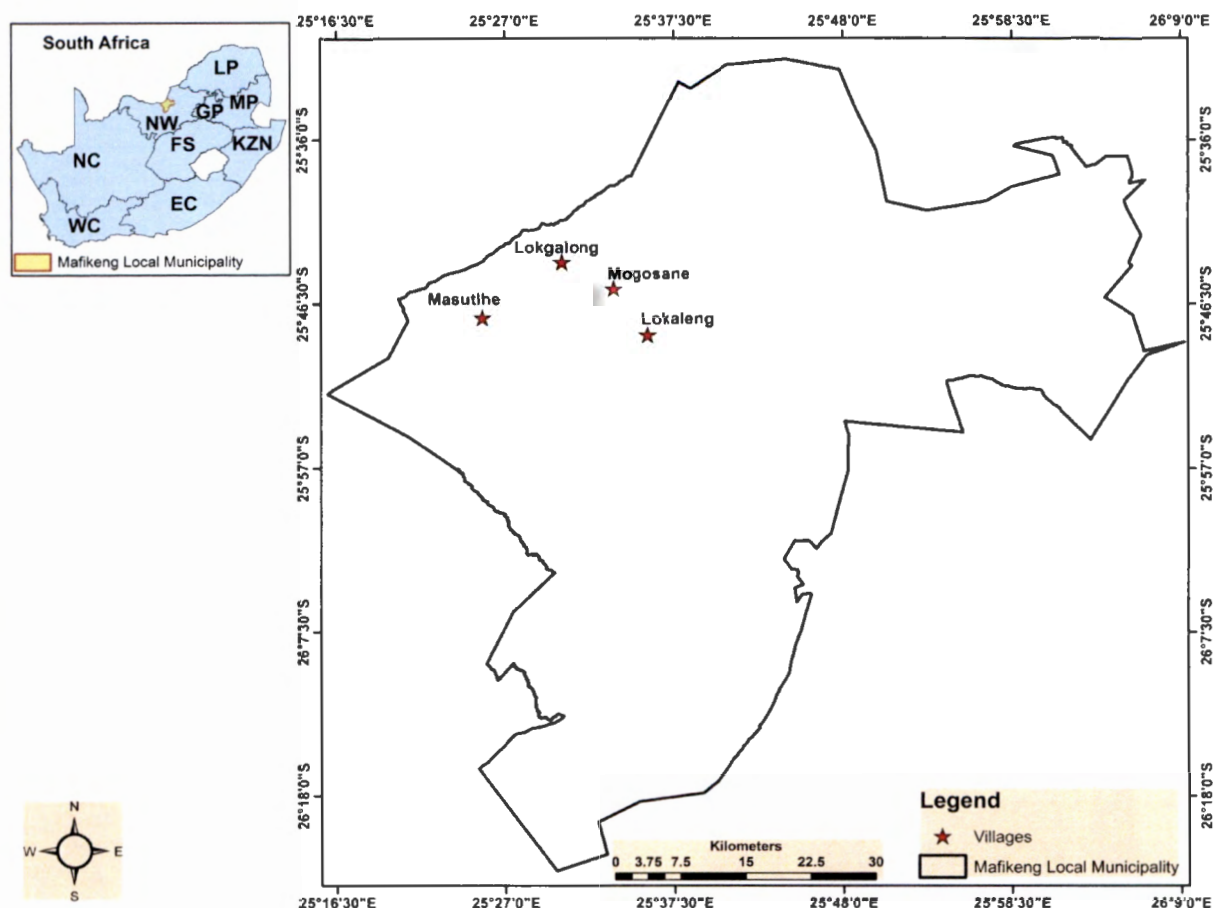


Figure 4.1: Map showing the location of Lokaleng, Mogosane, Lokgalong and Masuthe villages found within the Mahikeng Local Municipality in relation to the map of South Africa showing the different provinces, including the North West Province

4.2.2 Target population

The target population consisted of members of the communities who had some knowledge of ethnoveterinary medicine and thus, referred to as ethnoveterinary practitioners (EVPs). The EVPs included livestock farmers and traditional healers in the four villages. The population and other characteristics of the four villages are presented in Table 4.1.

Table 4.1: Information about the four villages in the study area

Name of village	Total households	Total population	Gender population proportion		Kgosi	Percentage (%) of Setswana speakers
			Males	Females		
Lokaleng	715	2661	1278 (48%)	1384 (52%)	Kgosi Phenyio Mosekgare	92.48
Mogosane	433	1927	923 (48%)	1004 (52%)	Kgosi Montshioa	94.65
Lokgalong	64	233	120 (51.5%)	113 (48.5%)	Kgosi Montshioa	80.26
Masuthe	811	3085	1483 (48%)	1602 (52%)	Kgosi Letshoho	92.35%

Source: Republic of South Africa (2012)

4.2.3 Sample size and sampling procedure

The overall sample size consisted of twenty-one (21) ethnoveterinary practitioners (EVP) from the four villages as shown in Table 4.2. The identification and recruitment of ethnoveterinary practitioners was done through snowball sampling as described by Lans *et al.* (2007). In brief, after each interview, participants were requested to refer the next participant for the study and the person was then approached and recruited to participate. The names of the first participants in Lokaleng, Lokgalong and Mogosane villages were provided by the translators while in Masutlhe village, the name of first participant was provided by the younger brother of the *Kgosi*'s. The snowballing continued until no new ethnoveterinary practitioner could be identified (Lans *et al.*, 2007).

Table 4.2: Sample size of participants in the four villages within the Mahikeng local municipality

Village	Number of participants
Lokaleng	6
Mogosane	4
Lokgalong	7
Masutlhe	4
Total	21

4.2.4 Study instrument and its piloting

A semi-structured questionnaire was designed in order to collect knowledge of ethnoveterinary medicine from ethnoveterinary practitioners (Appendix 1). The questionnaire was divided into four sections as follows: Section A consisted of an interview log that requested information on date of data collection, location of study area, ID code of participant, and members of the research team; Section B focused on the demographic characteristics of participants, including farming activities; Section C focused on knowledge of ethnoveterinary medicine; while Section D consisted of a medicinal plants log. The medical plant log served as a checklist in order to ensure that all questions were asked about each medicinal plants, including preparation protocols and administration (Van der Merwe *et al.*, 2001). Two farmers (ethnoveterinary practitioners and clients of the North-West University veterinary hospital) were used to pilot the instrument. One of the two participants was a traditional healer. The purpose of the pilot study was to establish the validity of the instrument in terms of its length, clarity, language and number of questions. Based on the results of the pilot study, a question was added to the instrument (where did you obtain your knowledge of ethnoveterinary medicine?). After revising the instrument according to the

feedback from participants who participated in the pilot study, the instrument was then used to collect data in the study area.

4.2.5 Data collection

Data was collected through semi structured face-to-face interviews with participants. The interviews were conducted in Setswana with the assistance of three translators. The translators were staff members of the Dale Beigle Centre of Animal Health Studies, North-West University (the researcher's work colleagues and two of them originate from the study area). Information provided by participants during the interviews was captured on a voice recorder. Though it was the original intention of the researcher to conduct individual interviews with each participant, in true African community style, most of the interviews ended up being conducted in groups. This is because of participants' preference to be interviewed in groups with the other ethnoveterinary practitioners. This resulted in group interviews of two or more people. All interviews were conducted at a place where participants felt most comfortable, including their homes and even informal community gathering places.

Although the researcher did not plan to conduct group interviews, they were very beneficial as they assisted participants to feel relaxed during interviews. The group interviews were also time-saving for the researcher. However, the greatest benefit of the group interviews is that the researcher was able to collect and validate data provided by other participants at the same sitting. In addition, to authenticate the data, member checking was done with eight of the participants through individual interviews after the data was transcribed and organised (Luseba & Van der Merwe, 2006; Van der Merwe *et al.*, 2001).

All of the participants who took part in the study were farmers majority of which were women (16). Also, majority of participants (85.7%) were above fifty (50) years. When asked about their farming experience, all participants indicated that they were "born into farming" before indicating their specific "own" farming experience. All participants were also long-time residents of their respective villages and though not intentional, all the participants were Batswana. A short profiling of participants is provided in Table 4.3. Pictures of some interviews with participants are shown in figure 4.2.

Table 4.3: Demographic characteristics and other information of participants in the study area

Participant	Age	Gender	Village	Farming enterprises	Own farming experience	EVM training	Group/individual interview
1	70	Female	Mogosane	O, C, B, FRC*	BIF ^a and 30 years	Ancestors and parents	Individual
2	68	Male	Lokgalong	O and C*	BIF ^a and 30 years	Parents	Individual
3	29	Male	Lokgalong	C*	BIF ^a and 5 years	Grandfather	Individual
4,5,6,7 ^b	66, 60, 58 and 37	Males	Lokgalong	B, G, FRC*	BIF ^a and ranged from 10-30 years	Parents and relatives	Group
8	41	Male	Lokgalong	O, C, FRC*	BIF ^a and 10 years	Parents and relatives	Individual
9	76	Female	Lokaleng	B,C,O,FRC*	BIF ^a and 30 years	Father	Individual
10 ^c	75	Male	Lokaleng	B,C,O,FRC*	BIF ^a	Parents and grandparents	Individual and group
10, 11 ,12 ^b	75,95 and 65	Males	Lokaleng	B,C,O,FRC*	BIF ^a	Parents and grandparents	Group
13,14, 15 ^b	65, 47, and 51	Female(13) and two males	Mogosane	B,C,O,FRC*	BIF ^a	Parents and relatives	Group
16, 17 ^b	70 and 60	Male and female	Masutlhe	B,C,O,FRC*	BIF ^a	Parents and grandparents	Group
18, 19 ^b	70 and 65	Males	Masutlhe	B,C,O,FRC*	BIF ^a	Parents and grandparents	Group (18 also as individual)
18 ^c		Male	Masutlhe	B,C,O,FRC*	BIF ^a	Parents and grandparents	Individual
20, 21 ^b	85 and 75	Male and female	Lokaleng	B,C,O,FRC*	BIF ^a	Parents and grandparents	Group

*O= Ovine, B= Bovine, C= Caprine and FRC= Free range chicken, ^aBIF = “Born Into Farming” (a person born into a farming household), ^bmultiple numbers indicate group interviews, ^crepeating participants numbers means the individual was also interview on his own



Picture 1



Picture 2



Picture 3



Picture 4

Figure 4.2: Some of the elders (bagolo) who participated in, Picture 1: sitting Mr Mogwera, Mr Lepedi and his sister Ms Lepedi and standing is the researcher; Picture 2: Mr Tau and Mr Legwale with the researcher; Picture 3: Mr Mjekula from the right (the translator), the researcher and Mr and Mrs Magape; Picture 4: Mr Mogwera wearing the traditional print shirt presented to him as a gift of appreciation.

Additional information about some participants is provided below.

Participant 1 is a well-known traditional healer specialised in women reproductive health, including issues of childlessness and obstetrics. Her traditional healing of animals' philosophy is well captured by the following statement: "*Kgomo a e farologane thata le motho. Molemo e o e fang motho, o kgona go e fa kgomo.*" This means that most diseases or health problems in animals are similar to those in human beings, thus the treatment is usually the same.

Participant 3 is an animal health technician at the North-West University. He also served as a translator during data collection at Lokgalong village. Even though he is a Western-trained animal health practitioner, he still respects the knowledge handed down to him by his grandfather. However, he confessed that he hardly used the indigenous knowledge after becoming an animal health technician and has lost memories of some of them.

Participant 8 is well-known among the villagers for his successful use of medicinal plants in chickens.

Participant 10 is well-known among the villagers for his success in solving cases of dystocia in cattle.

Participant 18 was the most knowledgeable among the participants and a very enthusiastic participant who continued to share knowledge even during the field walk of additional plants he had forgotten to mention during the interview.

Participant 20 is one of the oldest participants and a well-respected cattle farmer in his village and beyond.

4.2.6 Collection and identification of herbarium specimens

Medicinal plants mentioned during interviews were identified by participants themselves during field walks in grazing, crop and open lands in the different villages and also in the open fields at the North-West University. Figure 4.2 shows one of such field-walks with participant 18. The purpose of the field walks was to observe live plants in-situ and to collect plant samples for botanical identification. Botanic data was recorded using the South African National Biodiversity Institute (SANBI) field labels (Appendix 2) and the plants were photographed. Thereafter, the whole plants or plant parts were collected and immediately transported to the North-West University, Mafikeng Campus. At the laboratories of the Dale

Beighle Centre of Animal Health Studies, the plants were pressed to prepare a herbarium specimen according to the instructions of the South African National Biodiversity Institute (SANBI). Preliminary identification of the plants was done by Mr. D Phalatse, a botanist in the Department of Crop Science and Prof. P Malan of the Department of Biology (both of them from the North-West University). Thirty (30) herbarium specimens were botanically identified and the voucher specimen deposited at SANBI. In addition, one (1) herbarium specimen was botanically identified by Prof. S Siebert, curator for the AP Goossens Herbarium.



Figure 4.3: The researcher (on the right) and Mr. Ditlotlo collecting a plant during a field walk in a grazing field of Masutlhe village

4.2.7 Data analysis

4.2.7.1 Qualitative data analysis

Data collected during the interviews was first transcribed from the voice recorders and translated from Setswana into English with the assistance of the translators. Thematic analysis was manually done on the data according to Braun and Clarke (2006) using the following sequence: In stage 1, the researcher read all the transcribed interview data thoroughly; In stage 2, recurrent phrases and concepts that were considered important were colour-coded in all the interview data; In stage 3, concepts and phrases from the different data

sets were matched and categorised into themes; In stage 4, themes were reviewed and similar themes merged; In stage 5, the themes were reported as results of the study.

4.2.7.2 Calculation of informant consensus factor (F_{IC}) for data on medicinal plants

To determine culturally significant medicinal plants in the study area for six chosen ailments, the informant consensus factor (F_{IC}) (Heinrich *et al.*, 1998; Mandal & Rahaman, 2014; Trotter & Logan, 1986; Uddin & Hassan, 2014) was calculated. Ailments selected were those frequently mentioned by participants and which had multiple treatment options using medicinal plants. The informant consensus factor (F_{IC}) was calculated as:

$$F_{IC} = \frac{Nur - Nt}{(Nur - 1)}$$

where, *Nur* = number of used reports from informant for a particular plant-use category; *Nt* = number of taxa or species used for that plant use category for all informants; *F_{IC}* Values ranged between 0 and 1, where '1' indicates the highest level of informant consent (Heinrich *et al.*, 1998).

The results of the F_{IC} were entered into a Microsoft excel sheet to generate tables for each ailment and a column chart for the overall results.

4.2.8 Ethical considerations

The North-West University (NWU) prioritises ethical conduct of its researchers during the research process, thus protecting the University, the researcher/research team, research participants and the environment. There are different research ethics committees in the North-West University that evaluate research proposals and approve those that are deemed ethical before the research can be undertaken (North West University, 2008). This researcher followed two protocols to obtain research approval from NWU. The research proposal was first submitted to the Faculty Research Council (FRC) of the Faculty of Agriculture, Science and Technology (NWU) for approval. That approval was obtained on 13 July 2016 (see Appendix 3). The research proposal was then sent to the Human Research Ethics Committee of the Faculty of Commerce and Administration (NWU) for ethical clearance. The ethical clearance was obtained on 07 February 2017 (Appendix 4). In addition, permission to conduct research among the people in the four villages was obtained following traditional protocols in the villages. The researcher sought the approval of the traditional leadership in the four different villages, which was done through presenting the proposed research to the *Dikgosi* and requesting permission to conduct the study among their people.

The *Dikgosi* were: Kgosi Mosekgare of Lokaleng village; Kgosi Montshioa of Mogosane and Lokgalong villages; and Kgosi Letshoho of Masutlhe. All of them gave the researcher permission to conduct the study in their villages and also offered words of encouragement for the endeavor. After obtaining permission to conduct the study, participants were recruited to participate in the study. The people identified were approached to determine if they had knowledge of ethnoveterinary medicine. If the person had the knowledge, then consent to interview and permission to publish the findings were obtained before each interview. This was done through reading out the consent form and having the participant attach a signature or thumb print as consent to participate. The consent form (Appendix 5) had details of the study and also how the data collected would be handled. It also informed participants that the data collection process was voluntary and that if they chose so, their personal information would not be published. Furthermore, participants were assured that all information provided would be kept under lock and key for a maximum of five years. Other documents that accompanied the consent form were an introduction letter from the Centre of Indigenous Knowledge Systems (Appendix 6), non-disclosure agreement (Appendix 7), FRC approval certificate (Appendix 3) ethical clearance certificate (Appendix 4) and the instrument (Appendix 1).

In addition, traditional ethical protocols were followed during village visits, including the respect for participants with reverence to the elderly and also dressing in skirts below the knees. This researcher acknowledged her handicap as a non-indigenous person of Mahikeng, but prior to the data collection, she immersed herself in the culture of the communities to gain values that assisted her to conduct herself appropriately during interaction with the communities (Asante, 2011). The cultural immersing was done through consultation with colleagues at the North-West University to learn cultural “don’ts and dos” of Batswana and to also improve her knowledge of Setswana language. In fact, her knowledge of Setswana language (or her attempts at speaking Setswana language) was at times an ice-breaker during interviews.

The researcher was able to present gifts as token of appreciation to each participant. These gifts were not “incentives”, but a symbol of appreciation for the keen interest in the study (beyond what the researcher had anticipated). The gifts included veterinary clinical services and advice, African dress material to all Bomme (ladies), African print shirts to all Boorre (gentlemen) and food stuff such as eggs and drinks to participants. This researcher sincerely appreciates the spirit of *Ubuntu* within the communities sampled, which was

evident in the warmth and acceptance received during data collection. To acknowledge that this research would not have been possible without their participation, five key participants are to be included as co-authors and the others acknowledged in subsequent publications derived from the documented knowledge. Furthermore, the *Dikgosi* of the four villages will be approached in 2018 to request group meetings in each village with participants and other interested parties in order to share knowledge documented. Furthermore, during the meetings, each participant and the *Kgosi* will receive a summary of the results. The results will also be presented at a meeting of the African Traditional Medicine and Healing Practices in the North West Province in 2018.

4.3. Results

4.3.1. Introduction

Thematic analysis of data provided two categories of themes as follows: ethnodagnostic methods; and ethnoveterinary treatments. The theme of ethnoveterinary treatments was further categorised into six pre-set sub-themes and four emerging themes. The sub-themes were pre-set as follows: 1, ethnoveterinary medicinal plants used in the study area; 2, plant parts, preparation and administration methods in the study area; 3, ethnoveterinary non-plant remedies used for the treatment of animal ailments; 4, ethnoveterinary procedures used in the study area; 5, culturally significant plants in the study area; and 6, trust of ethnoveterinary medicine. Emerging themes are those that emerged from the data during analysis as follows: Pluralism in treatment indications for certain medicinal plants; symbolism in naming of plants by Batswana; “*Go senste* Terramycin, we are losing ethnoveterinary medicine knowledge”; and *Modikasope*, the conservation of medicinal plant species.

4.3.2 Theme: Ethnodagnostic methods in the study area

With regard to how participants diagnosed sick animals, all participants indicated that careful observation of animals was the main ethno-diagnostic method used, and if necessary, followed by physical examination. Participants described livestock observation as paying close attention to animals in the field, kraal and on their walk back home from grazing to spot signs of ill-health. Signs of ill-health were seen by the animal's habitus. The habitus was determined by the following observations: Whether the animal's head and ears were down; whether the eyes were downcast; the general level of activity of the animal and its interaction with other animals. In addition, the dung of the animal was also observed for signs of

constipation and diarrhoea. Physical examination included lifting of hoofs and limbs to examine fractures and injuries.

Majority of practitioners cited heartwater “*haswater*”, *gala*, calf diarrhoea and lumpy skin diseases in cattle as some of the diseases prevalent in the area. Heartwater was said to be a major disease of small-stock in the area and was diagnosed by mortalities in the herd, nasal foaming, recumbence with cycling and “high-stepping gait”. However, treatment of heartwater was done using Western medicines (oxytetracyclines). Additionally, lumpy skin diseases in cattle was said to be getting more common in recent years and was diagnosed by observing nodules on the skin. Vaccination against lumpy skin disease was implemented by some participants depending on whether they can afford the vaccine. Some participants (18, 20 and 21) also indicated that lumpy skin disease was a “new” problem that did not exist in the past. Calf diarrhoea was among the health problems regularly mentioned by participants with a number of plant remedies indicated for its treatment. Most participants generally considered calf diarrhoea as emanating from the consumption of too much milk from its mother. However, diarrhoea in calves, cows and other livestock was also considered a sign of helminthic infestation.

The disease that had the highest number of plant remedy treatment options and highest number of recurrence during interviews was *gala*. Diagnosis of *gala* was, at times, confusing to the researcher who had previously assumed that *gala* was the local name for gallsickness (anaplasmosis) in cattle. However, during the interviews, *gala* was described as occurring in cattle, small-livestock, chickens and humans. Participants sometimes provided a varied range of clinical signs for the disease. Some participants referred to it as *sebeta* which means liver, as they maintain *gala* was caused by liver dysfunction. The liver problems would be accompanied by a general malaise and weight loss. However, other participants associated constipation in live cattle and post-mortem findings of a dry omasum “ntshotwane” and a full gallbladder with *gala*. Some participants also indicated that the above signs were also accompanied by a dry muzzle. Participants maintained the muzzle of healthy cattle is supposed to be moist with sweat beads. All clinical and pathological signs mentioned by participants in relation to *gala* in cattle were similar to those of the infectious disease called gallsickness (anaplasmosis) in cattle. However, though anaplasmosis may occur in small stock and human, it is not prevalent in the study area and does not occur in chickens.

In small stock and chickens, *gala* might refer to any disease that leads to general malaise and inappetence or anorexia, which were associated with liver dysfunction by participants. Therefore, *gala* in these species could be a sign of any non-infectious and infectious diseases. Thus, for the purpose of this study, *gala* refers to gallsickness (anaplasmosis) in cattle and in other livestock as general ailments. Furthermore, participants indicated that in chickens, hurdling, drowsiness, shivering and sores on the head were signs of ill-health. In poultry, diseases commonly diagnosed and indigenously treated was *gala*.

In addition, ethnoveterinary practitioners also had a manipulative diagnostic method for fractures to distinguish between simple and compound fractures. The manipulation process involved moving the bones around the fracture line but caution was taken to prevent further injury of the animal. Bones crackling and palpation of bone fragments indicated a compound fracture. It was the general agreement of participants that ethnoveterinary fracture repair procedures were only applied to simple fractures and that in cases of compound fracture; the animal was either culled or referred to veterinarians.

4.3.3 Theme: Knowledge of ethnoveterinary medicine used in the study area to treat or prevent animal ailments

4.3.3.1 Sub-theme: Ethnoveterinary medicinal plants used in the study area

A total of thirty-one (31) medicinal plants were documented for twenty five (25) animal health indications (uses), including, fracture repair, protection of livestock after death in the family (*sefifi*), uterine cleansing, retained placenta, *gala* (general ailments in chicken, sheep, and goats and gallsickness in cattle), diarrhoea of ruminants, gastrointestinal parasites, blood cleansing, pains, maintenance of pregnancy after cow had aborted and reproductive efficiency/fertility enhancement as shown in Table 4.4. The medicinal plants belonged to seventeen (17) plant families and the most common plant family was Asteraceae with five (5) plant species followed by Fabaceae with four (4) plant species (Figure 4.4).

Table 4.4: Plant families and species used in ethnoveterinary medicines, their Setswana names, revealing participant(s), frequency of mention, medical indications and preparation and method(s) of administration

Family	Scientific name and voucher number	Setswana name	PRT(s)*	FOM ^a	Medical indication(s)	Method of preparation and route of administration/ application
Amaranthaceae	<i>Amaranthus lividus</i> L Ndou RV 25	Modinakana	4,5,6,7	4	Blood cleansing for septicaemia	Leaf infusion, oral route: The leaves are crushed and mixed with water and administered orally in a 2 litre bottle to the cattle.
			4,5,6,7	4	Wounds not healing	Leaf infusion, oral route: The leaves are crushed and mixed with water and administered orally in a 2 litre bottle to the cattle.
Amaryllidaceae	<i>Boophone disticha</i> (L.f) Herb. Ndou RV 22	Leshoma/Leswama	1	1	Uterine cleansing after abortion	Bulb decoction, oral route: The bulb is crushed and put in either warm or cold water, allowed to sit a while and then 1 litre of the infusion is administered orally to the animal.
			1,13,14,15,18	5	Retained placenta	Bulb decoction, oral route: The bulb is crushed and put in either warm or cold water, allowed to sit a while and then 1 or 2 litre(s) of the infusion is administered orally to the animal. The treatment is given only once and the retained placenta would fall off.
			1	1	Abortion	Bulb decoction, oral route: Prepared as above, plant after abortions of cows to cleanse the uterus (preparation and administration as above). This plant is also used to facilitate the next pregnancy and its maintenance in a protocol that includes <i>Teucrium trifidum</i> (see description under <i>Teucrium trifidum</i>).
			16	1	Fracture	Scales of the bulb are wrapped around the fracture line before applying the splint made of <i>Acacia Karoo</i> bark.

*PRT(s) = participants who mentioned the plant, ^aFOM = frequency of mention of the plant

Table 4.4: (continuation)

Family	Scientific names	Setswana name	PRT(s)*	FOM ^a	Medical indication(s)	Method of preparation and route of administration
Apocynaceae	<i>Gomphacarpus fruticosus</i> (L.) Aiton f. <i>subsp. Fruticosus</i> Ndou RV 36	Sebogamashi	8	1	Retained placenta in cows	Root decoction, oral route: The root is crushed and boiled in water and given to an animal orally after cooling in a 2 litre bottle.
			18, 19	2	<i>Gala</i> (general ailments) in goats and chicken	Root decoction, oral route: The plant is dug with its roots and boiled till it changes colour to brown and given to animals in their drinking water.
			18, 19	2	Respiratory diseases in chicken	Root decoction in drinking water: The plant is dug with its roots and boiled till it changes colour to brown and given to the animals in their drinking water.
Asparagaceae	<i>Asparagus nodulosus</i> (Oberm) J.P.Lebrun 7 Stock Ndou RV 11	Radopolwane/ polopolwane	1, 3	2	Eye infection	Root juice topical eye application: The roots, which look like "carrots", are warmed in a fire to make the liquid inside jelly-like and then squeezed into the eye.
Asphodelaceae	<i>Aloe zebrina</i> Baker Ndou RV 07	Kgophane	10	1	Retained placenta	Root decoction, oral route: The roots are boiled and given to cattle in one litre bottle and the placenta would fall off the following day.
			18, 19	2	Ripening of abscess	Heated topical leaf application: The leaves are put on fire to heat them up and then placed on a hard abscess to "ripen" and after it becomes soft, it will be opened and the pus removed.
			3	1	Fleas in poultry	Leaf infusion: Leaves put in drinking water.
			3	1	Gastrointestinal parasites in poultry	Leaf infusion: Leaves put in drinking water.
			10,11,12	3	General health in poultry	Leaf infusion: Leaves put in drinking water.
			13,14,15	3	<i>Gala</i> (general ailments in chicken	Leaf infusion: Leaves put in drinking water.

Table 4.4: (continuation)

Family	Scientific names	Setswana name	PRT(s)*	FOM ^a	Medical indication(s)	Method of preparation and route of administration
Asphodelaceae	<i>Bulbine abyssinica</i> A.Rich. Ndou RV 30	Makgabenyana	4,5,6,7	4	Blood cleansing Internal sores	Root infusion combined with roots of <i>Solanum lichtensteinii</i> and the roots of <i>Withania somnifera</i> ; 2 litres of the remedy is administered orally.
Asteraceae	<i>Artemisia afra</i> Jacq. ex Willd. var. <i>afra</i> Ndou RV 34	Lengana	4,5,6,7	4	Cough in cattle	Leaf infusion combined with roots of <i>Helichrysum caespititium</i> , oral route: (see <i>Helichrysum caespititium</i> section for instructions)
Asteraceae	<i>Dicoma galpinii</i> F.C. Wilson Ndou RV 18	Tlhlonya	4,5,6,7	4	Diarrhoea	Root decoction: mixed with <i>Senna italica</i> root, oral route: The roots of both plants are crushed and mixed with cold water and the infusion is dosed with a litre for adult cattle. Calves and goats are given 0.5 litre.
			4,5,6,7	4	Gala in all animals	Root infusion: Mixed with <i>Senna italica</i> root, oral route: preparation and administration as above.
			18, 19	2	Blood cleansing	Root decoction: Combined with roots of <i>Ziziphus zeyheriana</i> , <i>Senna italica</i> and <i>Cadaba aphylla</i> oral route: The plants parts are boiled (pitsa) and 2 litres given to animals.
			18, 19	2	Pains (from sores, fractures, etc)	
			10, 11, 12	3	After abortion to clean the uterus	Root infusion, oral route: The root is crushed and put cold water and the animal is given a litre of the remedy (see <i>Dicoma galpinii</i>).
			10,11,12	3	Cleansing the uterus after dystocia	
			16, 17	2	Stomach pains in livestock	Root decoction, oral route: The root is crushed and boiled in water and given to an animal orally after cooling. in a 2 litre bottle.

Table 4.4: (continuation)

Family	Scientific names	Setswana name	PRT(s)*	FOM ^a	Medical indication(s)	Method of preparation and route of administration
Asteraceae.	<i>Helichrysium caespititium</i> DC. Ndou RV 15	Phateyangaka	4,5,6,7,13, 14, 15	7	Coughs in cattle	Root infusion: Combined leaves of <i>Artemisia afra</i> , oral route: The plant parts of both plants are crushed and mixed with water and given to animals orally (1-2 litres). The roots of the plant can also be used alone, and is boiled and the decoction given orally to cattle in a litre bottle.
			18, 19	2	Blood cleansing Pains (from sores, fractures, etc.)	Root decoction: combined with <i>Solanum panduriforme</i> and <i>Withania somnifera</i> (root), oral route: The plants parts are boiled (pitsa) and 2 litre decoction given orally.
			20, 21	2	Diarrhoea	Root decoction combined with roots of <i>Ziziphus zeyheriana</i> Sond: The roots of both plants are crushed and boiled together. The sick calf is given about half a litre of the decoction orally.
Asteraceae	<i>Kleinia longiflora</i> DC. Ndou RV 35	Mosiamama	1	1	Go tlabela thobega	Procedure described in section 4.3.3.4.
			13,14,15	3	Protect livestock after death in the family (sefifi)	Procedure described in section 4.3.3.4.
Asteraceae	<i>Tarchonanthus camphoratus</i> L. Ndou RV 16	Mohatlha	18, 19	2	To prevent cold	Leaf infusion, oral route: The leaves of the plant are put in drinking water.
Brassicaceae	<i>Cadaba aphylla</i> (Thunb.) Wild Ndou RV 23	Munnamutsu	18, 19	2	Blood cleansing	Root decoction: Combined with roots of <i>Z. zeyheriana</i> , <i>Senna italica</i> and <i>Dicoma galpinii</i> , oral route (explained under <i>Dicoma galpinii</i>).
			18, 19	2	Pains (sores, fractures, etc.)	

Table 4.4: (continuation)

Family	Scientific names	Setswana name	PRT(s)*	FOM ^a	Medical indication(s)	Method of preparation and route of administration
Cannabaceae	<i>Cannabis sp</i>	Motekwane	10	1	Anthelmintic in donkeys and horses	Leaf decoction, oral route: The leaves are boiled in water and a litre of the decoction is given to the animal.
Cucurbitaceae	<i>Cucumis myriocarpus</i> Naudin subsp <i>myriocarpus</i> Ndou RV 05	Monyaku	9 2.,21	1	To induce abortion in dogs	Fruit juice infusion, oral route: The fruit (which is very juicy) is picked and rolled between fingers to soften the content. A hole is opened on the fruit and only the juice is squeezed out into milk that is given to the animal. Caution should be taken not to squeeze out the seeds because they are highly poisonous and could kill the animal.
				2	To induce vomition in dog when there was general malaise(gala)	
Euphorbiaceae	<i>Croton gratissimus</i> Burch. var <i>gratissimus</i> Ndou RV 33	Moologa	16,17,18,19	4	Fertility enhancement in livestock	The leaves are dried and then crushed and mixed with supplement feed. Altenatively sprinkling/ spread in the kraal (exposure treatment).
Euphorbiaceae	<i>Euphorbia serpen</i> Kunths Ndou RV 27	Luetsane	20, 22	2	Blood cleansing	Root decoction with a bit of tuber of <i>D sanguinea</i> , oral route: (see <i>Drimia sanguinea</i> for instructions).
Fabaceae	<i>Elephantorrhiza elephantina</i> (Burch) Skeels Ndou RV 20	Bosetsana	18	1	Blood cleansing	Root infusion, oral route: The root is crushed and put into water and the 2 litre of the infusion is given orally to cattle.
Fabaceae	<i>Indigofera cryptantha</i> Benth. ex Harv. var. <i>cryptantha</i> Ndou RV 10	'kofi"	8	1	Calf diarrhoea	Root decoction, oral route: The roots are crushed and boiled and administered orally (0.5-1 litre) when the remedy has cooled but is still warm.

Table 4.4: (continuation)

Family	Scientific names	Setswana name	PRT(s)*	FOM ^a	Medical indication(s)	Method of preparation and route of administration
Fabaceae	<i>Senna italica</i> Mill. subsp. <i>arachoides</i> (Burch) Skeels Ndou RV 06	Sebetebete	All except Participant 1 and 3	19	<i>Gala</i> (general ailments in chicken, sheep and goats and gallsickness in cattle)	Whole plant or root decoction: The remedy is prepared by boiling the plant in clean water until the water changes to a brownish colour (prepared tea colour) and administered to cattle when cooled. For calves, 0.5 litre is given and 1-2 litre for adult cattle. Given once but could be repeated if the animal does not recover. Some participants preferred using the whole plant in the decoction. Dry root infusions can also be made from dry grounded roots soaked for a while in cold or hot water. Can also be combined with <i>Dicoma galpinii</i> in a root infusion, oral route (see <i>Dicoma galpinii</i>).
			All except Participant 3	20	Diarrhoea in calves, cows and sheep	Root decoction, oral route as describe above.
			8, 10, 16	3	Retained placenta	Whole plant infusion or root decoction, oral route as described above.
			16	1	Treat cattle and small-stock after abortions	Whole plant infusion, oral route as described above.
			1	1	Gastrointestinal parasites for calves, sheep and goats	Whole plant decoction, oral route as described above.
			16	1	General health in livestock	Whole plant infusion, oral route as describe above
			18, 19	2	Blood cleansing	Root decoction: Combined with roots of <i>Ziziphus zeyheriana</i> , <i>Cadaba aphylla</i> and <i>Dicoma galpinii</i> , oral route.
			18,19	2	Pains (from sores, fractures, etc.)	

Table 4.4: (continuation)

Family	Scientific names	Setswana name	PRT(s)*	FOM ^a	Medical indication(s)	Method of preparation and route of administration
Fabaceae	<i>Vachellia karroo</i> (Hayne) Banfi & Gallaso Ndou RV 09	Mookana	1, 20, 21	3	Fracture repair (Go tlabela thobega)	Procedure described in section 4.3.3.4.
			10,16,18	3	Splints for fracture repair	Procedure described in section 4.3.3.4.
Hyacinthaceae	<i>Drimia sanguinea</i> (Schinz) Jessop Ndou RV 12	Sekaname	4,5,6,7	4	Snake bite in cattle	Tuber infusion (small part of tuber), oral route: A small portion of the tuber is crushed and mixed with drinking water. Alternatively, the tuber is mixed with water and 1 litre is administered orally to make sure the animal drank the remedy.
			18, 19	2	Build immunity against heartwater	The tuber is dug out and put into the kraal and animals step all over it (exposure treatment).
			2, 16	2	To build immunity against <i>Drimia sanguinea</i>	The method prevents mortalities caused by consumption of the <i>Drimia sanguinea</i> (sekaname) plant in the field while grazing. The tuber is dug out, crushed and mixed with water and then infusion sprinkled in kraals. Alternatively, the tuber is placed in the kraal for animals to trample over for immunity against the plant(exposure treatment)
			18	1	Blood cleansing	Tuber decoction (a bit of tuber): A bit of the <i>sekaname</i> tuber and the roots of <i>Euphorbia serpens</i> (Luetsane) are boiled and administered orally with a litre of water.
Iridaceae	<i>Babiana hypogaea</i> Burch Ndou RV 14	Thuge	2	1	Diarrhoea in goats	Root infusion, oral route: A crushed tuber infusion is made and given in 1 litre doses.
Lamiaceae	<i>Acrotome inflata</i> Benth. Ndou RV 19	Mogato	4,5,6,7	4	Wound and abscess	Root decoction, oral route: The roots are crushed and mixed with water and 2 litres is given orally.

Table 4.4: (continuation)

Family	Scientific names	Setswana name	PRT(s)*	FOM ^a	Medical indication(s)	Method of preparation and route of administration
Lamiaceae	<i>Teucrium trifidum</i> Retz. Ndou RV 32	Lethe la noga	1	1	Maintenance of pregnancy after cow had aborted	Whole plant infusion, oral route: use the plant in a protocol that includes <i>Boophone disticha</i> (Leshoma) to treat and prevent abortion problems in a cow. When a cow aborts, the uterus is cleansed using 1 litre of <i>Boophone disticha</i> (Leshoma) plant remedy (see preparation under the section <i>Boophone disticha</i>). After three days, the animal is given 0.5 litre of the <i>Teucrium trifidum</i> (Lethe la noga) remedy to "correct the uterus". The dried leaves of <i>Teucrium trifidum</i> (Lethe la noga) are crushed and boiled and 1 litre of the decoction is administered orally to the animal. The cow is again given 0.25 litre of the Lethe la noga when she is 2 months pregnant to maintain the pregnancy.
Rhamnaceae	<i>Ziziphus mucronata</i> Willd. subsp <i>mucronata</i> Ndou RV 28	Mokgalo	18, 19	2	Abscess ripening	Crushed leaves and soft branches poultice: Softer leaves and branches are crushed and placed on a hard abscess, in the morning; the abscess would be soft and opened.
Rhamnaceae	<i>Ziziphus zeyheriana</i> Sond. Ndou RV 26	Sekgalofatshe/ Mokgalofatshe	18, 19 18, 19 20, 21 20, 21	2 2 2 2	Blood cleansing Pains (from sores, fractures, etc) Calf diarrhoea	Root decoction: Combined with roots of <i>Cadaba aphylla</i> , <i>Senna italica</i> and <i>Dicoma galpinii</i> (see <i>Dicoma galpinii</i>). Root decoction combined with root of <i>H caespitium</i> (see <i>H caespitium</i>). Root decoction combined with root of <i>Grewia flava</i> , oral route: The roots of both plants are crushed and boiled together. The sick calf is given about half a litre of the decoction orally.

Table 4.4: (continuation)

Family	Scientific names	Setswana name	PRT(s)*	FOM ^a	Medical indication(s)	Method of preparation and route of administration
Santalaceae	<i>Thesium spp</i> Ndou RV 08	Motlhogapele	9, 18	2	Diarrhoea in calves and cows	Whole plant decoction, and Root decoction, oral route: A bulk of 5 litre remedy can be prepared to treat the sick animal. The plant is boiled in clean water until the water changes to a brownish colour (prepared tea colour) and administered orally to cattle when cooled to room temperature. For calves, 0.5 litre and 1 litre for cows. Given once but could be repeated if the animal does not recover.
			18	1	Gastrointestinal parasites in calves	Root decoction, oral route: The roots are crushed and boiled in water, cooled and administered orally to calves.
Solanaceae	<i>Solanum campylacanthum</i> Hochst. ex A.Rich. subsp. <i>panduriforme</i> (Drege ex Dunal) J Ndou RV 21	Tolwane e nyane	18, 19	2	Blood cleansing Pains (caused by sores, fractures, etc)	Root decoction: combined with <i>Helichrysum caespititium</i> and <i>Withania somnifera</i> (root), oral route.
Solanaceae	<i>Solanum lichtensteinii</i> Willd. Ndou RV 03	Tolwane	4,5,6,7	4	Blood cleansing Internal sores caused by gastrointestinal parasites	Root infusion combined with roots of <i>Bulbine abyssinica</i> and roots of <i>Withania somnifera</i> , oral route.
Solanaceae	<i>Withania somnifera</i> (L.) Dunal Ndou RV 31	Modikasope	4,5,6,7	4	Internal sores	Tuber infusion combined with roots of <i>Solanum lichtensteinii</i> and <i>Bulbine abyssinica</i> , oral route (procedure as above).
			18, 19	2	Blood cleansing Pains (caused by sores, fractures,	Tuber decoction: combined with roots of <i>Helichrysum caespititium</i> and <i>Solanum panduriforme</i> , oral route or, Tuber decoction: combined with roots of <i>Helichrysum caespititium</i> and <i>Solanum campylacanthum</i> , oral route in a 2 litre bottle.
Tiliaceae	<i>Grewia flava</i> DC. Ndou RV 17	Morethla	18, 19	2	Calf diarrhoea	Root decoction combined with root of <i>Ziziphus zeyheriana</i> and given orally (described under <i>Ziziphus zeyheriana</i>)

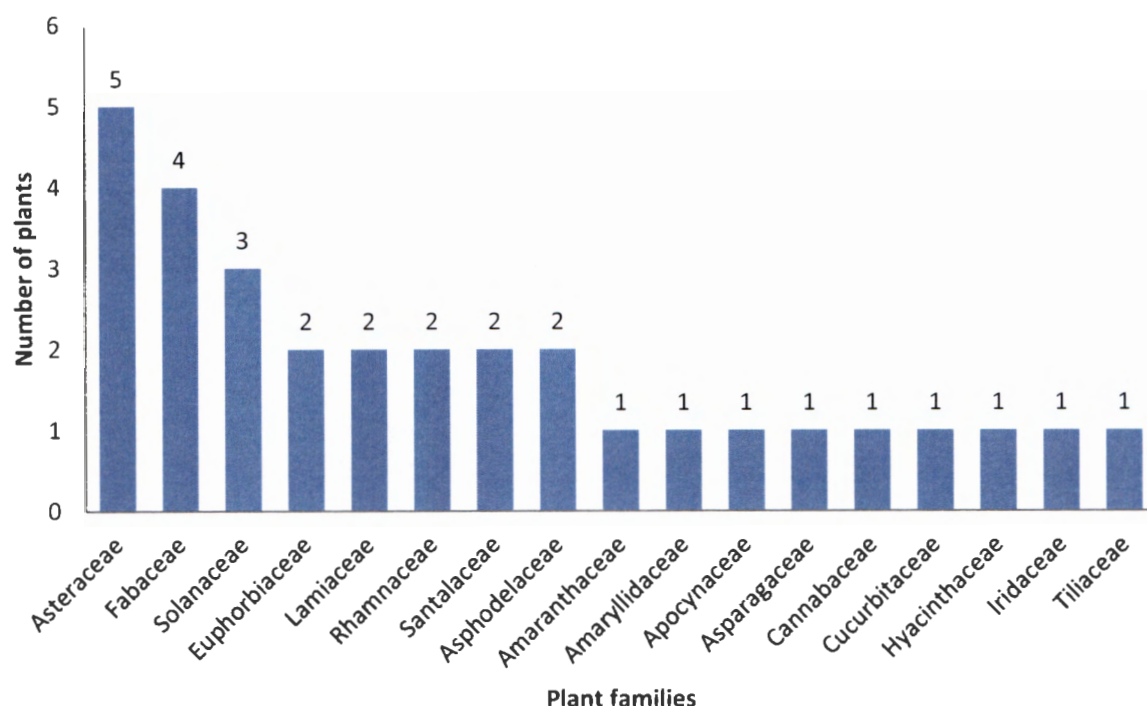


Figure 4.4: Families of ethnoveterinary medicinal plants and the frequency of mention by participants in the study area

4.3.3.2 Sub-theme: Plant parts, preparation and methods of administration in the study area

The results revealed that during the preparation of in ethnoveterinary remedies, plant parts used included aerial parts, thorns, fruit juice, bark, leaves, roots, bulbs, tubers and whole plants as shown in Figure 4.5. Out of a total of sixty-five (65) remedy preparations that were documented, roots (50.8%) are the most commonly used plant parts, followed by leaves with 16.9%. The use of fruit juice, thorns and barks is not common in the study area. In addition most remedies are prepared as decoctions and administered orally (41.5%) as shown in Figure 4.6. The second most popular method of preparation and administration was oral infusions (37%).

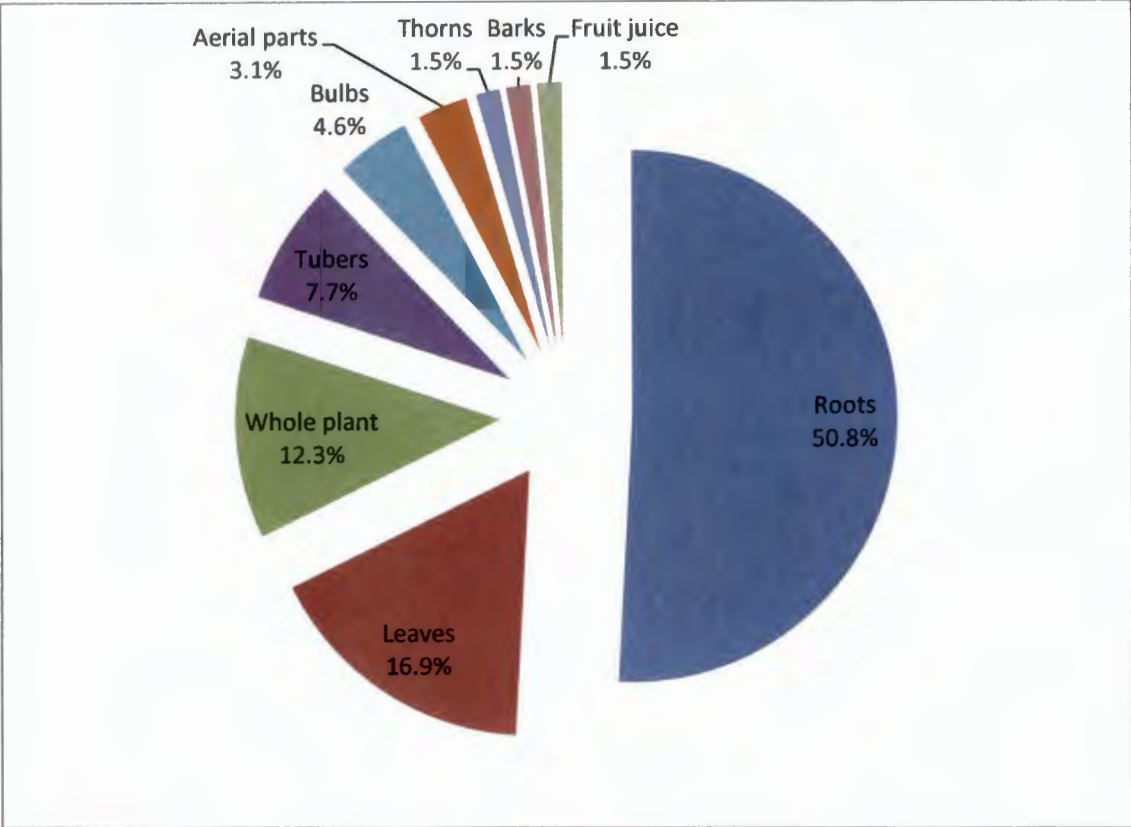


Figure 4.5: Percentage distribution (%) of plant parts used in the preparation of remedies or other applications

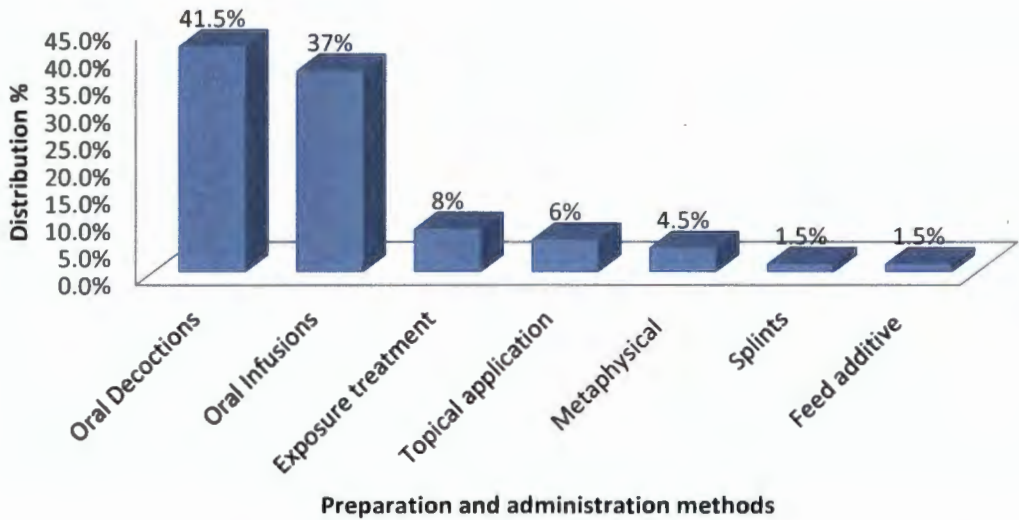


Figure 4.6: Percentage distribution (%) of methods of preparation and application of ethnoveterinary medicinal plants in the study area

4.3.3.3 Sub- theme: Ethnoveterinary non-plant remedies used for the treatment of livestock ailments

Table 4.5 shows non-plant remedies documented for the treatment of retained placenta, constipation, general malaise and eye infection. The treatment includes coarse salt for the treatment of retained placenta, *bojalwa jwa Setswana* for the treatment of general malaise and dead and dry millipedes for eye infections.

Table 4.5: Ethnoveterinary non-plant remedies used for the treatment of livestock ailments

Non treatment	plants	Treatment indication	Participant	Preparation and administration instructions
Coarse salt		Retained placenta, constipation	1,2,8,10,11,12,20,21	Coarse salt is mixed with 2 litres of water and given orally.
Sorghum (bojalwa Setswana)	beer jwa	Constipation General malaise	13,14,15,21	Sorghum beer and coarse salt are mixed together and given to the animal orally.
Dead and dry millipede		Eye infection	1, 16, 17	The millipede is crushed and the powder dropped in the eyes.

4.3.3.4 Sub-theme: Ethnoveterinary procedures used in the study area

Nine procedures were recorded in the study as shown in Table 4.6. The procedures are used with or without medicinal plants. These procedures are classified into metaphysical, fracture repair, surgical, manual manipulation and obstetrics procedures.

Table 4.6: Metaphysical, nonsurgical orthopedic, surgical, manupilation and obstetrics procedures used to treat animal health problems

Indication	Participant	Classification of procedure
Fractures (<i>Go tlhabela thobega</i>)	1, 20,21	Metaphysical
Fractures (Splinting)	10, 17, 18	Nonsurgical fracture reduction
Botulism (mokokomalo)	10, 11, 12	Surgical
Dystocia	1,10,18	Obstetrics
Desired colour of calves	3	Metaphysical
Movement control of livestock	3	Metaphysical
Retained placenta	20	obstetrics
Prevention/control of milk-induced diarrhea in calves	20, 21	Manual manipulation
Protection of animals against <i>sefifi</i> (darkness)	13,14,15	Metaphysical

Procedure: *Go tlhabela thobega*

Go tlhabela thobega is a metaphysical procedure that was fully described by participant 1. It is used for the treatment of simple fractures in cattle (this method does not work for compound fractures). The method requires the hip-bone of a dog that died in the field (a dog that died and was not buried). The bone is burnt in a fire and then ground to powder. The animal is restrained and its fractured limb placed on the ground to make a hoof print and then the animal is allowed to leave. Using a knife, a circular outline of the hoof print is “cut”/drawn on the ground and then a cross made inside the outline (Figure 4.7). The ground hipbone powder is then sprinkled inside the circle. Four thorns of the *Vachellia karroo* (Mookana) tree are embedded into the ground where lines of the cross touch the circle and the fifth thorn into the cross lines bifurcation. Lastly, the *Kleinia longiflora* (Mosiamama) plant powder is also spread on the circle by taking a small portion of powder into the palm of the hands and the hands are clapped together over the hoof print. The participant indicated that the fractured bone heals in seven days. This is the same treatment used by the participant to treat simple bone fractures in humans. This procedure was also described by participants 20 and 21, but with less precision. However, they acknowledged that this treatment was only applied (or best applied) by traditional healers.

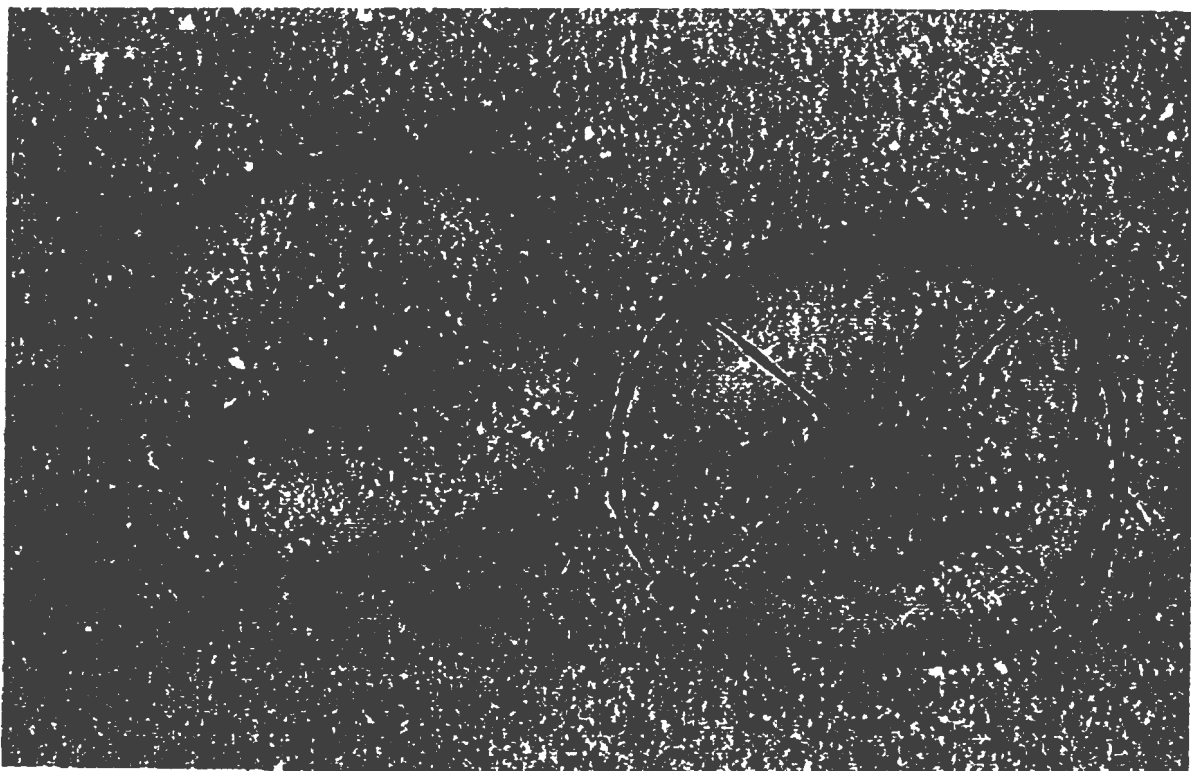


Figure 4.7: *Go tlhabela thobega*, a metaphysical method of fixing simple fractures in animals and humans as described by participants in the study

Procedure: Reduction of nonsurgical fractures

The procedure was described by participants 10, 17 and 18. They use the bark of *Vachellia karroo* for external coaptation of simple bone fractures (thobega) in livestock. The bark is used as splints by placing them over the fracture line to prevent movement of fractured bones. The strings (kgabati) from the bark are used to tie the splint together. Participant 16 also wrapped the scales of the bulb of *Boophone disticha* (Leshoma/ Leswama) around the fracture line before applying the splint of *Vachellia karroo*. No specific length of time was given; however, participant 10 indicated that when the splint falls off, the animal is healed.

Procedure: *Mokokomalo* (Botulism)

The description for the treatment of *mokokomalo* (botulism) in cattle was provided by participants 10, 11 and 12. The treatment is done by making an incision on the end of the tail and letting the blood flow out until it stops flowing. The animal recovers the following day.

Procedure: Obstetrics procedure

Participant 1 described the following procedure used in cases of dystocia in cattle: the hands are washed thoroughly with a bar of sunlight green soap and water. The birth canal is then inspected with the hands. The soap and water mixture is also used as a lubricant. The calf's feet are located and, if misaligned, they are corrected and placed facing the birth canal. At the same time, the head is also located and placed facing the birth canal on top of the feet. After this, the cow is left to continue giving birth to the calf. The remedy from the plant *Boophone disticha* (Leshoma) as described in Table 4.4, is also given to facilitate contraction of the uterus, which helps the cow push out the calf. However, if the cow does not expel the calf after a while, cold water is splashed on its head and this will cause a jerking response that will lead to the calf being pushed out. If the cow is still struggling to produce the calf, the cow is assisted by pulling out the calf.

Participants 10 and 18 described a slightly different procedure. In cases of dystocia, a bar of sunlight green soap and warm water are used to clean the hands thoroughly. The soap and water are also used as a lubricant. The hands are placed into the birth canal and the calf's position corrected and, after that, the calf is pulled out. Medicinal plants are not used in this procedure.

Procedure: Production of python coat colours in calves

Participant 3 described this method as used by his late grandfather. A python snake is used to produce nice colours (like the colours of a python) among the calves. The snake is kept in the kraal and when pregnant cows licked it, they then produce beautiful coloured calves. The python is fed with milk and sometimes meat. Though the python would not leave the kraal because it likes being licked by the cows, the kraal has to be constructed properly to prevent the snake from wandering away.

Procedure: Restricting the movement of animals

Participant 3 described this method as used by his late grandfather. A tortoise is used to prevent animals grazing too far away from home so that they do not get lost. It is believed that if a tortoise is placed inside the kraal permanently, the livestock will adopt the slow pace of the tortoise. Hence, when animals are released into grazing, they would not wander too far from home and would come back to the kraal every night. The tortoise is fed with vegetable leaves.

Procedure: Manipulation of retained placenta

The following method is used to manually manipulate a retained placenta so that it falls out of the uterus. A small stone is tied at the end of the hanging placenta and, each day, the stone is rolled around the descending placenta to facilitate the falling of the placenta by the small traction force of the stone.

Procedure: Prevention of milk-induced diarrhoea in calves

The method is used to prevent or control diarrhoea in calves whose dams produce too much milk, thus leading to diarrhoea. Two quarters of the cow's udder is milked out for human consumption and the calf suckles from the other two quarters

Procedure: Protection of livestock against *sefifi* (death darkness)

Kleinia longiflora (mosiama) plant is used to protect livestock after a funeral. In Setswana culture, death is said to bring *sefifi* (darkness) to the family, especially when the owner of the livestock dies. The *sefifi* can result in the death of other family members (especially the wife) and livestock. The plant is used to remove the *sefifi*. The aerial plant parts are crushed and put in water and the infusion spread (sprinkled) in the kraal and the yard.

4.3.3.5 Emerging theme: Pluralism in treatment indications for certain medicinal plants

Fifteen (15) of the thirty-one (31) medicinal plants documented in this study had multiple indications (uses) for treatments, either as single-plant remedies, or poly-plant remedies. Single-plant remedies with multiple indications included *Senna italica*, *Dicoma galpinii*, *Aloe zebrina*, *Drimia sanguinea*, *Boophone disticha*, *Thesium* sp, *Asparagus nodulosus* and *Gomphacarpus fruticosus*. *Senna italica* (Figure 4.8) had the highest number of indications (7) in animal health care as shown in Table 4.4. The plant was mentioned for the treatment of animal health problems such as, *gala*, diarrhoea in calves, cows and sheep, retained placenta, abortions, gastrointestinal parasites, general health and blood cleansing. The importance of this plant among participants in the study area was best expressed by a participant 9 in the following excerpt: “*Sebetebete ke ona molemo wa Setswana*”, expressing the importance of the plant to Batswana people. The other evidence of the importance of *Sebetebete* in the study area is the fact that it is almost always mentioned first by participants during interviews. This is an indication that it is probably the first plant in the minds of participants when issues of traditional animal healing are discussed. In addition, many participants also indicated that it was also a great medicine for *gala* in humans. These narratives are best represented by the words of participant 18 as follows: “*Sebetebete is great for “gala” in all livestock and even yourself. When you have “gala”, you prepare it and drink it. You will then feel the “gala” going down and you will release it in a form of diarrhoea*”.



Figure 4.8: *Senna italica* with flowers on the left and the branching patterns on the right

Another plant with a high number of treatment indications (5) is *Aloe zebrina* (Kgophane). The plant is used for abscess ripening in ruminants. However, it is also the most popular plant for the treatment of poultry diseases. The indications for the plant in poultry include fleas, helminthes, general health and general ailments (*gala*). *Dicoma galpinii* (Figure 4.9) is another plant with five ethnoveterinary indications, including diarrhoea, gallsickness, blood cleansing, uterine cleansing after abortion and stomach pains. Another plant with multiple indications is *Boophone disticha* (Figure 4.10) used for uterine cleansing, retained placenta and fractures.



Figure 4.9: *Dicoma galpini* whose woody root is used for treating five ailments, including diarrhoea, gallsickness, blood cleansing, uterine cleansing after abortion and stomach pain



Figure 4.10: *Boophone disticha* with characteristic fan arrangement of leaves (left), picture on the right shows the dugout plant, the bulb with dry scales (right)

In addition, *Gomphacarpus fruticosus* was mentioned as used for the treatment of retained placenta in cows, *gala* in goats and chicken and respiratory diseases in chickens. Other plants, including *Drimys sanguinea* (sekaname) and *Withania somnifera* (modikasope), also had a higher number of indications (4) but were also included in poly-plant mixtures with other plant species. Eight (8) poly-plant remedies with two, three or four plant combinations documented for the treatment of various ailments and some poly-plant remedies, have multiple indications. The poly-plant remedy is referred to as “pitsa” in Setswana language. Plants such as *Euphorbia serpens*, *Cadaba aphylla*, *Solanum campylacanthum*, *Solanum lichtensteinii*, *Withania somnifera*, *Grewia flava* and *Bulbine abyssinica* are only used as part of poly-plant remedies. The combination of roots of *Withania somnifera*, *Solanum panduriforme* and *Bulbine abyssinica* plus *Dicoma galpinii* and *Senna italica* are used for blood cleansing and treatment of internal sores caused by gastrointestinal parasites.

4.3.3.6 Sub-theme: Culturally significant plants in the study area

In order to determine medicinal plants that are culturally significant for the treatment of animal ailments in the study area, the informant consensus factors were calculated (F_{IC}) for six animal health ailments with higher frequency of mention. The ailments were as follows: fractures; diarrhoea; *gala*; retained placenta; coughs; and blood cleansing. Tables 4.7 - 4.12 show the categorisation of treatment with medicinal plants according to the different ailments, the frequency of mention and informant consensus values. According to Table 4.7, there are seven plants that are used for the treatment of diarrhoea and the most mentioned plant was *Sebetebete* (20) and its F_{IC} value was 0.68. Table 4.8 further shows that in the category of medical plants species used for the treatment of *gala* (general ailments and gallsickness), the plant with the highest mention (19) and a high F_{IC} value of 0.83 was *Senna italica* (Sebetebete). Table 4.9 shows that for the category of plants used for the treatment of retained placenta, four plants were mentioned. However, there was a low agreement of 0.25 among participants for *Boophone disticha*. In the category of plants for the treatment of coughs or respiratory disorders in animals as seen in Table 4.10, two plants were mentioned and *Helichrysum caespitium* (Phetayangaka) had the highest F_{IC} of 0.86. Table 4.11 shows that three plants were mentioned for the treatment of fractures. *Vachellia karroo* (Mookana) was mentioned six times either as splint or in *go tlhabela thobega* and had the highest F_{IC} value of 0.6. Table 4.12 shows that there is no agreement among participants for medicinal plants used for blood cleansing.

Table 4.7: Frequency of mention and the F_{IC} value of medicinal plants used for the treatment of diarrhoea in animals in the study area

Scientific and local names of plants	Frequency of mention	F _{IC}
<i>Senna italica</i> (Sebetebete)	20	0.68 ^a
<i>Babiana mucronata</i> (Thuge)	1	E ^b
<i>Dicoma galpinii</i> (Tlhlonya)	4	-1
<i>Indigofera cryptantha</i> ("kofi")	1	E ^b
<i>Thesium spp</i> (Motlhogapele)	2	-5*
<i>Ziziphus zeyheriana</i> (Sekgalofhasi/Mokgalofhasi)	2	-5*
<i>Grewia flava</i> (Morettha)	2	-5*

^a stands for high consent among participants for plants used in the treatment of diarrhoea. * is the error that resulted due to the number of times the plant was mentioned for use in the treatment of diarrhoea (being too low to generate a F_{IC} from 0-1). E^b is the error that resulted from frequency of mention = 1.

Table 4.8: Frequency of mention and the F_{IC} value of medicinal plants used for the treatment of *gala* (gallsickness in cattle and general malaise in other livestock) in animals in the study area

Scientific and local names of plants	Frequency of mention	F _{IC}
<i>Senna italica</i> (Sebetebete)	19	0.83 ^a
<i>Aloe zebrina</i> (Kgophane)	4	0 ^b
<i>Dicoma galpinii</i> (Tlhonya)	4	0 ^b
<i>Gomphacarpus fruticosus</i> (Sebogamashi).	2	-2*

^a stands for high consent among participants for plants used in the treatment of *gala*. ^b is a low F_{IC} of zero. * is the error that resulted due to the number of times the plant was mentioned for in the treatment of *gala* (being too low to generate a F_{IC} from 0-1).

Table 4.9: Frequency of mention and the F_{IC} value of medicinal plants used for the treatment of retained placenta in animals in the study area

Local name	Frequency of mention	F _{IC}
<i>Senna italica</i> (Sebetebete)	3	-0.5*
<i>Boophone disticha</i> (Leswama/Leshoma)	5	0.25
<i>Asparagus nodulosus</i> (Radipolwane)	3	-0.5*
<i>Gomphacarpus fruticosus</i> (Sebogamashi)	1	E ^b

* is the error that resulted due to the number of times the plant was mentioned for in the treatment of retained placenta (being too low to generate a F_{IC} from 0-1). E^b is the error that resulted from frequency of mention = 1.

Table 4.10: Frequency of mention and the F_{IC} value of medicinal plants used for the treatment of coughs in animals in the study area

Scientific and local names of plants	Frequency of mention	F _{IC}
<i>Helichrysum caespititium</i> (Phetayangaka)	8	0.86*
<i>Artemisia afra</i> (Lengana)	4	0.66 ^a

^a stands for high consent among participants for the number of times the plant was mentioned for use in the treatment of coughs (respiratory disorders). ^a is a F_{IC} value (high but still lower than the other plant).

Table 4.11: Frequency of mention and the F_{IC} value of medicinal plants used for the treatment of fractures in animals in the study area

Scientific and local names of plants	Frequency of mention	F _{IC}
<i>Boophone disticha</i> (Leshoma)	1	E ^b
<i>Vachellia karroo</i> (Mookana)	6	0.6
<i>Kleinia longiflora</i> (Mosiamama)	1	E ^b

^a stands for high consent among participants for the number of times the plant was mentioned for use in the treatment of coughs (respiratory disorders). E^b is the error that resulted from frequency of mention = -

Table 4.12: Frequency of mention and the F_{IC} value of medicinal plants used for the treatment of blood cleansing in animals in the study area

Local name	Frequency of mention	F _{IC}
<i>Senna italica</i> (Sebetebete)	2	-11
<i>Drimia sanguinea</i> (Sekaname)	1	E ^b
<i>Dicoma galpinii</i> (Tlhonya)	2	-11
<i>Bulbine abyssinica</i> (Makgabenyana)	4	-3
<i>Withania somnifera</i> (Modikasope)	6	-1.4
<i>Solanum lichtensteinii</i> (Tolwane)	6	-11
<i>Solanum panduriforme</i> (Tolwane a nyane)	2	-3
<i>Helichrysum caespititium</i> (Phetayangaka)	2	-1.4
<i>Amaranthus lividus</i> (Madinakana)	4	-11
<i>Ziziphus zeyheriana</i> (Sekgalofhasi/mokgalofhasi)	2	-3
<i>Cadaba aphylla</i> (Munnamutsu)	2	-11
<i>Euphorbia inaequilatera</i> (Luetsane)	2	-11
<i>Elephantorrhiza elephantina</i> (Bositsane)	1	E ^b

* is the error that resulted due to the number of times the plant was mentioned for use in the treatment of blood cleansing (being too low to generate a F_{IC} from 0-1). ^b is the error that resulted from frequency of mention = 1.

The informant consensus factor values shows agreement among participants for treatment with medicinal plants for five animal ailments in the study area. The highest F_{IC} values (between 0 and 1) were used to generate a column chart (Figure 4.11). It was observed that there is agreement among participants in the treatment of diarrhoea, *gala*, coughs, retained placenta and fractures. The highest consensus values were for the treatment of coughs using *Helichrysum caespititium* (Phateyangaka) and *Senna italica* (Sebetebete) for the treatment of *gala* both at 0.83. *Senna italica* (Sebetebete) is also a significant plant of choice for the treatment of diarrhoea at F_{IC} value 0.7. Treatment of fracture using *Vachellia karroo* (Mookana) had a F_{IC} value of 0.6. The lowest F_{IC} value was for the treatment of retained placenta using *Boophone disticha* at 0.25.

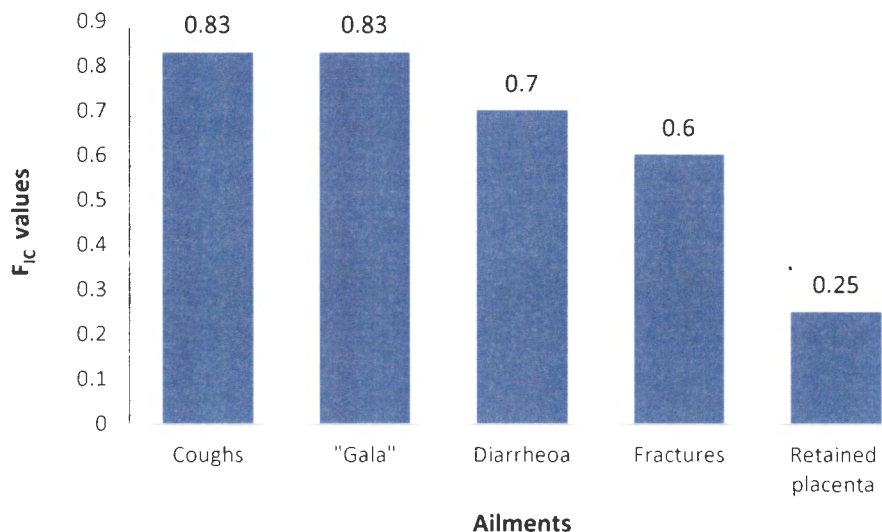


Figure 4.11: Graphical representation of the informant consensus factor values for the treatment of diarrhoea, gala, cough, retained placenta and fractures

4.3.3.7 Emerging theme: Symbolism in the naming of plants by Batswana

Issues of semantics in the names of Batswana medicinal plants emerged during data collection (when the researcher was interviewing participant 4). The researcher mispronounced the word *Phateyangaka* (*Helichrysum caespititium*). The participant took time to explain the proper pronunciation and also why the plant is referred by this name. The participant indicated that the plant spreads out on the ground like a traditional reed mat (traditional carpet), thus the reason why it is referred to as a mat (carpet) belonging to a traditional healer. The association with a traditional healer stems from the fact that the plant is very effective in healing. The researcher was then fascinated by the symbolic naming of plants by Batswana people. Participant 18 explained the naming of medicinal plant as follows: “Batswana people when naming medicinal plants, give them names that show the plant’s purpose in the body”. An explanation of the names of some plants as provided by participants is given below.

“Mookana” (*Vachellia karroo*) is used to repair fractures either during *go tlhabela thobega* or as splints; its name, explained by participants, refers to a plant with the capacity to attract others to itself. This meant that when the plant is used to treat fractures, it would cause the broken fragments to pull towards each other, thus closing the gap of the fracture line faster. “Moologa” (*Croton gratissimus*) is used for fertility enhancement in livestock. The name of the plant refers to something that continuously overflows, an indication that when

the plant is administered to animals, it would cause an unceasing overflow (production) of calves, kids and lambs.

“Mosiamama” (*Kleinia longiflora*) is a plant that has both physical and spiritual importance (Figure 4.12). The plant is used to repair fractures (go thabela thobega) and to protect animals and people against death (sefifi) due to a person’s death in the household. *Mosiamama* means to correct/arrange properly/ or cleanse (*o a siamisa*) situations. The plant is very important in the cleansing of rituals of family members and livestock after a funeral. The belief behind its use after funerals is that death spiritually disarranges the family (sefifi). The disarrangement (spiritual imbalance) leads to bad luck and death of other family members and livestock. In order to bring back spiritual balance, *mosiamama* is used during cleansing rituals. The function of this plant during rituals is testimony of African people’s reliance in, trust of and connectivity with their natural resources for both spiritual and physical healing.



Figure 4.12: “Mosiamama” (*Kleinia longiflora*) whose flowers have a feathery texture

4.3.3.8 Sub-theme: “We trust ethnoveterinary medicine”

Participants were requested to indicate the level of confidence they had for knowledge of ethnoveterinary medicine among ‘low’, ‘medium’ or ‘high’ confidence. Only one plant *Babiana hypogaea* (Thuge) used for the treatment of goat diarrhoea was rated low by participant 2. The participant indicated that the reason for the low confidence was because he

was not so sure of its effectiveness and had never used it himself. With regard to the other medicinal plants, non-plant remedies and procedures, participants were highly confident of their efficacy and such confidence is best represented by the excerpt from participant 18: *“I use traditional medicines for my livestock and that is why I was the first participant you were referred to in the village. I know these plants and I am always in the look out for them in the veld when I am herding my animals. I use them and they are effective and very fast to work”*.

Participant 10 expressed his trust in EVM by indicating as follows: *“I cannot remember all the remedies that I once knew but what I still remember, I still use and they still work very well for me”*. In addition to the trust for EVM, some participants were of the opinion that the remedies they used in the olden days were not too many because there were fewer diseases than nowadays. This sentiment is well expressed by participant 20 as follows: *“Long ago, we did not have as many diseases as we do today. In fact, livestock products did not make a person sick like it happens these days with diseases such as gout. In the olden days, when a cow was sick, we would use traditional remedies and the following day, the animal would be as healthy as if it was never sick”*. The belief in ethnoveterinary medicine was echoed by all participants. One participant summed up this belief in the following excerpts: *“These remedies work and since you are a scientist, go and test them and you will come back and testify.”* With this great belief in indigenous remedies, why then were participants worried about lost knowledge of ethnoveterinary medicine?

4.3.3.9 Emerging theme: “Go senste Terramycin, we are losing knowledge of ethnoveterinary medicine”

During data collection, the researcher observed that interviews with older participants always started on a slow note while they gathered their thoughts in order to recollect their knowledge of ethnoveterinary medicine. Majority of older participants admitted to having lost some of the memories of knowledge of EVM practised by their long gone grandparents, parents and themselves when they were still very active in animal husbandry. In addition, there was consensus among all participants that ethnoveterinary medicine has been lost and continues to be lost through time. This phenomenon was attributed to three factors or subthemes: their diminishing memories due to age; availability of Western medicine; and disinterest by the younger generation. Two of these factors (availability of Western medicine and disinterest by the younger generation) are discussed below.

4.3.3.9.1 Availability of Western medicines in their local towns

During the interviews, a few participants were quick to admit that they had either abandoned some practices in favour of Western medicines or integrated both Western and traditional medicine to the detriment of the retention of knowledge of EVM. Farmers cited Western medicines such as Terramycin (an antibiotic), Triatix (external parasite remedy), and Prodose (anti-helminthic) as medicines they used regularly in the treatment of ailments. In the beginning of an interview with a 95 year old man (participant 11), he altered a statement that can best describe why knowledge of EVM is being lost within farming communities due to the availability of Western medicine: *“Honestly, I have forgotten most of the EVM remedies we used in the olden days. The remedies I remember are those I still use for my livestock like sebetebete. But, I could show you all the Western medicine I use at present, including Terramycin and “dip”. My son buys them in bulk and brings to me”.*

Some participants indicated that the interviews made them realised how much information they had lost already and were glad someone was taking interest in the knowledge they possessed. Participant 18 was very excited about his interview and asked why he was so happy, he declared as follows: *“As I am speaking to you, it is like my brain is being opened and I remember a lot of things that we used for animal health care. I still use a lot of ethnoveterinary medicine but some practices I abandoned because of availability of Western medicines, tota go sentse Terramycin”.* Participant 13 also uttered a statement which shows the prejudice faced by African traditional medicine, including ethnoveterinary medicine: *“Medical indigenous knowledge is being lost because Western trained practitioners like nurses discourage us from using them. They tell us to stop digging for medicinal plants and go to the clinics to seek medical attention”.*

4.3.3.9.2 Disinterest by descendants or any other younger generation to take over “olden” practices

A general consensus among participants, especially older ones was that if their descendants and/or younger generations were interested in EVM, then the knowledge would not get lost. In an interview with participant 21, when asked if she shared her knowledge of EVM knowledge her children and grandchildren, she laughed out very loudly as she fell back on the bed she was sitting on and uttered the following statement. *“When we tell our children and grandchildren about traditional medicine for animals and any other olden practices, they laugh at us and say these practices are outdated, they also claim not to have time to learn such things.”*

Her older brother (participant 20), then added on the discussion of the disinterest in EVM by their descendants with the following statement: *“We send them (the descendants) to school and some of them even studied agriculture, understandably, they now prefer to use their Western knowledge for animal health care. They say traditional medicine for treatment of animals is not scientific. So, what can we say to that?”* The two participants also acknowledged that may be if they (the participants) were raised in modern times, and never witnessed the efficacy of EVM, they would probably also prefer Western medicine as it is easily available.

Almost all participants agreed that their learning of EVM and its efficacy was not a “choice”. They stated that when they were young, their parents or grandparents taught them EVM as a necessary skill in order to survive as future farmers. Theoretical and practical methods were used during this learning. Participants (21) best expressed the sentiment in the following excerpt: *“Our parents would tell you about the remedies, show you the medicinal plant in the field and how to dig it out, and also how to prepare the remedies. Then the next time, they would send you to collect it and prepare it yourself. That is how we learned these things.”* Surprisingly, even the youngest person in the study (participant 3), shared almost the same method of learning. He indicated that the learning of ethnoveterinary was through a series of theoretical and practical teachings where he could appreciate the effectiveness of EVM applied. Participant 18 describes his childhood as a time full of learning ethnomedicine for both human and animal treatment from his father (who was a traditional healer). He indicated that he was taught the philosophy of healing, observed and applied the treatment with guidance from his father.

Older participants were excited about the interviews with the researcher and indicated that it provided them with an opportunity to recall and share the knowledge they possessed. This sentiment is captured by the excerpt from participant 11 who maintained as follows: *“You do well by asking these questions and recording the information, because as for us, where we are going (death) is near and we will go with it (their knowledge of EVM).”*

4.3.3.10 Emerging theme: *Modikasope*, conservation of medicinal plant species

Even though the researcher had at times thought about issues of conservation of medicinal plant species, the seriousness of this situation was made known to her by two gentlemen (participants in the study). First, was participant 18 who, during field walk, lamented at the fact that other plants that were to be collected were not so easy to find because traditional

healers were depleting the field of the plants. The participant claimed that improper plant collection methods were the root of this problem. He, especially, blamed traditional healers from outside the village who come into the village and harvest without thinking of conserving the plant. After listening to the participant, the researcher felt guilty and wondered about the impact that she was making towards the extinction of medicinal plants with her plant part collections for the study.

The second incidence happened in Lokgalong village. The plant, *Withania somnifera* (Modikasope), was mentioned and when asked to identify the plant in the field, the participant was a bit reluctant. However, a week later, branch and part of the root of the *Modikasope* was delivered to the researcher through the translator. This was not an ideal situation as the plant had been mentioned severally and the researcher also wanted to take pictures of the plant and record its position. This concern was raised with the translator. The translator informed the researcher that the plant was very scarce as it was being depleted by traditional healers. He indicated that the participant did not want to reveal the location of the *modikasope* in the village to prevent its extinction.

The conservation of plant species was not unique to *Withania somnifera*. During other field walks with participants, plants such as *Boophone disticha*, *Cadaba aphylla* and *Drimia sanguine* were difficult to find in their “regular” fields. In such cases, the plant had to be “hunted” in other locations. Fortunately, all plants that were documented in this study were found, with the exception of one plant called *matebele*. The researcher had to accept that the plant had eluded her.

4.4 Discussion

4.4.1 Introduction

The study achieved its aim of documenting knowledge of ethnoveterinary medicine used in four villages within Mahikeng Local Municipality. The documentation included ethnodiagnostics, the use of ethnoveterinary medicinal plants, metaphysical procedures, non-plant remedies and nonsurgical and surgical procedures. This discussion is based on knowledge of ethnoveterinary medicine, rationale behind the use of ethnoveterinary medicine and the limitations of ethnoveterinary medicine as revealed in this study.

4.4.2 Knowledge of ethnoveterinary medicine of Batswana people in the study area

The proper ethnoveterinary treatment of animals depends on the systematic diagnostic procedures referred to as ethnodagnosis. Ethnodagnosis forms part of knowledge of ethnoveterinary medicine (McCorkle & Mathias-Mundy, 1992). The diagnostic methods in this study area were mainly through careful observation of animals, followed by physical examination, if necessary. The diagnostic methods in this study were not different from those used by other ethnoveterinary practitioners in Africa. Jacob *et al.* (2004) argue that observation and physical examination are the main diagnostic methods among the Maasai community in Kenya. In indigenous farming communities, the close observation of animals means they can treat any health problem quickly before it escalates (McCorkle & Mathias-Mundy, 1992). Furthermore, this researcher can attest that observation is an integral part of diagnostics even in Western veterinary medicine, despite the availability of sophisticated equipment, including X-rays and ultrasound. Many animal ailments have distinctive clinical presentation to allow diagnosis without use of medical equipment. In addition, diagnosis by observation is a reality for most rural veterinarians and animal health technicians due to lack of equipment in some areas.

Ethnoveterinary practitioners have to be vigilant and skillful observers in order to spot sick animals as early as possible. However, ethnoveterinary practitioners in Africa have acknowledged that ethnodagnosis is sometimes poor (McCorkle & Mathias-Mundy, 1992). Poor ethnodagnosis is attributed to a gap in knowledge by local people, which only sophisticated modern technology can provide (McCorkle & Mathias-Mundy, 1992). An example in this study was *gala* (as referred to by participants). The description of the ailment was, at times, unclear and too general, and could be confused with other ailments. The difficulty in distinguishing *gala* from other ailments was also faced by Van der Merwe (2000) in a study among the Batswana of Madikwe and Masika *et al.* (1997) and Masika and Afolayan (2003) in the Eastern Cape. However, this researcher has to acknowledge the fact that even though she was confused about *gala*, participants were not confused at all as they explained with confidence what they meant by *gala* in both animals and human beings. Therefore, failure to give a definite Western name(s) to *gala* by the researcher is not a misdiagnosis by ethnoveterinary practitioners but an error of language conversion.

McCorkle and Mathias-Mundy (1992) reported that the occasional misdiagnosis is not unique to ethnoveterinary medicine. In some cases, in Western veterinary medicine, only a tentative diagnosis of diseases can be made in the field and definite diagnosis is through

sophisticated equipment in laboratories. Therefore, if the equipment is not available, misdiagnosis of cases is possible, and even with sophisticated equipment, misdiagnosis in Western veterinary and medical fields are quite common. McCorkle and Mathias-Mundy (1992) suggest that many people can attest to this fact either as patients, veterinary clients or health care practitioners. Therefore, this researcher believes that in surveys on ethnoveterinary medicine, though participants should be requested to explain certain indistinct concepts, the focus should never be on possible misperceptions and misdiagnosis of diseases but knowledge of ethnoveterinary medicine applied to effectively treat animals.

Ethnoveterinary medicinal plants are the main treatment used in the study area. The medicinal plants are from seventeen plant families and among them; Asteraceae is the most popular, followed by Fabaceae and Solanaceae. These families are among those found to be popular in the inventory of South African ethnoveterinary medicinal plants discussed in Chapter 3 and also the review by McGaw and Eloff (2008). The similarities reveal that most South African indigenous communities have a consensus on the medicinal properties of certain plant families. In this study, medicinal plants were used in metaphysical procedures, fracture fixing, as *dipitsa* (poly-plant remedies) and single plant remedies. The documenting of several poly-plant remedies in this study confirmed the cultural importance of *dipitsa* among Batswana people. This is because *dipitsa* are also a common practice among the Batswana people of Madikwe as recorded by Van der Merwe *et al.* (2001). *Dipitsa* are not very common among the Vatsonga and Vhavenda of Limpopo Province, few poly-plant remedies were documented by Luseba and Van der Merwe (2006) and Luseba and Tshisikhawe (2013). However, poly-plant combinations are common in the Eastern Cape as reported by Masika and Afolayan (2003); Dold and Cocks (2001); Maphosa and Masika (2010) and Masika *et al.* (2000).

Another culturally significant finding in this study is the high percentage use of roots to make remedies which is similar to the study by Van der Merwe *et al.* (2001). This finding is contrary to those documented by Luseba and Van der Merwe (2006) among the Vhavenda who found that they preferred leaves to other plant parts. Also, Masika and Afolayan (2003) and Maphosa and Masika (2010) found the preference of leaves by communities in the Eastern Cape Province. In addition, in neighbouring Namibia, Chinsebu *et al.* (2014) found that leaves were most commonly used plant part. Chinsebu *et al.* (2014) explained that the preference of leaves was likely due to the fact that harvesting leaves was less labour-intensive and not likely to permanently damage the plant compared to harvesting roots.

The findings in this study also revealed that the most popular ethnoveterinary medicinal plant in the study area is *Senna italica* (sebetebete). This plant is recommended for the treatment of calf diarrhoea, gallsickness, general malaise, retained placenta, abortions, gastrointestinal parasite, general health and blood cleansing. In the study by Van der Merwe (2000) among the Batswana people of Madikwe, the plant was used for the treatment of gallsickness, diarrhoea, general intestinal diseases, heartwater, anthrax and pneumonia. Though the treatment of gallsickness and diarrhoea was the only similar indications in both studies, the multiple treatment indications of the plant in the two studies show the importance of the plant among the Batswana people. The findings of this study concur with those of Gabalebatse *et al.* (2013). The authors conducted a study in Botswana and found that the plant was recommended for calf diarrhoea. Interestingly, the only other mention of *Senna italica* in all South African ethnoveterinary surveys is by Luseba and Van der Merwe (2006) among the Xitsonga-speaking people of Limpopo Province, where it was recommended for the treatment of gallsickness and diarrhoea. This finding thus supports the cultural importance of *sebetebete* to Batswana people.

The researcher observed that certain medicinal plants used in the study area were indicated for the treatment of more than one animal ailment. Similar findings of pluralism in treatment indications were reported by Van der Merwe *et al.* (2001) where approximately twenty of the plants species out of forty-five recorded, had more than one ethnoveterinary indication. Also, Masika and Afolayan (2003), found that thirteen of the thirty-six plant species recorded had two or more indications. This phenomenon has been reported in most studies conducted in South Africa that have documented ethnoveterinary medicine as reported in the review by McGaw and Eloff (2008). The pluralism in treatment indication means that indigenous communities have discovered the multiple medical effects of certain plants. Medicinal plants possess different compounds that have different effects when applied to animals. *Senna italica* is used as an example in order to show the multi-effect of medicinal plants.

Senna italica has been scientifically tested to assess its medicinal potential and was discovered to possess different phytochemicals as reviewed by Masoko *et al.* (2010). The plant is reported to possess alkaloids, quinines, anthraquinones and flavonoids. Furthermore, Dabai *et al.* (2012) also determined the presence of steroids in addition to alkaloids and flavonoids. These compounds give *Senna italica* different medical effects when administered to an animal. The effects include anti-inflammatory, purgative, antiviral, antibacterial,

antifungal, anti-tick and antioxidant medicinal properties (Magano *et al.*, 2008; Masoko *et al.*, 2010; Mokgotho *et al.*, 2013; Van der Merwe, 2000). The healing properties of the plant must have been discovered by ancestral indigenous people and this is the basis of the trust they have in the medicinal plant.

The trust that indigenous communities of South Africa have in traditional healing is a fact that cannot be denied. Studies have reported that 70-80% of South Africans consult with traditional healers (Mokgobi, 2012). The high percentage of patronage of traditional healers shows the trust that South African have in traditional healing. The present study revealed a high level of trust in ethnoveterinary medicine among participants. The high level of trust and confidence in EVM has been observed in many other studies in South Africa. A study conducted by Masika *et al.* (1997) in the Eastern Cape Province, South Africa found that majority of respondents (89%) used and trusted ethnoveterinary medicine. The trust in EVM by farming communities is found throughout Africa as noted by McCorkle and Mathias-Mundy (1992). They authors found that some African livestock keepers used only ethnoveterinary medicine even with the availability of Western veterinary medicines.

Non-plant remedies and procedures constitute a component of treatment with ethnoveterinary medicine in the study area. The remedies and procedures include animals and insect-based remedies, obstetrics, reduction of external fractures and metaphysical methods. A hip bone of a dead dog is used as part of *go tlhabela thobega*, which is a metaphysical procedure to treat simple long-bone fractures in animal. The method, as used in animals, was also mentioned but not described among the Batswana of Ngamiland District, Botswana by Gabalebatse *et al.* (2013), while Monteiro and Thlabano (2013) described the *go tlhabela thobega* (also referred to as *thobega* in the publication) procedure as used in humans for the treatment of fractures and sprains in Botswana. *Go tlhabela thobega* is, therefore, a culturally important procedure among Batswana people. Some participants in the present study believe that *go tlhabela thobega* is better administered by traditional healers. However, in the study by Monteiro and Thlabano (2013), participants believed it could be performed by traditional healers or any knowledgeable person, including the youth for treatment of human fractures.

Another culturally important non-plant remedy is coarse salt water solution administered orally for the treatment of retained placenta, either used alone or in a mixture with plants. Salt is also used by the Batswana of Ngamiland District, Botswana for the treatment of retained placenta (Gabalebatse *et al.*, 2013). The other culturally important non-

plant remedy is *bojalwa jwa Setswana* (traditional beer) used for the treatment of “gala”, general ailments and constipation. The traditional beer is drenched to stimulate movement of the fore-stomach of ruminants. Van der Merwe (2000) also indicated that the traditional beer is used in the treatment of gallsickness. Another finding in this study is the use of dry millipedes for the treatment of eye infections. This remedy was also reported by Van der Merwe (2000) for the same indication among Batswana people of Madikwe area. The frequency of mention of some non-plant remedies and procedures revealed consensus among participants for the treatment of certain ailments.

4.4.3 Phytochemical constituents and their biological activities that validate the use of medicinal plants

This study determined consensus amongst participants for the use of *Helichrysum caespititium* to treat coughs, *Senna italica* for the treatment of *gala* (gallsickness in cattle and general malaise in other livestock), *Senna italica* for the treatment of diarrhoea, treatment of fracture using *Vachellia karroo* and treatment of retained placenta using *Boophone disticha*. The consensus shows that the plants mentioned above are culturally important and that their effectiveness in the treatment of those conditions must have been validated by the indigenous communities through indigenous experimentation. However, scientific testing of the plants has been done by researchers to determine the efficacy of some plants.

The photochemistry and the medical effects of *Senna italica* was discussed in the section 4.4.1 above. The chemical constituents of *Senna italica* include the alkaloids, quinines, anthraquinones, flavonoids (Masoko *et al.*, 2010) and steroids (Dabai *et al.*, 2012) which is reported to give the plant anti-inflammatory, purgative, antiviral, antibacterial, antifungal, anti-tick and antioxidant medicinal properties (Magano *et al.*, 2008; Masoko *et al.*, 2010; Mokgotho *et al.*, 2013; Van der Merwe, 2000). There is therefore logic in the plant use in cases of gallsickness (*gala*). Gallsickness as previously mentioned in the section above causes constipation and the purgative effect of the plant relieve the constipation. The plant stimulates the muscular coat of the intestine and produces purgation and the effect is seen within 6 to 12hrs (Masoko *et al.*, 2010). In addition, some *Senna sp* were found to have anti-protozoal activity as a result of the type of alkaloids and anthraquinones they contain (Moo-Puc *et al.*, 2007), which might explain their use in treatment of anaplasmosis, a disease caused by the protozoa *Anaplasma marginale* and *Anaplasma centrale*. On the other hand *Senna italica* is also used for the treatment of diarrhoea, this seem contradictory to its use as a purgative. However, cases of diarrhoea were mostly associated with helminthes or calves

drinking too much milk from the mother and *Senna italica* was found to have some anthelmintic activity by Fouche *et al.* (2016) using acetone extracts, rationalising its use in cases of diarrhoea. However, it is the opinion of this researcher that medical properties of this plant still require further investigations.

Helichrysum caespititium was another culturally important medicinal plant in the study area for the treatment of coughs caused by respiratory tract infections. This is not a surprise as the plant has similar uses in humans, the plant was reported by South Africans for use in treatment of respiratory tract infection symptoms such as cough, fever, blood in the sputum, flu (influenza) and chest complaints (Lourens *et al.*, 2008; Meyer *et al.*, 2002). The plant extract is reported to exhibit antimicrobial activities during testing by different researchers (Lourens *et al.*, 2008) and found to possess inhibitory activity against drug-sensitive strain of *Mycobacterium tuberculosis* (Meyer *et al.*, 2002). Those finding validate the use of this plants by the indigenous communities in this study.

Vachellia karroo was also a plant of cultural significant used in the repair of fractures, its use was either as splints or in *go tlhabela thobega*. Therefore, the phytochemical constituents of the plants may not be of obvious important in these cases. Interestingly, Van der Merwe *et al.* (2001) document the plant being used as splints by Batswana of Madikwe, and Van der Merwe *et al.* (2001) attributed the use of the plant to its bark's tough, fibrous structure, that would be able to stabilise fractures without breaking over an extended period of time.

Boophone disticha was also found to be an important treatment of retained placenta in this study. *Boophone disticha* has a long history as a medicinal plant in South Africa (Nair & Van Staden, 2014). The plant was reported to be used in cases of abortions in cattle by Van der Merwe *et al.* (2001) and though not the same indication as found in this study the two findings shows that the plant is significant in treatment of reproductive problems in by Batswana people. The plants is reported to contain a unique alkaloid constituents which are dividable into six structurally-diverse groups (Nair & Van Staden, 2014). These alkaloid constituents give the plant its antimicrobial, anti-inflammatory and anticancer activities (Nair & Van Staden, 2014). The participants in this study claimed that the plant has an ability to cause foetal membrane expulsion and also cleanses the uterus. The cleansing ability can be validated by the antimicrobial activity of the plant. However its ability to cause foetal membrane expulsions cannot be substantiated at this point. The plant is also a known toxic

plant, and its effects in human include sedation, analgesia, visual hallucinations, irrational behaviour, coma or death. However, *Boophone disticha* was not the only toxic plant documented in this study.

In addition to *Boophone disticha* the following were other plants with potential toxicological effect documented in the study; *Gomphacarpus fruticosus*, *Drimia sanguinea*, *Solanum campylacanthum*, *Solanum lichtensteinii* and *Cucumis myriocarpus*. *Gomphacarpus fruticosus* also called milkweed contains poisonous cardenolide cardiac glycosides which causes paralysis, breathing difficulties and quick, but weak heartbeat (Botha & Venter, 2002b). *Drimia sanguinea* contains the non-cumulative bufadienolides form of cardiac glycoside that causes acute intoxication in animals The clinical signs include diarrhoea, colic, tremors, staggering, muscular weakness, paralysis and death from heart failure (Botha & Venter, 2002a).

Solanaceae family, including *Solanum campylacanthum* and *Solanum lichtensteinii* fruits contain glycoalkaloids that causes acetylcholinesterase inhibition resulting in diarrhoea (Botha & Penrith, 2008). *Cucumis myriocarpus* contain cucurbitacins that are concentrated in the ripe fruits and the roots, which result in sudden death with lung oedema to severe, sometimes haemorrhagic diarrhoea (Botha & Penrith, 2008). The participants in the study were aware of the poisonous effects of these plants, made obvious by the technique they used in remedy preparation and application. Case in point, a small portion of *Drimia sanguinea* bulb is used to make a remedy in cases of snake-bite. In fact, the plant is mainly used in exposure prophylactic procedures to prevent poisoning by the same plant or heartwater. Also in the case of *Cucumis myriocarpus*, the participants insisted that only the juice without any seeds should be used since the seeds poisonous. This shows that the indigenous people have since realised the poisonous effects of some plants and have developed methods to safely use the plants including using certain parts of the plants and small quantities of the plant parts.

4.4.4 Limitations of ethnoveterinary medicine within Mahikeng Local Municipality

One of the limitations of ethnoveterinary medicine (that emerged in this study), is loss of knowledge over time. The participants attributed the loss of knowledge to three factors as follows: the advanced age of participants; westernisation of animal health care; and lack of interest by young people in old practices. This researcher must confess that even though she was aware of the loss of knowledge of ethnoveterinary medicine over time, as stated in many publications, including Wanzala *et al.* (2005), the dire nature of the situation became a reality during this study. Most of the participants in the study were older in terms of age and worried

that their knowledge of ethnoveterinary medicine will be lost if they pass-on. Loss of knowledge of ethnoveterinary medicine is not a unique phenomenon in Mahikeng; it has been reported in many publications throughout Africa (Luseba & Van der Merwe, 2006; Wanzala *et al.*, 2005; Yineger *et al.*, 2007; Yirga *et al.*, 2012).

In a study conducted by Wanzala *et al.* (2012) among the Bukusu community of Kenya, it was surmised that some of the reason for the loss in knowledge of ethnoveterinary medicine included the following: (1) untimely death of persons with ethno-knowledge without knowledge documentation; (2) extinction of some specific plant and animal species and ritual practices; (3) encroachment of development and modernisation on cultural and traditional life; (4) adoption of lifestyles and educational systems that do not embrace ethnoknowledge; (5) shifting bias in religious beliefs; (6) perception of certain socio-cultural practices as unhygienic and satanic; and (7) cost- and health-related risks involved in certain socio-cultural practices. The above factors have resulted in the dwindling of knowledge that is passed onto the next generation. In Southern Africa, similar sentiments have been echoed by authors such as Gabalebatse *et al.* (2013), Matekaire and Bwakura (2004), Maphosa and Masika (2010) and Van der Merwe *et al.* (2001). Retention of knowledge of ethnoveterinary medicine is very fragile because knowledge transfer from one generation to the next is without documentation and lack of interest by the youth as reported in this study will contribute to loss of knowledge.

Ethnoveterinary medicine does not have the luxury of continued information retention like its counterpart, ethnomedicine (human traditional medicine). In ethnomedicine, the knowledge is generally in the possession and protection of traditional healers (Mokgobi, 2012). The knowledge is continually passed from generation to generation through training of new traditional healers initiates “matwasane” (Mokgobi, 2012). Though most traditional healers are vested with the knowledge of animal health care, they did not receive such knowledge through traditional healing training (Ramovha & van Wyk, 2016). Traditional healers also received knowledge of ethnoveterinary medicine from their parents or grandparents (Ramovha & van Wyk, 2016). This sentiment was also expressed by the traditional healer who participated in this study, though she acknowledged that some of her treatments for animals were an adaptation of the methods used in humans. However, the participant received most of the knowledge of ethnoveterinary medicine from her parents. Lack of “formal” retention systems in ethnoveterinary medicine is one of the major contributors to the loss of knowledge in ethnoveterinary medicine. In addition, participants

also admitted that availability of commercial Western drugs, such as Terramycin, was detrimental to the retention of knowledge of ethnoveterinary medicine.

Oxytetracycline, commonly referred to as Terramycin (one of the trade names of the drug) by farmers, is an anti-microbial drug frequently used in livestock, either as prophylaxis, growth promoter and the treatment of infectious diseases (Schwarz *et al.*, 2001). In the many farming communities of South Africa, the drug is mostly used as either a prophylaxis or for the treatment of heartwater. It is also used in the treatment of gallsickness and other diseases of livestock. Oxytetracycline is an over-the-counter drug; therefore, farmers are able to access the drug easily at livestock remedies retailers and pharmacies. However, as with all antibiotics in current veterinary use, the threat of anti-microbial resistant micro-organism is a health risk for both human and animals (Hao *et al.*, 2014).

Studies have shown that the misuse and overuse of antimicrobial, including oxytetracycline drugs, is the most important cause of anti-microbial resistant micro-organisms (Hao *et al.*, 2014). This researcher has observed that some farmers within the Mahikeng Local Municipality, either under-dose, overdose or unsuitably use oxytetracycline drugs. Furthermore, the therapeutic duration of the drug is rarely observed, and all these factors amount to the misuse of the drug. Therefore, the development of drug resistant pathogens is possible with a resultant public health risk. Remedy-resistance problems are not common in the use of medicinal plants (Wanzala *et al.*, 2005) and this makes them an alternative to Western medicine, in some cases. However, this realisation may come too late to the “younger generation” livestock keepers if they continue to be ignorant to the great potential of ethnoveterinary medicine and if the knowledge continues to reduce further through generations.

The issue of plant conservation also emerged as a one of the main limitations of ethnoveterinary medicine (though *Modikasope* is very scarce). Plant conservation is not unique to South Africa, but a continent and global problem (Botha *et al.*, 2004). According to Wiersum *et al.* (2006), in South Africa, the intensive harvesting of wild medicinal plants due to the increasing use, has in many places, resulted in overexploitation, which is a threat to biodiversity. In the neighbouring Zimbabwe, Marandure (2016) also reported the loss of biodiversity as a challenge which was largely due to over-harvesting. Botha *et al.* (2004), suggest plant cultivation as a means of preserving the much needed plant species in different areas of South Africa. Furthermore, Botha *et al.* (2004), also suggest a local-level

management intervention strategy in harvesting and marketing medicinal plants, regional cooperation in management strategies and policies for harvesting of plants for national and international markets. These suggestions, especially the cultivation and local-level management interventions, should perhaps, be considered to assist plant conservation within Mahikeng Local Municipality.

4.5 Summary of chapter

The rich cultural heritage of Batswana people (in Barolong boo Tshidi land) within Mahikeng Local Municipality has been reported in this chapter. This study is the first of its kind in the study area. Medicinal plants, procedures, non-plant remedies and ethnodiagnostics used in indigenous animal health care were documented in this chapter. However, other important themes emerged from the study as follows: the holistic nature of chosen plants; trust in ethno-medicine; symbolism in plant names in Setswana; the concern that knowledge of ethnoveterinary medicine is continually lost through time and issues of conservation of medicinal plants. Among the emerging themes, of great worry to this researcher was the concern by participants for the loss of EVM knowledge. It is, therefore, recommended that urgent exploratory surveys be conducted in unexplored regions of the North West Province. The next Chapter focuses on awareness and perceptions of ethnoveterinary medicine among veterinarians and animal health technicians in the North West Province.

CHAPTER 5

AWARENESS AND PERCEPTIONS OF ETHNOVETERINARY MEDICINE AMONG VETERINARIANS AND ANIMAL HEALTH TECHNICIANS IN THE NORTH WEST PROVINCE

Abstract

The South African government recognises the value of traditional healing, especially as a primary health care solution and supports the integration of the Western and traditional health care systems. However, the success of any integration endeavour depends on the perceptions of different stakeholders in the fields of health. Many studies have been undertaken to evaluate the perceptions of Western-trained health care practitioners of ATM. However, studies on the perceptions of Western-trained animal health practitioners (WTAHPs) have been neglected. The purpose of this study was, therefore, to determine the perceptions of EVM among state veterinarians and animal health technicians (AHTs) in the North West Province. A Within-Stage Mixed Model and a Non-Probability sampling method were used to gather quantitative and qualitative data (QUAN+qual) from 53 participants, using a self-administered questionnaire. Statistical and thematic analytical processes were used for the quantitative and qualitative data. Overall, 77.4% of participants were aware of EVM practices for the treatment of ailments, including diarrhoea and wounds. Chi-square test revealed a significant relationship between district municipality of employment and awareness of EVM at $\chi^2 = 17.490$, $df = 3$, $p = 0.001$. Agreement with the use of EVM had an above average mean of 3.57, $SD = 1.016$ on a 5-point Likert scale. However, majority of participants (65.9%) were doubtful of the effectiveness of EVM, suggesting that even though EVM is tolerated, its value is not appreciated by most WTAHPs. Thematic analysis of the comments revealed that EVM is perceived as un-scientific and interfering with Western veterinary medicine by those who do not agree with its use by farmers. Whereas, those who agree with its use, believe it is effective in the treatment of some ailments and a good alternative to Western veterinary medicine. The study also revealed that 52.8% of participants were in support of integration of EVM into veterinary science and animal health curriculum. A logistic regression test indicated that participants, who were not against the use of EVM by farmers, were 4.45 times more likely to support the integration of EVM into the curriculum of veterinarians and animal health technicians and was statistically significant at $p < 0,005$. The study further revealed

that 20.8% of WTAHPs used EVM for the treatment of animal health problems such as retained placenta. However, lack of appreciation of the value and effectiveness of ethnoveterinary medicine among most WTAHPs may hinder suggested government proposed integration processes, illuminating the need for increased activities that improve perceptions among these stakeholders.

5.1 Introduction

African ethnoveterinary medicine (AEVM) is derived from African traditional medicine, which is part of African Indigenous Knowledge Systems (Semali & Kincheloe, 2002; Wanzala *et al.*, 2005). These practices, like any other form of traditional medicine, have survived the test of time and even survived the era of colonisation in many countries. It has been able to survive despite the fact that colonisers viewed such practices as forms of superstition and magic, and therefore, preaching the gospel to indigenous people with the aim of eradicating these practices. In South Africa, after the demise of apartheid (post-democratic elections of 1994), the ruling party (African National Congress, ANC), recognised the role played by traditional healing in the lives of South Africans and sought to right the wrongs of the past through legalising and regulating traditional practices (Mokgobi, 2012).

Traditional medicine in South Africa is important in rural areas, in particular, where access to appropriate and affordable primary healthcare is difficult and, at times, near impossible (Pefile, 2005). The South African government recognises the value of traditional medicine, including EVM, especially as a primary health care solution and supports the integration of Western and traditional health care systems (Pefile, 2005). The recognition of the value of traditional medicine led to the development of a legislative framework that includes the Traditional Health Practitioners Act 22 of 2007 (“the THPA”) and the draft policy on African Traditional Medicine for South Africa, 2008. However, the success of any integration endeavour depends on the perceptions of stakeholders in the different health fields. In the South African animal health sector, veterinarians and para-veterinarians would be critical in the process of integrating Western veterinary medicine with EVM and preservation of knowledge of EVM. While many studies have been undertaken to evaluate the perceptions of Western-trained human-health practitioners towards ATM (Hopa *et al.*, 1998; Mokgobi, 2012; Peltzer *et al.*, 2008), studies on the perceptions of WTAHPs have been neglected.

The aim of this study was to determine awareness and perceptions of ethnoveterinary practices among state employed Western-trained animal health practitioners (WTAHPs). The study thus, determined the readiness of WTAHPs to integrate Western and EVM and support the integration of EVM into the curriculum of veterinary and para-veterinary institutions.

5.2 Methodology

5.2.1 Study area

The study was conducted in the North West Province. An overview of the Province was discussed in section 2.6.

5.2.2 Study design

The Within-Stage Mixed Model was employed in this study (Johnson & Onwuegbuzie, 2004), which comprised of mainly a quantitative data (QUANT + qual). The mixing in the model occurred at data collection, data analysis and data interpretation stages. Quantitative (QUAN) and qualitative (qual) data were collected using the same research tool by strategic blending of closed ended with open ended questions. Statistical analysis was used on the quantitative data and thematic analysis for the qualitative data. The themes generated from the qualitative data were used to supplement or elaborate on responses of the closed ended questions (Johnson & Onwuegbuzie, 2004).

5.2.3 Study population

The targeted population for this study consisted of veterinarians (vets) and animal health technicians (AHTs) (collectively referred to as Western-trained animal health practitioners) employed by the South African Government in the Sub-Directorate of Animal Health, Directorate of Veterinary Services, North West Provincial Department of Rural Environment & Agricultural Development (READ). This population was selected because of its substantial contact with farmers in rural areas and communities within the Province compared to veterinarians and para-veterinarians in the private sector. It was assumed that the targeted population was likely to have been exposed to EVM practices within the communities in which they serve and would have formed perceptions about such practices.

According to North West Province (2016), the staff component in the sub-directorate at the time of enquiry, was as follows: fourteen field vets with six vacancies; and six managerial vets with two vacancies. The total number of vets was twenty (20). There were a total number of 121 animal health technicians (AHTs), including 21 control animal health

technicians, with a total of 17 vacancies. The total population for this study was N = 141 (North West Province, 2016).

5.2.4 Sample size and sampling procedure

A total of 53 participants from the study population were sampled using a non-probability sampling technique (convenience sampling) (Etikan *et al.*, 2016). This method was chosen because of its low cost and availability of the target population in certain governmental events. Data was collected at the South African Association for Animal Health Technicians (SAAAHNT) North West Provincial Congress 2016, held in Christiana town, three State Veterinary offices and the Provincial Rabies day 2016 campaign held at Phaposane village near Ganyesa town as shown in Table 5.1.

Table 5.1: Data collection sites and number of duly completed questionnaires at each venue

Locations of sample collections	No of questionnaires completed
South African Association for Animal Health North West Provincial Congress	34
State Veterinary area 1 and 2	8
State Veterinary area 3	3
Rabies Campaign (Phaposane village)	8
Total	53

5.2.5 Instrumentation

In line with the Within-Stage Mixed Model, a self-administered questionnaire (Appendix 8) that contained mostly closed-ended and a few open-ended questions was designed in accordance with Adjei (2013) and Sabarinathan Nair *et al.* (1997). The questionnaire contained two sections as follows: Section A focused on demographic characteristics of participants; while section B focused on awareness, perceptions and other EVM-related issues. The closed-ended questions consisted of multiple choice and Likert-scale questions, while the open-ended questions were short comments to further clarify and/or complement the responses provided by participants to some closed-ended questions (further exploring the rationale for responses provided by participants).

5.2.6 Piloting the instrument

The tool was tested for validity by piloting it at the North-West University, Mafikeng campus. The pilot participants included eight veterinarians and three AHTs in the Centre of Animal Health Studies and two members of staff of the Department of Agricultural Extension

and Economics with expertise in questionnaire design. The content validity of the questionnaire was determined through feedback obtained from the pilot participants. Participants were given time to scrutinise and respond to the questionnaire. After that, one-on-one sessions were held with each pilot participant for feedback on the tool. The instrument was revised according to the recommendations provided by participants.

5.2.7 Data analysis

Two different data analysis processes were employed in order to analyse the quantitative and qualitative data as described below:

5.2.7.1 Quantitative data analysis

The quantitative data was sorted and organised. The process consisted of cleaning and coding the data collected. Data cleaning was done through reading of each completed questionnaire in order to detect any omissions that could be corrected and also to remove questionnaires that were not worth analysing. During this process, two questionnaires that were not properly completed were discarded. The next step was data coding, done by allocating nominal values for responses provided by participants, for example, using 1 to 5 for Likert-scale type questions and using 0 and 1 for 'YES' or 'NO' questions. The data was then entered into a Microsoft excel spread sheet using the coding and later imported into the IBM-Statistical Package for Social Science (SPSS version 24.0) data sheet. Final data cleaning was done on SPSS through frequency analysis to detect errors such as missing values and wrong coding. These errors were subsequently corrected or defined on the variable view sheet. The clean and defined data was analysed to generate descriptive and inferential statistics. Descriptive statistics included frequencies, percentages, mean and standard deviations of variables. The results were used to construct bar charts, tables and column charts.

Inferential statistical analysis was done using the Chi-square test of independence and a logistic regression model. However, the inferential statistics results were only applicable to the sample in this study because non-probability sampling was employed during data collection. The Chi-square test determines association between categorical variables using contingency tables (cross-tabulation) to classified data according to categorical variables. The Chi-square test was used to test the following ten alternative hypotheses (H_a):

H_{a1} : There is a significant relationship between gender and awareness of EVM;

H_{a2} : There is a significant relationship between age and awareness of EVM;

- H_{a3}: There is a significant relationship between profession and awareness of EVM;
- H_{a4}: There is a significant relationship between professional experience (in years) and awareness of EVM;
- H_{a5}: There is a significant relationship between the district of employment and awareness of EVM;
- H_{a6}: There is a significant relationship between gender and agreement with the use of EVM;
- H_{a7}: There is a significant relationship between age and agreement with the use of EVM;
- H_{a8}: There is a significant relationship between professional experience and agreement with the use of EVM;
- H_{a9}: There is a significant relationship between professional experience (in years) and agreement with the use of EVM; and
- H_{a10}: There is a significant relationship between the district of employment and agreement with the use of EVM.

A logistic regression model was also used to determine predictors for future support of integration of EVM into the curriculum for veterinarians and animal health technicians. A logistic regression test quantifies the relationship between the dichotomous dependent variable and the predictors using odds ratios (Muchabaiwa, 2013). The stepwise logistic regression Forward LR model was used in this study. The model is a systematic method of identifying variables for inclusion or exclusion from the model in a statistical chronological manner starting with a null or basic model and adds significant variables to the model (Muchabaiwa, 2013).

5.2.7.2 Qualitative data analysis

The questionnaire had some strategically placed open-ended questions in the form of short comments. The comments were analysed through thematic analysis using the following protocol (Braun & Clarke, 2006): 1. The researcher read through all the comments in each completed questionnaire in order to better understand the data; 2. The comments were later entered into a Microsoft excel data sheet; 3. Repeating phrases and concepts were then highlighted; 3. The phrases and concepts were used to generate categories of themes; 4. The themes were reviewed in order to combine some themes that could be similar; and 5. The themes were reported through narratives.

5.2.8 Ethical considerations

All North-West University research proposal approval processes have been discussed in Chapter 4. In this section, the ethical considerations specific for this Chapter are described. A request for permission to collect data among state employed Western-trained animal health practitioners was sent from the North West Provincial Department of Rural, Environment & Agricultural Development (READ) through the office of the Chief Director Veterinary Services. An agreement was reached with the Chief Director Veterinary Services for data collection to proceed as long as consent to participate is obtained from individual WTAHPs.

During data collection, WTAHPs received an introductory letter (Appendix 9) attached to the questionnaire. The introductory letter provided an explanation of the purpose of the study. The letter also informed participants that their involvement was voluntary and that completing the questionnaire and handing it back to the researcher indicated consent to participate. The data collection process was done with utmost respect of the rights of participants.

5.3 Results

5.3.1 Introduction

A total of 53 questionnaires were duly completed, representing a participation rate of 37.5% (of the total population of 141 state officials). The results of this study are presented below according to the different sections of the questionnaire. Description of the demographic characteristics of the participants is presented first.

5.3.2 Demographic characteristics of participants

The demographic characteristics of participants reveal that out of the n=53 participants who took part in the study, majority (56.6 %) were males as shown in Table 5.2. In addition, most of participants (32.1%) were aged between 30 and 40 years. Furthermore, majority of participants (42) were animal health technicians (AHTs), representing 79.2 %, while most participants (49) were blacks, representing 92.5%. Also, most of participants had between 5 and 10 years working experience, representing 24.5%. The sample constituted of people from the four district municipalities of the North West Province with participants employed within Ngaka Modiri Molema District Municipality being the most represented (37.7%).

Table 5.2: Demographic characteristics of participants in the study area

Demographic characteristics	Descriptions	Frequency	(%)
Gender	Male	30	56.6
	Female	23	43.4
Age	>30 years	9	17.0
	30-40 years	17	32.1
	41-50 years	13	24.5
	51-60 years	14	26.4
Profession	Veterinarians	11	20.8
	Animal Health Technicians	42	79.2
Race	Black	49	92.5
	White	2	3.8
	Coloured	1	1.9
	Asian	1	1.9
Professional experience in years	Less than 5	12	22.6
	Less than 10	13	24.5
	Less than 15	10	18.9
	Less than 20	8	15.1
	Less than 30	6	11.3
	Above 30	4	7.5
District municipality of employment	Ngaka Modiri Molema	20	37.7
	Dr Kenneth Kaunda	6	11.3
	Bojanala	11	20.8
	Dr Ruth Segomotsi Mompati	16	30.2

5.3.3 Awareness of Western-trained animal health practitioners in terms of the use of ethnoveterinary medicine by farmers

5.3.3.1 Descriptive statistics

The aim of the section was to determine the level of awareness of ethnoveterinary medicine among the participants. Table 5.3 shows that a total of forty-one (77.4%) participants had either heard or experienced ethnoveterinary medicinal practices. In addition, there was no significant difference between awareness of EVM among veterinarians (72.7%) and animal health technicians (78.6%). Participants were aware of several ailments treated using ethnoveterinary medicine. Among the ailments, diarrhoea (23), wounds (21), poisoning (16), constipation (16), bloat (15), external parasites (14) and eye infections (14), were more frequently mentioned as shown in Figure 5.1. Furthermore, most Western-trained animal health practitioners (56.10%) believed that farmers use ethnoveterinary medicine because it is locally available and cheap as shown in Table 5.4. In addition, WTAHPs also believed that factors such as lack of availability of Western veterinary services (41.46 %) and ease of application of EVM (36.59%) also motivate the use of EVM by farmers. However, most WTAHPs did not believe that farmers use EVM because of its effectiveness. This view is

supported by the statistics obtained in this study, only 12.2% of participants indicated that farmers use EVM because of its effectiveness.

Table 5.3: Awareness of ethnoveterinary medicine among participants (n=53)

Awareness of EVM	Veterinarians	AHTs	Total (n)
No	3 (27.3%)	9 (21.4%)	12 (22.6%)
Yes	8 (72.7%)	33 (78.6%)	41 (77.4%)
Total	11 (100.0%)	42 (100%)	100%

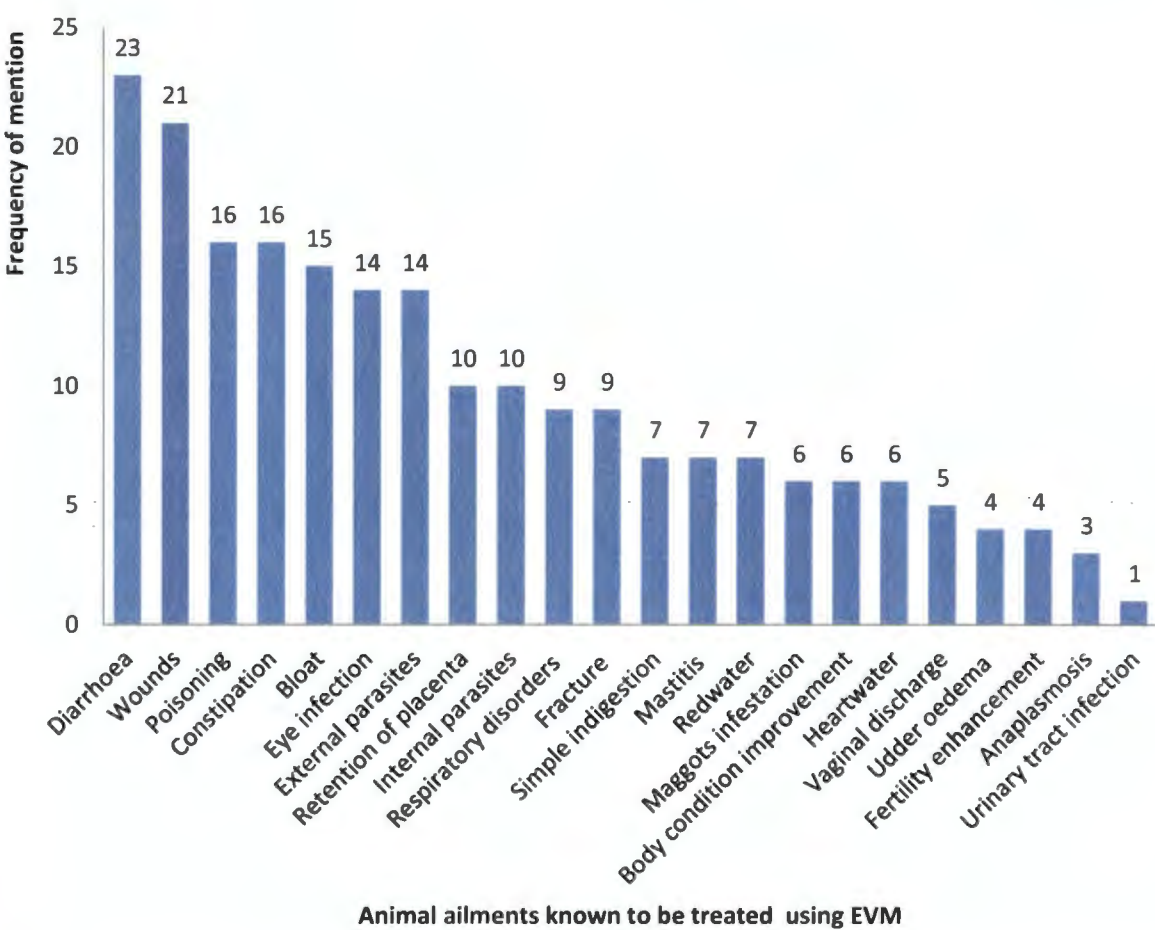


Figure 5.1: Frequency distribution of animal ailments known by participants to be treated using ethnoveterinary medicine within farming communities (n=41)

Table 5.4: Advantages of EVM to farmers as perceived by Western-trained animal health Practitioners (n=41)

Advantages of EVM	Cases	Proportional percentage of responses*
Cheap and economical	23	56.1%
Locally and easily available	23	56.1%
Where Western veterinary assistance is not available	17	41.5%
Easy application	15	36.6%
Satisfies the owner	14	34.2%
Technical person not required	10	24.4%
Treatment at farmers' residence	9	21.9%
Less toxic	5	12.2%
Effective	5	12.2%
Helps when animal is immobile	5	12.2%
Hastens the natural process of healing	4	9.8%
No side effects	3	7.3%
Less risk	1	2.4%
None of the above	1	2.4%

*the percentage is calculated from cases that were more than the sample size since participants provided multiple responses

5.3.3.2 Inferential statistics

The Chi-square test did not reveal associations between awareness of ethnoveterinary medicine among WTAHPs with the following variables: gender, age, profession and professional experience (alternate hypothesis H_{a1} - H_{a4}) at $p > 0.05$. However, an association was determined for the following alternative hypothesis: “there is a significant relationship between the district of employment and awareness of EVM (H_{a5})”. The null hypothesis was rejected at $\chi^2 = 17.490$, $df=3$ and $p = 0.001$. Table 5.5 shows that WTAHPs at Dr Ruth Segomotsi Mompoti (100%) were the most aware of ethnoveterinary medicine than in other District Municipalities while those in Dr Kenneth Kaunda (16.7%) were the least aware.

Table 5.5: Cross tabulation of district municipality of employment and awareness of EVM among participants to determine association between the two variables

District municipality		Ngaka Modiri Molema	Dr Kenneth Kaunda	Bojanala	Dr Ruth Segomotsi Mompoti	Total
Have you heard or experienced EVM?	No	25.0%	83.3%	18.2%		22.6%
	Yes	75.0%	16.7%	81.8%	100.0%	77.4%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

5.3.4 Sources of information of ethnoveterinary medicine for Western-trained animal health practitioners (WTAHPs)

The aim of the section was to determine sources of information of ethnoveterinary information for WTAHPs. The findings revealed that collectively, indigenous communication networks (farmers, community and family members) were responsible for most of the awareness about ethnoveterinary medicine among WTAHPs as shown in Table 5.6. Among indigenous communication networks, community members (including farmers) were the main source of information (70.7%), followed by family members (39.0%). In addition, Figure 5.2 shows that most of the participants (50.9%) were willing to learn more about ethnoveterinary medicine.

Table 5.6: Percentage distribution (%) of sources of EVM information for Western-trained animal health practitioners (n=41)

Sources of EVM	Cases	Proportional percentage of responses *
From community members (including farmers)	29	70.7%
From family members	16	39.0%
Never heard of it before now	12	29.3%
At conferences	8	19.5%
From colleagues	6	14.6%
On publications	5	12.2%
From traditional healers	5	12.2%

*the percentage is calculated from cases that were more than the sample size since participants provided multiple responses

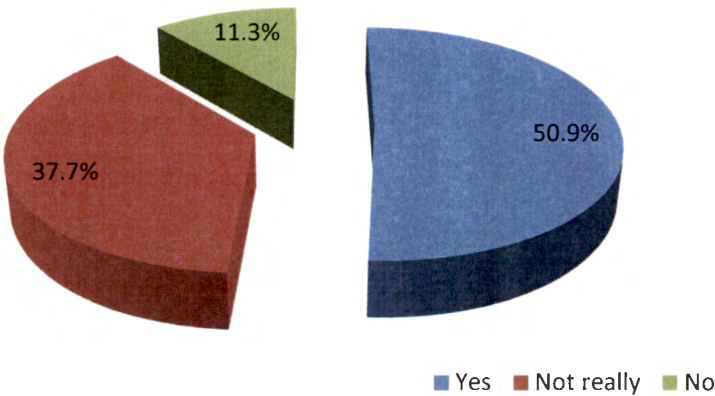


Figure 5.2: Percentage distribution (%) of participants' willingness to learn more about EVM (n=53)

5.3.5 Agreement with the use of ethnoveterinary medicine by farmers

5.3.5.1 Descriptive statistics

The study also sought to establish if participants agreed with the use of EVM by farmers using a 5-point Likert scale. Majority of participants agreed with the use of EVM by farmers with a mean of 3.57 (standard deviation (SD) = 1.016) on the agreement scale which ranged from 1 (not agreement) to 5 (agreement). Table 5.7 shows that the highest percentage of participants (57.4%) was not against the use of ethnoveterinary medicines by farmers.

Table 5.7: Percentage distribution (%) of Western-trained animal health practitioners’ agreement with the use of EVM by farmers

Agreement with use of EVM	Frequency	Percentage
Against	6	12.8
Not sure	14	29.8
Not against	27	57.4
Total	47	100

Thematic analysis of the reasons provided by participants to explain the agreement or lack of agreement with the use of EVM by farmers revealed four main themes. They are categorised into those against the use of EVM (themes 1 and 2) and those in favour of the use of EVM (themes 3 and 4). The following themes emanated from the study: 1) Ethnoveterinary medicine is un-scientific; 2) Use of ethnoveterinary medicine interferes with Western veterinary services; 3) Ethnoveterinary medicine is an alternative to Western veterinary medicine; and 4) Ethnoveterinary medicine is effective. The themes against the use of EVM are presented first.

Theme 1: Ethnoveterinary medicine is un-scientific: The results revealed that participants who do not agree with the use of ethnoveterinary medicine believe that EVM has no scientific bases compared to Western veterinary medicine which is based on science. Under this main theme, two sub-themes emerged that exposed why participants consider ethnoveterinary medicine as un-scientific. Sub-theme 1: No scientific testing to determine the pharmacological properties and effects of EVM. Participants believed that since EVM is indigenous knowledge, it lacks scientific testing, and therefore, lacks dosages, information on side-effects and withdrawal periods. The following narrative can best represent the views of participants: “*Pharmacodynamics and pharmacokinetics of such remedies need to be*

scientific and published". Consequently, participants would not recommend the use of EVM and this sentiment is best represented by the following excerpt: *"I can only recommend medicines that fall in my jurisdiction or profession. That is declared, usable by pharmaceutical companies"*. Sub-theme 2 was that, ethnoveterinary medicine is dangerous and toxic. This sub-theme can best be summed up by the following statements: *"lots of the items used are toxic substances with more potential to harm than do good"* and also *"most medicines used have no known active ingredient(s), may have severe side effects due to the ingredients since the medicine is not purified."*

Theme 2: Use of ethnoveterinary medicine interferes with Western veterinary services: Participants were of the opinion that the use of EVM interferes with Western veterinary medicine since farmers delay consultation with WTAHPs which could lead to the spread of serious diseases. This view is best represented by the following comment: *"but I feel modern medicine is constantly improving and is more effective and a vet can examine an animal, give the correct diagnosis and ensure that the correct medication is provided to prevent spread of diseases, some of which zoonotic."* Participants were also of the opinion that if farmers use EVM, they will resist the intervention of Western veterinary services. The view can best be represented by the following excerpt: *"Farmers resist the use of correct medicine."*

Theme 3: Ethnoveterinary medicine is an alternative to Western veterinary medicine: Participants believe that EVM is an alternative to western medicine and should be used by farmers. According to participants, Western veterinary medicine and services are sometimes, not available or expensive and, therefore, EVM offers other options of treatment to farmers. This stance is best represented by the following excerpts: *"It could be that farmers are far from co-op or town to buy vet medicine or may be when they do not have a co-op or are struggling with finances"* and also because *"In remote areas, animal health technicians are scarce"*.

Theme 4: Ethnoveterinary medicine is effective: Participants also believe that EVM is effective for all or some of the ailments and, therefore, should be used to treat animals. They maintained that if EVM was not effective, it would not have survived the test of time and farmers would not testify of its effectiveness. This belief is expressed in the following excerpts: *"Farmers have been using ethnoveterinary medicine for generations and were never disappointed; otherwise, they could have quit using the medicines."*, *"In the past decades, medicines were not there but our grandparents and great grandparents managed to*

cure animals with herbs, it is beneficial.” and “Farmers will always tell you the stories of when they used ethnoveterinary medicines and were satisfied with results.”

5.3.5.2 Inferential statistics

The Chi-square test did not reveal any associations between agreement with farmers’ use of ethnoveterinary medicine with the gender, age, profession and professional experience of WTAHPs. Therefore, the alternative hypotheses (H_{a6} - H_{a10}) were not accepted at $p > 0.05$.

5.3.6 Perceptions on effectiveness and limitations of ethnoveterinary medicine

The perceptions of participants on the effectiveness of EVM were determined and the results show that majority of participants (65.9%) were not sure of the effectiveness of ethnoveterinary medicine as shown in Figure 5.3. Interestingly, though a smaller percentage of participants (22.0%) considered EVM to be effective, these numbers were higher than those who perceived EVM as ineffective (12.2%). Probing into participants’ perceptions of limitations of EVM as an alternative to Western veterinary medicine revealed that most (43) believed lack of scientific proof of the effect of the medicine was the greatest disadvantage of EVM as shown in Figure 5.4. In addition, the limited availability of ingredients for EVM remedies was also perceived as another major limitation (41).

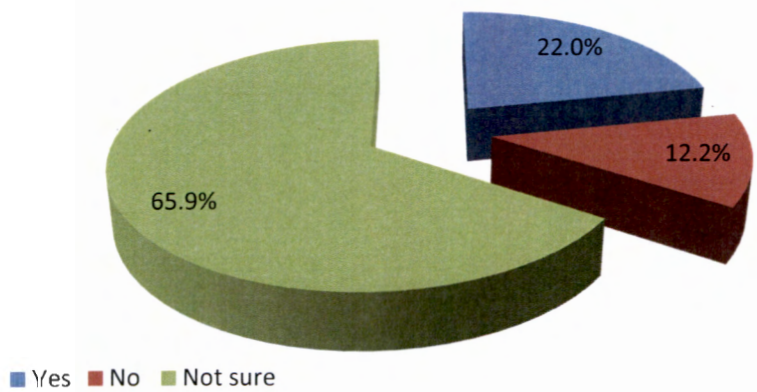


Figure 5.3: Percentage distribution (%) of the perceptions of participants regarding the effectiveness of EVM

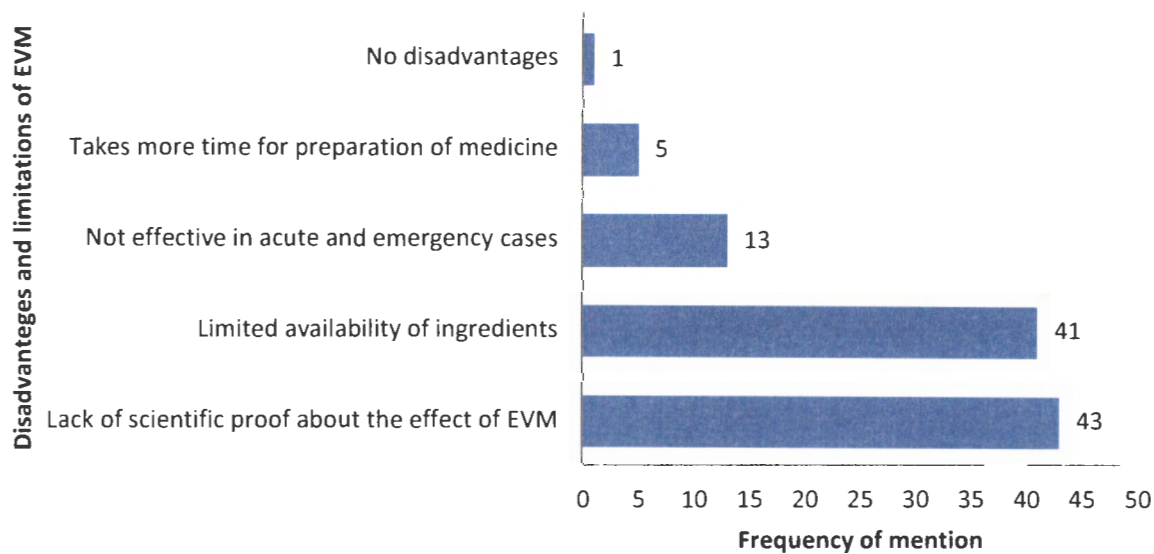


Figure 5.4: Frequency distribution of the perceived disadvantages and limitations of EVM (n=43)

5.3.7 Views on integration of ethnoveterinary medicine into veterinary and animal health curriculums

5.3.7.1 Descriptive statistics

The views of WTAHPs on the integration of EVM into the curriculum development of veterinary and animal health programmes were determined in this section. The responses distributed almost evenly, 52.8% (28) and 47.2% (25) as shown in Figure 5.5. The highest number represents participants who support the integration of EVM into the curriculum of veterinary and animal health programmes.

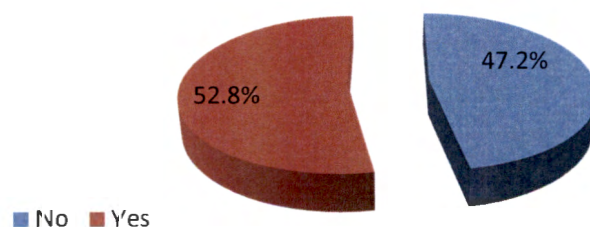


Figure 5.5: Percentage distribution (%) of participants who support the integration of EVM into curriculum development

Analysis of the qualitative data revealed three themes (one was those that do not support and two was those who support integration). The themes were as follows: 1. Ethnoveterinary medicine is neither effective nor essential; 2. Integration into the curriculum will result in efficient animal health care; and 3. Integration into the curriculum will encourage ethnoveterinary research and development.

Theme 1: Ethnoveterinary medicine is neither effective nor essential: Participants believed that EVM is unscientific and ineffective and, therefore, it was not necessary for WTAHPs to learn about it. This stance is best captured in the following excerpt: *"It (EVM) is not scientifically proven and not effective at all."* The other view is that even if EVM is effective, its knowledge by WTAHPs will be confusing to farmers and even cause them to resist veterinary intervention as captured in the following excerpt: *"To avoid confusion to farmers as tradition and technology clash."*

Theme 2: Integration into the curriculum will result in efficient animal health care: Participants believed that integration of EVM into the curriculum will result in a more efficient animal health care as it will open up more treatment options for farmers (that are cheap and available, especially, for poorly resourced farmers and those in remote areas). This position is captured in the following excerpt: *"Primary animal health care is the tool, integration of traditional or modern, together can make a big difference."* In addition, the integration will also provide WTAHPs with knowledge of EVM, thus encouraging an integrative state of animal health care. This position is captured in the following excerpts: *"They (WTAHPs) all have to get experience about the usefulness of this practice"* and *"Knowledge needed to be able to educate farmers on what ethnovet remedies are useful and its use in clinical cases, alternative treatments are always required."*

Theme 3: Integration into the curriculum will encourage ethnoveterinary research and development: Participants considered integration of EVM into the curriculum as a means of encouraging research and regulation of EVM. This sentiment is best expressed by the following excerpt: *"To enable further scientific research and regulation."* The following excerpt supports the role of academic institutions in ethnoveterinary research and development: *"Academic institutions are the only centres that can authenticate the approach (EVM), and research is best studied at university."* Interestingly, one participant who supported the integration of EVM into the curriculum gave the following comment: *"Let EVM be introduced, but under toxicology because EVM is toxic."* The statement shows a total

lack of support for EVM but still encouraging its integration into curriculum, with the intent to present it as an undesirable method of animal health care.

5.3.7.2 Inferential statistics

Binary logistic regression was also performed to determine if certain characteristics of participants were predictors for support of integration of EVM into the curriculum of veterinarians and animal health technicians. The binary regression model was able to classify 57.4% of cases that supported the integration of EVM into the curriculum of veterinary and para-veterinary sciences. The model summary explained 45.4% (Nagelkerke R2) of the variance in support of integration of EVM into the curriculum. The results showed that years of professional experience, district of employment, age of participants, awareness of EVM and gender were considered not to be predictors of support of integration of EVM into the curriculum at $p > 0.05$ as presented in Table 5.8 and, therefore, were not included in the equation. However, the results showed that the predetermined agreement of participants with regard to the use of EVM by farmers was a predictor in terms of support of integration of EVM into the curriculum, statistically significant at $p=0.002$ and included in the equation. In addition, at odd ration 4.455, it is an indication that participants, who are not against the use of EVM by farmers, are 4.45 times more likely to support the integration of EVM into the curriculum of veterinarians and AHTs as shown in Table 5.9.

Table 5.8: Variables not in the equation to determine predictors of support of integration of EVM into the curriculum of veterinarians and animal health technicians

Variables not in the equation			Score	Df	Sig.
Step 1	Variables	Professional experience in years	1.178	1	0.278
		District of employment	1.173	1	0.279
		Age of participants	0.741	1	0.389
		Have you heard or experienced EVM?	1.484	1	0.223
		Gender(1)	1.449	1	0.229
		Overall Statistics	5.972	5	0.309

Score - Score test used to predict whether or not an independent variable would be significant in the model
df-degrees of freedom for the Wald chi-square test; Sig – p value

Table 5.9: Variable in the equation ‘agreement with the use of EVM’, had a positive effect on support of integration of EVM into the curriculum of veterinarians and animal health technicians

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a	Are you against the use of EVM?	1.494	0.480	9.669	1	0.002	4.455
	Constant	-4.991	1.737	8.259	1	0.004	0.007

: a. Variable(s) entered in step 1: Are you against the use of EVM? B- the coefficient for the constant (also called the “intercept”) in the null model. ; SE-standard error around the coefficient for the constant; Wald-Wald chi-square test that tests the null hypothesis that the constant equals 0; df-degrees of freedom for the Wald chi-square test; Sig- p value. ; Exp (B)- exponentiation of the B coefficient, which is an odds ratio

5.3.8 Recommendations for the improvement of EVM by WTAHPs

Recommendations by participants for the improvement of EVM reiterate the need for scientific testing of EVM, as shown in Figure 5.6. The majority of participants (40) recommended scientific research into the safety and efficacy of EVM. In addition, they also recommended the documentation of EVM plants and their uses (19), registrations and the provision of licences for practitioners of traditional medicine (19).

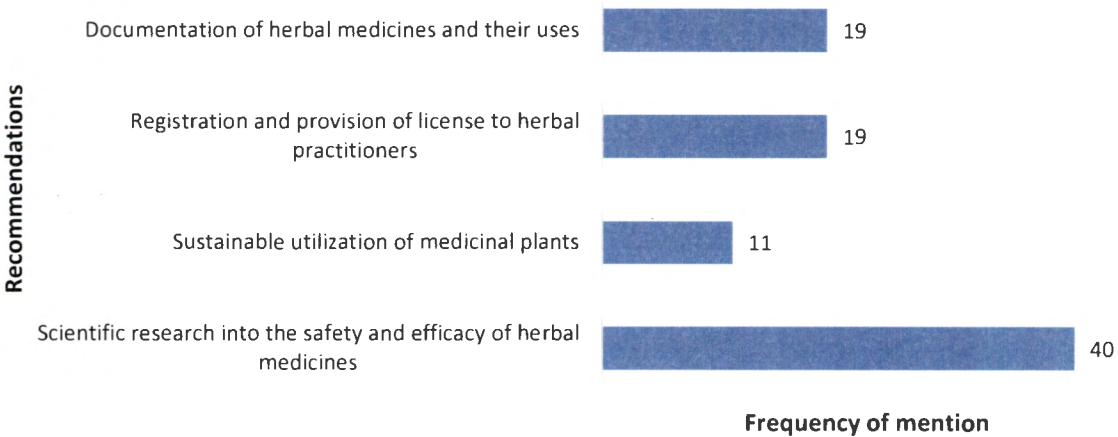


Figure 5.6: Frequency distribution of recommendations by participants for the improvement of EVM

5.3.9 Use of ethnoveterinary medicine among Western-trained animal health practitioners

This study also revealed that 11/53 (20.8%) of the participants in this study, used ethnoveterinary medicine as shown in Figure 5.7. A total of fifteen (15) ailments were treated using EVM, including retained placenta, internal parasites, gallsickness and eye infection as shown in Figure 5.8. The main reason the participants used EVM was their trust in the remedies (54.5%) as shown in Table 5.10. Another popular reason for using EVM was experimentation (36.4%) to determine its effectiveness.

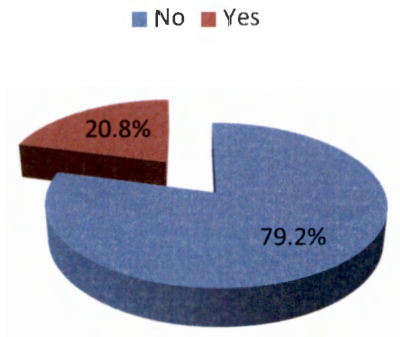


Figure 5.7: Percentage distribution of participants according to whether they practised or did not practise EVM

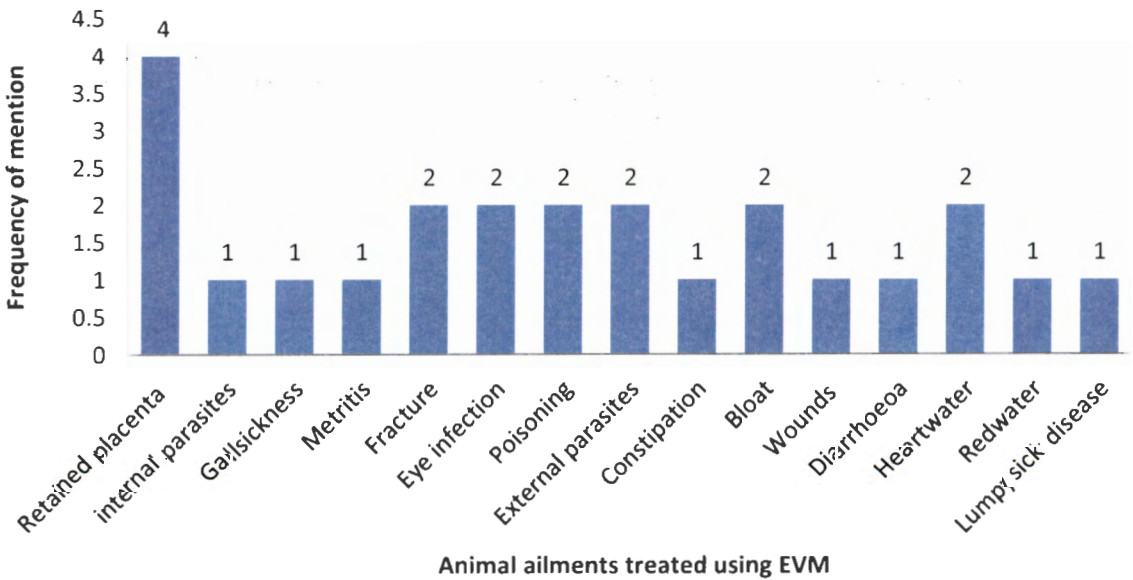


Figure 5.8: Frequency distribution of animal ailments treated using EVM by Western-trained animal health practitioners (n=11)

Table 5.10: The reasons why EVM is used by WTAHPs (n=11)

Reasons for using EVM	Cases	Proportional percentage of responses*
Modern medicine is failing	2	18.2%
Modern medicine is taking too long	3	27.3%
Farmer's request	3	27.3%
I trust EVM for certain ailments	6	54.5%
I wanted to experiment	4	36.4%

*the percentage is calculated from cases that were more than the sample size since participants provided multiple responses

5.4 Discussion



5.4.1 Introduction

The objective of determining awareness and perceptions of ethnoveterinary medicine among Western-trained animal health practitioners (WTAHPs) in the North West Province was achieved in this study. Ascertaining the perceptions of EVM among WTAHPs, determines their willingness and readiness to accept ethnoveterinary medicine as an alternative to Western medicine. The findings of this study are discussed below.

5.4.2 Awareness of ethnoveterinary medicine among Western-trained animal health practitioners

Majority of Western-trained animal health practitioners (WTAHPs) in this study were aware of ethnoveterinary medicinal practices used by farmers. The awareness dispels the notion suggested by Toyang *et al.* (1995) that EVM is practised in secret. On the other hand, the unawareness of EVM among the smaller percentage of WTAHPs could be linked to a number of factors, including the location of their employment (rural or urban), and type of farming (commercial or communal) the areas they service. Many authors have suggested that EVM is mostly practised among rural and (or) poor farmers (Luseba & Van der Merwe, 2006; Masika *et al.*, 2000; McGaw & Eloff, 2008), an indication that WTAHPs stationed in commercial farming areas or urban areas are likely to be uninformed about EVM.

The results of the present study, when compared to the primordial study by Jirli *et al.* (1997) and Sabarinathan Nair *et al.* (1997) in India, shows that Western-trained animal health practitioners (WTAHPs) in India have an upper hand on EVM issues compared to participants in this study. In the study by Jirli *et al.* (1997), almost all WTAHPs were aware of EVM practices and more than half of them had a profound knowledge (practical

knowledge) of EVM for specific animal health problems. In the study by Sabarinathan Nair *et al.* (1997), over three-fifth of WTAHPs used EVM at different levels of frequency for many ailments. The higher awareness and profound knowledge found by Jirli *et al.* (1997) and Sabarinathan Nair *et al.* (1997) were expected since EVM in India has a more established EVM system with more research and development than in South Africa (Hoareau & DaSilva, 1999). In India, integration of EVM and Western veterinary medicine or even the experimental usage of indigenous medicine by WTAHPs is a common practice (Sabarinathan Nair *et al.*, 1997).

It could, therefore, be concluded that the high level of awareness among WTAPHs in the North West Province is symptomatic of the following: 1. A rich amount of ethnoveterinary knowledge among communities of the North West Province; 2. Even in “modern” times, farmers still rely on ethnoveterinary medicine which has led the knowledge being preserved (retained) in communities; and 3. Farmers or communities are generally willing to share their knowledge of ethnoveterinary medicine. The finding of this study also showed an association between awareness of EVM and the district municipality of employment of participants. Awareness of EVM practices was higher in Ngaka Modiri Molema, Bojanala and Dr Ruth Segomotsi Mompati (DRSM) district municipalities. As previously stated, EVM practices are more predominant among rural and poor communities (McGaw & Eloff, 2008) and speculatively, it could be surmised that the social and economic profiles of district municipalities influenced the findings of this study.

Ngaka Modiri Molema and Dr Ruth Segomotsi Mompati (DRSM) are classified as the most poor and rural district municipalities of the North West Province. Dr Ruth Segomotsi Mompati District Municipality has been described as the rural hinterland of the North West Province with vast rural areas containing scattered small low-level urban nodes (North West Province, 2015). Extreme poverty is widespread throughout the District with 82% of households living at or below subsistence level (North West Province, 2015). Whereas, Ngaka Modiri Molema District Municipality is also classified as mainly rural with 72.6% of the total population living under the minimum living income (North West Province, 2012). The two districts rank first and second in terms of unemployment in the Province (North West Province, 2015). On the other hand, though Bojanala Platinum District Municipality is the economic growth engine of the North West Province and contributes the vast majority of both total economic production and employment opportunities within the Province, 67% of the total population live under the minimum living income; an indication that majority of the

people are poor (North West Province, 2015). The socioeconomic characteristics of the three district municipalities have, perhaps, resulted in the reliance of the communities in EVM as opposed to the more expensive Western medicine, which explains the high level of awareness of EVM practices among Western-trained animal health practitioners stationed in those Districts.

The findings of this study also revealed that indigenous communication networks are responsible for most of the awareness about ethnoveterinary medicine among WTAHPs while Western communication networks such as conferences play a minor role. This finding is similar to those of Jirli *et al.* (1997), who found that indigenous communication networks were the main source of EVM knowledge for participants. The findings also reveal that research on ethnoveterinary medicine in South Africa is not widely shared at conferences, especially those attended by para-veterinarians and veterinarians. This shows that there is a gap in ethnoveterinary research and development in South Africa. The researcher believes that EVM, as a new field and as a means to decolonise the African mind, should be promoted extensively by researchers. Furthermore, all available opportunities (including conferences) should be utilised, targeting mainly WTAHPs.

5.4.3 “We tolerate ethnoveterinary medicine but, we do not see its value”

Acceptance of and agreement by human beings of any phenomenon is determined by the individual perception of that entity (Ogunniyi, 2007). In this study, a moderate majority of WTAHPs agreed with the use of (EVM) by farmers. In South Africa, similar findings have been reported by Mokgobi (2012) among Western-trained health care practitioners (WTHCPs) in Limpopo and Gauteng provinces in South Africa. WTHCPs in the study included psychiatrists, general physicians, general nurses and psychiatric nurses while majority were found to accept the use of traditional medicine in human beings, especially as a primary health care system. Similarly, in the present study, some participants believe EVM is a good primary animal health system, especially for poor resourced farmers and those in remote areas. This researcher believes the moderate agreement with the use of traditional medicine, including EVM found in this study and that of Mokgobi (2012), are positive indications that could be used as a building block for the government suggested integration of Western and traditional medicine. In addition, the agreement by WTAHPs with the use of EVM by farmers in the present study was found to be a predictor for support of future integration of EVM into the curriculum of veterinary and para-veterinary sciences. This is

perhaps an indication that if acceptance of EVM is increased through perception change, then support of the integration will also improve.

An interesting finding in the present study is the fact that even though majority of participants agreed with the use of EVM by farmers, a higher number of participants were not sure of the effectiveness of ethnoveterinary medicine. Therefore, even though WTAHPs tolerate ethnoveterinary medicine, they do not see its value. Why then would participants tolerate the use something they do not believe works? This could be explained by the fact that most participants in this study perceive EVM as lacking scientific bases and, therefore, did not have confidence in its effectiveness. These concerns concur with those of similar studies in either ethnomedicine or the field of ethnoveterinary by Adjei (2013); Fielding (1997); Hopa *et al.* (1998); Jirli *et al.* (1997); Peltzer and Khoza (2002); Peltzer *et al.* (2006); Peu (2000); Sabarinathan Nair *et al.* (1997); Van Rooyen *et al.* (2015) and Mokgobi (2012).

The concerns about the lack of scientific testing expressed by WTAHPs in this study are not groundless. A South African review of ethnoveterinary medicine by McGaw and Eloff (2008) maintained that at the time, majority of documented plant species had not undergone validation testing and concluded with a recommendation of further testing of veterinary medicinal plants. However, the deficiency in scientific validation of ethnoveterinary medicine is not unique to South Africa. Iqbal and Jabbar (2010) observed the same trend in the worldwide review of EVM research. As stated above, ethnoveterinary research and development is a relatively “new” field in South Africa and its advances or lack thereof, can possibly be linked to its infancy. However, the literature revealed that significant research has been conducted on medicinal plant and their scientific validation in the aftermath of the review by McGaw and Eloff (2008). The researcher thus believes that the uncertainty in the effectiveness of EVM among WTAHPs is also partly due to the aforementioned gap in formal dissemination of information of ethnoveterinary research and development.

Another very interesting finding is the fact that ethnoveterinary medicine is also practised by some Western-trained animal health practitioners. Majority of whom, use ethnoveterinary medicine because of the trust in the practice. This finding raised a major question that follows: how did these WTAHPs learn to appreciate EVM and when did it happen? Their appreciation could have developed during their childhood or as a belated adulthood learning (as in the case of this researcher). Their sources of inspiration could have

been parents and/or other people. This is an indication that their perceptions could have been influenced by either “past” experiences (the witnessing of the effectiveness of EVM), the cultural status assigned to the practice, cultural upbringing or socio-cultural settings during learning (Kashyap, 2016). All these factors could have led to an ethnoveterinary learner with strong positive perceptions of the effectiveness of ethnoveterinary medicine, and because perceptions influence behaviour, then the learner becomes a practitioner. This finding concurs with what has been stated above, that perceptions of ethnoveterinary medicine can only be improved through learning its value.

5.5 Summary of chapter

Awareness and perceptions among Western-trained animal health practitioners (WTAHPs) with regard to ethnoveterinary medicine was examined in this study. It was revealed that there is high level of awareness and moderately high tolerance of ethnoveterinary medicine among WTAHPs. However, most participants were doubtful of the effectiveness of ethnoveterinary medicine and perceived it as unscientific. Therefore, WTAHPs do not appreciate the value of ethnoveterinary medicine. The negative perceptions may hinder government suggested integration processes of traditional and Western medicine in South Africa. The findings of this study illuminate the need for promotional processes to improve perceptions among stakeholders. The processes could be through conferences and workshops with the intention of promoting EVM through enlightening WTAHPs in terms of the scientific research and developments in EVM. The next chapter focuses on the general discussion, recommendations and conclusions.

CHAPTER 6

GENERAL DISCUSSION, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

South Africa, has a vast amount of knowledge on ethnoveterinary medicine (EVM) residing in different regions of the country (McGaw & Eloff, 2008). This knowledge was developed in the past to solve health problems of livestock, and was the only available animal health care resource until the introduction of Western medicine (McCorkle, 1995). The aim of this study was primarily to answer two main questions: 1. What indigenous knowledge and practices are used for animal health care in villages within Mahikeng Local Municipality; and 2. Are Western-trained animal health practitioners in the North West Province aware of ethnoveterinary practices, and if so, how do they perceive such practices? These questions were answered in the research, and have hopefully, contributed immensely to the body of knowledge. This chapter provides practical implications of the findings and also discusses the limitations of this study. It also highlights some lessons that were learned and the contribution of this study to the body of knowledge, as well as provides recommendations for stakeholders and researchers.

6.2 Effective animal health care system in South Africa through integration: practical implications of the study

For many South African farmers, Western veterinary medicine is very expensive and inaccessible. EVM is the readily available and effective solution to animal health care to most farmers (Luseba & Van der Merwe, 2006; McGaw & Eloff, 2008). Integration of Western veterinary and ethnoveterinary medicine for effective animal health care system is the central concept in this study (Chapter 3). It was proposed in the conceptual framework (section 3.3) that the key to a more effective, sustainable and cost-effective solution to animal health care in South Africa is the collaboration between Western veterinary and ethnoveterinary medicine. The same sentiments were raised by some Western-trained animal health practitioners in this study, who consider integrative animal health care as a solution to primary animal health problems. This does not only apply to animal health but also holds true for human health as suggested by the World Health Organization (2013). Formal integration of the two health systems has been successful in countries such as China, Korea and Sri Lanka as previously discussed (section 3.9). The South African government has attempted,

since the 1990s, through reform of the health policy to integrate the two health systems but integration has not yet been achieved (Felix, 2017; Pefile, 2005). According to Mokgobi (2012), achieving an integrative health system is a mammoth task that would require collaborative efforts of different stakeholders and huge financial commitments.

The other focus on the integration agenda (the integration of traditional medicine and other indigenous knowledge systems into the curriculum of higher learning) offers a promising prospect to resolve the issue of integration. Integration of indigenous knowledge, including EVM into the curriculum of higher learning, as previously stated, is one of the mandates of the National Indigenous Knowledge Systems Office (NIKSO). The call to decolonise South Africa's education by students in recent “#tagfeesmustfall” protests, raised an issue that has not been fully addressed post-1994 in South Africa. The protest has led to many debates and discussions on the issue at universities throughout the country (Canca, 2017) and though many people have different ideas on how to decolonise South Africa's education system, the general consensus is that there needs to be an urgent paradigm shift in education (Canca, 2017). After attending a few debates and addresses on decolonisation, this researcher observed that the suggested solutions to decolonisation of education are diverse and such process may be best tackled gradually in stages.

Ngugi wa Thiong'o (in his public address) advocates for the use of indigenous languages at institutions of higher learning (Canca, 2017). However, his main message is that “to understand the world and Africa's place in it, “we must understand ourselves”. This researcher believes that for students in the veterinary and para-veterinary fields, the “understanding of ourselves” will be the knowing of African achievements in animal health care. This knowing will give rise to students who do not view their own people (Africans practices) as backward and barbaric. Student will understand that Africans have contributed and still contribute greatly to Western advances and in most instances without recognition. This is evident through the development of many western drugs and therapies based on African knowledge with no acknowledgement of Africans.

The findings in this study point to the lack of appreciation of the value of ethnoveterinary medicine by WTAHPs. This is partly due to Eurocentric veterinary education which failed to expose WTAHPs to African healing and its potential (Chitindingu *et al.*, 2014). However, considering the history of South Africans during the apartheid era, where traditional healing was discouraged, labeled as witchcraft and even legally banned (Mokgobi,

2012), it is not surprising that most WTAHPs still doubt the value of EVM. In fact, since most of the EVM information was received informally as determined in this study, it is understandable that EVM would be viewed with skepticism and labeled as unscientific and, therefore, inefficient. On the other hand, farmers in this study provided a description of EVM learning processes that had both practical and theoretical aspects facilitated by their parents and/or grandparents. The learning was through cultural transmission of knowledge systems similar as described by Wanzala *et al.* (2005) and Zobolo and Mkabela (2006), that included vertical (child to parent) and horizontal (child to other source) learning processes (Ellen *et al.*, 2013). Therefore, their knowing of the value of EVM was through witnessing the effectiveness of EVM.

Integration of EVM into the curriculum of veterinary and para-veterinary sciences, if achieved, will assist with the following: 1. Production of WTAHPs, who have a holistic approach to animal health care and value African achievement; 2. Production of WTAHPs, who will not discourage EVM practices but address such issues with knowledge of the potential of EVM; 3. Production of WTAHPs, who may even assist in the preservation of knowledge of EVM; and 4. Push the agenda of an integrative animal health system in the country by generating discussions in the field of veterinary sciences.

Farmers involved in this study expressed concern that EVM is getting lost because the younger generation does not appreciate EVM and its potential. It is time for universities to produce graduates who have a holistic point of view and can integrate African knowledge with the Western knowledge. Therefore, integration of ethnoveterinary medicine into the curriculum is suggested as one of the main steps in the decolonisation of veterinary and para-veterinary education. According to this researcher, the integration of EVM into the curriculum will also be the greatest step towards integrative animal health care system. However, integration of traditional medicine into the curriculum of higher learning, as suggested by Mokgobi (2012), through short courses or incorporation of small parts of IKS in the development of certain modules such as pharmacology in the medical field, would not suffice. Bolder and bigger steps are suggested by this researcher, such as the development of semester modules on ethnoveterinary medicine that are integrated into the curriculum.

6.3 Limitations of the study and reflections

The researcher's undertaking of this study was a maiden voyage to the land of indigenous knowledge systems (IKS) research. However, even though some challenges were

encountered during the voyage, the successes greatly outweighed the limitations. The limitations and reflections are presented hereafter in the pious hope that they will assist future IKS researchers. The first limitation to be discussed here is the challenges of an over-long questionnaire.

6.3.1 Length of the questionnaire

The questionnaire used to collect data in Chapter 5 was designed with the aim of generating a huge data set to address different issues on perceptions of EVM, but resulted in one that was too long. The researcher (in her enthusiasm) ignored the fundamentals of human behaviour, that as human beings, we get wary of never-ending stories and that she herself could not withstand long questionnaires. According to Deutsdens *et al.* (2004), the response rate to long questionnaires is lower compared to short questionnaires. Deutsdens *et al.* (2004) further state that in order to improve the response rate of long questionnaires, incentives have to be awarded. In this study, even though WTAHPs were not offered any incentives, the response rate was still considerably good. However, this researcher believes that if the questionnaire was of appropriate length, the response rate would have been higher.

6.3.2 Snowballing

The snowball sampling technique was used to recruit participants in Chapter 4. The approach seemed straightforward “on paper”; however, its application was, at times, uncomfortable for the researcher. After an interview, a participant generally felt that he or she had revealed all EVM knowledge that the researcher could possibly want to learn. When the researcher then asked interviewees to identify another person who had knowledge of EVM, three reactions were observed as follows: 1. Some participants felt offended by the request as they thought the researcher implied that their knowledge was insufficient; and 2. Some participants did not want to be tattletales in case the next person was offended by the referral. One interviewee, while referring the researcher to another participant, even pleaded with the researcher not to mention his name to the referred person. In addition, one participant recommended his own friend, not because the friend had new or more EVM knowledge to share but because the participant was comfortable with revealing the person’s name. However, the shortcomings of snowball sampling are not unique as they have been previously mentioned by Atkinson and Flint (2001). In the present study, the challenges of snowballing were overcome by handling the issue of referral with sensitivity to avoid offending *bagolo* (elderly people) and also by consulting other villagers for referrals.

Though the snowball sampling worked well in terms of generating participation in the study, the researcher recommends the Rapid Rural Appraisal (RRA) method as used by Luseba and Van der Merwe (2006); Masika *et al.* (1997) and Van der Merwe *et al.* (2001). The RRA approach does not have some of the advantages of snowballing, including time saving and cost effectiveness. However, RRA starts with introduction of the study at community meetings. The recruitment of participants is mostly done in the same gathering. The selection of participants is generally an agreement reached by community members and the researcher, thus eliminating bias and avoiding the shortfalls of snowballing.

6.3.3 Challenges of plant collection within Mahikeng Local Municipality

Even though *Withania somnifera* raised the researcher's awareness of the serious issue of the preservation of plant species (as discussed in Chapter 5), it also highlighted challenges EVM researchers could encounter in the quest to collect plants for botanic identification. In this study, interviews with participants were relatively free-flowing and as the list of ethnoveterinary medicinal plants grew longer, the researcher became more and more excited. The euphoria lasted until challenges started manifesting during the planning of field walks with some participants. The challenges included time constraints for the participants and the researcher, reluctance of participants to identify certain plants, understandable reluctance of older participants to do field walks and sterile specimen due to seasonal changes. The challenges are discussed below.

6.3.3.1 Time constraints for both the participants and the researcher

Most of the field walks in this study were not done on the day of the interviews since some of the participants had other commitments and could only schedule a field walk at a later date. During all group interviews, one participant was elected by the other group members to conduct the field walks. The participant was usually the one who was more knowledgeable than the others. Therefore, the field walks depended on the availability of such participant, which at times, clashed with the schedule of the researcher who is a full time employee at the North-West University. Though this was a challenge that was eventually resolved, the researcher realised that the best time to conduct indigenous research is when the researcher is free from other commitments. This helps to prevent the cancellation of appointments with participants, which could put a strain on the relationship between the participants and the researcher.

6.3.3.2 Understandable reluctance of older participants to do field walks

The Mahikeng Local Municipality had good rains this summer (early 2017). Therefore, the grass and bushes in some areas were still very dense during the data collection period. The initial assumption by the researcher that the field walks would be excursions of one and a half hours proved wrong as they took much longer (2-3 hours). Therefore, older participants who knew the scarcity of some plants, especially with the bush cover and also being troubled by age-related health problems, were understandably reluctant to venture into the fields. Fortunately, this problem was resolved through the delegation of younger individuals to go with the researcher to collect the plants while the older participants verified the identity of the plants after their collection.

6.3.3.3 Reluctance of participants to identify certain plants: the story of *Cannabis sp*

Cannabis sp was documented in this study, however, the participant who revealed the plant, refused to identify it for fear of being arrested. This was a similar situation faced by Van der Merwe (2000) who found that people were reluctant to talk about treatment using *Cannabis spp*. Therefore, for the purpose of plant identification, this researcher brought pictures of *Cannabis sp* to participants for them to identify the species used. The most common and locally accessible *Cannabis indica* was identified by participants. Therefore, the listing of *Cannabis sp* in the medicinal plant table (Table 4.4.) was done without botanic identification.

6.3.3.4 Sterile herbarium specimen

While preparing to undertake this study, the researcher was sent for training at the South African National Biodiversity Institute (SANBI). The purpose of the training was to equip the researcher with proper plant collection and herbarium specimen preparation techniques. However, due to time constraints and other delays, data collection was done in early May when some plants were sterile. Though SANBI did its best to identify the plants, one of the plants could only be identified up to the level of the genera. The study should have been conducted during spring, summer and autumn when most plants are either inflorescent or with fruits.

6.4 Lessons learned from the study

A lot of miscellaneous learning occurred during data collection for both the quantitative qualitative approaches, Chapter 5 and Chapter 4, respectively. During the quantitative part of the study, some participants shared their and their parents' knowledge on ethnoveterinary medicine during conversations. During the qualitative study, participants also shared

knowledge on human traditional healing, including those for babies and reproductive problems. The knowledge was valuable and truly appreciated by the researcher and even though most will not be documented in this manuscript, the researcher was very grateful for the knowledge obtained. One of the most amazing and eye-opening experience, occurred during the planning and undertaking of a field walk. The experience is described below.

The first participant in the qualitative part of the study (a traditional healer) postponed the field walk for two weeks because she was travelling out of the village. During those two weeks, the researcher interviewed and collected plants with other participants in different villages. During the plant collection with other participants, no ceremony or ritual was observed. However, the field walk with the traditional healer was different. The day before the scheduled field walk, the researcher was informed to come early in the morning (time unspecified). The researcher arrived at 8 am and was told to go back and come the following day as it was too late to go into the fields. The participant explained that she does not collect plants after cattle have been released from the kraal (around 9am) (meaning the field walk had to be done by 9 am). The participant also explained that her ancestors made it impossible for her to see medicinal plants after such time.

The researcher arrived the following day at the right time (7 am) and the collection was successful. The researcher observed two rituals as follows: 1. If a plant was spotted, the collectors were not allowed to cast their shadow over the plants (explanations were never sought by the researcher); and 2. When a plant was not spotted, the participant did the ritual of “*go phatlha*”. This was a ritual of sprinkling some *snuff* (ground tobacco) on the ground and speaking to the ancestors for assistance with spotting the plant. The process worked very well for the location of *Teucrium trifidum* (lethe la noga). This whole process highlighted the ritualistic nature of plant collection/harvesting, and this may need to be investigated further in future studies.

6.5 Contribution of the study to ethnoveterinary research and development

The study explored a geographic area of the North West Province that were previously uncharted, and documented a wealth of knowledge that will contribute to the preservation of indigenous knowledge of South Africa. Similarities in ethnoveterinary knowledge, as found in this study and that reported by Van der Merwe *et al.* (2001) in Madikwe and Gabalebatse *et al.* (2013) in Ngamiland District, Botswana, exposed the oneness in cultural practices of the Batswana in different regions of Southern Africa. In addition, though the higher

prevalence in terms of the use of ethnoveterinary medicine is said to be in remote and impoverished areas due to these circumstances (Luseba & Tshisikhawe, 2013; Wanzala *et al.*, 2005), this study dispelled that notion. The study area consisted of villages situated very close to Mahikeng town (10-15 km) and not all participants were impoverished. Therefore, this study suggests that, at times, ethnoveterinary medicine is preferred over Western medicine possibly because of its effectiveness.

The study also exposed the awareness and perceptions of ethnoveterinary medicine among Western-trained animal health practitioners. Those findings will contribute to the body of knowledge not only in South Africa but also in other parts of Africa. As previously mentioned, a study of this nature has never been undertaken before despite the fact that there are many publications on perceptions among Western-trained health care practitioners both in South Africa and in other parts of Africa. This study will contribute to ethnoveterinary research and development by providing the perspective of Western-trained animal health practitioners about ethnoveterinary medicine. This study could also generate debates about the integration of ethnoveterinary and Western veterinary medicine in animal health management of South Africa, as well as integration of ethnoveterinary medicine into the curriculum development of veterinary and para-veterinary programmes. In addition, the study highlighted perceptions of Western-trained animal health practitioners that could be encountered during the process of government proposed integration of Western and traditional medicine.

6.6 Areas for further studies

Future research could be conducted as a sequel to this study:

1. Documentation of ethnoveterinary medicine in other areas of the North West Province using the Rapid Rural Appraisal method;
2. Determination of plant constituents of documented plants (the present and future studies) using qualitative and quantitative techniques such as high performance liquid chromatography (HPLC) testing;
3. In-vitro antimicrobial, anthelmintic, antioxidant activity of documented plants (the present and future studies); and
4. Cohort studies to determine the efficacy of documented plants as anthelmintic (the present and future studies).



6.7 Conclusion

The researcher examined an alternative aspect of animal health system practised in South Africa. The aim of documenting ethnoveterinary medicine and determining perceptions of ethnoveterinary medicine among Western-trained animal health practitioners was achieved in the study. However, concerns for loss of knowledge were raised by the indigenous communities. On the other hand, WTAPHs are concerned about the lack of a scientific base for EVM, which makes them doubt EVM's value in animal health care. It is argued in this study, that the solution for the concerns of both parties lies in the integration of Western medicine and EVM through practice and education. It is also argued that WTAHPs, who learn EVM at tertiary institutions, will appreciate its value and contribute to knowledge preservation. In addition, with such integration, research activity for both exploratory surveys and validation testing will increase. It is hoped that this study will generate debates on the integration of Western veterinary and ethnoveterinary medicine in practice and education. In addition, it is anticipated that the study will inspire an increase in surveys on ethnoveterinary medicine in other parts of the country. Furthermore, the study could also encourage the dissemination of information on EVM research to WTAHPs, since unawareness of the advances in EVM is also partly to blame for the lack of appreciation of the value of EVM among WTAHPs.

6.8 Recommendations

Based on the findings of this study, the following recommendations are advanced:

1. Increased activities to promote awareness of ethnoveterinary medicine among Western-trained animal health practitioners;
2. Integration of ethnoveterinary medicine into the curriculum development of veterinary and para-veterinary programmes in South Africa;
3. Development of activities that promote ethnoveterinary medicine in communities, especially among the youth; and
4. Adoption of conservation strategies that could assist communities in the conservation of medicinal plants.

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LIST OF APPENDICES

APPENDIX 1: QUESTIONNAIRE ON THE DOCUMENTATION ETHNOVETERINARY MEDICINE

SECTION A: INTERVIEW LOG

Name of project:

Date of data collection:.....

Location of data collection site:

Name of village:.....

District:.....

Sub-district:.....

Name of participant.....

State vet area:.....

ID code of informant:

Research team:

 Main researcher:.....

 Supervisor:

 Interpreter:

 Any other and their role:

SECTION B: DEMOGRAPHIC CHARACTERISTICS

Gender	Male		Age	30-40		Experience in Livestock farming (years)	Less than 10 years	
	Female			41-50			Less than 20 years	
Language	Setswana			51-60			Less than 30 years	
	IsiXhosa			61-70			Less than 40 years	
	Afrikaans			71-and above			Less than 50 years	

Type of farming enterprise if informant is a farmer.

Subsistence	
Emerging	
Commercial	

Which specie(s) of animals do you keep?

	Tick the correct answers	Numbers
Sheep		
Goat		
Cattle		
Horses		
Donkeys		
Chicken		
Others, please specify		

SECTION C: KNOWLEDGE AND PRACTICE OF EVM

Where did you obtain your knowledge on traditional veterinary medicine?

Through training as a traditional healer	
Through interaction with other farmers	
From my parents/grandparents	
Though interaction with members of the community	
Others, please specify	

How did you acquire this knowledge on traditional veterinary medicine, or how did your parents or other teach you?

Please explain to me how you diagnose diseases of livestock.

What are the most common diseases in animals in the area?

Please tell me the different ethnoveterinary methods you use for the treatment or prevention of livestock diseases and conditions.

- health problems
- Parts of plant used
- Preparation method
- Administration
- Level of confidence

Do you share your traditional veterinary knowledge with your children and grandchildren?

Section D: Medicinal plants log (this will be duplicated according to the number of plants the informant will mention)

Local name:

Health problems and animal species	Parts of plant used	Preparation	Method of administration and dosage, and frequency of administration	Toxicity	Recovery time
1.					
2.					
3.					
4.					

Key for confidence level: 1. Low, 2. Medium, 3. High

APPENDIX 2: SANBI'S FIELD LABEL FOR PLANT COLLECTION

APPENDIX II

APPENDIX II: FIELD LABEL

Collector	Name		Date
Project name			
Region	Grid	Alt	dbm
GPS	S	E	E
Locality			
Biome	Forest Fynbos Grassland Veld Karoo Savanna Succulent Karoo Thicket		
Vegetation type			
Habitat	mountain peak mountainside hilltop hillside ridge cliff face riverbed/rocky gorge riverbank plateau valley floodplain wetland riparian/river bank dunes dry grassland coastal dune/flatland pan cape forest forest swamp wetland savanna dune forest dune forest estuary floodplain lagoon sea lake dune forest forest wetland		
Substrate	soil sandstone rocky soil gravel sandstone limestone bank leaf litter roots other		
Moisture regime	wet-dry seasonally waterlogged very dry standing water tidal marine		
Soil type	mossy forest waterlogged very dry other		
Lithology	granite sandstone shale quartzite basalt dolomite gneiss shale granite sandstone limestone quartzite basalt dolomite gneiss shale granite sandstone limestone quartzite basalt dolomite gneiss		
Aspect	N S W E NE NW SE SW steeply sloping level plateau and valley recently cleared garden coastal		
Life form	tree shrub dwarf shrub herb grassland geophyte epiphyte vine climber parasite succulent hydrophyte hypophyllous heliophyte anemophyte scrophyllous anemophyllous other		
Plant features	leaves, bark, fruit, seed, wood, etc.		
Flowers	present absent fruit present seed plant height		
Notes	Food plant, uses, phenology, soil culture, ecology, morphology & phytochemical features, other relevant info		
Collector	name, date, locality, etc.		
Plant name			
Conservation	status, etc.		

APPENDIX 3: APPROVAL OF RESEARCH PROPOSAL



NORTH-WEST UNIVERSITY
YUNIBESITHI YA BOKONE-BOPHIRIMA
NORTHWEST-UNIVERSITÄT
MAFIKENG CAMPUS

FACULTY OF AGRICULTURE, SCIENCE AND TECHNOLOGY
SCHOOL OF RESEARCH AND POSTGRADUATE STUDIES

Tel: -27 18 3892531
Fax: -27 18 3892052
E-mail: ushotane@nwu.ac.za
Internet: <http://www.nwu.ac.za/>

CERTIFICATE OF APPROVAL OF RESEARCH PROPOSAL AND TITLE REGISTRATION

This is to certify that: Ndou RV - 16959744

Whose proposal is titled: A study of ethnoveterinary medicine in the North West Province

Was considered by the Faculty Research Committee on the 13 July 2016 and approved.

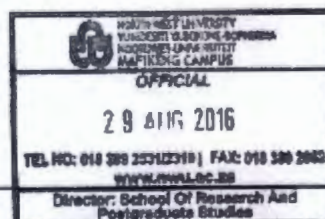
Proposed Qualification: MIKS

Supervisor (s): Prof SA Materechera
Dr WO Mbeng
Dr M Mwanza

Signature: Director SRPS

Prof Ushotane Useh

Name: Director SRPS



Date

APPENDIX 4: NWU ETHICS APPROVAL



ETHICS APPROVAL CERTIFICATE OF PROJECT

Based on approval by the Health Science Ethics Committee (FAST-HSEC) on 07/02/2017 after being reviewed at the meeting held on 07/02/2017, the North-West University Institutional Research Ethics Regulatory Committee (NWU-IRERC) hereby approves your project as indicated below. This implies that the NWU-IRERC grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the project may be initiated, using the ethics number below.

Project title: A study of Ethnoveterinary medicine in the North West province																
Project Leader/Supervisor: Prof SA Materechera																
Student: RV Ndou																
Ethics number:	<table border="1"><tr><td>N</td><td>W</td><td>U</td><td>-</td><td>0</td><td>0</td><td>5</td><td>5</td><td>4</td><td>-</td><td>1</td><td>6</td><td>-</td><td>A</td><td>9</td></tr></table>	N	W	U	-	0	0	5	5	4	-	1	6	-	A	9
N	W	U	-	0	0	5	5	4	-	1	6	-	A	9		
Application Type: N/A																
Commencement date: 2017-02-07	Expiry date: 2019-08-30															
Risk:	Minimal/ No															

Special conditions of the approval (if applicable):

- Translation of the informed consent document to the languages applicable to the study participants should be submitted to the HSEC (if applicable).
- Any research at governmental or private institutions, permission must still be obtained from relevant authorities and provided to the HSEC. Ethics approval is required BEFORE approval can be obtained from these authorities.

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- The project leader (principle investigator) must report in the prescribed format to the NWU-IRERC via HSEC:
 - annually (or as otherwise requested) on the progress of the project, and upon completion of the project
 - without any delay in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.
 - Annually a number of projects may be randomly selected for an external audit.
- The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the HSEC. Would there be deviation from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.
- The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date, a new application must be made to the NWU-IRERC via HSEC and new approval received before or on the expiry date.
- In the interest of ethical responsibility the NWU-IRERC and HSEC retains the right to:
 - request access to any information or data at any time during the course or after completion of the project;
 - to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process.
 - withdraw or postpone approval if:
 - any unethical principles or practices of the project are revealed or suspected,
 - it becomes apparent that any relevant information was withheld from the HSEC or that information has been false or misrepresented,
 - the required annual report and reporting of adverse events was not done timely and accurately,
 - new institutional rules, national legislation or international conventions deem it necessary.
- HSEC can be contacted for further information via Musangchi.Sichembo@nwu.ac.za or 018 280 2310.

The IRERC would like to remain at your service as scientist and researcher, and wishes you well with your project. Please do not hesitate to contact the IRERC or HSEC for any further enquiries or requests for assistance.

Yours sincerely

**Prof LA
Du Plessis**

Digitally signed by
Prof LA Du Plessis
Date: 2017.02.23
09:32:38 +0200

Prof Linda du Plessis

Chair NWU Institutional Research Ethics Regulatory Committee (IRERC)

APPENDIX 5: CONSENT FORM FOR PARTICIPANTS IN INDIGENOUS KNOWLEDGE RESEARCH



Dear sir/madam

Consent form for survey study

You are invited to take part in this research that will gather knowledge of traditional methods used for livestock health. Before you decide, you can talk to anyone you feel comfortable with about the research. This consent form may contain words that you may not understand. Please ask me to stop as we go through the information and I will explain. Your participation in this research is entirely voluntary. It is your choice whether to participate or not. You are requested to participate in an interview, field walk and group discussion with me. During the interview, I will sit down with you in a comfortable place, if it is better for you, the interview can take place in your home or a friend's home. During the field walk, we will walk round the field together for you to show me plants that are used for livestock health. After all other participants are interviewed; we will have a group discussion to reflect on the information obtained. Other members of the research team might be there, including my supervisor, Prof. SA Materechera and a language interpreter. The interviews and field walk will last about two hours and the group discussion will be held once and will take about one and a half hour. We may ask questions that may be a sensitive issue to you and you may feel uncomfortable talking about some of the topics. You do not have to answer any question or take part in the discussion/interview/survey if you do not wish to do so, and that is also fine. You do not have to give us any reason for not responding to any question, or for refusing to take part in the interview and field walks. I will give you an opportunity at the end of the interview/discussion to review your remarks, and you can ask to modify or remove portions of these, if you do not agree with my notes or if I did not understand you correctly.

The information that we collect from this research project will be kept private. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is, we will lock that information up with a lock and key. But this is your knowledge and skills; therefore, you have the right to be acknowledged in this information. So, if you choose to, your name does not need to be hidden. The knowledge that we will obtain from this research will be shared with you and your community before it is made widely available to the public. Each participant will receive a summary of the results. Following the meetings and completion of the study, we will publish the results so that other interested people may learn from the research.

If you have any questions, you can ask them now or later. If you wish to ask questions later, you may contact any of the following: Dr. R.V. Ndou at 0765844185 or Prof. Materechera at 0183892294. This proposal has been reviewed and approved by the Ethics Committee of the North-West University. The Committee is tasked to make sure that research participants are protected from harm. If you wish to find out about the Ethics Committee of the North-West University, contact Musanchi Sichembe at 018 289 2319. The ethics approval number is 00554-16-A9.

I have been invited to participate in research about traditional methods used for livestock health care.

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Print name of participant_____

Signature of participant _____

Date _____

Day/month/year

If illiterate ¹

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of witness_____

Thumb print of participant

Signature of witness _____

Date _____

Day/month/year



Statement by the researcher/person taking consent.

I have accurately read out the information sheet to the potential participant, and to the best of my ability, made sure that the participant understands that the following will be done:

1. Interview
2. Field walk and observation
3. Group discussions

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this ICF has been provided to the participant.

Print name of researcher/person taking the consent_____

Signature of researcher /person taking the consent_____

Date _____

Day/month/year

APPENDIX 6: INTRODUCTORY LETTER FROM IKS CENTRE



NORTH WEST UNIVERSITY
YUNIBESITHI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
MAFIKENG CAMPUS

Faculty of Agriculture, Science & Technology

Indigenous Knowledge Systems

Private Bag X2040, Mmabatho
South Africa, 2720

Tel: (018) 389-2453

Fax: (018) 389-0775

Web: <http://www.nwu.ac.za>

26 April 2017

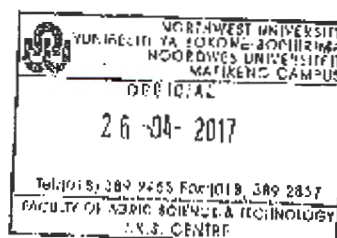
TO WHOM IT MAY CONCERN

This is to confirm that Dr Rendani Victress Ndou, is a registered student at the Mafikeng Campus of the North West University (Student no. 15859744). She is working towards a Masters degree in Indigenous Knowledge Systems in the Faculty of Agriculture, Science and Technology. Dr Ndou is conducting a research titled "A study of Ethnoveterinary medicine in the North West Province" as of her studies. Part of the research process requires that she conducts interviews and field trips with participants to collect data for the research. The IKS Centre has given Dr Ndou the permission to conduct the study in any community within Ngaka Modiri Molema District, North West province and would like to humbly request for your assistance in this regard. The IKS centre would greatly appreciate if you could allow her to implement the research study in your facilities.

Yours Sincerely,

Professor SA Matorechona

Director, IKS Center



APPENDIX 7: NON-DISCLOSURE AGREEMENT



NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
MAFIKENG CAMPUS

Non-disclosure Agreement

Between (Disclosing party)

a _____ (insert profession) residing at _____

_____ in his/her capacity as _____

(Hereinafter referred to as Disclosing party)

AND (Recipient)

a _____ (insert profession) studying at _____

_____ in his/her capacity as _____

(Hereinafter referred to as Recipient)

WHEREAS:

The parties have capabilities and expertise in using scientific knowledge and technological application to

The parties possess proprietary information, technical knowledge, experience, specimens and data of a secret and confidential nature relating to the field as specified below, all of which are regarded by them as valuable commercial assets of a highly confidential nature.

During the course of business discussions, negotiations, meetings and activities including, without limitation, any on-site premises visits or demonstrations, between the parties, each party may receive, observe or otherwise have access to information, whether inside or outside the field, that (a) relates to the Disclosing Party's past, present or future research, development, business activities, products, services and technical knowledge and (b) either has been identified in writing as confidential or is of such a nature (or has been disclosed in such a way) that it is obvious to the other party that it is claimed as confidential ("Confidential Information"). Confidential Information may equally well be written information or information transmitted verbally, visually, electronically or by any other means.

As used herein, the party disclosing Confidential Information is referred to as the "Disclosing Party" and the party receiving the Confidential Information is referred to as the "Recipient".

The nature of the discussions, meetings or activities prompting this Agreement is to share information, research results, background intellectual property and the wish to exchange more information, including Confidential Information and material in this regard.

For _____ the _____ purposes _____ of

Now, therefore, the parties hereby agree as follows regarding Confidential

Information:

1. USE OF CONFIDENTIAL INFORMATION

1.1 The Confidential Information of the Disclosing Party may be used by the Recipient only in connection with the purpose(s) set forth in this Agreement. The Parties agree to protect the confidentiality of each other's Confidential Information in the same manner they protect the confidentiality of their own proprietary and Confidential Information of TK kind, but in any case using reasonable care.

1.2 Except as necessary for the purpose(s) set forth in this Agreement, the Confidential Information of the Disclosing Party may not be copied or reproduced by the Recipient without the Disclosing Party's prior written consent. Should authorized copies of the Confidential Information be made, each party undertakes to reproduce in complete and identical form and wording the right of ownership of the Disclosing Party.

1.3 Each party shall in all events remain free to use, in the course of its business, its general knowledge, skills and experience incurred before, during or after the activities hereunder. (To this end, it is also recorded that nothing in this Agreement shall be construed as constituting an exclusive arrangement between the parties and both parties shall remain free to explore market opportunities in the field, unless otherwise agreed to in writing in a subsequent agreement.)

1.4 The parties shall:

1.4.1 Treat as strictly confidential any and all Confidential Information given or made known to them arising from this association;

1.4.2 Keep all such Confidential Information obtained secret to third parties and only use it in co-operation with each other for the purpose expressly agreed upon by the Parties.

2. COMMENCEMENT AND DURATION

2.1 This Agreement shall operate as from the date of signature hereof and shall remain binding for a period of ____ (_____) years, unless terminated prior thereto by mutual written consent between the parties or superseded by another written agreement between the parties in the field.

SIGNED at _____ this ____ day of _____.

AS WITNESSES (as appropriate):

1. _____

For _____

Full names

2. _____

Capacity (duly authorized)

APPENDIX 8: QUESTIONNAIRE FOR WESTERN-TRAINED ANIMAL HEALTH PRACTITIONERS

PART A: DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS

(Fill in the following about yourself). Please tick [✓] where appropriate)

1. Gender		Male				
		Female				
2. Age	Less than 30 years		3. Race	Black		
	30-40 years			White		
	41-50 years			Coloured		
	51-60 years			Asian		
	61-70 years			If other: Please specify:		
4. What is your profession?			Veterinarian			
			Animal Health			
5. Number of years of experience in your profession			Less than 5			
			Less than 10			
			Less than 15			
			Less than 20			
			Less than 30			
			Above 30			
6. Post graduate qualification			YES		NO	
7. Employment district in the NWP		Ngaka Modiri Molema				
		Dr Kenneth Kaunda				
		Bojanala				
		Dr Ruth Segomotsi Mompati				
8. Please specify your State Vet Area						
9. Do you originate from the North West Province?			YES		NO	
10. If No, please indicate where you originate from:						

SECTION B: AWARENESS AND PERCEPTIONS OF THE USE OF ETHNOVETERINARY MEDICINE AMONG ORTHODOX ANIMAL HEALTH PROFESSIONALS (Please tick [✓] where appropriate)

1. Have you ever heard about or witnessed ethnoveterinary medicinal practices used in farming communities?

YES[]..... NO[]

2. If Yes (above), what diseases or conditions were treated with ethnoveterinary medicine? (You can tick multiple answers)

Disease or condition		Urinary tract infection	
Eye infection		Mastitis	
Simple indigestion		Fracture	
Diarrhoea		Vaginal discharge	
Cough and other respiratory disorders		Bloat	
Wounds		Fertility enhancement	
Udder oedema		Body condition improvement	
Retention of placenta		Redwater	
Poisoning		Heartwater	
Internal parasites		Anaplasmosis	
External parasites		Urinary tract infection	
Maggots infestation		And other, please specify:	
Constipation			

3. According to you, what are the advantages of using ethnoveterinary medicine for the farmer? (You can tick multiple answers).

Advantages		Helps when animal is immobile	
Cheap and economical		Where Western veterinary assistance is not available	
Locally and easily available		Treatment at farmers' residence	
No side effects		Satisfies the animal owner	
Less toxic		Technical person is not required	
Easy application		Less risk	
Effective		None of the above	
Hastens the natural process		If others, please specify	

4. Where did you hear about ethnoveterinary medicine? (You can tick more than one answer).

- ☐ In publications
- ☐ At conferences
- ☐ From community members and farmers
- ☐ From traditional healers
- ☐ From family members as a youth/child
- ☐ From family members as an adult
- ☐ From colleagues
- ☐ Never heard of it before now

5. Knowledge about ethnoveterinary medicine is important to me as a Western-trained animal health practitioner

YES[☐]

NO[☐]

NOT REALLY[☐]

6. As a Western-trained animal health practitioner, are you against the use of ethnoveterinary medicines?

11. Have you ever used ethnoveterinary medicine to treat animals as Western-trained animal health practitioners?

YES[]..... NO[]

If Yes, for what condition(s)/disease(s)?

.....
.....

Also, why did you choose to use ethnoveterinary medicine in those occasions? (you can tick more than one answer)

- ☐ Western medicine was failing
- ☐ Modern medicine takes too long
- ☐ Farmer’s request
- ☐ I trust ethnoveterinary medicine for certain diseases/conditions
- ☐ I wanted to experiment

12. How often do you use ethnoveterinary medicine for the treatment of animals?

Always		Sometimes		Once in a while		Never	
--------	--	-----------	--	-----------------	--	-------	--

APPENDIX 9: INTRODUCTORY LETTER FOR WESTERN-TRAINED ANIMAL HEALTH PRACTITIONERS



NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
MAFIKENG CAMPUS

Private Bag X2046, Mmabatho
South Africa, 2735

Web: <http://www.nwu.ac.za>

Date: 26.09.2016

Veterinarians and Animal Health Technicians

Department of Rural, Environment & Agricultural Development

North West Province

Dear sir/madam

Introduction letter for a survey study

I am Rendani Victress Ndou, a staff member and student at the North-West University doing my degree in Master in Indigenous Knowledge Systems (MIKS). I am conducting research on the perceptions of ethnoveterinary medicinal practices among vets and AHTs in the North West Province. Ethnoveterinary medicine includes traditional medicinal plants and methods used for the treatment of animal diseases and conditions by indigenous communities. Traditional methods of treating animals have existed for a long time in our communities and passed from generation to generation through oral transfer. Ethnoveterinary medicinal practices are still very prevalent in remote poor resourced livestock farming communities.

You are requested to take part in this research because we wish to understand your experiences and views of ethnoveterinary medicinal practices in communities you serve. Therefore, you are requested to fill the attached self-administered questionnaire. If you need clarity on this letter or any part of the questionnaire, please ask the person handing this questionnaire to you. Participation in this study is voluntary. However, if you fill and hand back the questionnaire, this will be considered as consent to participate in the study.

All your contributions will be highly appreciated.

Yours Truly

Dr R.V. Ndou: 16959744@nwu.ac.za

Senior Lecturer: Centre for Animal Health Studies

Tel: 018-389-2714/01 Fax: 018-389-2749