

JIMMA UNIVERSITY
INSTITUTE OF TECHNOLOGY
FACULTY OF COMPUTING AND INFORMATICS
INFORMATION SCIENCE PROGRAM

**EXPLORING INDIGENOUS KNOWLEDGE AND SYSTEM DEVELOPMENT FOR
CATTLE DISEASES DIAGNOSIS, TREATMENT AND MODES OF APPLICATION**

By:

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Principal advisor: Chala Diriba (Ass.Prof)

Co-advisor: Workineh Tesema (MSc)

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Approval sheet

A research entitled “Exploring indigenous knowledge and system development for cattle diseases diagnosis, treatment and modes of application: in the case of East Wollega Zone, Oromia, Ethiopia” for Master of Science in Information and Knowledge Management in the Department of Information Science, Jimma University.

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October, 2019
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Declaration

I declare that this thesis is my original work and it has not been presented for a degree in any other Universities. All the material sources used in this work are properly acknowledged.

Mulgeta Asefa

Dedication

I dedicate this thesis to all my lovely family.

Acknowledgement

Above all praise to God. Next I would like to express my deepest thanks and appreciation to my co-advisor Msc Workineh Tesema and principal advisor Chala Diriba (Ass. Prof) for their guidance, timely comments and corrections enabled me to complete on time.

I would like to extend my deepest thanks to Jimma University for granting fund desired during data collection for this research and Department of Information Science staffs Jimma University for their guidance. Also, I express my respectful thanks to friends who have helped and given me suggestions, supports and corrections throughout the study.

I would also wish to thanks to Guto Gida, Leka Dulecha and Gida Ayana woreda administrator for their collaboration during the study. Finally, I want to extend my thanks to all Kebele manager of study area, all the participants of the study, my family and all other extended families for their encouragement and support me to complete the thesis.

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Acronyms

FGD: Focused Group Discussion

IK: Indigenous Knowledge

IKM: Indigenous Knowledge Medicine

IKS: Indigenous Knowledge System

LK: Local Knowledge

NGO: Non-Governmental Organization

SPSS: Statistical Package Social Science Software

TD: Traditional Knowledge

WHO: World Health Organization

Abstract

Indigenous knowledge is a local knowledge acquired by local people through the accumulation of experiences, informal experiments and an intimate understanding of the environment in a given culture. The knowhow of cattle diseases diagnosis and treatment practice using indigenous knowledge play key role to improve farming and animal husbandry practices. The main objective of the study was to explore indigenous knowledge and develop a system for cattle diseases diagnosis, treatment and modes of application. The study area of this study is limited to the selected kebeles from East Wollega Zone. To achieve this study, exploratory research method was used to carry out the research and data collection instruments like observation, focus group discussion and interview were used to collect data from respondents. The study populations were farmers of selected from Jireenyaa, Gaarii, Kewesssa Shoonaa, Hordaa Dongii, Guutee Guddinaa and Oboraa kebeles. To conduct this study; the researcher used purposive sampling techniques to select respondents. The total population of this study was 107 respondents. The data was collected from respondent during the period between April and May 2019. Based on the finding, a system was developed for cattle diseases identification, diagnosis and treatment. Rule based disease treatment and identification was constructed using decision tree algorithm and the data set of the rule was knowledge obtained from indigenous knowledge practitioners of study area. The attained data showed that, people in the study area have good perception and practices on indigenous knowledge medicine of cattle diseases diagnosis and treatment. Since the drugs of this knowledge practices are easy to access and very little in cost, it is economically important to the farmers. These types of knowledge practices was accessed from elders and transferred through orally. To acquire, share, store and use indigenous knowledge medicine, local herbalist used songs, poem and heroic tale mechanism. This kind of valuable knowledge need to be stored, transferred and preserved for the next generation. Documenting indigenous knowledge is very to avoid the loss of this knowledge practices and is strongly recommended.

Keyword: *Indigenous knowledge, Indigenous knowledge medicine practices, Local herbalists, Cattle diseases, treatment, drugs.*

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the study

The term knowledge has different definition in different context. According to oxford dictionary, knowledge is awareness or familiarity gained by experience of a person and the sum of what is known and certain understanding”. Moreover, Kumar (2010) stated the word knowledge as unseen and that can be transferred from one person to another’s through learning and communication within each other’s. Furthermore, according to Blackwell (2001), knowledge is specified as a fluid mix of framed experience and grounded intuition that provides an environment and framework for evaluating and incorporating new experiences and information. It originates and applied in both mind of the knower’s and in documents format. For instance, this knowledge can be categorized into procedural, tactical, tacit, explicit, descriptive/ declarative, domain, encoded, empirical, scientific and indigenous knowledge. From this different types of knowledge listed above this study focused on indigenous knowledge.

Indigenous knowledge is the type of knowledge that is available in the mind of knowers. It is difficult to transfer to another person by means of writing and verbalizing since it is not in documented format. This knowledge is generated at local area by indigenous people through interacting with the environment, know-how to accomplish and practices maintained and developed by peoples through generations (Lodhi, 2010).Moreover, Akull (2007) stated the term indigenous knowledge as ideas, beliefs, values and norms which are embedded in the minds of people. This knowledge is collected over a long sequence of observations and transferred from generation to generation orally. In improve of sustainable farming systems, animal husbandry practices, increasing the livelihood and disease treatment using indigenous knowledge plays a key role (Kumar, 2011).

According to Belay (2016), indigenous knowledge medicine practices are knowledge and beliefs integrating with the use of plant, mineral and other animal as drugs. This practices and exercises were applied singularly or in combination to treat, diagnose and prevent illnesses and maintain well-being. Moreover, traditional medicine has been defined as the sum total of all knowledge and

practical experience used for diseases diagnosis, prevention, elimination and observation handed down from generation to generation verbally (WHO, 2008). Furthermore, Njoroge (2006), stated indigenous knowledge medicine practices of animal health care as process based on traditional knowledge skills and methods used for curing diseases and maintaining health of animals easily. This knowledge was employed and gained popularity in developing countries because of readily accessible, easy to prepare and administer and with very little cost to the farmers.

In different developing countries, this knowledge provides for communities for problem solving strategies in various activities such as in health sector, education, natural resource management and in agriculture to support and maintain sustainable agricultural crop land management, animals production and climate change adaptation and mitigation (Tabuti, 2003). Farmers in rural area have experimentation which allows them to be innovated in the local practices and systems. In the study area, there are a lot of cattle diseases that are being treated and prevented using traditional medicine. This is when an animal is sick; there is a sign which is seen physically. After identifying the types of disease based on the sign shown on those cattle, local herbalists use their own knowledge to treat different ailments.

According to Endashaw (2007), traditional medicine in Ethiopia has been widely used by various ethnic groups and about 90% of livestock population depends on traditional medicine and most of it comes from plants. In Ethiopia up to 80% of the population use traditional medicine due to the cultural acceptability of healers, the relatively low cost of traditional medicine and difficulty of access to modern health facilities (Kebede, 2006).

Cattle have numerous uses aside from income generation and serve for milk and meat for household consumption draft power, manure for fuel and fertilize also for skins to earn foreign exchange to the country. The contribution of cattle in the Ethiopian economy context can generally be categorized in terms of food production, supplier of inputs and services for crop production, raw material for industry, cash income and export earning, saving and investment, social functions and generator of employment (Ayele, 2003).

According to Drug Administration and Control Authority of Ethiopia (2006), cattle diseases are categorized into five groups. These are non-infectious diseases, infectious diseases, diseases of the respiratory system, and diseases of the reproductive system. Infectious diseases, also known as

transmissible diseases or communicable diseases comprise clinically evident illness resulting from the infection, presence and growth of pathogenic biological agents in an individual host organism. It includes some viruses, bacteria, fungi, protozoa, multicellular parasites and aberrant proteins. On the other hand, noninfectious diseases can't be passed from one animal to another. These types of diseases are caused by factors such as environment, genetics and lifestyle.

Traditional medicine practices are the way in which local farmers identify types of diseases based on symptoms shown and clarify the way to diagnosis, treat and prevent different cattle diseases. So, based on decision tree algorithm, set of rules to treat and identify cattle diseases was constructed. The data set of this decision tree was knowledge obtained from familiar herbalists of the study area. The knowledge obtained from herbalists was changed to a set of rules and represented using *IF-THEN* expression to treat different types of diseases based on the symptoms observed on the cattle. This rule based system for cattle diseases treatment was developed to resolve indigenous knowledge medicine practices from loss and document the knowledge and transfer for next generation. Also the development of this system was valuable for next generation in order to improve indigenous knowledge medicine practices of cattle diseases diagnosis and treatment.

Indigenous knowledge medicine drug preparation and applications require different methods. Some of the mode of drug preparation are mixing plant parts with water at room temperature, chewing parts of the medicinal plant without the use of water and collection of latex from the plants with or without the use of water and also mixing minerals with other animals meat and their skin. In addition, during preparation and amount estimation of the drug local healers used various units of measurements. Farmer used numbers for seeds, fruits, bulbs, and flowers, spoon for paste and powdered plant and cups for water during preparation and liquid form of the prepared medicine (Romha, 2015). A single plant was found to be managed in different routes depending up on the preparation and type of the disease needed to be treated and provide multipurpose remedies, preventing or curing several kinds of ailments. The most frequently used of diseases treatment forms are liquid form and ordered through mouth, nose, and eye, and applied topically followed by paste or put on the affected parts. These traditional drug preparations are more preferred because they are locally available and cheaper. The fact shows that there are symptoms seen on the cattle physically; when they are affected by diseases. This symptom is different from diseases to

diseases. Based on the symptoms of diseases, local healers of study area have the ability to identify the type of diseases, diagnosis and treat different ailments using their own knowledge.

Therefore, the aim of this study was to explore indigenous knowledge that local farmers used for cattle diseases diagnosis, treatment and modes of preparation and application. Since this knowledge practices was not expressive and organized in the form of texts, advertising in the form of media, audiovisual forms and digital database, the researcher aimed to develop a system for this knowledge. Farmers of this study used their own knowledge practices to treat and diagnosis different cattle diseases. The researcher selected this area because there are various traditional medicine practices in this area. However, to the knowledge of the researcher, there is no research conducted on this topic to display such knowledge practices in this area.

To develop the system, decision tree algorithm allows representing rule based knowledge for cattle diseases treatment. The rule based knowledge of cattle diseases diagnosis and treatment was collected from farmers' familiar using traditional medicine practices. Decision tree was constructed to represent the collected knowledge from local healers *IF, THEN* rule expression. In this rule based system, this expression were employed if the system read the listed symptoms it identifies the results (types of cattle illness).So, the developed rule base system allows preserving indigenous knowledge medicine practices of cattle diseases prevent and treatment and also helps to understand types of cattle illness easily.

1.2 Statement of the problem

Indigenous knowledge (traditional) medicine practices for cattle health care is the only asset in the hands of farmers/cattle holder to mitigate the impact of cattle diseases treatment and production. There are different types of cattle diseases that affect cattle production in several ways. A study showed that cattle diseases have negative effect on international market export (Tamiru, 2010). Cattle diseases decreases cost of production, reduces the quantity of products and generally causes great loss of income of the farmer. Modern science to diagnosis and treat cattle diseases in form of veterinary service may not always be readily available to rural farmers. But to diagnosis and treat different types of cattle diseases indigenous people know a lot about how to prevent and treat different diseases in traditional methods. For example they use (*hora obaasuu*) to treat cattle

suffering from *scabies (cinni)*, stomach diseases and skin problem, where by cattle are taken a water body rich in mineral to drink for few days.

Therefore, indifferent areas indigenous knowledge medicine practices of cattle diseases diagnosis and treatment still plays an important role. But the mode of application of this knowledge was not equally employed from one local area to another since it given to specific culture or society and is not organized. Indigenous knowledge practices is the only medical practices accessible to the majority living in the remote areas, but currently different youth think as backward practice because it is not in standard format (Abdullahi, 2013).

Even indigenous knowledge medicines contributed for innovation of modern medicine, for instance the user of this knowledge becoming fewer and fewer in number. Moreover, because of such precious knowledge practices were not well documented and expressed and organized in the form of texts this knowledge was going to be lost (Asante, 2013). Since, modern knowledge medicine practices expansions are abundant, indigenous people are shifting from using their own knowledge because of indigenous knowledge medicine practices of cattle diseases prevent and treatment are the most cheapest and more accessible in society. In other cases individuals who are knowledgeable in traditional practices usually try to keep the knowledge secret and remain unwilling to openly teach to others (Mesfin, 2001), because rights of ownership are not protected. This is also considered as another problem causing a loss of indigenous knowledge medicine practices to the country, because such traditional people are becoming fewer and fewer in number. On the other hand, indigenous knowledge has not been well incorporated in development interventions (Abdullahi, 2013). Furthermore since indigenous knowledge is local or environmentally specific in nature and transmitted orally, the mode of application and preparation in different area and way of preservation also another problem (Kaniki, 2002).

Therefore, this study seeks to make an attempt to identify common cattle diseases identified, prevented and treated using indigenous knowledge practices and clarify mode of preparation and application of the drugs by farmers in the study area. Also it explores the applicability of using rule based system technology in the domain of cattle disease diagnosis and identification by developing a system.

1.3 Research Questions

The study answers the following research questions and solution for the above mentioned problems.

- ✚ Does indigenous knowledge practices used to diagnosis cattle diseases?
- ✚ What are modes of preparation and applications of this indigenous knowledge?
- ✚ What are mechanisms to store, transfer and preservations of this knowledge in the community?
- ✚ What are the challenges for protecting indigenous knowledge practices?
- ✚ Is possible to develop rule based system of indigenous knowledge for cattle diseases treatment?

1.4 Objectives of the Study

1.4.1 General objectives of the study

The main objective of this study was to explore indigenous knowledge used for cattle diseases diagnosis, treatment and modes of drug preparations and applications in case of East Wollega Zone and to develop a rule based system.

1.4.2 Specific objectives of the study

- To identify indigenous knowledge used for diagnosis and treatment of cattle diseases.
- To determine the modes of indigenous knowledge medicine drug preparation and application for cattle disease treatment.
- To identify mechanism of store, transfer and preservations of this knowledge in the community.
- To investigate the challenges of protecting indigenous knowledge medicine in the society.
- To develop rule based system for indigenous knowledge of cattle diseases treatment

1.5 Scope of the study

Even though there are numbers of other traditional activities that farmers use from rural areas, this study focused specifically on exploring indigenous knowledge of cattle diseases treatment and modes of application in the case of East Wollega Zone. Since, cattle is the backbone and key of the

farmers in case of providing asset which depends on to provide for most of their socio-economic needs and estimated that roughly 70% of the rural poor country at least partially dependent on livestock to sustain their livelihoods. Due to some constraints like budget, time and geographical location, the study only focused on East Wollega Zone of Leka Dulacha, Guto Gida and Gida Ayana Woredas.

1.6 Significance of the study

Indigenous knowledge has been developed by trial and error, actual experiment and is essential for treat different diseases. These types of knowledge also contribute important information for science and natural resource management and definitely fill gaps in understanding that science cannot (i.e. in agricultural crop land management, climate change adaptation and mitigation and agricultural innovation).The main importance to develop system in this study is to preserve and store the indigenous knowledge medicine of cattle diseases diagnosis and treatment for future.

The finding of this study benefits and provides valuable understandings to the farmers in different rural areas to improve cattle husbandry and also diseases prevention and treat using their own knowledge. It also enhance farmers understanding of how protecting natural resource and use properly, to contribute local empowerment and development, increasing independence and strengthening, increasing local culture and motivation to solve local problems with local knowledge and resources and also for others as literature.

Additionally, the output of this study can be used as an input for investigating and developing a scientific medicine for veterinary medicine. Moreover, the result of this study may source for intellectual property and protection of indigenous people knowledge of the study area. Furthermore, it may open a chance for other researchers who want to conduct further studies in the area.

1.7 Operational Definitions

Folk medicine: is the mixture of traditional healing practices and beliefs that involve herbal medicine or exercises in order to diagnose, treat or prevent a sickness or illness.

Ethno medicine: refers to the study of traditional medical practice which is concerned with the cultural interpretation of health, diseases and illness and also addresses the healthcare seeking process and healing practices.

Indigenous medicine: is the ancient and culture bound medical practice which existed in human societies before the application of modern science to health.

Traditional Knowledge: often abbreviated as TK, refers to the holistic total of an indigenous people's understanding of the world and it is body of knowledge built by a group of people living in close contact with nature.

Traditional medicine practices: refers to the knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures, used in the care of health and in the prevention, diagnosis, improvement or treatment of physical and mental illness.

Local knowledge: is the knowledge that people in a given community have developed over time, and continue to develop and it is based on experience, often tested over centuries of use, adapted to the local culture and environment, embedded in community practices, institutions, relationships and rituals, held by individuals or communities and dynamic and changing.

Indigenous knowledge: refers to the understandings, skills and philosophies developed by societies with long histories of interaction with their natural surroundings

Local herbalist: Person who has the ability to diagnosis and treats a variety of illness through the holistic uses of plants and minerals as locally.

Cattle: Large ruminant animals with horns and cloven hoofs, domesticated for meat or milk, or as beasts of burden; cows and oxen.

Expert system: is a computer program that uses artificial intelligence technologies to simulate the judgment and behavior of a human or an organization that has expert knowledge and experience in a particular field.

CHAPTER TWO

2. LITERATURE REVIEW AND RELATED WORK

2.1 Overview of Knowledge

Knowledge can be defined in different contexts. According to Halblander (2005), knowledge is information combined with experience, context and understanding. Moreover, Knowledge is also invisible, closely related to action and decision, different in thought after processing, spiritual product, identified with existing environment, transferable through learning and not duplicate and it is much more a process, a dynamic, or an ability to understand and to share understanding (Kumar, 2010). Furthermore, knowledge can be defined as all cognitive expectancies and observations that have been meaningfully organized, accumulated and embedded in a context through experience, communication or inference that an individual or organizational actor uses to interpret situations and to generate activities and solutions (Maier, 2004). This knowledge can be classified depending on the state of transferability, documentation, and codification and expression capacity of that knowledge. For instance, it can be categorized into procedural, tactical, tacit, explicit, descriptive/ declarative, domain, encoded, empirical, scientific and indigenous knowledge. From these different types of knowledge this study focused on indigenous knowledge

2.2 Indigenous Knowledge

Indigenous knowledge is a term covers different components and expressed in different ways like traditional knowledge and local knowledge interchangeably. These terms were used farmers of remote area for different purposes like for problems solving in different area. This knowledge is often perceived as historical and ancient practices of peoples which are a problematic perception. Also it is used to refer specific groups of people defined by ancestral territories, collective cultural configuration, and historical locations (Angioni, 2003). This knowledge is available and take part in agriculture for crop production, traditional medicines healing and disease prevention, sustainable use of natural resources and the environment and also take part in traditional arts and culture identification(Brascoupe, 2001).

According to Boven and Morohashi (2002), indigenous knowledge is a traditional knowledge practices that people in a given community have developed and applies over time which is based on experience. These types of knowledge is used to refer to the matured long standing traditions and practices of certain local communities which are often expressed through stories, legends, folklore rituals songs, and even laws. It is used to sustain the community and its culture to maintain the genetic resources necessary for the continued survival of the community (Appleton, 2001).

Based on different philosophers, indigenous knowledge has various characteristics that show its uniqueness. According to Forsyth (2013), the main characteristics that make this knowledge unique are it is generated within communities and rooted within a particular community and it is culture specific. Additionally this knowledge focuses on basic needs of human and animal, it is dynamic, is oral and rural in nature and directly related to the experiences that are generated by the people in communities. Moreover, this knowledge is experienced rather than theoretically learnt and it is based on practical experimentation and environmental innovation as opposed to being theoretically learnt in the formal schooling education system (Sen, 2005).

2.3 Types of Indigenous Knowledge

Indigenous knowledge may be categorized into different classes based on different philosophers and their uses. But according to Tavana (2002), there are two main types of indigenous knowledge. These are explicit indigenous knowledge and tacit indigenous knowledge. These are discussed further below.

2.3.1 Explicit Indigenous Knowledge

This type of indigenous knowledge consists of facts, rules, relationships and policies that can be faithfully codified in paper or electronic form and shared without need for discussion (Wyatt, 2001). This types of indigenous knowledge is an academic knowledge that is described in formal language, print or electronic media and often based on established work processes. It is also knowledge that is easily articulated and expressed in documented and recorded format. The nature of this knowledge is that it is easy to store, transfer and communicate with others (Smith, 2001).

2.3.2 Tacit Indigenous Knowledge

In contrast to explicit knowledge, tacit knowledge refers to the practical action oriented knowledge or know-how based on practice acquired by personal experience (Smith, 2001). These types of knowledge is often difficult to express openly with words because it encompasses carrying out something without having to think about and not existed in documented format. Tacit knowledge is that it is difficult to extract from the heads of individuals. It is very seldom found in books, manuals, databases or files as it is developed from mental models, values, beliefs, perceptions, insights, experiences and assumptions (Smith, 2001). Moreover, according to Tavana (2002), tacit indigenous knowledge refers to the types of traditional knowledge that cannot be easily expressed or articulated to outsiders and mostly based on an individual's emotions, experiences, insights, observations and perceptions. For instance, the best examples of these types of knowledge include riding a bicycle.

Therefore, from these types of indigenous knowledge this study focused on tacit knowledge which refers to the practical or action-oriented knowledge and know-how based on practice in society. It focused on the way local farmers used to applied their tacit knowledge that is not documented but employed for prevent and treat cattle diseases in society

2.4 Indigenous Knowledge and Indigenous Organizations

Indigenous knowledge is linked to the local culture and history of a particular community and holds significant value for different problem solving strategies in indigenous organizations and local communities. Indigenous knowledge is used in the indigenous organizations for economic development, health care, the preservation of culture and political transformation and other. Some communities use indigenous knowledge practices and structures for improve their socio economic development activities (Kayombo, 2013).

According to Dove (2000), indigenous organizations adapt external knowledge through interaction with other development partners to exchange ideas, build capacities and collaborate in order to achieve their organizational objectives. The integration of external knowledge and indigenous knowledge systems enables the community to compete and respond to global opportunities and challenge and advocate for change in the legal frameworks of their community.

As explicit nature of external knowledge makes it easy to share and preserve indigenous in organizations, there are also indigenous knowledge practices that are harmful to the health and welfare of the communities practicing them and may threaten future survival in organization. So, it is important to identify relevant indigenous knowledge and manage it since the utility of certain types of indigenous knowledge might have diminished. It is also important to integrate indigenous knowledge with external knowledge to strengthen it and for indigenous organizations to achieve their development goals and fight discrimination and marginalization. In any way indigenous knowledge can be used as a starting point for a process in which indigenous and exogenous knowledge merge in an effective development strategy that is controlled by local people rather than development agents (Vlaendere, 2000).

2.5 Indigenous Knowledge Medicine Practices

According to Eyong (2007), indigenous knowledge is part of the healthcare systems used in various communities and more than 80% of the world's population uses this knowledge to diagnosis and prevent different diseases. This idea is supported by Soewu and Ayodele (2009) that traditional healthcare is combined with conventional healthcare systems. In some countries traditional healing approaches are the main resources used to address various problems relating to health and well-being. It is therefore clear that indigenous knowledge is important in the health care of many communities. Another area where indigenous knowledge plays an important role is the conservation of water. Cheserek (2005) says in order to protect water bodies from contamination indigenous communities use certain taboos. Such taboos include not washing in or near the river or stream, lactating mothers are not allowed to come to water points and throwing objects into water bodies is prohibited. All these taboos are intended to assist the community to protect and conserve water which is a very important resource. Moreover, indigenous knowledge plays a critical role in enhancing household food security. In a study that was conducted in Uganda by Agea (2008) it was found that indigenous knowledge is used in enhancing food security. The study found that some households use animal wastes such as chicken manure, cow dung and crop residues such as coffee husks to fertilize their gardens in order to have increased crop yields.

2.6 Indigenous Knowledge Medicine Practice in Ethiopia

It is widely believed in Ethiopia that the skill of traditional health practitioners is given by God and this knowledge medicines practices were passed orally from father to a favorite child, usually a son or is acquired by some spiritual procedures. Traditional healing knowledge is guarded by certain families or social groups and healers are known by different names. Depending on the communities practice they are known as debtera, tenquay and kalicha (Dawit, 2001).The traditional knowledge on ethno veterinary practices by local healers who are knowledgeable and experienced in traditional systems of treatment is important and it have been developed by trial and error and by actual experimentation, but their knowledge are not documented and is dwindling fast (Bekele, 2007).

2.7 Indigenous Knowledge of Cattle Diseases Treatment

For many farmers, cattle are the key asset they depend on to provide for most of their socio-economic needs. To keep cattle healthy, traditional healing practices have been applied for centuries and have been passed down orally from generation to generation (Martin, 2001). Before the introduction of western medicine, all cattle keepers relied on these traditional practices to prevent disease because of cattle disease affects their production and husbandry in different ways. Ethno veterinary medicine or indigenous knowledge medicine of animal healthcare system is the traditional beliefs, knowledge or skills practices given to society for diagnosis and treat different animal diseases (Yineger, 2008). It comprises the traditional management of veterinary diseases, their remedies and the spiritual elements associated with the healing procedures practiced by a local community. Cattle owners and herders prepare powders, pastes and ointments from medicinal plant, animal, mineral and other non-plant substances. The modality involved in the production of ethno veterinary medicines varies according to the active ingredients to be extracted and these could be administered topically through smoke, vapors or massages or intra-nasally (Mathias, 2004).

At present time, traditional cattle disease treatment is restricted to a few herbal healers due to lack of proper documentation. Those practices are still continuing in the minds of local people and all tribal which have got greater accountability towards cattle management. In local and ethnic societies, use of plants as veterinary medicines is very common for the treatment of animal disease (Sahu, 2007).

2.8 Management of Indigenous Knowledge

Management of indigenous knowledge is extremely important because to have knowledge only is not sufficient but connecting knowledge with its application empirically or conceptually or even philosophically to desirable social ends is essential (World Bank, 2001). Indigenous knowledge practices generally provide a way of connecting a way of knowing, a way of feeling and also a way of doing. Like the scientific knowledge, indigenous knowledge also needs to be managed on technical base. The essential steps used as to transform or manage are recognition and identification, validation, recording and documentation, storage in retrievable repositories and transfer for new generation. Moreover, Sithole (2007) supported this idea as documentation is the main important way to protect indigenous knowledge from exploitation by actors other than its true originators. Additionally Ngulube (2002) points out that documentation were serving as the purpose of preservation indigenous knowledge easily available to professionals within the development sector. Since this knowledge is passed down by words of mouth to the trainee who might be a family member it needs management otherwise the knowledge is lost with the death of the individual. Preservation of traditional medicine knowledge therefore involves developing systems that will ensure the continued existence and viability of traditional medicine knowledge as well as passing them on to future generation.

2.9 Methods and Tools for Managing and Preserving Indigenous Knowledge

In different country there are numerous tools used for managing indigenous knowledge. Main tools and methods used for the management and preservation of indigenous knowledge include oral tradition like proverbs, riddles, songs, praise songs, legends and myths, folk dances and plays. Stevens (2008) reiterated that indigenous communities have their own tools for transmitting indigenous knowledge, like oral storytelling, ceremonies and apprenticeships. So, documentation is the main method of preserving indigenous knowledge as general. Traditional Medical knowledge can be documented in books, periodicals such as newspapers journals, indexes, other media for preservation including multimedia recordings and Information and Communication Technologies can be harnessed for collection and preservation of traditional medical knowledge.

2.10 Limitations of Indigenous Knowledge

Various researchers have argued that indigenous knowledge has a number of limitations and weaknesses. Not all indigenous knowledge and activities of local people are valid and environmentally sound. Some of the practices of indigenous knowledge have had unwanted effects. According to Naidoo (2007), one of the limitations of indigenous knowledge is that not all indigenous ways of living have proved to be sustainable. Based on this limitation it is clear that indigenous knowledge may not be a solution for all challenges. Furthermore, he argues that the shortcoming of most of the definitions is that they do not factor in the effects of modernization.

Tanyanyiwa and Chikwanha (2011) argue that indigenous knowledge is sometimes accepted uncritically because of the notions that whatever indigenous people do is naturally in harmony with the environment. Similarly, they argue that there is historical and contemporary evidence that suggests indigenous peoples have also committed environmental sign through over-grazing, over-hunting, or over-cultivation of the land and it is misleading to think of indigenous knowledge as always being good, right or sustainable.

Mosothwane (2007) indicated that some aspects of indigenous knowledge should be discarded because they do not tally well with industrial development. The authors are also view that traditional knowledge tends to be in conflict with industrial development and such knowledge systems have a certain amount of flexibility in adapting to ecological change, when change is particularly rapid or drastic, the knowledge associated with them may be rendered unsuitable and possibly damaging in the altered conditions. Another limitation of indigenous knowledge is that sometimes the knowledge which local people rely on is wrong or even harmful. This therefore implies that practices based on the wrong knowledge, mistaken beliefs, faulty experimentation, or inaccurate information can be dangerous and may even be a barrier to improving the well-being of indigenous people. The implication is that this may increase the vulnerability of the people that rely on the information to hazards and eventually disasters.

2.11 Challenges of Indigenous Knowledge Practices

While indigenous knowledge plays an important role in many areas of life, it is faced by many challenges. According to Ocholla (2007), the main challenges of indigenous knowledge are marginalization that occurred over the years. He states that marginalization refers insufficient

attention to something and caused by the perception that indigenous knowledge is primitive and old-fashioned and therefore thinks as has no value. This perception results in indigenous knowledge being marginalized and this being so western knowledge is used, because it is thought that it is more advanced and better suited to a third-world country. Moreover, he states causes or reasons why marginalization occurs as tacit knowledge is not codified or systematically recorded. It is also occurring because of difficult to transfer or share and lives solely in the memory of the beholder and is mostly oral and dies with the beholder. It is embedded in the culture and religion of a particular community and is therefore not universal and difficult to globalize. Furthermore, he argues that marginalization has also occurred because families and communities are becoming increasingly disintegrated and globalized then also there is a trend that may have stemmed from the push-pull of technologies.

According to Guchteneire (2004) another main challenge of indigenous knowledge is that of not being captured and stored in a systematic way since it is handed down orally from generation to generation and over-reliance on the intergenerational oral transmission of indigenous knowledge. So in order to solve this challenges indigenous knowledge needs to be recorded, protected and utilized in ways that could benefit its owners and the communities.

Additionally, Msuya (2007) state indigenous knowledge is faced by the challenge of disappearing because of the failure to preservation, protection record it. This is mainly due to the fact that most of the indigenous knowledge practices are not written down. The knowledge is transmitted from one generation to the next, orally and in practice. Further challenges of indigenous knowledge are relate to its management. This challenge includes the methods of identifying it, the access to it, the intellectual property rights and the media and format in which to preserve its (Dlamini, 2009).

Generally, traditional knowledge was gradually disappearing due to many factors such as the declining culture of sharing, the younger generation's lack of interest in indigenous knowledge practices with a deeper interest in social networking technology. Another challenge was the way of collection and preservation of traditional knowledge medicine and its mode of transmission in society since orally from generation to generation. So, this good part of knowledge is not captured or recorded in print or electronic format. Another importantly barrier is that the practice of traditional medicine is generally characterized by secrecy. There is a general unwillingness of practitioners to document and disclose the source, content, method and application of their drugs.

In most cases, apart from family members who may imbibe the knowledge, traditional practitioners die with their knowledge (Sithole, 2007). These barriers pose serious challenges in capturing, recording and documenting the knowledge for preservation.

2.12 Indigenous Knowledge Practices for Livestock Diseases Treatment.

The knowledge and practices related to the use of medicinal plants for the treatment of animal diseases has been handed down from generation to generation in different cultures as worldwide. In many developing countries, farmers and herders use indigenous knowledge practices care and to treat their livestock from different diseases. Therefore, this knowledge practices plays an important role in the animal health care system. It is perceived as simple, cost-effective, environment friendly, contextually appropriate and culture-based (Kolawole, 2007).

2.12.1 Overview of Cattle Diseases

Cattle are affected by different diseases either through contact with diseased animals or due to improper sanitation, feeding, care and management. Different types of cattle diseases and death of cattle cause loss of production and frequently a loss of body condition. Knowledge of cattle diseases understand and prevent is necessary because of many cattle diseases can be transmitted to man through milk. According to Dairy Year Book (2015), there are various diseases that affect cattle and also can be prevented in different ways. For instance these types of cattle illness can be prevented by means of traditional knowledge medicine practice and through modern medicine.

According to drug administration and control authority of Ethiopia (2006), cattle diseases are grouped into infectious diseases, non-infectious diseases, common reproductive problems diseases, respiratory diseases and chemicals and plant poisoning diseases. Some of the infectious and non-infectious cattle diseases are described as follows.

2.12.1.1 Infectious Cattle Diseases

2.12.1.1.1 Anthrax

Anthrax *is* a highly infectious and fatal disease of cattle that is caused by a relatively large spore forming rectangular shaped bacterium called *Bacillus anthracis*. This bacterium occurs in areas where animals have previously died of anthrax. Even though anthrax has appropriate vaccination,

in Ethiopia, still it occurs frequently. One of the common signs in cattle with anthrax is a progression from a normal appearance to dead in a matter of hours. Weakness, fever, excitement followed by depression, difficulty in breathing, uncoordinated movements and convulsions are other signs of anthrax. Treatment is of use in cases showing sub-acute form of the disease. In most cases, early treatment can cure anthrax. The cutaneous (skin) form of anthrax can be treated with common antibiotics. Regular annual vaccination of animals in endemic areas will prevent the disease from occurring. Vaccination may be carried out at least a month prior to expect disease occurrence in endemic areas. Never open a carcass of an animal suspected to have died from anthrax (Ministry of Agriculture and Rural Development, 2006).

2.12.1.1.2 Blackleg

Black-leg (*Black-quarter*) is an acute infectious and highly fatal, bacterial disease of cattle. Young cattle between 6-24 months of age in good body condition are mostly affected by these diseases. The sick animal usually dies in 12 to 48 hours. This type of diseases was caused by *Clostridium chauvoei* bacterial. It is soil-borne infection which generally occurs during rainy season. Blackleg is not transmitted directly from sick animals to healthy animals by mere contact. Lameness, loss of appetite, rapid breathing, depression and high fever are the signs observed in animals infected by the disease. In most cases the animal is found dead without being previously observed sick. Blackleg is mostly found in the northern part of Ethiopia. Early treatment can be possible to complete cure of the cattle and consult with veterinarian immediately is important for prevent and treatment of such kind diseases (Gebremedhin, 2007).

2.12.1.1.3 Skin Disease

Skin disease is one of viral diseases of cattle in Ethiopia. It was first identified in East Africa, Kenya, in 1957 and spread to other parts of east African countries. Fever, multiple firm, well-defined nodules in the skin, lesions left by erosion on the teats, nose, mouth and pharynx, enlarged lymph nodes and swelling of legs are the common symptoms of skin disease.

2.12.1.1.4 Trichomoniasis

Trichomoniasis is a venereal disease of cattle that causes infertility and occasional abortions in cows and heifers. It spreads to uninfected cows within short period of time. Repeat breeding or

infertility of individual cows can last up to five months. The reason for repeat breeding appears to be death of the embryo, often within ten days (Michael, 1992).

2.12.1.1.5 Foot and Mouth Disease

Foot and mouth disease is endemic and known for its distribution in Ethiopia. It is highly communicable disease that primarily affects cattle and is found in most African countries. Decreased milk yield, permanent hoof damage and chronic mastitis are the major symptoms of Foot and mouth disease. Foot and mouth disease is the most prevalent cattle diseases in Ethiopian highland areas. For prevention of this diseases heavy mulch animals and exotic breeds of cattle bred for milk should be protected regularly, it is advisable to carry out two vaccinations at an interval of six months followed by an annual vaccination programme and isolation and segregation of sick animals (Aklilu, 2008).

2.12.1.1.6 Actiobacillosis

According to the Drug Administration and Control Authority of Ethiopia (2006), Actionobacillosis refers to a group of diseases caused by gram-negative coccobacilli in the genus Action bacillus. The diseases are sometimes transmissible to humans. Inability to eat or drink for several days, drooling saliva, rapid loss of condition, painful and swollen tongue and nodules tongue are some clinical symptoms of Actionobacillosis.

2.12.1.2 Non-Infectious Cattle Diseases

2.12.1.2.1 Bloat

Bloat is the buildup of gas in the rumen. It is the seasonal problem in both dairy and beef cattle. Irrigated pastures in summer or good pasture growth in autumn may pose problems in some districts. Distended left abdomen, pain, discomfort, and bellowing and death with 15 minutes after the development of bloat are some symptoms of bloat (Drug Administration and Control Authority of Ethiopia, 2006).

2.12.1.2.2 Urolithiasis

Urolithiasis is the formation of urolith anywhere in the urinary system. Some symptoms of these diseases include: partial obstruction dribble, blood-tinged urine after prolonged, painful attempts at urination; before complete occlusion occurs, urine may dry on the preputial hairs and leave detectable mineral deposits. It mostly occurs in central parts of Ethiopia (Drug Administration and Control Authority of Ethiopia, 2006).

2.13 Rule Based System

Rule based systems (expert systems) are the simplest form of artificial intelligence that uses rules as the knowledge representation for knowledge coded into the system. It is a way of encoding a human expert's knowledge in a fairly narrow area into an automated system. The definitions of rule based system depend almost entirely on expert systems which are system that mimic the reasoning of human expert in solving a knowledge intensive problem. Instead of representing knowledge in a declarative and static way as a set of things which are true rule based system represent knowledge in terms of a set of rules that tells what to do or what to conclude in different situations. A rule-based system can be simply created by using a set of assertions and a set of rules that specify how to act on the assertion set. Rules are expressed as a set of if-then statements called IF-THEN rules or production rules (Ligeza, 2006).

2.13.1 Elements of a Rule Based System

Any rule based system consists of basic and simple elements listed as follows:

A set of facts: These facts are actually the statements and should be anything relevant to the beginning state of the system.

A set of rules: This contains all actions that should be taken within the scope of a problem specify how to act on the assertion set. A rule relates the facts in the IF part to some action in the THEN part. The system should contain only relevant rules and avoid the irrelevant ones because the number of rules in the system will affect its performance.

A termination criterion: This is a condition that determines that a solution has been found or that none exists. This is necessary to terminate some rule based systems that find themselves in infinite loops otherwise. Facts can be seen as a collection of data and conditions. Data associates the value

of characteristics with a thing and conditions perform tests of the values of characteristics to determine if something is of interest perhaps the correct classification of something or whether an event has taken place.

2.13.2 Rule Based Architecture of an Expert System

The most common form of architecture used in expert system and other types of knowledge based systems is the production system or it is called rule based systems. This type of system uses knowledge encoded in the form of production rules (i.e. if-then rules). The rule has a conditional part on the left hand side and a conclusion or action part on the right hand side. Each rule represents knowledge to the given domain of expertise. When the known facts support the conditions in the rules left side the conclusion or action part of the rule is then accepted as known. The rule based architecture of an expert system consists of the domain expert, knowledge engineer, inference engine, working memory, knowledge base, external interfaces, user interface, explanation module, database spreadsheets executable programs as mentioned in figure below.

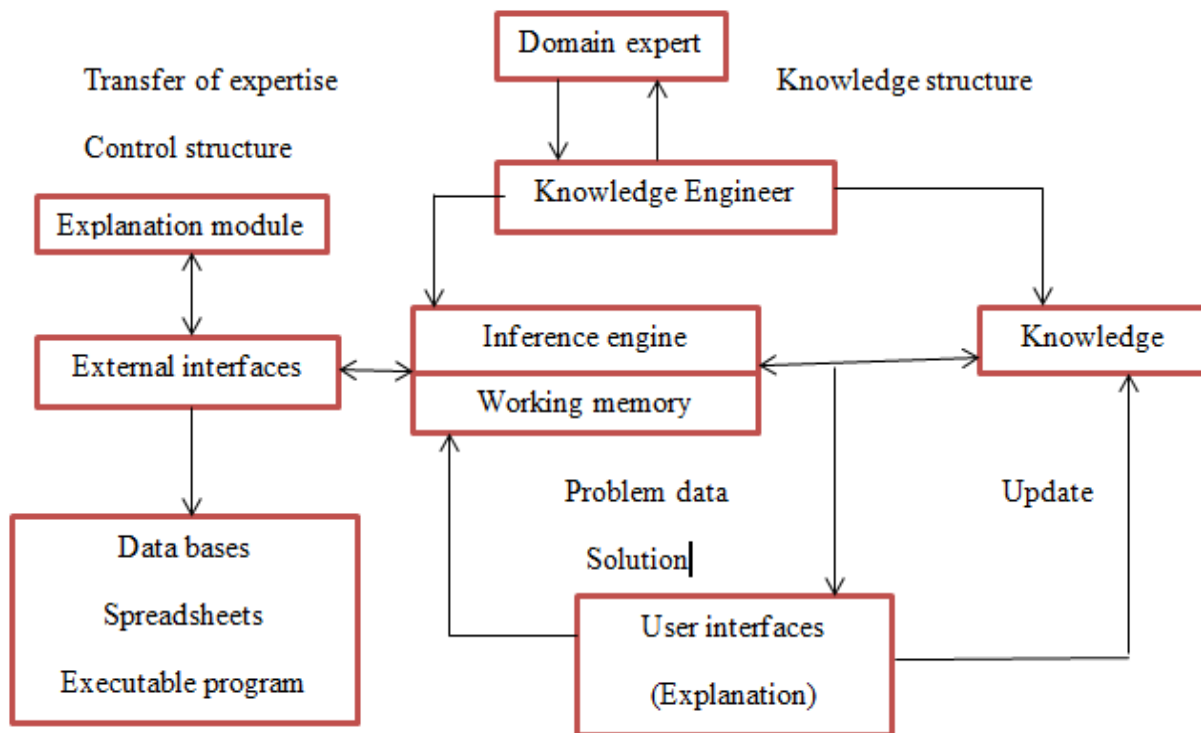


Figure 3.1 Integration of Expert systems Components (Giarratano, 2004).

User Interface: In expert system, user interface is the mechanism by which the user and the expert system communicate with each other (i.e. the user interacts with the system through a user interface). It acts as a bridge between user and expert system. This module accepts the user queries and submits those to the expert system. The user normally consults the expert system for reasons of get answer of his/her queries and to get explanation about the solution for psychological satisfaction.

Explanation Module: The explanation module explains the reasoning of the system to a user. It provides the user with an explanation of the reasoning process when requested. The credibility of expert system will be established only when it is able to explain “how and why” a particular conclusion is drawn. This explanation increases the belief of user in the expert system. In this cattle diseases identification system, explanation module helps the expert system to clarify and justify the drugs needed.

Working Memory: It is a global database of facts used by the rules. Case specific data are kept in this working memory. For example, in cattle diseases identification expert system, the working memory could contain the details indicators of different cattle disease.

Knowledge Engineering: The primary people involved in building an expert system are the knowledge engineer, the domain expert and the end user. Once the knowledge engineer has obtained a general overview of the problem domain and gone through several problem solving sessions with the domain expert he/she is ready to begin actually designing the system selecting a way to represent the knowledge, determining the search strategy (backward or forward) and designing the user interface. After making complete designs, the knowledge engineer builds a prototype. The prototype should be able to solve problems in a small area of the domain. Once the prototype has been implemented, the knowledge engineer and domain expert test and refine its knowledge by giving it problems to solve and correcting its disadvantages.

Knowledge Base: In rule based architecture of an expert system, the knowledge base is the set of production rules. The expertise concerning the problem area is represented by productions. In rule based architecture, the condition actions pairs are represented as rules with the premises of the rules (if part) corresponding to the condition and the conclusion (then part) corresponding to the action. The core part of an expert system is the knowledge base and for this reason an expert

system is also called a knowledge based system. Expert system knowledge is usually structured in the form of a tree that consists of a root frame and a number of sub frames. A simple knowledge base can have only one frame, i.e. the root frame whereas a large and complex knowledge base may be structured on the basis of multiple frames.

Inference Engine: The inference engine accepts user input queries and responses to questions through the input or output interface. It uses the dynamic information together with the static knowledge stored in the knowledge base. The knowledge in the knowledge base is used to derive conclusions about the current case as presented by the users input. Inference engine is the module which finds an answer from the knowledge base. It applies the knowledge to find the solution of the problem. In general, inference engine makes inferences by deciding which rules are satisfied by facts, decides the priorities of the satisfied rules and executes the rule with the highest priority.

2.14 Related works

This section discusses about some of the related researches that were conducted in different internationally on investigating indigenous knowledge of cattle disease treatment and its modes of application.

According to Hambisa, *et al.*, (2014) a research conducted on “Managing indigenous knowledge for corrective and preventive cares: The case of Horro Guduru Wollega Zone, Oromia, Ethiopia”, Indigenous Knowledge is mainly practiced by rural communities in developing countries as a basis for local level decision making in day-to-day activities of society like in agriculture, health care, education and natural resource management. The aim of this study is to investigate the extent to which knowledge management approaches can be used to manage indigenous knowledge of corrective and preventive cares in local communities of Horro Guduru Wollega Zone. The study populations include farmers and agricultural extension workers/ development agents (DAs). The researchers were used descriptive research design and data were collected with questionnaire and group discussions instruments. Questionnaires were distributed for the agriculture sector offices to understand what they did and how they managing indigenous knowledge of agricultural knowledge and group discussions were concerned to examine the indigenous knowledge of agricultural development from the local communities. During conduct the research SPSS version 20 and Microsoft office excel were used for analyzing the collected data. And also in his study the

researcher argues the barriers that inhibit the effective acquisition of agricultural indigenous knowledge like poor recognition, lack of IK records and poor knowledge sharing culture.

However in his research conducted, researcher was focus only on the way in which indigenous knowledge managed and specifically concerned the indigenous knowledge of agricultural development from the local communities.

Another study conducted by Hambisa, *et al.*, (2015) on the title “knowledge management approach for indigenous knowledge of traditional healthcare practices: the case of Horro Guduru Wollega Zone, Ethiopia”.The aim of this study was to investigate the extent to which knowledge management approaches can be used to manage indigenous knowledge of traditional healthcare practices in local communities of Horro Guduru Wollega Zone. The researcher were used descriptive research design through qualitative research method to collect reliable data about perception of disease and its main cause and the types of indigenous knowledge of traditional healthcare practices, the status of sharing and acquiring indigenous knowledge, indigenous self-medication and required from traditional healthcare practitioners and the barriers to effective management of indigenous knowledge of traditional healthcare practices and the data collected from 84 respondents through purposive sampling in Health Bureau, Agricultural Bureau and NGO. The qualitative data collected from the respondent were analysed using thematic content analysis.

The researcher finding shows that more than 95% of the indigenous knowledge of traditional healthcare practices have acquired from their parents. Also in his studies, parent-child transmission of indigenous knowledge was found to be the dominant mechanism. Undoubtedly, there is loose contact between parent and children, and between young people and community elders. Young people of Horro Guduru Wollega are not ready to acquire knowledge and skills related to traditional healthcare practices principally due to change in value system. Likewise, parents and elderly people are also not courageous to impart their local wisdom to the younger generation due to the expectation that their knowledge and skills are inferior to the knowledge and skills that their children get from formal schooling.

As generally, the main result of this research shows that the overall how traditional healthcare practices have acquired and way of transmission and practices without categorize into different specific. This means the researcher received and tries to explain traditional medicine practices that

the community used for different purpose. But researcher did not show the modes of application and preparation during this traditional medicine use in the community.

Additional study conducted by Tigist, *et al.*, (2018) on “Assessment of Indigenous Knowledge and its relevance for Livestock Production, the case of North Gondar zone, Amhara Region, Ethiopia”. The researcher said that the basic component of any country’s knowledge systems is its indigenous knowledge and it encompasses the skills of experiences and insights of people applied to maintain or improve their livelihood. Additionally, indigenous knowledge practices have good role to assist and maintain sustainable agricultural crop land management, livestock production, climate change adaptation and mitigation and agricultural innovation. The aim of this study was to explore the various indigenous knowledge systems practiced in livestock production by small holder farmers.

Finally the finding of the researchers showed that there are major different diseases which are affecting livestock productivity in study area. The common diseases mentioned by most of the respondents were *Gandii* (Trypanosomiasis), Aba Senga (Antrax), and Fentata (Sheep Pox), respectively.

However, in this research conducted the result of researcher explains only the major different diseases which affect livestock productivity and types of disease well known in study area. But researcher did not explain/ clarify method of treatment and modes of application in traditional sickness treatment methods in the study.

In Kenya, Ocholla, G. *et al.*, (2016) was conducting his study on “Application of Indigenous Knowledge systems in wildlife management: A Case Study of the Samburu Pastoral Community in Kenya”. The aim of the study was to clarify how the Samburu traditional knowledge is relevant in the conservation and management of wildlife species.

The survey was conducted among three communities in the Wamba Division of Samburu East District including Ngutuk Ongironi, Lodungokwe and Nkaroni. For the study, the researcher adopted a stratified random sampling to draw 72 households or respondent selected from the three conservation areas. The study was using both primary and secondary data collecting method. Primary data was collected through administration of questionnaires to the head of the household and interviews with key informants within the three community and focused group discussions

were also conducted to consolidate information. In his conducted study he also argues that the importance of wildlife to Samburu pastoral community can be categorized into different groups. These include the aesthetic values, cultural values, use of body parts, nutritional values and medicinal values. The community members ranked the benefits differently as their most beneficial product of wildlife. Finally the result of the study identified several indigenous benefits that the community derives from different wildlife species.

However, this study was focus on “exploring indigenous knowledge of cattle diseases diagnosis, treatment and its modes of application in the case of East Wollega Zone. The finding of this study used for farmers of cattle holders in remote rural area as they used for diagnosis and treat cattle diseases by their own knowledge and also displays the overall preparation method of this medicine and it’s mode of application during they used. Also it allows the veterinary medicine worker of different study area. Additionally the final finding of this study listed types and name of cattle diseases well-known in study area and method of diagnosis and treatment and name of drugs/ medicine they used for cattle diseases treatment. Data was collected through observation, focus group and interview with respondents.

Generally, the above related work showed and only focused on the way of managing indigenous knowledge and its application in wildlife management and its relevance for livestock production. However, the main ideas that makes different this study from other work was, this study focused specifically only on the way local farmers diagnosis and treat cattle diseases through indigenous knowledge medicine and listed different types of cattle diseases familiar in local area and displayed the overall steps for drug preparation and mode of application in study area.

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1 Research Design

The research method used to conduct this study was exploratory research design. This method is used to gather information about indigenous knowledge of cattle diseases treatment and its modes of application practices from primary data sources in the study that is not available from other sources or documented.

3.2 Description of the study area

The study was conducted farmers of Western part of Ethiopia, Oromia Region in three Woredas of East Wollega Zone, namely Leka Dulecha, Guto Gida and Gida Ayana Woreda found at 317 KM away from Addis Ababain the western part of Ethiopia. Nekemte is the town of this Zone. According to data obtained, East wollega Zone is located in 9° 04' north latitude and 38° 30' east longitude, having an altitude of 1960m to 2170m above sea level. The long wet period extends from late May to early September with an annual rainfall of 1,500 to 2,200 mm. The average annual temperature of the town is 14° to 26° C. East Wollega is bounded on the southwest by Illubabor, on the west by the Didessa River which separates it from West Wollega, on the northwest by the Benishangul-Gumuz Region, on the northeast by Horo Guduru Wollega Zone, on the east by West Shawa, and on the southeast by the Gibe River which separates it from Jimma. This Zone was familiar with livestock husbandry and adoption of traditional healthcare practices. In addition, indigenous knowledge of cattle diseases treatment and its modes of application practices were not explored. Since, the researcher selected this study area.

3.3 Population of study

The study population for this research was farmers and elder familiar with indigenous knowledge practices of selected Kebele of East Wollega Zone. The target population of the study was farmers of six (6) selected Kebeles namely Leka Dullechaa Woreda (Hordaa Dongii and Keweessa Shonaa) Kebele, Guutoo Giddaa Woreda (Jireenyaa and Gaarii) Kebele and Giddaa Ayyaanaa Woreda (Guutee Guddinaa and Oboraa) Kebele. The six kebeles were selected based on their

experience of indigenous knowledge practices for cattle diseases diagnosis and treatment in local community. As information obtained from agricultural office of East Wollega Zone total population of farmers in Horda Dongi Kebele was 1090 (535 Males and 555 Females) and farmers in Kewessa Shona Kebele was 1795 (880 Males and 915 Females) also farmers in Jireenyaa Kebele was 947 (468 Males and 479 Females) and farmers in Gaarii Kebele was 1187 (621 Males and 566 Females) also farmers in Guutee Guddinaa Kebele was 1146 (545 Males and 601 Females) and farmers in Oboraa Kebele was 1114 (559 Males and 555 Females).The total population of farmers of the six selected Kebele was 7279, whereas the targeted populations of the study were 107 respondents selected.

3.4 Sample technique and sample size

Sampling technique is the systematic way of researcher selected the study area and respondents. To conduct this study, researcher used purposive sampling to select a total of 107 respondents from six (6) kebeles of the local communities. For sample size, 12 (twelve) focus group discussions with at least seven (7) to nine (9) maximum members of elder people totally ninety six (96) respondents were selected and eleven (11) respondents were selected for interview from each three woreda. This purposive sampling approach was employed because of to prove effective when only limited numbers of respondent can serve as primary data sources due to the nature of research design, aims and objectives. In this purposive sampling, participants were knowingly selected because they are expected to give useful data for the study.

3.5 Data Types and Data Sources

Qualitative data was indigenous knowledge of cattle disease treatment and its modes of application practices in the study area while quantitative data was about respondent's information. In order to design and develop rule based system also qualitative data was used. Primary data sources for this study was farmers of selected kebeles and secondary data sources for this study was related resource documented support of primary data such as indigenous knowledge medicine books, journals, publications and etc.

3.5.1 Data collection Instruments

There are different types of data collection methods used for research studies. To accomplish the objectives of this study, the researcher utilized different data collection methods. The selection of the data collection methods are depending on the research objective and research design. To conduct the study, the data was collected through focus group discussion, interview and observation with farmers of selected study area. The duration of study was from April to May 2019.

3.5.1.1 Focus group discussion

The second data collection instrument the researcher utilizes was focus group discussion with respondents of study area. This data collection method were engaged with familiar indigenous knowledge medicine practices of selected study area in order to address details on way of indigenous knowledge medicine drug preparation, mode of implementation, dosage and measurement used by the local healers, duration of the treatment and other. Researcher was employed this method through gathering herbalists from similar backgrounds or experiences on indigenous knowledge medicine practices and discuss on a specific topic of interest. During this data collection method, researcher was discussing with participants by their mother tongue/ Afaan Oromoo. These types of discussion by their mother tongue help the researcher for accessing relevant data from participants. So, researcher organized totally twelve (12) focus group discussions from each kebeles of Jireenyaa, Gaarii, Keweessa Shoonaa, Hordaa Dongii, Guutee Guddinaa and Oboraa kebeles. From one kebeles two (2) focus group discussion was employed and the same to other kebeles. The total number of focus group participants was ninety (96) farmers from of selected six kebeles.

3.5.1.2 Interview

The third data collection methods that the researcher utilizes were interview. In this research, this type of data collection was employed in the form of asking question and response through face to face conversation between researcher and interviewee to collect data. So, according to this study, interview was prepared step by step for familiar elder who known using indigenous knowledge practices but, cannot participate in focus group because of old age in selected kebeles for accessing

relevant data. Therefore, the interview guide questioners were developed based on the findings of the preliminary of study. This interview was conducted in Afaan Oromoo language depending on the preference and ability of the participant. During interview, researcher was recorded response of respondent and took notes on notebooks. The total knowledge gained through interview was codified and developed as system to identify types of illness using if-then expression rules.

3.5.1.3 Observation

The first data collection method the researcher utilizes in this study was observation. This method of data collection was employed in the form overseeing of the activities done by some herbalists. Accordingly, a researcher observed some of the herbalist practices such as way of disease identification, dosage determination and mode of drug preparation and application using indigenous knowledge medicine practices. This method allows the researcher to cross- check the strength of data gained through interview and focus group discussion. Therefore, for conduct this research the researcher was observed for prove data collected through interview and focus group discussion is accurate or not and the real activities that related to cattle disease treatment and its mode of application using indigenous knowledge in community of the study area.

3.6 Data Analysis and Interpretation

In this research the data obtained throughout Observation and focus group discussion from respondents was analyzed qualitatively using descriptive statistical tools such as tabular method, percentages and bar graph.

3.7 Ethical Consideration

Ethical consideration of the study participants and the host community is clear and mandatory. Therefore, researcher had conducted this study with keeping all ethical standards of a research and detail background information of participants. This research was not imposed and deceived the participants and it does not involve people without their knowledge practices. Based on a formal written letter from the department of Information Science, Jimma University, permission of data collection was obtained from East Wollega zone to selected woreda and Kebele administration. During data collection, researcher respects the rules and norms of the study community to avoid any doubt and information gathered were used only for the purpose of conducting this research.

The photographs of the study participants who gave permission were disclosed in this paper. Otherwise, confidentiality was kept for other participants.

3.8 System Development Procedure

In this study, different procedures are followed for development of system for indigenous knowledge cattle diseases diagnosis, treatment and modes of application. These procedures are knowledge acquisition, knowledge modeling, knowledge representation and rule based system development for cattle diseases diagnosis and treatment.

Knowledge acquisition: In order to design and develop the rule based system qualitative data was used from different sources. The primary data was collected from indigenous knowledge practitioner's of the study area. In addition, secondary data is used in support of primary data like documented source of knowledge on the area of indigenous knowledge practices in healthcare and diseases treatment from different sources such as books, internet sources, journals and publications was analyzed. Focus group discussion, interview and observation is used as an instrument for data collection from the intended respondent

Knowledge modeling: The acquired knowledge is modeled by using decision tree. Decision tree shows the overall symptoms of cattle diseases and identify types of cattle diseases based on the listed symptoms. This way of diagramming knowledge in decision trees can easily converted to system. Decision tree is drawn using flow chart symbols as it is easier to read and understand.

Knowledge representation: After the knowledge is acquired and modeled, it is represented by using rule based knowledge representation method. For this research, the rule based knowledge representation method is chosen because it clearly proves the domain knowledge. In a rule based system, much of the knowledge is represented as rules that are conditional sentences relating statements of facts with one another. There are already defined sets of symptoms, diseases and basic issues that should be addressed to confirm the presence of cattle diseases. As a result, rule based representation method is more appropriate to represent and demonstrate the real domain knowledge in diagnosing, treat and recognize types of cattle diseases.

To design and develop the rule based system qualitative data acquired from indigenous knowledge practionniers was used. This data was indigenous knowledge practices of cattle disease treatment and its modes of application in the study area. Decision tree was used to model the acquired knowledge from the respondents. After modeling the acquired knowledge by using decision tree, this knowledge is represented for understandable by humans and executable on computers. In development of rule based knowledge of indigenous knowledge for cattle diseases treatment, knowledge obtained from respondents was classified using decision tree with IF-THEN rules expression to identify types of cattle diseases and treat. To develop rule based knowledge system for diagnosis and treat different cattle diseases through indigenous knowledge practices, Prolog logic programming language for window was used.

CHAPTER FOUR

Results and Discussion

4.1 Results

4.1.1 Socio-Demographic Characteristics of the Respondent

The respondents of the study were 107 farmers who were well known for indigenous knowledge medicine practices for cattle diseases diagnosis, treatment and mode of application. As it mentioned in the methodology section; focus group discussions, interview and observation were used by selecting the farmers from each kebeles purposively. The researcher conducted the group discussions and interview with these farmers. Then the data were analyzed based on the objectives of the study by including the sociodemographic characteristics of the respondents.

Table 4.1: Socio-demographic of the respondents.

Characteristic		Frequency	Percent (%)
Sex	Male	94	87.8
	Female	13	12.2
Total		107	100
Age:	1-20	00	00
	21-40	00	00
	41-60	38	35.5
	61-80	48	44.9
	81- 100	21	19.6
	Above 101	00	00
Total		107	100
Occupation:	Farmer	69	64.5
	Government work	18	16.8
	Merchant	20	18.7
	Other	00	00
Total		107	100

Marital status:	Single	00	00
	Married	98	91.6
	Widowed	7	6.5
	Divorced	2	1.9
Total		107	100
Education level:	Illiteracy	7	6.5
	Elementary	74	69.2
	High school and diploma	17	15.9
	Post-Secondary(11-12 and degree)	9	8.4
	Other	00	00
Total		107	100

As it was stated on the above table 4.1 data was collected from 107 respondents. Ninety six (96) farmers (group discussions) and Eleven (11) elders of farmer who cannot participate during focus group discussion with respondents since old in age. From the 107 respondents male were 94 (87.8%) and 13 (12.2 %) were female. As presented in the above table 4.1 from the respondents there was no age less than 40. Thirty eight or 38 (35.5%) respondents were an age between 41-60 and 48 (44.9 %) respondents were and age between 61-80, 21 (19.6%) respondent were an age between 81-100 and there was no an age more than 100 from the respondents.

Regarding to their occupational status form the total 107 respondents, 69 (64.5%) of the respondents were farmers, 18 (16.8%) of respondents were governmental worker and 20 (18.7%) of respondents were merchants. Based on the marital status of respondents from the total 107 respondents there is no single form the respondents and 98 (91.6%) of respondents were married, 7 (6.5%) respondents were widowed and 2 (1.9%) of respondents were divorced. Related to educational level of respondents, from the 107 respondents 7 (6.5%) of respondents were illiterate, 74 (69.2.4%) of respondents were elementary level of education, 17 (15.9%) of respondents were high school level of education and 9 (8.4%) of respondents were post-secondary school level of education.

4.1.2 Accessibility of Indigenous Knowledge Practices in Community

Ethiopia has the largest livestock population in Africa and it is estimated that about 90% of the livestock population are treated with traditional medicines. In some parts of the country, livestock diseases such as anthrax (*Abbaa sangaa*), Blackleg (*Bishooftuu*), and Trypanosomiasis (*Gandii*) have been treated using various natural plant product combinations and minerals (Mirutse, 2003).

As data collected from the study area relating to indigenous knowledge practices used to diagnosis cattle diseases, farmers in this local area uses their own local medicine to prevent and treat cattle diseases because of there were lack of cattle healthcare center. In addition to this, the cattle healthcare center was far from their home and when they tried to move from their home to the cattle healthcare center accidentally they will be dying on the road. As shown in table 4.2 below based on the accessibility of cattle healthy center in community 48 (44.9%) respondents were mentioned that there is cattle healthy center in the community. However, farmers of study area didn't use this knowledge frequently instead of their own knowledge. Additionally, 59 (55.1 %) of respondents stated that there is no cattle healthy center in this local area and implement and use their own knowledge practices for diagnosis and treat different cattle ailments as shown below.

Table 4.2: Accessibility of Cattle Health-Care Center

Cattle health-care center in study area	Yes	No
	48 (44.9%)	59 (55.1%)

4.1.3 Perception and Reason to Use Indigenous Knowledge Practices in Community

As the farmers of the study area said that, the value of indigenous knowledge practices of cattle diseases treatment in local community are improved from time to time and accepted from local farmers for solving their problems within their own knowledge locally. In this study area, indigenous knowledge practices are existed and healing practices of cattle diseases treatment was common. Thus, Farmers of this community used their own knowledge to treat and prevent

different cattle diseases that gained from their parents, local herbs and from their neighbor. Farmers of the study area used this indigenous knowledge medicine practice because of when it is comparable with modern cattle healthcare center, it is the most cheapest and easy accessible in this local area.

Regarding to value ability of indigenous knowledge practices in this study area, this community has high value and great perception based on using indigenous knowledge medicine practices during solve different problems. For instance, the value ability of this knowledge practices in this community includes preventing and treating different cattle diseases. Additionally, the way to prevent and treat different cattle diseases through indigenous knowledge practices was accepted from different community members.

4.1.4 Purpose of Using Indigenous Knowledge Practices

In Africa and other developing countries, herbalists or traditional medical practitioners are the protectors and respect of indigenous knowledge in different area. According to data gathered from respondents of study area, indigenous knowledge medicine controlled by the herbalist differ from one herbalist to another and they do not share their knowledge to each other and they are neighbor and know each other but they do not share what they know and practice to each other and other herbalists because of they think as it decreases their familiarity and minimal their income. One herbalist usually possesses different drugs knowledge for several illnesses and did not share medicinal knowledge, he mention cases or illness to tell one another. The relationship among the herbalists was not based on medicinal knowledge sharing but referring the patient to more experienced herbalist.

Regarding to the purpose of indigenous knowledge practices, Warren (1995) stated that Indigenous knowledge is mainly practiced by rural communities in developing countries as a basis for local level decision-making in day-to-day activities of society, like in agriculture, in health care, in education, natural-resource management.

According to different herbalists/ farmers of the study area, the main purpose of using indigenous knowledge practices in the study area includes for human diseases treatment, livestock husbandry, disease prevent and treatment, crop production, environmental conservation, land use

management, protection of plants and conserving water. As different herbalists mentioned the purpose of using indigenous knowledge medicine in study area, 74 (69.2%) were used for treat human diseases, 93 (86.9%) were used in order to livestock husbandry and diseases treatment, 56 (52.3%) were used for crop production, 38 (35.5%) were used for environmental conservation, 64 (59.8%) were used for land use management, 23 (21.5%) were used for plants protection and 31 (29%) were used for conserving of water. So for solving their problems, farmers from study area were used indigenous knowledge practices in order to answering their difficulties as the local community.

Table 4.3: Purpose of Using Indigenous Knowledge Practices

Purpose	Frequency	Percent %
Human diseases treatment	74	69.2
Livestock husbandry and disease treatment	93	86.9
Crop production	56	52.3
Environmental conservation	38	35.5
Land use management	64	59.8
Protection of plants	23	21.5
Preserving and conserving water	31	29

In addition to this, as collected data depicted from farmers from study area they consider indigenous knowledge for cattle diseases treatment as the method of healing cattle disease based on their own knowledge using natural resource (plants, mineral and others animals) that is available in their society and also it is the way of implementing their own knowledge based on the symptoms of cattle when it affected by different diseases. Additionally, it is the way in which local herbalists or farmers implement their knowledge acquired from their family and neighbor during when their cattle were affected in different illnesses without using modern medicine.

4.1.5 Cause of Cattle Ailments

As data gathered from respondents of study states, cattle ailments were any types of diseases that can affect body parts and have the ability to die the cattle. This problem or loss of the cattle were

influence on farmers in case of loss of income and additionally affect to improve in the farming, cattle husbandry and develop economic activities.

Cattles are usually caused by different diseases either through contact with diseased animals or due to improper sanitation, feeding, care and management. According to data gathered from respondents or farmers and herbalists of study area, there are several causes of cattle diseases recognized as shown in the table 4.4 below. Many respondents stated that Trypanosomiasis (*Gandii*) is caused by lack of not well housing/ shelter prepared of cattle. Feeding on grass infested with worms and drinking contaminated water were also suggested as other causes of diarrhea. Other respondents indicated that *Dhiiga finceessisaa* (*Bloody Urination*) is caused when the cattle feeding unwanted grass like (*tiriimii*). Eye diseases were caused by insects, flies, dust, pricking by sharp objects and poor blood circulation. Generally, regarding to the sources of cattle ailments, 23 (21.5%) were caused from stored water, 34 (31.8%) were caused from grass grew in cattle breeds, 9 (8.4%) were caused from colobus monkey urine, 12 (11.2%) were caused from urine of hyena, 17 (15.9%) were caused from grass grew in urine of hyena, 57 (53.3%) were caused from lack of cattle shelter, 7 (6.5%) were caused from when they mixed with others wild animals, 14 (13.3%) were caused from insects, flies/ dust, 9 (8.4%) were caused from sharp objects pricking the eye, 18 (16.8%) were caused from their poor blood circulation, 21 (19.6%) were caused from when cattle overfeeding and 36 (33.6%) were lack of grasses and water in their area.

Table 4.4 Cause of Cattle Diseases

S/n	In local name	In English name	Frequency	Percent %
1	<i>Kuufama bishaanii</i>	Stored water	23	21.5
2	<i>Marga soorata loonii keessaa biqilan</i>	Some grass species (clover)	34	31.8
3	<i>Fincaan weennii</i>	Urine of colobus monkey	9	8.4
4	<i>Fincaan waraabessaa</i>	Urine of hyena	12	11.2
5	<i>Biqiloota fincaan waraabessaa keessaatti biqilan irraa</i>	Grass grew in urine of hyena	17	15.9
7	<i>Bakka bultii looniif mijataa hin</i>	Lack of cattle shelter	57	53.3

	<i>taane irraa</i>			
8	<i>Wal makiinsa bineensota bosonaa waliin</i>	Mixing with wild animals	7	6.5
9	<i>Ilbiisota, awwaara/ dhukkee</i>	Insects, flies or dust	14	13.1
10	<i>Meeshaalee qara qaban</i>	Sharp objects pricking the eye	9	8.4
11	<i>Rakkina tatamsa'ina dhiigaa</i>	Poor blood circulation	18	16.8
12	<i>Soorata humnaa olii</i>	Overfeeding	21	19.6
14	<i>Hanqina soorataa fi bishaanii</i>	Lack of feed and water	36	33.6

As shown in table above most of the respondents mentioned that, there were a lot of cattle shelter/ house of cattle in this local area. Different respondents mentioned that, lack of shelter preparation for cattle was the main reason to cause cattle sicknesses. For instance, the different types of cattle shelter known in this community include in their main house, separate constructed house and cattle shelter attached with the main house. Based on this types of cattle shelter 9 (8.4%) of respondents were constructed cattle shelter in the main house, 27 (25.2) were attached cattle shelter to their main house and 71 (66.4) were separately constructed cattle house as shown as follows.







Figure 4:1 Cattle Shelter

4.1.6 Types of Natural Feed for Cattle

There are numerous cattle feeds recognized as worldwide. Some of these cattle feeds are adapted to the local climate and others were bred by humans for specialized uses. In this study area, there are different types of cattle feeding. From these kinds some of them include *citaa* (straw), *marga* (grass), *eebicha* (*Vernoniaamygdalina*) and *dhummuugaa* (*Justiciasimperiana*).

Table 4.5: Types of Natural Feed for Cattle.

Types of feeds for cattle	In local name	In English name
	<i>Citaa</i>	Amputated/ straw
	<i>Marga</i>	Grass
	<i>Eebicha</i>	<i>Vernonia amygdalina</i>

	<i>Dhummuugaa</i>	Justicia schimperiana
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4.1.7 Source of Indigenous Knowledge Medicine Practices

Plants have been used as a source of medicine in Ethiopia from time immemorial to treat different ailments. As collected data shows that and listed in the below table 4.6, most of respondents acquire indigenous knowledge medicine practices of cattle diseases treatment from God, father/mother, from wife/ husband, from their uncle/aunt, from traditional healers, through trial and error, from their sister and brother. Regarding to the sources of indigenous knowledge medicine practices 22 (20.6%) of respondents were acquired this knowledge from God, 31 (29%) were educated from grandfather/ grandmother, 26 (24.3%) were learned from neighbor of traditional healers, 47 (43.9%) were learned from their father/ mother, 19 (17.8%) were learned through trial and error, 24 (22.4%) were learned from their husband/ wife, 20 (18.7%) were learned from sister/ brother, 18 (16.8%) were learned from their uncle/ aunt and the left 9 (8.4%) were acquired this source of knowledge from their In-law.

Table 4:6 Sources of indigenous knowledge medicine practice.

No	In local name	In English name	Frequency	Percent (%)
1	<i>Waaqa</i>	God	22	20.6
2	<i>Akaakayyuu/ Akkoo</i>	Grandfather/Grandmother	31	29
3	<i>Ollaa irraa</i>	Neighbor	26	24.3
4	<i>Abbaa/ haadha</i>	Father/ mother	47	43.9
5	<i>Yaaliidhaan</i>	Trial and error	19	17.8
6	<i>Abbaawarraa/ haadhawarraa</i>	Husband/ wife	24	22.4

7	<i>Obboleetii/ obboleessa</i>	Sister/brother	20	18.7
8	<i>Eessuma/ adaadaa</i>	Uncle/aunt	18	16.8
9	<i>Soddaa</i>	In-law	9	8.4

4.1.8 Mode of Herbalists Prevent Cattle Diseases

According to obtained data shows, there were different modes used to prevent and control cattle diseases in the study area. There are different types of cattle diseases and each disease has its own symptoms. For instance, these types of diseases may be categorized into internal and external diseases. Internal cattle diseases are the types of diseases that affect the internal parts of cattle and external cattle diseases are other types of cattle diseases that affect the external parts of cattle. So, based on these different types of diseases and symptoms shown on the cattle, local herbalists have their own mode of treatment and prevent various cattle ailments. Therefore, the herbalists have the ability to prevent before the cattle was affected by diseases and also have the talent to treat after the cattle was affected by different ailments. For example, *Cinii* (Scabies) was the disease that was mentioned by most respondents as being preventable by using mineral water (*hora obaasuun ykn qaama isaaniitti naquun*) and plant parts available from their local area. Also some of the respondents believed that Trypanosomiasis (*Gandii*) can be prevented by prepare a good shelter for a cattle that can be treat the rain and cold from shelter. It was indicated that placenta retention could be avoided in a pregnant cow by feeding it with ashes mixed with water. As data obtained from respondents shows that, *Gororsiisaa* (Salivation) was another cattle disease known and familiar in this local area. This types of diseases was prevented using protect cattle from dew drop existed from the grass during the time was morning. Eye diseases were disallowed through protect cattle from sharp materials and Paratuberculosis were also prevented through protect from different breeds that affect cattle.

4.1.9 Indigenous Knowledge Practices for Cattle Diseases Diagnosis and Treatment

According to the World Health Organization, at least 80% of people in developing countries depend largely on indigenous knowledge for the control and treatment of various diseases affecting both human beings and animals (Jabbar, 2005). As information accessed from different herbalists of study area, there are a lot of cattle diseases known in this area. However, as the number of cattle diseases are there, also they know different methods/ mechanism for prevent and treat based on the

symptoms available on the their cattle. The following table 4.7 shows that the overall types of cattle diseases known in the study area with their well-known symptoms.

Table 4:7: List of cattle ailments and symptoms.

No	Name of cattle diseases	Name of cattle diseases in English	Common Symptoms of different cattle diseases
1	<i>Bishooftuu</i>	Blackleg	- <i>Garaa bokoksa</i> (abdominal distention), - <i>gogaa fi foon gidduutti sagalee dhageessisa</i> (crepitation), - <i>Hin furreessa</i> (nose discharge), - <i>Harka caccabsa</i> (arm joint tenderness),- <i>fincaan dhowwa</i> (difficulty of palling urine), - <i>dhoqqee dhowwa</i> (difficulty of palling feces).
2	<i>Qoraattii-arrabaa</i>	Actino- basilliosis	- <i>Soorata dhowwa</i> (loss of appetite) or inability to eat or drink for several days, - <i>Hin urgufa/hollachiisa</i> (shivering), - <i>Arraba guba</i> (febrile of tongue), nodules and ulcers on the tongue. - <i>Dhagna guba</i> (body fever), - <i>Arraba mucuceessa</i> (slippage of tongue), Drooling saliva, rapid loss of condition.
3	<i>Abbaa-sangaa</i>	Anthrax	- <i>Ni argansiisa</i> (fast breathing), - <i>Garaa bokoksa</i> (abdominal distention), - <i>Sarduun kuffisa</i> (loss of conciousness).
4	<i>Maasaa</i>		- <i>Qeensa gidduu guba</i> (febrile between nails) - <i>Ni okkolchiisa</i> (hope in place) - <i>Qeensa buqqisa</i> (nail destruction).
5	<i>Gandii</i>	Trypanosomiasis	- <i>Bifa kaassisa</i> (hair faising) - <i>Cidhaan buusa</i> (korma yoota'e) (scrotal drop) - <i>Gurra buussisa</i> (ear drop)

			<p>-<i>Titiisatu itti heddumaata</i> (overwhelming of fly)</p> <p>-<i>Nyaatanii hin quufan</i> (polyphagia)</p> <p>-<i>Funyaan gogsa</i> (nose dry)</p> <p>-<i>Qufaa</i> (cough)</p> <p>-<i>Dhoqqee gogsuufi qal'isuu</i> (constipation and diarrhea)</p> <p>-<i>Gateettii gurraachessa</i> (shoulder dipigmentation).</p>
6	<i>Maaree</i>	Skin disease	<p>-<i>Gogaa/ dhaqna madeessa</i> (skin or body vicer), weight loss, soorata dhowwa (lack of appetite) and shortness of breath</p>
7	<i>Dhiiga finceessisaa</i>	Bloody urination	<p>-<i>Dhiiga finceessisa</i> (bloody urination)</p> <p>-<i>Mar'imaan walitti buta</i> (intestine tightness)</p> <p>-<i>Cidhaan dhiitessa</i> (scrotal swelling)</p> <p>-<i>Ni ajjeesa</i> (high mortality).</p>
8	<i>Simbira</i>	Bird	<p>-<i>Qaama isaa karaa fincaaniin kan seenuudha</i> (urinary tract infection)</p> <p><i>Rifeensa naannoo qaama saalaa irraa kan fixuudha</i> (genital hair loss).</p>
9	<i>Garaa kaasaa/ dhoqqee qal'isaa</i>	Paratuberculosis	-Diarrhea, wasting, loss weight, decreases milk production.
10	<i>Gatachiisaa</i>	Brusulosis	-Abortion, stillborn, weak calf born and retention of fetal membranes.
11	<i>Dhukkuba ijaa</i>	Pink eye	-Copious watery eye discharge, aversion to sunlight, signs of irritation and reddening and swelling of the eyelids.
12	<i>Dhiitessaa/mucha doomsaa</i>	Mastait/ Breast cancer of cattle	<p>-<i>Qaama isaanii dhiitessa</i> (body swelling)</p> <p>-<i>Ni malaassisa</i> (formation of pus)</p> <p>-<i>Sochii dhowwa</i> (unable to move)</p>






			- <i>Ni kokottoonfachiisa</i> (body tightness).
13	<i>Mandaraarraa</i>	Foot and mouth diseases (FMD)	-Fever, blisters in the mouth and on feet, drop in milk production, weight loss, loss of appetite, quivering lips and frothing of mouth, cows may develop blisters on teats, lameness.
14	<i>Dhullaa</i>	Swelling	-Fever, loss of appetite, depression and dullness, suspended rumination, rapid pulse and heart rates, difficult breathing, lameness in affected leg, crepitation swelling over hip, back & shoulder in early stages whereas cold and painless inter.
15	<i>Furfura</i>	Blotting	-Suddenly death, distended left abdomen, Usually associated with pain, discomfort, and bellowing.
16	<i>Cittoo /Qanxoo</i>	Scabies	-Itching, thin and severe and usually worse at night
17	<i>Gororsiisaa</i>	Pasteurellosis	-A lot of salivation, emesis, and excitability, severe prolonged shivering, dyspnea, cyanosis, exhaustion and death.

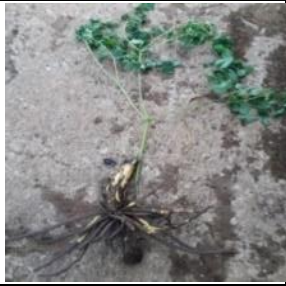





The herbalists of the study area used the following listed plants, minerals and other animals to control and treat cattle ailments based on their previous experiences and their own knowledge.






4.1.10 Plant Name and Parts Used to Treat Particular Cattle Health Problem

As data obtained from respondent of study area, there are numerous plants accessed in this community to diagnosis and treat different cattle diseases. From this some of the plant name and part used to treat different cattle ailments are described in the following table 4.9

Table 4.8: Plant name and part used for cattle disease treatment.

No	Image	Local name	Scientific name	Diseases it cures	Parts of the Plant used	Mode of preparation
1		<i>Faca'aa</i>	<i>Cucumisfici follius</i>	<i>Bishooftuuf</i>	<i>Hidda</i> (root)	Pounding the roots with water and then get drink.
2		<i>Kallachoo</i>	<i>Combretum aculeatum</i>	<i>Dhiiga finceessisaa f(bloodyurination) gaararraa itti dabalanii</i>	<i>Hundee</i> (root)	Pounding the roots with <i>Gaararraa</i> (<i>Chameleon</i>) and with water and then get drink.
3		<i>Timboogordii</i>	<i>Nicotianata bacum</i>	<i>Gandiidhaaf ,garaa ciniinnaaf, raammoo garaa keessaaf</i>	Parts	Pounding with water and then get drink.
4		<i>Kottefardaa</i>	<i>Sidaschimp erana</i>	<i>Dhoraaf, dhukkuba gogaaf</i>	<i>Baala</i> (leaves)	Pounding the leaves with water and then get drink.
5		<i>Maxxantuu bunaa</i>	<i>Englerinaw oodfordioides</i>	<i>Dhoraaf</i>	<i>Baala</i> (leaves)	Pounding the leaves with water and then get drink.

6		<i>Siraabusoo</i>	<i>Thalictrum hynchocarpum</i>	<i>Bishooftuuf</i>	<i>Hidda</i> (roots)	Pounding the roots with water and then get drink.
7		<i>Tunjoo</i>	<i>Piper capense</i>	<i>Maaree</i>	<i>Baala</i> (leaves)	Pounding the leaves with water and then get drink.
8		<i>Kisee</i>	<i>Ocimum lamifolium</i>	<i>Dhiitoof</i>	<i>Baala</i> (leaves)	Pounding the leaves with water and then get drink.
9		<i>Ceekaa</i>	<i>Calpurnia aurea</i>	<i>Ciniif, injiraanii fi tafkiif</i>	<i>Baala</i> (leaves)	Pounding the leaves with water and wash their skin.
10		<i>Eebicha</i>	<i>Vernonia</i>	<i>Muchadoome banuuf, aannan baasuuf</i>	<i>Baala</i> (leaves)	Feed after collect the laves
11		<i>Goodarree</i>	<i>Colocasia esculentum</i>	<i>Dilluu garaatti hafe baasuuf</i>	<i>Baala</i> (leaves)	Pounding the leaves with water and then get drink.

12		<i>Qomonyoo</i>	Bruccaantidysenterica	<i>Madaaraammoo baaseef</i>	<i>Ija</i> (seeds)	Pounding the seeds with water and then get drink.
13		<i>Dhummugaa</i>	Justice schimperiana	<i>Gororsaaf</i>	<i>Baala</i> (leaves)	Feed after collect the leaves.
14		<i>Hadheessa</i>	Tecleanobilis	<i>Dhiitoof</i>	<i>Baala</i> (leaves)	Pounding the leaves with water and then get drink
15		<i>Afarfattu</i>	Dracaena steudneri	<i>Dil'uu kan buusuu diddeef, Bishooftuuf.</i>	<i>Jirma/hidda</i> (crab/roots)	Pounding the roots /barks with water and then get drink
16		<i>Hagamsa</i>	Carissa spinarum	<i>Muchadoomeef</i>	<i>Baala</i> (leaves)	Pounding the leaves with water and then get drink

As data obtained from respondents of study area revealed based on the plant used as drug for prevent and treat different cattle diseases, most of plans were not cultivated for this purpose in this area. Such kind of plants was growing naturally in different area, in forest and other environment. So, farmers used these types of plants for drugs during solve different such kind of problems. However, some of the plants used as a drug for prevent and treat different cattle diseases were

cultivated for other purpose. For instance, the main benefit of plants that is cultivated was used for human being in case of feeding purposes and to make beauty the environment.

4.1.11 Indigenous Knowledge of Cattle Drugs Preparation.

Indigenous knowledge health practices drug were prepared from incorporating plant, animal and mineral based medicine and exercises applied singly or in combination to treat, diagnosis and prevent different illnesses. As respondents of study area mentioned before their cattle were affected by different diseases and after their cattle were affected by different illness they use their own knowledge to diagnosis and treat different cattle diseases. They acquire and prepared the drugs from different sources. For example they access these drugs and prepare from plant near to their environment, minerals and also from animals. As herbalist of study area mentioned, medical drugs for cattle diseases diagnosis and treatment were collected from different plant parts (leaves, fruits, barks, seeds, roots and dependent plant) and also prepared and accessed from different minerals available from their environment and other animals (meat, skin) from their society. Regarding to medical drug preparation to diagnosis and treatment different cattle diseases using indigenous knowledge, out of 107 respondents 76 (71%) were mentioned that the main sources of the drug was plants, 23 (21.5%) of respondents were mentioned minerals and the rest 8 (7.5%) were prepared from animals.

According to data collected from respondents from study area, in addition to plants parts used some minerals are also used by the local herbalists to cure cattle diseases. For example, the salt water is frequently given to the animal suffering from foot and mouth disease. The powder of gypsum is used to cure the broken horns of cattle. To cure or protect cattle from diarrhea and cattle skin problem, different local herbalist use *hora* (mineral water) in the form of washing their skin and get drink for different internal cattle diseases.

4.1.12 Modes of Indigenous Knowledge Plant Drug Preparation

In traditional herbal medicine practices, herbal remedies are prepared in several rather standardized ways which usually vary based upon the plant utilized, and sometimes, what condition is being treated. The data gathered argued that different herbalists of study area, after the collection of the plants and other drugs from different environmental zones in their society, they prepare the

medicine in the form of solid, liquid and powder and sometimes mixed with *damma* (honey), *daaraa* (ash) and also mixed different types of plant parts for different types of cattle illnesses. So, different respondents of the study mentioned that, such kind of drug preparation for prevent and treat different cattle diseases were the easiest to prepare and also applied in this area. Based on different cattle diseases also the modes of drug preparation is also different. These means that based on cattle diseases the herbalists may uses only one plants parts or they mixed two or more than two plant parts during cattle diseases drug preparation as locally. It has been mentioned by most of the herbalists that they prepare the drugs either earlier in the absence of cattle affected or at the moment based on their diseases. As the data collected indicated on mode of drug preparation 27 (25.3%) of respondents mentioned that the drug were prepared in the form of crushing, 40(37.4%) of respondents mention in the form of squeezing, 9 (8.4%) of respondents told in the form of chewing, 17 (15.9%) were in the form of fumigating, 13 (12.2%) were in the form of chopping, 15 (14%) were in the form of extract with cold water, 10 (9.4%) were in the form of roasting, 68 (63.6%) were in the form of wrapping and 23 (21.5%) were prepared in the form of heating different plant parts with water, honey, ash, minerals and other animals meat or skin.

The following table 4.9 shows the overall method of indigenous knowledge medical plants preparation.

Table 4.9: Methods of Indigenous Medicinal Plants Preparation.

S/n	Methods of preparation in local name	Methods of preparation in English	Frequency	Percent %
1	<i>Hurreessuu/ unkuteessuu</i>	Crushing	27	25.3
2	<i>Cuunfuu</i>	Squeezing	40	37.4
3	<i>Alanfachuu</i>	Chewing	9	8.4
4	<i>Aarsuudhaan</i>	Fumigating	17	15.9
5	<i>Muruu</i>	Chopping	13	12.2
6	<i>Bishaan qorraa keessa cuubuudhaan</i>	Extract with cold water	15	14
7	<i>Waaduu</i>	Roasting	10	9.4
8	<i>Walitti makanii tumuu ykn daakuudhaan</i>	Wrapping	68	63.6
9	<i>Hoo'isuudhaan</i>	Heating	23	21.5

4.1.12.1 Mix and Pound (*Walitti makanii tumuudhaan*)

This method of medical preparation is the way in which after herbalist's collected different parts of plant that is used for cattle diseases treatment and mixed each part in *mooyee* (mortar) with water and then bit each plant parts correctly with water and changed into liquid form. This mode of drug preparation for cattle diseases treatment can be prepared without limiting both sex (Male and Female) or both men and women can prepared this medical in easy way. Then after this they used different tools and taken to cattle that is affected by diseases or illness.



Figure 4.2Preparation methods of traditional medicinal plants.

4.1.12.2 Flour by mixing (*Walitti makanii daakuudhaan*)

This is also another form of cattle diseases medical preparation that is done using *dhagaa daakuu* (flour stone) after collected and mixed each plant parts used from different environment with adding water. This type of medical preparation can be prepared only by women according to their culture and norms in society.

4.1.13 Modes of Cattle Diseases Treatment Application

According to data collected from different group of respondents from study area, the modes of application for cattle diseases illness drugs are prepared and applied in the form of get drink (*bulbulanii obaasuu*), fever body part (*dhaqna gubaa*), put on (*itti firfirsuu*), fumigating (*itti aarsuu*), bleeding tongue (*arraba dhiigsuu*). This mode of application was implemented based on the types of cattle diseases. For example, if it was internal diseases, the drug was prepared in the form of liquid and implemented in the form of make drink a liquid of drug mixture.

4.1.13.1 Mixture and Get Drink (*Bulbulanii Obaasuu*)

This mode of application is the way of preparing cattle diseases drugs in the form of mixed plant parts used (leaves, roots, seeds, barks and fruits) with water and also adding ash, honey and made it liquid and take it through their mouth, eyes and nose. During this implementation the local herbalists used different tools to take the drugs for the cattle. They used the tools that are easy to insert in the cattle mouth and not broke easily during drugs implementation.



Figure 4.3 Modes of cattle diseases prevent and treatment application

4.1.13.2 Fever body part (*Gubaa/ Diimessaa*)

Gubaa/ fever is the methods of healing cattle diseases in the form of indigenous knowledge and applied using *haamtuu* (sickle) and other metal by inserting in the fire for the time being and drug

and pull on the part of cattle body around their neck and make it looks like + or x letter on their body as shown on the following figures 4.4.



Figure 4.4 Modes of cattle diseases treatment application

4.1.13.3 Put on (*Itti firfirsuu*)

According to data collected from respondents this form of indigenous knowledge medicine practice of cattle diseases treatment is implemented after herbalists collected medical from different area and prepared the drugs or plants parts used in the form of solid and liquid and put on the body parts of the cattle that is affected by diseases.

4.1.13.4 Sniffing (*fuunfachiisuu*) or fumigating (*itti aarsuu*).

This form of medical is applied after collected and prepared the drugs that is in the form of solid and also prepare a fire on the a piece of clay made plate (*qiraacii*) and add the drugs on the fire in the tools carry that fire. Then, it implemented when the drugs starts to smoke and put it under the faces/ or body parts cattle affected by diseases.

4.1.13.5 Bleeding Tongue (*Arraba dhiigsuu*).

This is another form of implementing cattle diseases drugs by cutting the *arraba* (tongue) of the cattle and *dhiigsuu* (bleeding) unwanted blood that stored in the tongue of the cattle. During this time, different herbalists used different tools for bleeding the blood stored in the tongue of the cattle. For example, they used *argisa* (aloemacrocarpa), *qoraattii* (thorn), *limmoo/ marfee* (needle) and etc. According to some respondents the main cause of this disease was when cattle drink water stored in dust places.



Figure 4: 5 Focus group discussion based on modes of cattle diseases treatment application

4.1.14 Part of Plants used to Prevent and Treat Cattle Diseases

As respondents of study area mentioned that fruits (*daraaraa biqilootaa*), roots (*hidda biqilootaa*), seeds (*ija biqilootaa*), leaves (*baala biqilootaa*), barks (*qola/ jirma biqilootaa*) and dependent plants (*maxxantuu biqilootaa*) were the main plants parts used during cattle diseases medicines preparation. From plants parts used during drugs preparation 30 (28%) drugs were prepared from plants fruits, 38 (35.5%) drugs were prepared from plants roots, 25 (23.4%) drugs were prepared

from plants seeds, 72 (67.3%) drugs were prepared from plants leaves, 43 (40.2%) drugs were prepared from plants barks and 24 (22.5%) drugs were prepared from some dependents plants available on other plants.

Table 4.10: Plants parts used for medicinal preparation.

S/n	Plants parts used in local name	Plants parts used in English name	Frequency	Percent (%)
1	<i>Daraaraa biqilootaa</i>	Fruits	30	28
2	<i>Hidda biqilootaa</i>	Roots	38	35.5
3	<i>Ija biqilootaa</i>	Seeds	25	23.4
4	<i>Baala biqilootaa</i>	Leaves	72	67.3
5	<i>Qola/ gogaa/ jirma biqilootaa</i>	Barks	43	40.2
6	<i>Maxxantuu biqilootaa</i>	dependent plant	24	22.5

In this study area, herbalist’s used different instruments for cutting and collecting medicinal plant from the original sources/ from the forests or from where the medicinal plants available. Mostly they use to cut and collect the medicinal plants by hands and additionally, they used instrument like Billa (knives) and *Eeboo* (spear) to cut the areal and underground part of the medicinal plants that are used as herbal.

Most of plants parts used as herbal medicine for cattle diseases treatment are cultivated and some of this is naturally available/ not cultivated in the environment. The cultivated plants are used for these purposes/ for treating of cattle diseases and for others cases. For example, most of the plants used for cattle diseases treatment that is cultivated are used in other ways for human breeding’s.

4.1.15 Measurement of Indigenous Knowledge Medicine

After identifying of the illness of the cattle diseases, the herbalist manage the drug which is either prepared earlier or at the moment. The herbalists have mentioned that determination of the dosage of the drugs depend on the type of cattle illness and the age of the cattle. The dosage is determined by indigenous methods which have been under use for generations and descended down together




with the medicinal knowledge. They also mentioned that drugs taken in liquid forms are measured by water glasses, a glass bottle (*qaruuraa*), calabash (*hullee*).





According to herbalists, there are illnesses to which the medicines are taken once and there are also illnesses to which the medicines are taken two and more than two days. However, the amount determination of the drug of the same disease may vary from herbalist to herbalist in the local community which may be the challenge to use the indigenous medicine. For example, one herbalist uses water glass to determine the quantity depending on the type of cattle illness and the age of cattle, but another herbalist's use *qaruuraa* (bottle).

4.1.16 Tools used during Indigenous Knowledge Medicine implementation.

Herbalists were use different tools during implementation of indigenous knowledge medicine practice for diagnosis and treat cattle diseases. Based on the signs shown on cattle and affected by different diseases they use different tools for treat diseases. For example, herbalists use *sickle* (*haamtuu*) for treating cattle affected by lack of neck movements as they want. These types of diseases were caused based on problem of blood stored and also problem of cold (lack of well preparation of cattle shelter). Additionally they mentioned that they used *needle* and *thorn* for bleeding blood stored in tongue of the cattle and use mortar and calabsh during preparation and implementation of the drugs.

Table 4.11 Tools used during indigenous knowledge medicine implementation.

S/N	Tools	Local names of tools	Name of tools in English	Purposes
1		<i>Haamtuu</i>	Sickle	Sickles are used to when internal part of cattle are affected by illness and fever body part of the cattle are needed to treat diseases.
2		<i>Qaruuraa</i>	A glass bottle	This material was used during when applying cattle drugs that are in prepared in the form of liquid (for internal cattle diseases).
3		<i>Lilmoo/ Marfee</i>	Needle	It is used to treat cattle diseases when blood was stored in the tongue of cattle and used to bleeding of blood stored.

4		<i>Argisa</i>	Thornofaloe macrocarpa	Thorn ofaloemacrocarpais also another way used for bleeding blood stored in cattle tongue optionally with thorn.
5		<i>Qoraattii</i>	Thornof a plant	Thorn isused for bleeding blood stored in the tongue of cattle in traditional way.
6		<i>Hullee</i>	Calabash	A traditional utensil made of calabash used to pour a liquid traditional drug through mouth of cattle
7		<i>Mooyyee</i>	Mortar	A traditional utensil made up of wood used to pound grain, coffee, traditional medicine.

4.1.17 Mechanism to Acquire, Store, Preservations and Transfer IK

Different respondents from study area mentioned that, there is various application area of indigenous knowledge practices that acquired from parents, god and through experiences and until now using it. Respondents of the study stated that, this type of knowledge was generally been passed from generation to generation by word of mouth from parents to child typically exchanged through personal communication from main to learner, from neighbor to neighbor. Therefore data collected from the indigenous knowledge practitioners about indigenous knowledge acquisition, store, preservation and transfer were presented as follow:

4.1.17.1 Indigenous Knowledge Acquisition

According to the data collected and evaluated from the respondents of study area, indigenous knowledge practice and healing of cattle diseases treatment area well adapted in society. Thus knowledge and practice of indigenous knowledge for cattle diseases treatment was accepted by the society and still serving the community. As mentioned, based on the acquisition of indigenous knowledge, all herbalist do not gain the knowledge of prevent and healing cattle diseases treatment from the same source in study area. Some herbalists had acquired the knowledge of healing cattle diseases treatment and skill from their parent (father, mother, aunts and uncles). Additionally, most of respondents were acquired this knowledge through experience, observe during knowledge was implemented and also learned from relative herbalist. Furthermore, different respondents of study area stated that this knowledge was acquired from gift of God.

4.1.17.2 Mechanism to Store Indigenous Knowledge

Regarding to store indigenous knowledge practices, any such kind of knowledge practices needed to store in order to transfer for future and for problem solving. Also all the participants of this study encourage that, as this knowledge practices was stored and extend for new generation in documented format. As information obtained from study area, “any types of indigenous knowledge have vital in different area (for economic development, agriculture, education sector, in healthcare and land preservation)”. So, to safeguard this indigenous knowledge from going into loss and saving them for future generation any individual person should have to play its role to store this valuable knowledge practices. Since indigenous knowledge was passed down from generation to

generation through orally, most of respondents of study area stated that the main mechanisms used to store was documenting as a book the mode of preparation and implementation of the knowledge. Furthermore, they specified that these types of existed knowledge of traditional medicines practices of diseases treatments should be respected promoted and communicated widely in each country through documenting using information communication technology.

4.1.17.3 Mechanism to Preservations Indigenous Knowledge

Indigenous knowledge preservation is the way of conserving and protecting the knowledge from the loss. This knowledge is preserved in case of kept in recording format and additionally training the beneficiary of the knowledge all the new generation for future. Moreover, as data collected from different respondents of the study area shows, the main mechanisms used for preserving this indigenous knowledge is cultivating the main plants used as drug of cattle diseases treatment in one places and also make it familiar in internationally based on their application/ implementation and modes of preparation. Furthermore, most of respondents mentioned that, the significance of preserving indigenous knowledge practices in different area allows the generation as they resolved their problem by their own knowledge and proves their skill and practices. For instance this knowledge was preserved through respecting the familiar herbalists and accessing and practices the knowledge for problem solving.

4.1.17.4 Mechanism to Transfer Indigenous Knowledge

According to data gathered from the study area, indigenous knowledge medicine for cattle diseases prevents and treatment was transferred through oral and practice. Most herbalists of indigenous knowledge medicine for cattle diseases prevent and treatment prefer to transfer their knowledge verbally either to their family members or trusted person in neighbor. This indigenous knowledge medicine practice and skill requires willingness, continued practice and recalling ability to distinguish various healing plants, minerals and other animals' meat and skin. In the context of study area, indigenous knowledge medicine has been usually transferring from herbalist parent to a preferred son, daughter or may be outside family member. If herbalist does not have a son/daughter or if the herbalist's son/daughter does not attract his/ her attention, he/she may transfer the knowledge to one of his/her relative's son/daughter. Mostly, the herbalist has a habit of

to transfer the indigenous medicinal knowledge to a person who respects them and has good attitude towards the knowledge practice.

Through focus group discussion with respondents based on indigenous knowledge transfer “Mr. Umata Boke said that “I am happy to transfer my medicinal knowledge that I used during cattle diseases prevent and treatment and other indigenous knowledge medicine to my son or daughter who is honest, respect, truthful and trustworthy individual”. However, Mr. Buli Galata wants to transfer his knowledge only for his son only, but does not want to transfer his medicinal knowledge to his daughters. They mentioned the reason as the females will take the knowledge out of the family member when they get married and also he believes that medicinal knowledge is a resource (income) and he wants to share for only his male children. Based on knowledge transfer, most of respondents of study area stated that this knowledge were transfer through work together (*daboo*), through storytelling, respecting the practices, protecting sources of indigenous knowledge medicine and show the overall approach of practices and implementation to learner.

According to data gathered from respondents and different herbalists from study area, documenting indigenous knowledge in the form of books, recordings and using information and communication technologies during store of indigenous knowledge can be used from the loss indigenous knowledge. So, for next generation unless it is formally well codified, documented and transfer it is in danger of being lost.

They also stated that, these types of knowledge practices of diseases treatment can be documented in the form of expressive and organization in the form of texts such as reports, inventories (for example, lists of plant species, tables listing remedies and their preparations, etc.), advertising in the form of media, representing in the form of dramas, stories, songs, using digital database that includes the list of diseases names and drugs used , mode of preparation and application and their specificities, in both local and international languages.

Additionally, as data collected from study area, farmers and all local herbalists uses their own local knowledge for treating different types of cattle diseases. For transferring their knowledge from one generation to next generation they used different methods in different ways orally. For example, they transfer their knowledge through working together (*Daboo*), dramas, stories, songs according to norms, custom and cultures in the communities. Additionally, to clarify the

perception and significance for their cattle local herbalists explain in the form of songs look like as follows:

“Looni yaaloonishee Looni yaaloonishee

Loontu maal hin taane waan loonii maaltu badaa ta’ee?

Kotteen shinii ta’aa, kan bunaan dhuganii

Gaafni fal’aan ta’aa, kan marqaan nyaatanii

Erbeen latii ta’aa, kan irra bulanii

Foon irbaata ta’aa, kan ittiin bulanii

Faltiin qoraan ta’aa, Kan ittiin bilcheessanii.

Looni yaaloonishee, afaaniin huuba guurii Kotteen barakaa guurii”.

When it is translated it means:

“Oo cattle oo cattle

What cattle do not and what made cattle bad

Hootprint would be a cup of coffee

Horn would be a spoon that is used for eat a porridge

Meat would be a dinner that to eat

Compost would be firewood to use for cooking”.

4.1.18 Strategies used for store, preserve and transfer indigenous knowledge

As data collected from study area confirmed, any individual person or government should be participate in order to store, preserve and transfer indigenous knowledge practices. The main strategy of store, preserve and transfer this knowledge practices was protect the knowledge from loss. According to data gathered from community, this below points is used as the strategies for store, preserve and transfer indigenous knowledge of cattle diseases treatment in this local

community. These points include: Make it as internationally modes of application and preparation, done strong study based on this indigenous knowledge, teaching new generation as it is historically, make it clear as it is sources of income and make it familiarity in case of law/ or legally and officially.

4.1.19 Challenge of preserve, store and transfer Indigenous Knowledge practices.

As herbalists mentioned there are a lot of challenges to knowledge preserve, store and transfer indigenous knowledge. The collected data depicted that the main challenge to protect, store and transfer of indigenous knowledge were most of children of herbalists and other young were not willing to receive the knowledge by considering the practice as a primitive or manifestation of uncivilization and think as backward practice. This knowledge is not captured or recorded in print or electronic media format. Its mode transmission was by secrecy, transmitted orally from generation to generation. Son/daughter of herbalists have unwillingness of practitioners to document and disclose the source, content, method and application of their drugs and is not living together with the herbalist parents.

Additionally another challenge to transfer indigenous knowledge were most of both female and male young perceived indigenous knowledge as an outdated knowledge or have a poor recognition on indigenous knowledge, negative attitudes and lack of awareness, as well as lack of interest to share and received from each other, lack of fitting intellectual property right for the herbalists. Also Lack of similar mode of drug preparation and implementation was another challenge to preserve, store and transfer this knowledge.

4. 1.20 Challenge occur during Indigenous Knowledge medicine preparation

According to data gathered from different herbalists of study area indicated, there are a lot of challenges occur during indigenous knowledge medicine practices preparation and implementation. As they mentioned there is no well-known measurement tools used as generally. Different herbalist uses their own tools to measure the drug and estimated the amount of drug by them selves. So this lack of correct storage measurement during application/ measure tools have its own problem or cause another difficulty to diagnosis and treat different cattle diseases. Additionally, drug contamination was another challenge as the stated during this data collection. This drug contamination is a way in which herbalists mixing or substituting the original drug

material with other useless parts of same or different plant or harmful substances or drug which do not confirm with the official standards. This challenge was cause another problem if it was not mixing different drug parts proportionally. Additionally other challenges include imperfect preparation. This challenge were occur when non removal of associated structures (stems are collected with leaves, flowers, fruits. non-removal of undesirable parts or structures are not removed from the original drugs used.

Based on the challenge occur during indigenous knowledge medicine practice preparation, 39 (36.5%) were occur lack of correct measurement, 33 (30.8%) were occur during mixing or substituting the original drug material with other useless parts of different plant or harmful substances and 35 (32.7%) were occur in case of imperfect preparation.

4. 1.21 Developed System Based on the Finding

Based on the finding the researcher has been developed a rule based system. Rule based systems are part of artificial intelligence that uses rules as the knowledge representation for knowledge coded into the system. The definitions of rule based system depend almost entirely on expert systems, which are system that mimic the reasoning of human expert in solving a knowledge intensive problem. Instead of representing knowledge in a declarative, static way as a set of things which are true, rule based system represent knowledge in terms of a set of rules that tells what to do or what to conclude in different situations.

A rule-based system is a way of encoding a human expert's knowledge in a fairly narrow area into an automated system. It is simply created by using a set of statements and a set of rules that specify how to act on the assertion set. Rules are expressed as a set of if then statements (called IF-THEN rules or production rules) as shown in below figures.

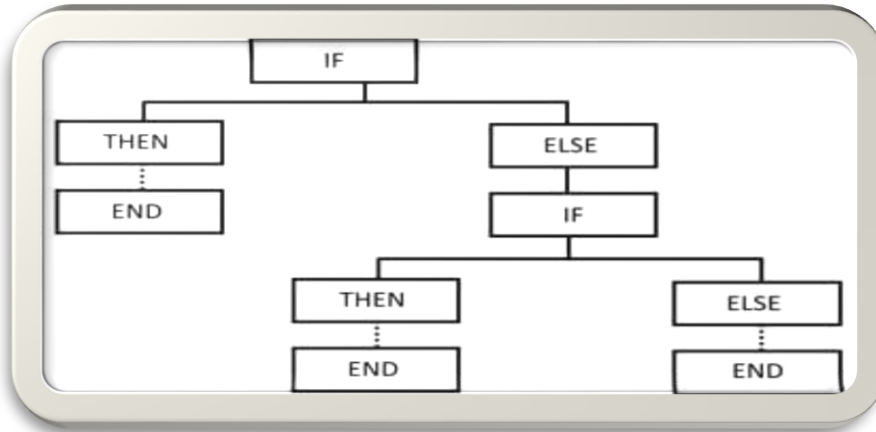


Figure 4.6 Flow diagram of IF-THEN rule expression.

4.1.21.1 Rule based system developed for cattle disease identification

The following is a representation of indigenous knowledge medicine system application to identify cattle diseases based on the symptoms and treat cattle illness. To develop the rule based knowledge of indigenous knowledge cattle diseases identification the researcher employed decision tree algorithm within *IF-THEN* expression. The data of this decision tree algorithm were knowledge obtained from herbalists of study area and used to model knowledge as tree representation. The algorithm display knowledge obtained from herbalists (Condition) and explains types of cattle diseases (result) based on the acquired knowledge. This expression clarifies (read) the overall symptoms of cattle diseases and identifies the types of diseases. Thus, generally the rule was constructed from decision tree and used knowledge obtained from herbalist of study area as data set as shown below:

Rule 1:

If cattle diseases symptoms have abdominal distention, crepitation, nose discharge, arm joint tenderness, difficulty of palling urine and difficulty of palling feces **THEN**, *Bishooftuu* (Blackleg).

Rule 2:

If cattle diseases symptoms have loss of appetite, shivering, febrile of tongue, body fever and slippage of tongue **THEN**, *Qoraattii-arrabaa* (Actino-basilosis).

Rule 3:

If cattle diseases symptoms have fast breathing, abdominal distention and loss of consciousness **THEN**, *Abbaa-sangaa* (Antrax).

Rule 4:

If cattle diseases symptoms have febrile between nails, hope in place and nail destruction **THEN**,
Maasaa

Rule 5:

If cattle diseases symptoms have hair faising, scrotal drop, ear drop, overwhelming of fly, polyphagia, nose dry, cough, constipation and diarrhea and shoulder depigmentation **THEN**,
Gandii (Trypanosomiasis).

Rule 6:

If cattle diseases symptoms have skin or body vicar, weight loss, lack of appetite and shortness of breath **THEN**, *Maaree* (Skin diseases).

Rule 7:

If cattle diseases symptoms have bloody urination, intestine tightness, scrotal swelling and high mortality **THEN**, *Dhiiga finceessisaa* (Bloody urination).

Rule 8:

If cattle diseases symptoms have urinary tract infection and genital hair loss **THEN**, *Simbira*
(Bird)

Rule 9:

If cattle diseases symptoms have body swelling, formation of pus, unable to move and body tightness **THEN**, *Dhiitessaa /muchaaadoomsaa* (Mastait).

Rule 10:

If cattle diseases symptoms have a lot of salivation, emesis, excitability, severe prolonged shivering, dyspnea, cyanosis, exhaustion and death **THEN**, *Gororsiisaa* (Pasteurellosis).

Rule 11:

If cattle diseases symptoms have itching, thin and severe and usually worse at night **THEN**, *Cittoo* (Scabies).

Rule 12:

If cattle diseases symptoms have suddenly death, distended left abdomen, Usually associated with pain, discomfort, and bellowing **THEN**, *Furfuraa* (Blotting).

Rule 13:

If cattle diseases symptoms have Fever, loss of appetite, depression and dullness, suspended rumination, rapid pulse and heart rates, difficult breathing, lameness in affected leg, crepitation swelling over hip, back & shoulder in early stages whereas cold and painless inter **THEN**, *Dhulla* (Swelling).

Rule 14:

If cattle diseases symptoms have Fever, blisters in the mouth and on feet, drop in milk production, weight loss, loss of appetite, quivering lips and frothing of mouth, cows may develop blisters on teats, lameness **THEN**, *Mandaraarraa* (Foot and mouth diseases (FMD)).

Rule 15:

If cattle diseases symptoms have Copious watery eye discharge, aversion to sunlight, signs of irritation and reddening and swelling of the eyelids **THEN**, *Dhukkuba ijaa* (Pink eye).

Rule 16:

If cattle diseases symptoms have Abortion, stillborn, weak calf born and retention of fetal membranes **THEN**, *Gatachiisaa* (Brusellosis).

Rule 17:

If cattle diseases symptoms have Diarrhea, wasting, loss weight, decreases milk production **THEN**, *Garaakaasaa/ dhoqqee qal'isaa* (Paratuberculosis).

4.1.22 Knowledge Modeling

In this study, knowledge obtained from herbalists was modeled as a set of rules. The obtained knowledge was represented using decision tree algorithm to understand types of diseases based on listed symptoms and show the mode of treat different cattle diseases. In this knowledge modeling decision tree is a flow-chart-like tree structure where each node denotes symptoms of cattle diseases and each branch represents to identify types of diseases based on listed symptoms and understand the mode to treat different cattle diseases. This decision trees are constructed in a top-down as shown as follows.

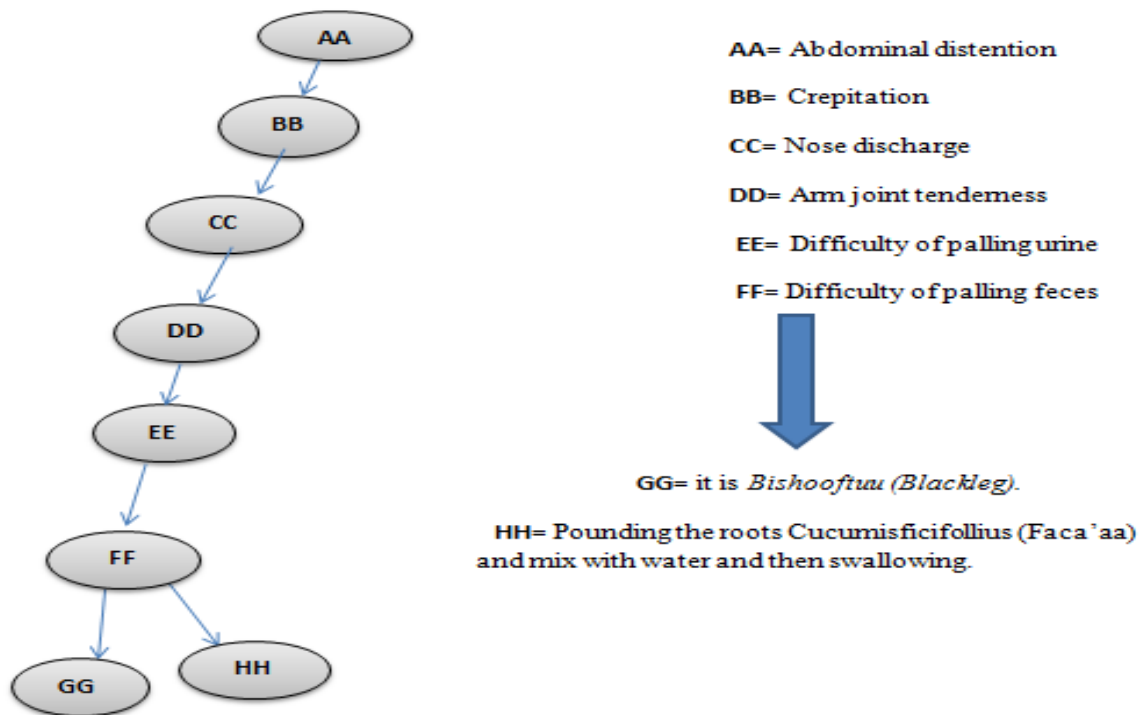


Figure 4:7 Blackleg Cattle Disease Symptoms and Recommended Mode of Treatment.

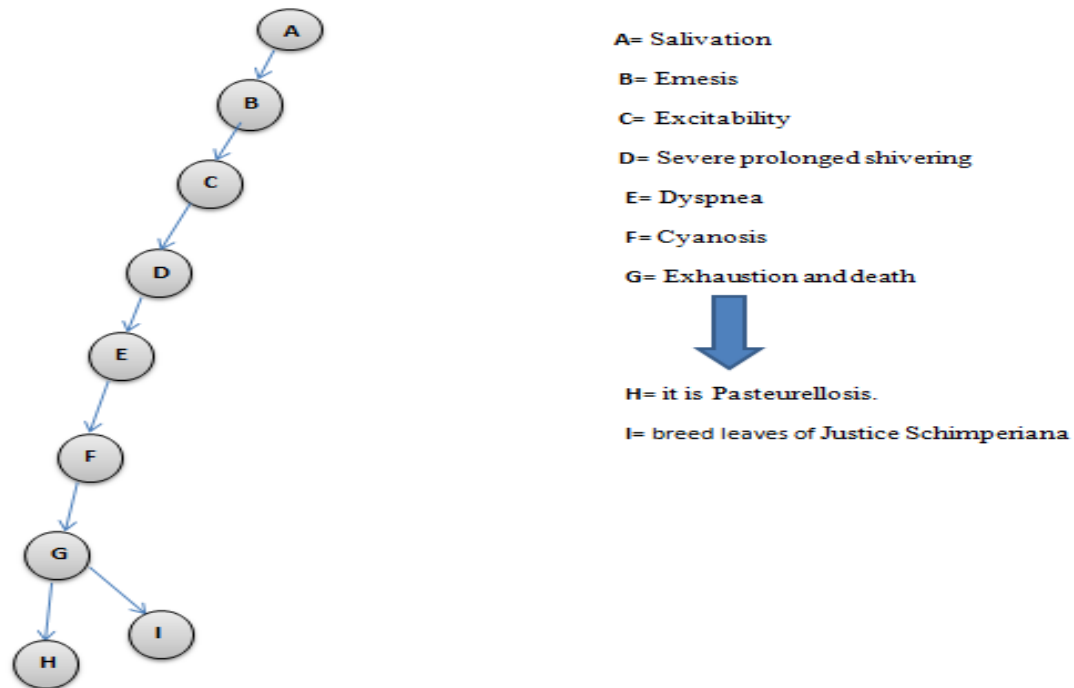


Figure 4:8 Pasteurellosis Cattle Disease Symptoms and Recommended Mode of Treatment.

As shown on the above figure 4:10 and 4:11 there are numerous symptoms shown on the cattle where they are affected by different diseases. So, based on the above decision tree, each node represents different symptoms of cattle diseases. For instance, based on the above figure 4:10, each letter from AA-GG represents symptoms shown cattle affected by Blackleg (Bishooftuu). Letter FF represents types of cattle diseases based on the recorded symptoms and lastly, letter HH shows the mode used to treat and ways to implement the knowledge.

However, in addition to the above rule base decision tree to interact with the system the user interface is needed. This user interface is a communication between the system and the user in which the system is able to return information to the user. Then the system asks questions and the users respond by saying y if the answer is “yes” or n if it is “no”. Based on the user’s response, the system provides types of cattle diseases for the users through the user interface. Therefore based on the decision tree constructed, the sample system is going to be implemented as follows using prolog programming language.

```

1 ?- start.
JIMMA UNIVERSITY INSTITUTE OF TECHNOLOGY
FACULTY OF COMPUTING AND INFORMATICS
INFORMATION SCIENCE PROGRAM
WELCOME TO SYSTEM DEVELOPED OF INDIGENOUS KNOWLEDGE FOR CATTLE DISEASES DIAGNOSIS AND TREATMENT
By: MULGETA ASEFA
Advised by
CHALA DIRIBA (Ass. proff)== (Principal advisors)
WORKINE TESEMA (MSc) == (Co-advisors)
To use it, just answer the questions that systems asks you.

```

Figure 4.9: Prolog Screen Interface

The following interface shows that the overall prolog interface that when system requested users to identify types of cattle diseases based on the general symptoms viewed on the cattle.

```

1 ?- start.
JIMMA UNIVERSITY INSTITUTE OF TECHNOLOGY
FACULTY OF COMPUTING AND INFORMATICS
INFORMATION SCIENCE PROGRAM
WELCOME TO SYSTEM DEVELOPED OF INDIGENOUS KNOWLEDGE FOR CATTLE DISEASES DIAGNOSIS AND TREATMENT
By: MULGETA ASEFA
Advised by
CHALA DIRIBA (Ass. proff)== (Principal advisors)
WORKINE TESEMA (MSc) == (Co-advisors)
To use it, just answer the questions that systems asks you.

Diagnosing cattle disease.....
Does the cattle have abdominal-distention?(y/n)y.
Does the cattle have crepitation?(y/n)y.
Does the cattle have nose-discharge?(y/n)y.
Does the cattle have arm_joint-tenderness?(y/n)y.
Does the cattle have difficulty-of-palling-urine?(y/n)y.
Does the cattle have difficulty-of_palling-feces?(y/n)y.
That cattle disease could be blackleg
====Recommendation====
Pounding the roots of cucumisficifollius with water and then swallowing

Thank you for using this system

```

```

Does the cattle have abdominal-distention?(y/n)n.
Does the cattle have febrile-between-nails?(y/n)n.
Does the cattle have hair-faising?(y/n)y.
Does the cattle have scrotal-drop?(y/n)y.
Does the cattle have ear-drop?(y/n)y.
Does the cattle have overwhelming-of_fly?(y/n)y.
Does the cattle have polyphagia?(y/n)y.
Does the cattle have nose_dry?(y/n)y.
Does the cattle have cough?(y/n)y.
Does the cattle have constipation_and-diarhea?(y/n)y.
Does the cattle have shoulder-dipigmentation?(y/n)y.
Does the cattle have shortness_of_breath?(y/n)y.
That cattle disease could be trypanosomiasis
====Recommendation====
Pounding the nicotianatabacum with water and then swallowing

Thank you for using this system

```

Figure 4.10: Prolog screen interface used for cattle diseases prevent and treatment.

As shown on the above, the collected information (list of symptoms based on cattle diseases) was stored as database into the system. After user select the all option requested by the system, based on the symptoms and answers of user finally it explains the types of cattle diseases for user. For instance if one cattle has an abortion, still born, weak calf born and retention of fetal membranes, then the system was identify and recognize the type of this cattle diseases as *Gatachiisaa* (Brucellosis) as it shown on the above figure 4.10

The proposed system has important to use as a decision for identifying types of diseases and mode of prevent and treat different cattle diseases by knowing all the symptoms shown on the cattle affected by illness. For the developed system, user acceptance was employed to evaluate the performance of the system and measure how the system has the ability to take decision and accomplished its tasks. Based on the developed system, the result obtained through close ended question from the user or veterinary medicine workers (evaluators) showed that, user are satisfied on the performance of the system.

4.2 Discussion

4.2.1 Accessibility of Indigenous Knowledge Practices in Community

Accessibility is the way in which farmers of study area access the knowledge practices for solving different problems as locally. As the finding of the study stated that, there are various types of indigenous knowledge that approved in this community for a long time. Farmers of this area use this knowledge in order to solve different problem. For instance, as respondents of the study mentioned, this types of knowledge was valuable in the community to prevent and treat different diseases of both livestock and human being. Also the finding of the study stated that farmers in the community use this knowledge to crop production, environmental conservation, land use management, protection of plants and for preserving and conserving water. As a result of the study shows, there are two types of healing and treat different diseases. This was healing and diagnosis through modern and through indigenous knowledge. However, from these types of diagnosis and treat different diseases farmers in study are applied indigenous knowledge medicine to treat different cattle diseases. The finding shows the reason to use this knowledge in this area includes it easily accessible in the community and the cheapest in study area. The finding of study also confirmed that, this kind of knowledge was transformed from herbalist to child, neighbor through orally and also gifted from God. Moreover, further finding of study based on accessibility of indigenous knowledge practices in community shows that, these traditional medicine practitioners are usually farmers, hunters, fishermen; timber workers usually above 50 years of age. Transfer of knowledge and skills of the practice are mainly through family inheritance, only very few practitioners developed their skill through apprenticeship (Ibrahim, 2007).

4.2.2 Cause of Cattle Ailments

The study finding indicates that, Cattles are usually caused by different diseases either through contact with diseased animals or due to improper sanitation, feeding, care and management. As the result of this study shows, lack of cattle shelter were the most cited cause of cattle ailments in study area which scores 57(53.3%). Also the finding of the study stated, 23 (21.5 %) were caused from stored water, 34 (31.8 %) were caused from grass grew in cattle breeds, 9 (8.4%) were caused from colobus monkey urine, 12 (11.2%) were caused from urine of hyena, 17 (15.9%) were caused from grass grew in urine of hyena, 7 (6.5%) were caused from when they mixed with others

wild animals, 14 (13.3%) were caused from insects, flies/ dust, 9 (8.4%) were caused from sharp objects pricking the eye, 18 (16.8%) were caused from their poor blood circulation, 21 (19.6%) were caused from when cattle overfeeding and 36 (33.6%) were lack of grasses and water in their area. As cattle diseases were caused from different sake, also herbalists know different practices used to prevent and treat various diseases. However, from this practice indigenous knowledge medicine was the main known practices used in the community. This knowledge practices was the approach of using local knowledge for prevent and treat different diseases locally.

4.2.3 Source of Indigenous Knowledge Medicine Practices

As the finding of study exposed, indigenous knowledge practices was obtained from different sources. For instance, different respondents of this study mentioned that this knowledge practices was accessed from familiar herbalists, neighbor, God and acquired through trial and error. As a result indicates, 22 (20.6%) of respondents were acquired this knowledge from God, 31 (29%) were educated from grandfather/ grandmother, 26 (24.3%) were learned from neighbor of traditional healers, 47 (43.9%) were learned from their father/ mother, 19 (17.8%) were learned through trial and error, 24 (22.4%) were learned from their husband/ wife, 20 (18.7%) were learned from sister/ brother, 18 (16.8%) were learned from their uncle/ aunt and the left 9 (8.4%) were acquired this source of knowledge from their In-law.

Similar result was study by Turnbull (1993). According to researcher finding traditional knowledge is derived from observations of the local setting or at a specific location and held by a specific group of people. Researcher describes that, this knowledge is a growing body of knowledge and beliefs, progressing by adaptive practice and passed down through generations by cultural communication which seen as important for sustainability. Also, based on the mode of indigenous knowledge practices implementation used to prevent and treat different cattle diseases the finding of study displays, the farmers of the community applied this knowledge cure cattle diseases. As different herbalists stated that, indigenous knowledge practices of disease treatment was applied based on different sign of diseases shown on the cattle affected by illness. So, based on this different sign, herbalists of study area have the ability to understand types of illness and find the solution through this knowledge practices.

Additionally as the finding of study stated, herbalists have the ability to prevent different diseases before the cattle was affected and also have the talent to treat after the cattle was affected by different ailments. For example, *Cinii* (Scabies) was the disease that was mentioned by most respondents and preventable using mineral water (*Hora*). Also the study results clarify Trypanosomiasis (*Gandii*) can be prevented by prepare a good shelter for cattle that can be treat the rain and cold.

4.2.4 Source of Indigenous Knowledge Drugs Preparation for Cattle.

The finding of the study stated that, there are various sources of indigenous knowledge medicine practices used to prevent and treat different cattle diseases. The main sources used to prepare this medicine were plant, mineral and animals. As the result of this study shows, plant was the main sources used to prepare indigenous knowledge medicine for cattle diseases in study area which scores 76 (71%) was drug prepared from plants existed in the community. Also, 23 (21.5%) was prepared from minerals and the rest 8 (7.5%) of indigenous knowledge medicine was prepared from animals. Moreover, Simonetta (2018) conducted related study based on the source of indigenous knowledge drug preparation and the result confirmed that, 98 sources (42 were from plant, 14 were from animal-based substances, 15 were from minerals and 27 were from other materials).

The finding of this study also stated, fruits (*daraaraa biqilootaa*), roots (*hidda biqilootaa*), seeds (*ija biqilootaa*), leaves (*baala biqilootaa*), barks (*qola/ jirma biqilootaa*) and dependent plants was certain plant parts used during drug preparation. So, the result of the study confirmed 30 (28%) drugs were prepared from plants fruits, 38 (35.3%) drugs were prepared from plants roots, 25 (23.4%) drugs were prepared from plants seeds, 72 (67.3%) drugs were prepared from plants leaves, 43 (40.2%) drugs were prepared from plants barks and 24 (22.5%) drugs were prepared from some dependents plants available on other plants.

Moreover, the result of the study also cited that indigenous knowledge medicine practices was prepared in several rather standardized ways which usually vary based upon the plant utilized and what condition is being treated. Therefore, as the finding of this study, this drug /medicine was prepared in the form of crushing, squeezing, chewing, fumigating, chopping, extract with cold water, roasting, in the form of wrapping and heating different plant parts with water, honey, ash,

minerals and other animals meat or skin. Additionally, the finding of the study confirmed this knowledge medicine practices was applied in the swallowing, fever body part, put on, fumigating and through bleeding tongue. However, this mode of application was implemented based on the symptoms shown on the cattle or types of cattle diseases.

4.2.5 Measurement of indigenous knowledge medicine

Based on the finding of the study, different herbalists of study area use different measurement during implementation of the drugs. For instance, this measurement was differing based on the types of diseases and mode of employment. However, these results illustrate that the herbalist of this community used measurement like water glasses, a glass bottle (*qaruuraa*), calabash (*hullee*) and also use a cup of tea to know the determination and amount of the dosage. Additionally, since the measurement of drug was not similar as generally the amount determination of the drug of the same disease may differ from herbalist to herbalist in the local community which may be the challenge to use the indigenous medicine. For example, one herbalist's uses water glass to determine the quantity depending on the type of cattle illness and the age of cattle. On other hand, another herbalists uses *qaruuraa* (bottle).

According to the finding of this study, based on tools used during indigenous knowledge medicine implementation, the herbalists of the community used different tools for implement this types of knowledge practices. For instance, herbalist of the community used tools like sickle, bottle, needle, thorn of aloemacarpa, calabash, mortar and also thorn of a plant for diagnosis and treat different cattle diseases through indigenous knowledge practices.

4.2.6 Mechanism to Store, Preservations and Transfer of Indigenous Knowledge

The study finding revealed that, this knowledge practices was not existed in documented format but passed from generation to generation through interacting with environment. So, for store and preserve this kind of knowledge medicine practices, different local herbalists protects the source of drugs (plants, minerals and other animals used as medicine). Also, herbalists of study area used different mechanisms for transfer this knowledge from generation to generation through working together and through telling history to the new generation.

Also as the result of study stated, there are several challenges to preserve, store and transfer this knowledge. The main challenge that different herbalists mentioned in the results was most of children of herbalists and other young were not willing to receive the knowledge by considering the practice as a primitive or manifestation of uncivilization and think as backward practice. Also, the finding of this study clarifies another challenge to transfer indigenous knowledge was most of both female and male young perceived indigenous knowledge as an outdated knowledge. Moreover, poor recognition on indigenous knowledge, negative attitudes and lack of awareness, as well as lack of interest to share and received from each other, lack of fitting intellectual property right for the herbalists and lack of similar mode of drug preparation and implementation was another challenge to preserve, store and transfer this knowledge medicine practices in the community. Furthermore, as the finding of the study stated that, there are a lot of challenges that occur during indigenous knowledge medicine practices preparation and implementation. However, the lack of correct storage measurement during application, drug contamination and imperfect preparation was the main challenges that occur during indigenous knowledge medicine practices of cattle diseases prevent and treatment.

4.2.7 Strategies used for store, preserve and transfer indigenous knowledge

According to the finding of study area, different herbalists cited several strategies that used for store, preserve and transfer this knowledge medicine practices. For instance, make it as internationally modes of application and preparation, done strong study based on this indigenous knowledge, teaching new generation as it is historically, make it clear as it is sources of income and make it familiarity in case of law/ or legally and officially was the main strategies obtained from the result of study.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This research explored indigenous knowledge medicine used for cattle diseases diagnosis, treatment and modes of drug preparations and applications in case of east Wollega Zone. In this local area, indigenous knowledge have valuable in different sector. Different researcher mentioned that indigenous knowledge is important in agriculture, environmental preservation, in healthcare, education, livestock husbandry and treat different diseases. Related to different study, according to this research conducted, indigenous knowledge of cattle diseases diagnosis, treatment and modes of application were the way in which different local herbalists used their own knowledge to diagnosis/ prevent different cattle diseases before affected by illness and also treat after they affected by different diseases and applied by their own knowledge. Other different related studies supported the idea of indigenous knowledge about the causes of disease as an important element in protective and preventive health care. With this knowledge local herbalists are able to avoid vulnerability to disease by avoidance of disease causing agents.

The finding of study showed that local communities of study area use indigenous knowledge practices highly in diagnosis and treat different cattle diseases. So, herbalists in this area applied their knowledge to safeguard their cattle and treats different cattle diseases like Trypanosomiasis (*Gandii*) and Blackleg (*Bishooftuu*) based on the symptoms of cattle illness.

Based on the aim of the research, researcher was collected data through interview, focus group method with elders and observed indigenous knowledge implementation during diagnosis and treat different cattle diseases from study area. So, using this data collection method researcher obtained different indigenous knowledge medicine practices that local farmers of study area used during diagnose and treat different cattle diseases. Essentially, as the result and finding researcher acquired different plant parts, different minerals and other animal's meat and skin used during cattle diseases diagnosis and treat through indigenous knowledge practices.

This type of knowledge was transformed from generation to generation through orally from father, uncle, aunt and neighbor to child. The person who received herbal medicinal knowledge was

selected either from the family members or outside family based on honesty, trustworthy and patience as well as commitment to serve the community and have the ability to apply this knowledge. All the herbalists have not the same (equal) feeling to share this knowledge to others (child) and they do not share their knowledge to each other. Also the way herbalists used to transfer these types of knowledge were different from one herbalist to another.

Most of herbalists used to share/ transfer this type of knowledge through oral communication (songs, poems and consult) and showing during preparation and implementation through observation. Farmers/ herbalists prepare cattle drugs from different sources. For example they prepare from plants and minerals and from other animals available in their environment.

Medicinal plant parts collection, preparation, preservation and administration used for treating cattle diseases was carried out by the herbalist based on medical believes and practices. Herbalists collect the medicinal plants parts used for prevent and treat cattle diseases from different environments such as from forests mainly during raining seasons. A seed, fruits, barks, leaves, roots and dependent plant was some of the plant parts used during cattle drug preparation for diseases treatment. The drugs were prepared in the form of solid, liquid and powder and sometimes mixed with *daaraa* (ashes) and *damma* (honey) for treat different types of illnesses.

Although, the method of medicinal plants used collection was varied from herbalist to herbalist and mostly they collect the plants early in the morning. During cattle drug preparation and implementation, herbalist of study area used *qoraattii* (thorn), *marfee* (needle), *haamtuu* (sickle), *mooyyee* (mortar), *qaruuraa* (bottle), *hullee* (calabash) and *argisa* (*aloemacocarpa*) for implement this knowledge medicine. Additionally, this indigenous knowledge medicine practices used for diseases diagnosis and treatment were prepared in the form of homogenizing in water, crushing, squeezing, chewing, smoking/fumigating, chopping, extract with cold water, roasting, wrapping, sniffing, heating, and swallowing.

5.2 Recommendations

Based on the research results the following recommendations are forwarded:

- ✓ For safeguard the loss of this knowledge, local community of the study area should be involved in conservation and management of plant resources, minerals and their indigenous knowledge in their locality to generate this knowledge for future generation.
- ✓ Identifying effective medicinal plants and encouraging the local people to grow medicinal plants in home gardens, mixing with crops, coffee farms.
- ✓ Since some of the traditional healers might have given much attention to the indigenous knowledge transfer while others have little concern regarding the value of indigenous knowledge, some governmental and nongovernmental organizations should participate in awareness raising for healers to minimize the loss of indigenous knowledge.
- ✓ For safeguard the loss of this knowledge, local community of the study area should be involved in conservation and management of plant resources, minerals and their indigenous knowledge in their locality to generate this knowledge for future generation.
- ✓ Identifying effective medicinal plants and encouraging the local people to grow medicinal plants in home gardens, mixing with crops, coffee farms.
- ✓ Motivate local indigenous knowledge healers must be important to more exercises and develop their skills broadly.
- ✓ Coordination of traditional healers of the area together by certification or by organizing them at various levels that popularize their indigenous knowledge on medicinal plants are needed to have culture of knowledge sharing.
- ✓ For saving this vital and important practices of knowledge used to treat and diagnosis different diseases from loss, establishing traditional healers association, by providing land for cultivating medicinal plants, funds and assisting their activities with professional guidance helps to preserve the medicinal plants of the area.
- ✓ Researchers who are interested to conduct research in this area also will focus on indigenous knowledge of crop production and land management.
- ✓ Because of certain limitation, researcher only conducted on indigenous knowledge medicine practices for cattle diseases diagnosis, treatment and mode of application. However, other researcher will focus on further indigenous knowledge practices known in the community

such as knowledge of Weather condition adaptation and understanding, indigenous knowledge used for manage well seeds for crop production.

- ✓ Since this study only focus on indigenous knowledge of cattle diseases diagnosis, treatment and modes of application, other future study will consider on indigenous knowledge of other livestock (sheep, goat, horse, donkey, dog) husbandry and diseases treatment.
- ✓ It is recommended that other researcher and local community should participate in capturing, sharing indigenous knowledge of healthcare practices by using information communication technology.
- ✓ It is recommended to give/ protect the right of owner is vital to strength and advertise this kind of knowledge.
- ✓ Also it is recommended that to transfer and share through different media will make familiar such kind of knowledge for future.

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YUUNIVARSITII JIMMAATTI

DHAABBATA TEEKINOOLOOJII

GOSA BARNOOTAA ODEEFFANNOO SAAYINSIITIIN

Ani barataa **Mulugeetaa Asaffaa** barataa digirii lammaffaa gosa barnootaa odeeffannoo Saayinsii Yuunivarsitii Jimmaati. Yeroo ammaa kanatti qorannoo mata dureen isaa “Qo’annoo beekumsa aadaan fayyadamuun dhibee loonii ittisuu, fayyisuu, akkaataa hojiirra oolmaa fi qopheessuu isaa kan Oromiyaa ta’ee Godina Wallagga Bahaatti argamu gara Teeknooloojiitti jijjiiruun fayyadama isaa guddisuu irratti xiyyeeffadheera. Kanaaf qorannoo kana keessatti hirmaattota taatanii akka deggertaniif filatamtaniittu. Qorannoon kun beekumsa naannoo kanaa mul’isuuf bu’a qabeessa kan ta’eef hirmaattota kam irratti iyyuu miidhaa kan hin qabnes ta’uu isaaisin hubachiisaa yaada beekumsa kanaa irratti qabdan akka na deggertaniif kabajaanin isin gaaffadha.

Gaaffilee marii waliigalaa hirmaattota waliin

Ajaja 1^{ffaa}. Odeeffannoo fi seenaa guutuu hirmaattotaa.

1. Maqaa _____

2. Ganda _____

3. Saala Dhi Dha

4. Umurii: 1-20 21-40 41-60 61-80 81-100 Above 101

5. Dalagaa: Qonnaan bulaa Daldalaa Hojjetaa mootummaa an biroo

6. Sirna gaa’elaa: Kan hin fuune/ heerumne Kan fuudhe/ heerumte

Gursummaa Kan wal hiikan

7. Sadarkaa barnootaa: Kan hin baranne Sadarkaa 1^{ffaa} Sadarkaa 2^{ffaa}

Dipiloomaa Digirii jalqabaa Digirii 2ffaa Digirii 3ffaa Kan biraa _____

Ajaja 2^{ffaa}.Beekumsa waliigalaa shaakala qoricha beekumsa uumamaa fi naannawaa fayyadamuun dhukkuba loonii ittisuu irratti qaban.

1. Dhaabbanni ittisa dhibee loonii ganda kana ni jiaa?
 - A. Jira
 - B. Hin jiru
- 1.1 Dhaabbannii ittisa dhibee loonii kun yoo jiraate dhibee loonii ittisuuf yeroo hundaa ni fayyadamtuu?
 - A. Eeyyee
 - B. Lakki
- 1.2 Yoo yeroo hundaa dhaabbata dhibee loonii ittisuuf ganda keessaan jiru kana hin fayyadamtan ta'e sababni isaa maalii?
2. Sababa maaliitu akka isin qoricha kan aadaa ganda kanatti argamu akka fayyadamtan godhaa?
3. Akka ganda kanaatti shaakala beekumsa uumamaatti fayyadamuu akkamiin ilaaltuu?
4. Akka ganda kanaatti sababa maaliif beekumsa fi dandeettii uumamaa kana fayyadamtuu?
 - a. Dhukkuboota namaa ittisuuf
 - b. Horii yookiin loon horsiisuuf akkasumas dhibee isaanii ittiin yaaluuf
 - c. Callaa oomishuuf
 - d. Eegumsa naannootiif
 - e. Kanneen biroodhaaf. Fakkeenyaaf_____
5. Sababni rakkoo fayyummaa yookiin dhukkuba loonii ganda kanaa maaliidhaa?
6. Akka ganda kanaatti gosootni soorata loonii beekamoo ta'an kanneen akkamiiti?
7. Akkaataa ganda kanaatti akkamiin dhukkuboota loonii ittisuu dandeessu?
8. Maddi beekumsa uumamaatti fayyadamuun dhibee loonii ittisan eessaa argamaa?
9. Akkaataa ganda kanaatti qonnaan bulaan akkamitti dhibee loonii eegu fi loon erga dhibeedhaan qabamanii booda yaaluu danda'aa?

10. Shaakala beekumsa uumamaatti fayyadamanii dhibee loonii ittisuuf jechuun maal jechuudha?
11. Dhukkuboota loonii kanneen beekamoo ta'an kam ittisuuf mala aadaa fi beekumsa uumamaa kan fayyadamtuu?

Ajaja 3^{ffaa}.Hubannoo akkaataa haala qopheessuu isaa fi hojiirra oolmaa beekumsa uumamaa fi naannawa irratti qaban

1. Maqaa biqiloota dhibee loonii ittisuuf gargaaran akka ganda kanaatti isaan kami? Qaamota isaa keessaa kamiin rakkoolee fi dhukkuboota loonii yaaluuf fayyadamtuu?
2. Biqilaan kun ganda kanatti ni oomishamaa? Yoo kan oomishamu ta'e sababa maaliitiif?
3. Maddi qoricha beekumsa uumamaan fayyadamuun dhibee loonii ittisuuf gargaru maal irraa argamaa?
4. Haalli fi akkaataan beekumsa yookiin dandeettii uumamaan qoricha dhibee loonii ittisuuf gargaaru qopheessan maal fakkaataa? Yookiin akkamiin qophaa'aa?
5. Akkaataan hojiirra oolmaa biqiloota qoricha dhibee loonii ittisuuf fayyadan kanneenii maal fakkaataa?
6. Dhibee loonii kana ittisuuf qaamota biqilootaa keessaa kanneen kamtu fayyadaa?
7. Qaamni biqiloota kun akkamitti walitti qabamaa? baay'inni isaahoo?
8. Yeroo beekumsaaf dandeettii uumamaatti fayyadamuun qoricha dhibee loonii ittisuuf gargaaru hojiirra oolchitan safartuulee akkamuu fayyadamtuu?
9. Dhibee loonii ittisuuf dandeettiifi beekumsa uumamaatti yeroo fayyadamtan meeshalee akkamii fayyadamtu yookiin hojiirra oolchituu?
10. Wantootni fayyadama qoricha dandeettii fi beekumsa uumamaa daangessan jiruu? (kan akka ulfaa, umurii, saalaa fi kan kana fakkaatan).

Ajaja 4^{ffaa}.Hubannoo akkaataa haala kaa'uu fi walitti qabuu, eegu fi daddabarsuu beekumsa uumamaa fi naannawa irratti qaban

1. Malli isin beekumsa uumamaan qoricha dhukkuba loonii ittisuuf fayyadu kaa'uuf yookiin walitti qabuuf fayyadamtan maaliidha?
2. Malli ittiin beekumsa uumamaan dhukkuba loonii ittisan daddabarsuuf fayyadu maalii?
3. Malli ittiin beekumsa uumamaan dhukkuba loonii ittisan eeguuf akkasumas kunuunsuuf fayyadu maalii?
4. Ganda kana keessatti qoricha beekumsa uumamaa fayyadamuun dhukkuboota loonii ittisuuf gargaaru tarsimoo akkamiin kaa'uu, eegu yookiin kunuunsuu fi daddabarsuun danda'amaa?
5. Rakkooleen yeroo shaakala beekumsaaf dandeettii uumamaan fayyadamuun qoricha dhibee loonii qopheessan mudatu maal fa'ii?

Gaaffilee waliigalaa namoota dhuunfaa waliin.

1. Maqaa _____
2. Ganda _____
3. Saala Dhi dha
4. Umurii: 1-20 21-40 41-60 61-80 81- 100 Above 101
5. Dalagaa: Qonnaan bulaa Daldalaa Hojjetaa mootummaa Kan biroo
6. Sirna gaa'elaa: Kan hin fuune/ heerumne Kan fuudhe/ heerumte
- Gursummaa n wal hiikan
7. Sadarkaa barnootaa: Kan hin baranne Sadarkaa 1^{ffaa} Sadarkaa 2^{ffaa}
- Dipiloomaa Digirii jalqabaa Digirii 2ffaa Digirii 3ffaa Kan biraa _____

Ajaja 2^{ffaa}.Beekumsa waliigalaa shaakala qoricha beekumsa uumamaa fi naannawaa fayyadamuun dhukkuba loonii ittisuu irratti qaban.

1. Shaakalli beekumsa uumamaatti fayyadamuu ganda kana jiraa?
Eeyyee Lakkii
2. Beekumsa uumamaa fayyadamuun ganda kanatti bu'aa hammamii qabaa?
3. Shaakala beekumsa uumamaatti fayyadamuu irratti gandi kun ilaalcha akkamii qabaa?
4. Ganda kanatti dhukkuboota loonii akkamitti ibsitu yookiin madaaltuu?
5. Akkaataa ganda kanaatti beekumsa uumamaatti fayyadamuun dhukkuboota loonii ittisuun fudhatama akkamii qabaa?
6. Akka ganda kanaatti bu'a qabeessummaa shaakala beekumsa uumamaatti fayyadamuun qabu akkamitti ibsitu yookiin madaaltu?
7. Akka ganda kanaatti dhukkuboota loonii ittisuuf mala kamtu sirriidha akkasumas mijaawaadha?
8. Miidhaan beekumsa uumamaatti fayyadamuun dhukkuboota loonii ittisan akka ganda kanaatti maaliidha

Ajaja 3^{ffaa}.Mala yookiin tooftaa kaa’umsa, eegumsaa fi daddabarsa beekumsa uumamaa irratti qaban.

1. Shaakala beekumsa uumamaa ganda kana jiru kaa’uun ni barbaachisaa?

Eeyyee Lakki

2. Deebiin gaaffii armaan olii “eeyyee” yoo ta’e, beekumsa kana gara fuulduraatti akkamiin kaa’uun danda’ama?

3. Shaakalli beekumsa uumamaa kun uummataan haala kamiin daddarbaa?

Ajaja 4^{ffaa}.Akkaataa qopheessuu fi hojii irra oolchuu beekumsa uumamaa irratti qaban.

1. Qorichi dhukkuboota loonii ittisuuf gargaaru haala kamiin qophaa’aa?

2. Maddi beekumsa uumamaan dhukkuboota loonii ittisan maaliidhaa?

3. Ganda kanatti haalli itti beekumsa uumamaan dhukkuboota loonii ittisu qopheessanii fi hojii irra oolchan salphaadhaa?

Ajaja 5^{ffaa}.Rakkinoota beekumsa uumamaa eeguuf mul’atan/ daangessan.

1. Hanqinootni yookiin gufuun beekumsa uumamaan dhukkuboota loonii ittisan argachuuf, eeguuf, daddabarsuu fi kaa’uuf mul’atan maal fa’ii?

2. Hanqinootni fi gufuun yeroo qoricha beekumsa uumamaan dhukkuboota loonii ittisan qopheessan mul’atu maal fa’ii?

3. Miidhaan qoricha beekumsa uumamaa fi naannawaan dhukkuboota loonii ittisan akka ganda kanaatti maaliidhaa?

4. Beekumsa uumamaa yookiin naannawaa fayyadamuun kunuunsaa fi eegumsa naannoo irratti miidhaa qabaa?

A. Eeyyee B. Lakki

4.1 Deebiin gaaffii armaan olii “eeyyee” yoo ta’e rakkoo maaliifi akkamiiti?

Gaaffilee waliigalaa dawwannaa irratti hundaa’e

1. Akkaataa argama shaakala qoricha beekumsa uumamaa fi naannawa jiru irratti.
2. Shaakala beekumsa dhukkuba loonii ittisuu argamu akkaataa ganda kanaa irratti
3. Akkaataa qophii fi hojiirra oolmaa shaakala qoricha beekumsa uumamaatti fayyadamuun dhukkuboota loonii ittisuu argamu irratti.
4. Qaama biqilootaa keessaa kan fayyadu yeroo qoricha dhukkuboota loonii ittisu qopheessan beekumsa uumamaatiin.
5. Shaakala beekumsa uumamaa, meeshaalee, safartuu fi maloota yeroo dhukkuboota loonii ittisan fayyadaman irratti

JIMMA UNIVERSITY
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FACULTY OF COMPUTING
DEPARTMENT OF INFORMATION SCIENCE

Appendix A: Focus group discussion

I am Mulgeta Asefa, a master's student in information and knowledge management at Jimma University. I am conducting a research on exploring and system development of indigenous knowledge for cattle diseases diagnosis, treatment and modes of application in the case of east Wollega Zone, Oromia, Ethiopia. You have been purposively selected to assist in this research by responding to the questionnaire intended for this research. Note that you are not supposed to indicate your name anywhere and the information you provide will be treated with greatest confidentiality and will be used for the purpose of this research only. There are no risks associated with participation and no financial benefits. Findings from the study will help to explore and system development of indigenous knowledge for cattle diseases diagnosis, treatment and modes of application thus to generate and document for future.

Name of researcher: Mulgeta Asefa

Phone: 0921219820/0910690732

Email: mulerase55@yahoo.com

Part I: General Information

Direction: Tick the answer of the following question in the box given for you.

1. Name _____

2. District/ Kebele _____

3. Gender: Male Female

4. Age: 1-20 21-40 41-60 61-80 81- 100 ve 101
5. Occupation: Farmer Merchant Other
6. Marital status: Single Married Widowed Divorced
7. Educational level: Illiteracy Elementary High school Post-Secondary
 Other, please specify _____

Part II: Describing indigenous knowledge practices used to diagnosis cattle diseases

1. Is there cattle healthcare center in your community?

Yes No

1.1 If yes do you use it frequently for cattle diseases treatment?

Yes No

1.2 If you say no why not frequently used?

2. What is the reason making you to use indigenous knowledge?

3. How do you see indigenous knowledge practices in your community?

4. For what purpose you use indigenous knowledge?

- A. Human diseases treatment
- B. Livestock/ Cattle husbandry and disease treatment
- C. Crop production
- D. Environmental conservation
- E. Others

5. What is the cause of cattle diseases?

6. Which types of feeds for cattle was known in this area?

7. How you prevent different cattle diseases based on indigenous knowledge in this community

8. What is the source of indigenous knowledge medicine practice of cattle diseases?

9. How local farmers prevent before cattle was affect by illness and treat after caused by different diseases?

10. What is an indigenous knowledge medicine practicefor cattle diseases diagnosis and treatment?

11. For what type of common cattle diseases you use indigenous knowledge?

Part III: Modes of preparation and applications of this indigenous knowledge

1. Which plant and parts do you use to treat particular cattle health problem/diseases?

2. Is this plant cultivated in the area? If yes, for what purpose?

3. What is the source of indigenous knowledge medicine for cattle diseases diagnosis and treatment

Preparation? _____

4. What are the Modes of Medical Drug Plant Preparation for cattle diseases treatment?

5. What are modes of applications of this indigenous knowledge for cattle diseases treatment?

6. Which Part of Plants used to Prevent and Treat Cattle Diseases?

7. How plant parts used as drugs were collected and the amount in dosage?

8. What Measurement you used during applies indigenous knowledge to treat cattle diseases?

9. What are the tools used during indigenous knowledge medicine implementation?

10. Is there any problem that limited to applied indigenous knowledge such as pregnancy, age and sex based?

Part IV: Mechanism to store, preservations and transfer of indigenous knowledge

1. What are the indigenous mechanisms you would use to store indigenous knowledge of cattle diseases treatment?

2. What are mechanisms of transfer, of this indigenous knowledge?

3. What are mechanisms of preserve of this indigenous knowledge?

4. What strategies used for store,preserveandtransfer indigenous knowledge of cattle diseases treatment in local communities?

5. What is challenge occur during indigenous knowledge medicine practice preparation?

Appendix B: Interview

Part I: General Information

1. Name _____

2. District/ Kebele _____

3. Gender: Male Female

4. Age: 1-20 21-40 60 80 100 Above

5. Occupation: Farmer Merchant Other

6. Marital status: Single Married Widowed Divorced

7. Educational level: Illiteracy Elementary High school Post-Secondary
Other, please specify _____

Part II: Describing indigenous knowledge practices used to diagnosis cattle diseases

1. Is there indigenous knowledge practices available in this area?

Yes No

2. How indigenous knowledge have valuable in the community?

3. How do you see indigenous knowledge practices in your community?

4. How would you describe a cattle illness in this area?

5. How cattle diseases treatment through indigenous knowledge practices was accepted in the community members? _____

6. How you can describe the value of indigenous knowledge practice in this local area?

7. Which cattle diseases treatment method is appropriate through indigenous knowledge in this area?

8. What is the effect of using local knowledge for cattle diseases treatment in this community?

Part III: Mechanism to acquire, store, preserve and transfer of indigenous knowledge

1. Is indigenous knowledge practices in this area needed to store?

Yes No

2. If your above answer is “**Yes**” how to store this knowledge for future?

3. How indigenous knowledge practice transmitted within communities?

Part IV: Modes of preparation and applications of this indigenous knowledge

1. How this medicine of cattle diseases treatment is prepared?

2. What is the source of this traditional cattle diseases treatment?

3. Is it easy to prepare and apply indigenous knowledge of cattle diseases treatment in this area?

Part V: Challenges for protecting indigenous knowledge

1. What are the barriers in the process of acquisition, protecting, share and store indigenous knowledge for cattle diseases treatment practices?_____

2. What is the challenge occur during preparation of indigenous medicine practice for cattle diseases treatment?

3. What is the effect of local knowledge medicine of cattle diseases treatment on this area?

4. Is there any problem using indigenous knowledge on environmental protection?

Yes No

If “yes” what is the problem and how?_____

Appendix C: Observation

1. Forms of indigenous knowledge medicine practices available
2. Cattle diseases treatment practiced available in community regarding to indigenous knowledge.
3. Modes and application of indigenous knowledge practice for cattle diseases treatment available.
4. Plant part that community used during cattle diseases treatment by indigenous knowledge.
5. Indigenous knowledge practices, tools, measurement and methods they used during cattle diseases treatment.