

## Chapter

# Ethnoveterinary Practices for Indigenous Poultry Health Management by Smallholder Farmers

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## Abstract

Most resource-constrained smallholder farmers rely on ethnoveterinary medicine to treat village chicken diseases. An in-depth literature review and empirical study was conducted to establish ethnoveterinary practices used in indigenous chicken health management. The study showed that most village chicken farmers were female (70%). Most farmers kept chickens for socio-economic purposes; food, status and income. Common birds' ailments treated and controlled using EVPs include Fowl Cholera; Pullorum; Diarrhea; Gumboro; Avian Influenza; Ngorok & Snot (Infectious Coryza); Bloody & watery diarrhea (Coccidiosis). Variety of materials were used to treat and control chicken diseases either as purely indigenous methods or in combination with conventional medicines. Among the practices, medicinal plants like *Aloe vera* emerged as the most commonly used botanical plant. More so, both literature and the empirical study, showed that farmers prepared and applied *A. vera* uniquely depending on the region and type of *A. vera*. Majority of remedies are used to treat more than one ailment. It is recommended that these practices be preserved and considered for new drug advancement and commercialization to promote cheaper and environmentally friendly options for poultry health management.

**Keywords:** chicken diseases, ethnoveterinary medicine, medicinal plants, village chickens, smallholder farmers

## 1. Introduction

The use of traditional medicinal practices in animal health management also referred to as Ethnoveterinary Practices (EVPs) dates back to the time in memorial [1, 2]. Since the onset of industrial revolution, the use of EVPS like medicinal plants and herbs began to decline as the preferred alternative to conventional medicine. Recently, their use is gaining attention and importance in modern day

practices that pursue organic solutions to health problems emanating from the use of the populous conventional medicine [3]. This shift is prompted by sustainability, comprehensiveness, cost effectiveness, availability and environmental friendliness of medicinal plants, traditional practices and herbs [4]. Resultantly, this necessitated a revisit to traditional grassroots medicines and paradigm shift to modern day animal health practices. This chapter critically reviews literature and empirical documents on medicinal plants or herbs and other traditional practices and approaches used in the control and treatment of indigenous village chicken diseases. Village chickens are domestic fowls of either indigenous type or any genetic stock, improved or unimproved [5, 6]. Almost every household in rural sector owns a chicken. The chickens play a significant role towards rural household income, food security and rural development [7]. Despite their substantial importance, they are significantly affected by diseases and parasites infections and infestations. Specifically, an inventory of common indigenous chicken disease types as well as medicinal plants or herbs resources used, their availability, parts used, harvesting methods, preparation and their therapeutic value are investigated and documented. This is key to promote awareness and avoid extinction of valuable information.

## **2. History and background of ethnoveterinary practices**

Herbs and medicinal plants along with other traditional practices play a crucial role in human and animal health management [8]. Herbs and medicinal plants are a source of drug compounds, emerging modern medicines and play a critical role in the conventional medicine revolution [1]. Thus, herbs form an important foundation in the development of medicines and are a natural blueprint in advancement of new drugs or phyto-medicine in controlling and treating livestock diseases such as indigenous chickens. Ethnoveterinary practices in general consist of local based indigenous knowledge and methods used to care for, heal and manage livestock health. These were developed over a long time through trial-and-error method [8–10]. They are a viable and valuable alternative to and complement conventional synthetic veterinary medicines in the management of chicken's health characterized by rising costs [11]. Although, EVPs such as herbs or plants are recognized for their medicinal and pesticidal value, there is consensus among farmers and science that these be documented and preserved as alternatives for and advancement of animal health management [12]. Fears are that this valuable knowledge might be lost due to rapid socio-economic, environmental and technological changes.

The EVPs are commonly used among rural communities and smallholder farmers. Evidently, they are also used in commercial breeds such as broilers [13]. The resource constrained production systems used by smallholder farmers is characterized by free ranging behavior and scavenging nature in indigenous chicken management. Birds produced under these conditions, have a high mortality, that is why indigenous chickens have low productivity as a result of accidents, predation and diseases [14]. High prevalence of diseases is one of the principal limitations to these production systems [15]. Smallholder farmers and those in peri-urban areas are resource constrained, finance included, have limited access to veterinary services, information about the prevention and treatment of animal diseases, as well as prophylactic and therapeutic veterinary medicines [16]. This forms the basis as to why farmers utilize a combination of EVPs for their indigenous chicken health

management, and in most cases are inclined more to EVPs. Most of these commercial drugs are expensive and are not easily accessible and affordable to the resource-poor smallholder farmers [17]. Natural options, especially plant-based products or herbs that are locally available and easily accessible as the medicines of choice for most resource poor smallholder farmers, especially women. The knowledge of EVPs appears to be mostly in the custodian of older people, both men and women. They systematically pass it to younger generations by word of mouth. This form of communication is still the most widespread means of communication in local villages in Africa.

It is observed that a fraction of EVPs knowledge is accessible to all indigenous chicken producers, and another portion is a protectively guarded family secret [18]. In rapidly changing world driven by commercialization, EVPs are increasingly shunned upon, and viewed as backward and old fashioned. Despite, these contestations, the continued use of conventional medicines is linked to environmental damage, rising costs and adverse effects to human health [19]. There are also increasing concerns for drug resistant disease-causing microorganisms due to over and improper use of conventional medicines [20]. It is why recently, there is a paradigm shift to focus on and increased demand for organic agricultural practices globally for animal health management. Herbs and medicinal plants offer a practicable choice due to the fact that they are broader in spectrum of action. Ethnoveterinary Practices are relatively more accessible, easy to prepare and administer at a little to no cost on the farmer. Moreover, most traditional herbs have a long record of safety. Their documentation offers more new options in the advancement of science and new insights or inroads to cheaper and healthier alternatives to animal health management. This makes them an attractive and viable option for use in indigenous chickens by both commercial and resource constrained rural farmers [21, 22]. Clearly, EVPs have once again become an important component of agriculture and are set to play a crucial role in the future of animal health management [17]. This chapter, therefore, comprehensively reviews literature on EVPs and uses empirical data from Vhembe district in Limpopo province of South Africa to document herbs, medicinal plants and other traditional practices used to treat and control indigenous village chicken diseases.

### **3. Chapter objectives**

The objectives of this chapter are to:

1. Document common ailments and diseases that afflict indigenous village chickens,
2. Produce a comprehensive inventory of traditional practices, medicinal plant resources, plants parts used, harvesting techniques, preparation, and therapeutic value associated chicken health management, and
3. Assess the sustainability of the EVPs in indigenous chicken health management.

Where applicable and necessary illustrative sketches are given. Also, socioeconomic aspects of EVPs are scrutinized with the view to understand the system of knowledge transfer and gender roles.

## **4. Methods used**

### **4.1 Study design**

The study used an explorative descriptive design to gather, unpack and document the medicinal plants used to cure, heal, treat and control indigenous village chicken diseases in rural communities. Systematic literature search and empirical evidence from Vhembe district of Limpopo province, South Africa provided data for the study. Pragmatic approach review of literature was followed in this study. Pragmatic approach goes beyond identifying and understanding chickens' ailments to proposing possible actionable treatment interventions that enhance effective use of EVPs [23]. This approach is considered appropriate in this work for its methodological rigor and objectivity in review and analysis of information [24]. It is used in this chapter to offer tools that describe, explain, predict, interpret and understand the usage, application and sustainability of medicinal plants/herbs and other traditional methods used in the control and treatment of indigenous village chicken ailments [23].

### **4.2 Data collection**

Data was sourced empirical and from literature. Literature was reviewed in multiple-levels through searching for related publication in database sources (Web of Science, Ebscohost and Science Direct) and search engines (Google Search, Google Scholar). Literature published between the year 1990 to 2022 on the EVPs and medicinal plants used to treat and control indigenous village chicken ailments was used. Ethnoveterinary Practices, Ethnoveterinary Medicine (EVM), medicinal plants/herbs, indigenous chickens, village chickens, and rural poultry production were the key search words/phrases for randomly selected articles in published literature. Through snowballing by reviewing the citations in each of the identified relevant articles, more relevant literature was sourced.

A semi-structured interview guide was used to collect data from indigenous chicken farmers in Thulamela local Municipality of Vhembe district in South Africa. Postgraduate students pursuing various degree programmes at the University of Venda were recruited and trained to serve as research assistants. The study was piloted to test the data collection tool prior to the actual full-scale collection of data. Participants with similar characteristics to the study participants were used for the pilot test. The purpose was to check the usability and applicability as well as to enhance the validity and reliability of the data collection tool. Minor errors observed during the pilot study, were noted and the data collection instrument was revised. Face to-face interviews were then conducted with the smallholder farmers owning chickens. The interviews were administered to the smallholder farmers via reading the questions, recording answers, and explaining to the respondents in the local language, viz. *Tshivenda*. Demographic data, prevalent chicken diseases, medicinal plants/herbs and traditional methods used to treat and control the chickens' ailments were gathered. Moreover, data on techniques of medicinal plants/herbs harvesting, parts used, preparation method and administration were collected. Data was triangulated through consultations with key informants in the form of extension officers and traditional leaders. Similarly, the results of the empirical study were presented at conferences (Society for Medicinal Plants and Economic Development Conference). The



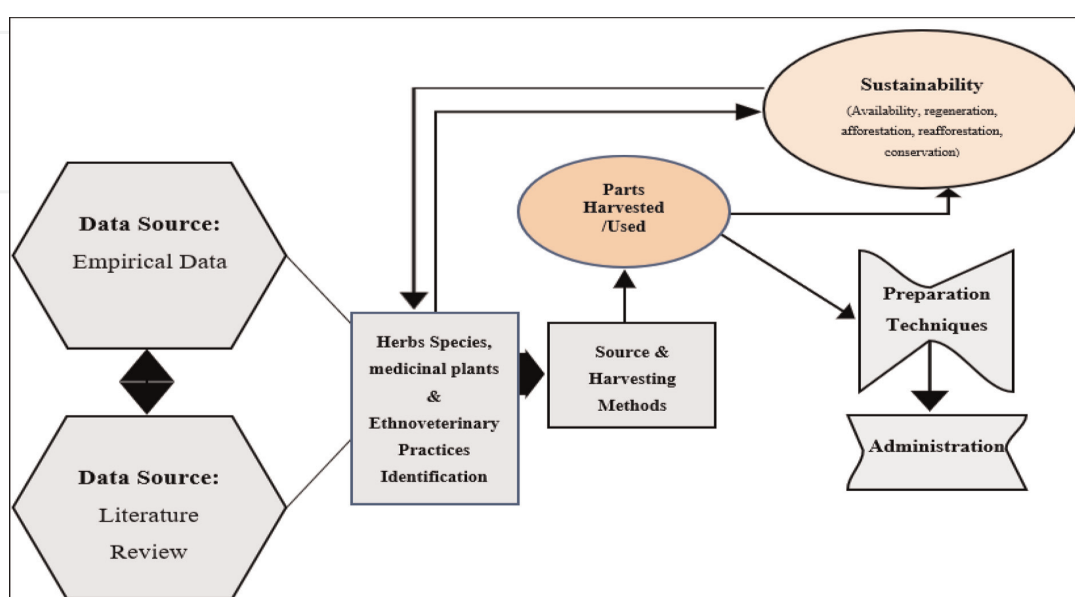
conference had representatives from the Limpopo Province Department of Agriculture Executive Managers, extension officers, advisors and researchers in the field.

### 4.3 Analysis procedure

**Figure 1** illustrates the analysis procedure followed in this chapter. In both cases of data collection, data was analyzed thematically by first identifying the indigenous chicken disease ailments, and EVPs used. This process was aided by Atlas-ti (Version 8) a sophisticated qualitative data analysis software. The software is recommended for large texts such as in document review and it has a network diagrams capability that joins family of codes for easier analysis and drawing conclusions. Sources and harvesting methods of medicinal plants/herbs, parts used, preparation techniques and medicine administration are also observed. The chapter also unpacked the sustainability of the herbs and different EVPs used in the control and treatment of chickens' ailments based on availability, regeneration, and harvesting techniques.

### 4.4 Demographic information

A total of 103 articles related to EVPs in the production of indigenous chickens were found in the literature search conducted. Only 21 were considered relevant according to the search criteria and hence used in the study [3, 6, 8–12, 15, 17, 18, 21, 25–33]. Pertaining the empirical study, **Table 1** shows the demographic information of the household heads responsible and directly involved in taking care of the birds in the empirical study are presented. It is also worth noting that the responsibility of taking care of chickens is also shared with the rest of the family members. This depends on one's availability and for skills and knowledge transfer purposes. Females accounted for 70% (42) of the farmers and slightly above half (51.7%) of all the farmers were above the age of 50 years. Thus, fewer youth and children participated in day-to-day chicken farming activities. However, they are an integral part of the process. Their least representation was influenced by the time and days of the data collection process in which majority will be at school or working elsewhere.



**Figure 1.**  
*Analysis framework of the study.*

Variable	Category	Frequency	Proportion (%)
Gender	Male	18	30
	Female	42	70
Age group	30 years and below	5	8.3
	31 to 40	11	18.3
	41 to 50	13	21.7
	50 years and above	31	51.7

**Table 1.**  
Demographic information of indigenous village chicken farmers (n=60).

## 5. Common indigenous village chickens ailments

The study identified several village chicken ailments both in literature and the empirical study. Diarrhea [*Kwingi*], Newcastle, and a disease described as a “walking duck” are the three common ailments identified that afflict indigenous village chickens in Vhembe district of Limpopo province, South Africa. In the review of literature, Fowl Cholera; Pullorum; Diarrhea; Gumboro; Avian Influenza; Ngorok & Snot (*Infectious coryza*); Bloody & watery diarrhea (Coccidiosis), Ectoparasite; Open wound; Newcastle (Fengile), kofis; Swelling of the body; depression; and swelling of head were revealed as the common diseases.

## 6. Ethnoveterinary practices and indigenous chicken disease management

### 6.1 Ethnoveterinary practices used

Smallholder farmers use several EVPs in indigenous village chickens' health management. The EVPs products used are mainly based on plants, herbs, combination of modern products with plants and other traditional practices. **Table 2** and **Figure 2** display different EVPs products used in the treatment of indigenous village chicken diseases from both literature and the empirical data. In the empirical study, farmers in Vhembe district used mainly natural occurring EVPs as one or in combination with other modern products or conventional medicines to treat and control indigenous village chicken diseases. As shown in **Table 2**, these include *Capsicum frutescens* [Chilies or Peri -Peri]; *Aloe vera*; [*Mushikili*]; [Musero]; Sunflower cooking oil; Hot water; Ashes (*Mopani Musese*) - African black wattle, [*Muunga*] *Acacia nigriscen* & [*Munanaga*] - Monkey thorn; Magazine (paper); Potassium permanganate, and locally available washing powder. Among the EVPs, Aloe species were the most utilized medicinal plants in managing chickens' ailments. Most commonly, plants or herbs like chilies and Aloes were crushed, soaked in water and applied orally i.e. given to chickens as a drink or in drinking water. Similarly, ashes used as firewood at home composed of *Mopani*, *Acacia mearnsii* [African black wattle; *Musese*], *Acacia nigriscen* [*Muunga*] & *Acacia galpinii* [Monkey thorn, *Munanaga* or *Tshikwalo*] were soaked in water and given to chickens as a drink or in drinking water.

The reviewed literature showed similar results to the findings of the empirical study. From literature, the EVPs comprised of botanical or herb families like Mimosaceae (*Parkia sp.*), Caesalpiniaceae [*Cassia sp.*]; Euphorbiaceae [*Euphorbia sp.*],

No	Ethnoveterinary Practice product	Source & Harvesting Technique	Parts used	Preparation & Application methods	Therapeutic Value/ Ailment
<b>STUDY 1: EMPIRICAL DATA</b>					
1	Aloe [ <i>Aloe Vera</i> ]	In the bushes. Harvested by plucking out the whole or half	Leaves	<ul style="list-style-type: none"> <li>• Dried, Crushed, fluid squeezed, mixed with salt and soaked in water for chickens to drink</li> <li>• Crush fruit, mix with donkey faeces in drinking water</li> <li>• Crushed leaves mixed with pepper (fresh) and ashes</li> <li>• Crushed mixed with grinded fresh garlic and neem leaves</li> </ul>	Diarrhea, Newcastle and Duck disease.
2	Chilies [Peri -Peri]	Grown at home. The whole fruit is plucked out and used	Whole Fruit	Crushed and mixed with water for chickens to drink	Diarrhea [ <i>Kwingi</i> ], Newcastle
3	[Mushikili]	Found in the bushes. Leaves are collected and used	Leaves	Soaked in water for chickens to drink	Preventative
4	[Musero]	Grown at home and found in the bushes. Wholesome leaves are collected and used	Leaves	Soaked in water for chickens to drink	Diarrhea [ <i>Kwingi</i> ]
5	Sunflower cooking oil	Bought from the shops	N/A	Put oil in the palm or deep the finger in the oil and directly apply onto the location of disease-causing parasite	Parasites
6	Hot water	Normal tap or river water.	N/A	Pour water in the chicken house to kill lice [ <i>Thatha</i> ] and Mice [ <i>Vhulive</i> ] (diseases causing parasites)	Parasites
7	Ashes	Firewood from various trees such as Mopani	Stems/ trunk	Mix it with water apply on the area infested with parasites	Diarrhea [ <i>Kwingi</i> ], Newcastle and Duck disease
8	Magazine (paper)	N/A	N/A	Burnt and the ash mixed with water for chickens to drink	

No	Ethnoveterinary Practice product	Source & Harvesting Technique	Parts used	Preparation & Application methods	Therapeutic Value/ Ailment
9	Moringa	Grown at home or found in the bushes. Leaves are pruned from small branches.	Leaves	<ul style="list-style-type: none"> <li>Leaves soaked in water and given to chickens to drink</li> <li>Sun dried moringa ground into powder and mixed with chopped fresh aloe leaves add in drinking water</li> </ul>	Diarrhea [Kwingi], Newcastle and Duck disease
10	Washing powder	N/A		Burn and use ashes with water for chickens to drink	

#### STUDY 2: LITERATURE REVIEW

No	Ethnoveterinary Practice product		Parts used	Preparation & Application methods	Therapeutic Value/ Ailment
1	Aloe [ <i>Aloe spicata</i> ; <i>Aloe ferox</i> ; <i>Aloe Saponaria</i> ; <i>Aloe chabaudii</i> ; <i>Aloe excels</i> ; <i>Aloe Vera</i> ]		Leaves	Soaked and administered orally	Newcastle, Sleeping disease, Depression, Fowl Cholera
2	Chillies [ <i>Capsicum annum</i> ]		Fruit	Crushed and administered orally	Newcastle, Diarrhea, depression
3	<i>Albizia adianthifolia</i> (Mutowa)		Roots	Crushed and pasted onto the wound	
4	<i>Lannea Stullmanni</i> (Musosoti)		Bark	Crushed, soaked in water and administered orally	
5	Cactus [ <i>Opuntia vulgaris</i> ], lemon [ <i>Citrus limon</i> ] and red pepper [ <i>Capsicum frutescens</i> ]			Crushed, fluids mixed together and inoculated	Newcastle
6	Paw Paw ( <i>Carica papaya</i> )		Leaves	Soaked in water mixed with feed and orally administered	Parasite worms, respiratory diseases, anti-inflammatory
7	Ginger [ <i>Zingiber officinale</i> ]		Rhizome	Soaked in water mixed with feed and orally administered	Respiratory diseases (prevention and cure), immunity booster.
8	Turmeric [ <i>Curcuma sp.</i> ]		Rhizome	Soaked in water mixed with feed and orally administered	Respiratory diseases, parasite worms, wounds and immunity booster
9	Onion [ <i>Allium cepa</i> ]		Bulb	Mixed with either aromatic ginger, brown sugar, vegetable oil, or garlic and given with feed to chickens	Respiratory diseases, antibiotic, immunity booster, antipyretic

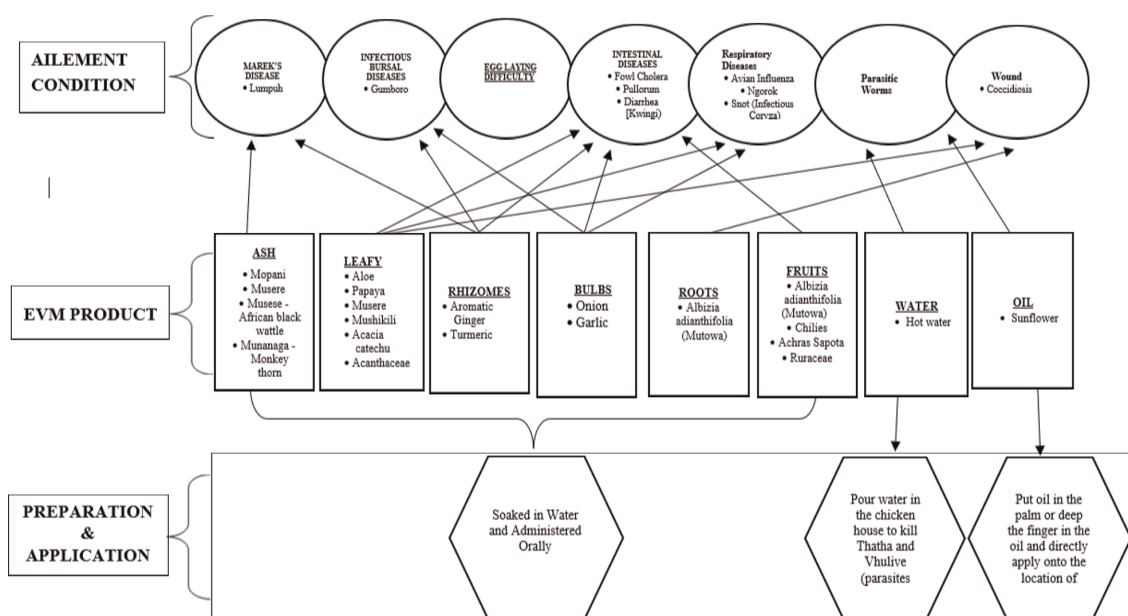


No	Ethnoveterinary Practice product	Source & Harvesting Technique	Parts used	Preparation & Application methods	Therapeutic Value/ Ailment
10	Garlic [ <i>Allium sativum</i> ]		Bulbs	Mixed with either aromatic ginger, brown sugar, or garlic and given with feed to chickens	Respiratory diseases, antibiotic, immunity booster
11	Aromatic ginger		Rhizome	Soaked in water mixed with feed and orally administered	Respiratory diseases, antibiotic, immunity booster, increasing palatability, prevention of parasitic worms
12	Anacardiaceae [ <i>Schinus mole</i> ]				Bloody diarrhea & Ectoparasite
13	Brassicaceae [ <i>Lepidiumstaviium</i> ]		Seeds	Grind the seeds, mix with butter and apply locally.	Open wounds
14	Euphorabiaceae [ <i>Croton mscrostachyus</i> ]		Leaves	Collecting juice extract and apply locally	Open wound
15	Aloceae Ret		Whole part	Squeezing and collecting juice, flower and mixing with salt and given to birds to drink	Newcastle (Fengile), Coccodios (kofis)
16	Bisana [ <i>Euphorabiaceae</i> ]		Leaves	Collecting juice extract and apply locally	Open wound
17	[ <i>Allium astavium</i> ] Allicaceae		Bulbs	Crushing it and mix with katical	Bloody diarrhea
18	Astraceae [ <i>Verinonia amygdalin del</i> ]		Leaves	Crushing leaves and mix with <i>injera</i> (a sour fermented pancake-like flatbread with a slightly spongy texture, traditionally made of teff flour) and fed to chickens	Watery diarrhea
19	Rutaceae [ <i>Rutachalepensis</i> ]		Whole	Crushing it add mixing with <i>injera</i> (a sour fermented pancake-like flatbread with a slightly spongy texture, traditionally made of teff flour) and fed to chickens	Swelling
20	<i>Citrus sinesis</i>		Fruits	Squeezing and collecting juice	Prevention and control

No	Ethnoveterinary Practice product	Source & Harvesting Technique	Parts used	Preparation & Application methods	Therapeutic Value/ Ailment
21	<i>Citrus ourantifoli</i>		Fruits	Squeeze, collect juice and mix with water for birds to drink	Diarrhea and ectoparasite
22	<i>Catha edulis</i>		Leaves	Crush leaves, mix with salt and water for birds to drink	Prevention
23	Oleaceae [ <i>Olea europaea capensis</i> ]		Leaves	Burn leaves and fumigate the house of chicken	Depression
24	[ <i>Phytolaccadodecandra</i> ] Phytolaccaceae		Whole	Crush leaves, mix with salt and water for birds to drink	Diarrhea
25	Zingiberaceae [ <i>Zingibarofficinale</i> ]		Rhizome	Crush a rhizome and mix it with water for birds to drink	Newcastle diseases (fengile)
No	Ethnoveterinary Practice product		Parts used	Preparation & Application methods	Therapeutic Value/ Ailment
26	Moringaceae [ <i>Moringa stenopetalia</i> ]		Leaves	Crushing leaves and mix with water for birds to drink	Diseases prevention
27	Rhamnaceae [ <i>Rhamnusprinoides</i> ]		Leaves	Crush leaves and mix it with water for birds to drink	Depression
28	Cucurbitaceae [ <i>Zehneriascabra</i> ]		Leaves	Crush leaves and mix them with water for birds to drink	Swelling of head
29	Brassicaceae [ <i>Brassica carinata</i> ]		Seeds	Grind seeds, mix with salt and water for birds to drink	Depression
30	<i>Pauzzoziamixta</i>		Leaves	Leaves crushed and water added; animal made to Swallow the mixture	Bloat

**Table 2.**  
Literature review.

Solanaceae [*Capsicum sp*], Cucurbitaceae [*Lagenaria sp.*]; [*Meliaceae*] (*Khaya sp.*); Anacardiaceae [*Mangifera sp.*]; *Liliaceae* (*Aloe sp.*); and Agavaceae [*Agave sp.*]. Herbs and plants used could be categorized into bulbs, rhizomes, fruit, leafy and ash based on medical plants like Onion (*Allium cepa*); Turmeric [*Curcuma sp.*]; Chillies [*Capsicum annum*]; Paw-paw or Papaya [*Carica papaya*]; and *Mopani*, respectively. Herbs such as [*Rutachalepensis*] Rutaceae and [*Phytolaccadodecandra*] Phytolaccaceae were used as a whole plant. The reviewed and empirical researched list of herbs and other EVPs is not exhaustive.



**Figure 2.**  
 Ethnoveterinary practices used to control and treat indigenous village chickens' ailments.

## 6.2 Preparation

Farmers prepared EVMs variedly depending on the nature and type of the EVP. Identified EVMs were mainly soaked in water and given to chickens to drink. Moreover, some herbs were combined with a number of elements and thereafter soaked in water for chickens to drink. For example, in some instances Aloe was crushed, and mixed salt, donkey faeces, fresh pepper, neem leaves, ashes or garlic and then soaked in water for chickens to drink. In the empirical study, farmers mixed Aloe with potassium permanganate and gave to chickens as part of the drinking water. Also, onion and garlic are mixed with either aromatic ginger, brown sugar, vegetable oil, or garlic and given with feed to chickens.

## 6.3 Therapeutic value

Majority of EVPs were used as a preventative measure, immune boosting and for healing purposes in multiple chicken ailments. This was observed in both the empirical data and the reviewed literature. For example, Aloe was used to prevent and cure ailments such as diarrhea, Newcastle, depression, and duck disease. Similarly, Onion [*A. cepa*], Garlic [*Allium sativum*]; and Turmeric [*Curcuma sp.*] treat multiple respiratory diseases such as avian Influenza, and snot [*Infectious Coryza*]. Equally, Chillies [*Capsicum annum*], Oleaceae [*Olea europaea capensis*] and Rhamnaceae [*Rhamnusprinoides*] all treat depression.

## 6.4 Herbs and medicinal plants sustainability

The two studies conducted also reviewed issues of sustainability in relation to the EVPs. In relation to the herbs and medicinal plants, harvesting techniques, availability, parts used/harvested, regeneration, afforestation, reforestation, and conservation were observed in both literature and the empirical studies. Herbs used were either

found and harvested from the bushes or they were grown at home. Herbs like *Aloe*, and *Mopani* were generally harvested in the bushes. Moringa is harvested in the bushes and also grown at home for medicinal purposes for both animals and humans. In many cases, fewer tree leaves are harvested used to treat and control diseases. Aloe as the most used medicinal plant was harvested by either removing the entire leaf or by cutting the required size. The number of chickens a farmer has determines the size of the leaf to be harvested and this was also done for conservation purposes. Some plants especially fruity ones like chilies are used in whole (**Table 2**). Other EVPs are by products. For instance, sunflower oil and donkey faeces are mixed with Aloe and used.

The sustainability of these elements depends on the primary industry like farming (sunflower & donkeys). Furthermore, firewood ashes used are products of old and drying trees. Thus, the sustainability of ashes depends on the continued adherence to traditional practices of vegetation conservation. The reviewed literature does not show how each herb or EVP is sourced. However, evidence from literature shows that while most plants are harvested in the bushes, preservation and their conservation is emphasized in practice through community ostracism, secrecy and restrictions. For example, only certain members of the community or family are permitted to harvest these herbs. Also, some herbs are a family secret while others are harvested in the night. The scarcer the herb is, the higher level of protection with measures such as secrecy. Surprisingly, there is no evidence both in literature and the empirical study of attempts to preserve these plants or herbs by engaging in mass production. Privacy and secrecy are rather preferred as a preservation measure. It is also evident that most herbs used are scarce and need to be protected, cultivated and/or conserved for their future sustainability.

## **7. Dosage and contraindications**

Literature revealed that there is no specific dosage and contraindications for different methods used in indigenous chicken health management. For instance, in the empirical study farmers indicated that depending on the number of chickens at home, different *Aloe* leaf sizes are cut, crushed and put in water for birds to drink. In some instances, the entire leaf is used. The dosage accuracy is further made difficult by the fact that most EVP practices are administered to the entire flock once the disease is suspected or when controlling diseases without systematical measured dose. This was also the case, with other herbs like *Moringa oleifera*, *C. papaya* (Papaya), *C. frutescens* (chillies) and other EVPs. Moreover, some medicine is secretly used or hidden from the general population due to cultural reasons, hence the dosages remain unknown. This is as well linked to maintaining the intellectual property rights of the community or knowledge holders. Farmers also claim that their EVPs are risk free and have no negative side effects to the health of animals. These results present an opportunity for further investigations on the actual recommended dosage ideal for a treating a particular ailment, mechanism of action, risks or contraindications associated with different herbs and other traditional medical practices.

## **8. Weakness and strengths of *ethnoveterinary practices***

The results show that majority of farmers relied on EVPs to manage poultry ailments. For example, an earlier study in the same area. A study reported that most

farmers use herbs, plants and other traditional practices as EVMs for poultry in the area [14]. Also, in Zimbabwe it was found that over 95% of communal farmers do not use veterinary services but preferred indigenous knowledge systems in controlling or treating poultry ailments [30]. The high cost of drugs and services was cited as prohibitive by farmers. There are farmers who believe that veterinary health services aim to destroy livestock in the event of disease outbreaks. It is why, farmers do not seek assistance from extension services. Ethnoveterinary Practices perform well to a reasonable spectrum of common symptoms and conditions such as septicemia, diarrhea, wounds, colds, worms, and reproductive disorders. Evidently, EVPs cure several bacterial diseases like coccidiosis, mycobacteriosis, plague and a wide spectrum of coliform diseases.

The practice of EVP is popular in rural farmers and it lags in its development, commercialization and knowledge transfer. Another reason for this was secrecy of the practice and absence of information in the gray literature. The weakness of EVPs is they fail to treat and control epidemic or endemic infectious diseases. For instance, foot and mouth disease, rinderpest, anthrax, and acute life-threatening bacterial diseases. Their popularization creates diversity of habitat shocks in semi-arid woodland and savanna habitats. This chapter presents an evidence-based EVPs practices especially medicinal plants. The inventory also opens opportunities for herbs and traditional practices commercialization and opening further inroads into new poultry drugs development in managing birds' ailments. Intellectual property rights of the knowledge holders needs to be respected for them to benefit. Cultivation of species most at risk is an agri-business opportunity and a chance to know, conserve, manage and protect endangered herbs. Research on right soils and conditions for growing these important poultry herbs is needed to optimize their collection and sustainable use. It is also worth noting that EVPs are not universally recognized as a valid method for disease treatment and control. Variations occur from region to region as well as within communities. Additionally, the decision for the ailment is based on trial and error and deliberate experimentation. The results show that while there are similarities, EVPs are less systematic and formalized. There are also new opportunities for researchers to further validate, document and acknowledge EVM in South Africa and other tropical countries.

## 9. Conclusions

Herbs, medicinal plants and traditional practices identified control a wide spectrum of poultry diseases such as diarrhea, wounds, coccidiosis, respiratory diseases and reproductive disorders. The chapter revealed that there are a variety of herb species and other traditional practices used by farmers in indigenous village chicken disease management. It is evident that several medicinal plants are reliably and safely used to treat poultry ailments. However, the same are less effective in epidemic or endemic infectious diseases like foot and mouth disease, rinderpest, as well as anthrax. In most countries including South Africa legal registration of these botanical products is not yet a major hurdle or requirement for their promotion. Farmers, thus have incentives to commercialize or trade the knowledge on poultry health management without many challenges. The observed herbs and traditional medicines, offer viable alternative health care options that are environmentally friendly, safe and affordable for farmers. Also, these herbs could be used to produce alternative less harmful conventional medicine if further investigations such as laboratory tests are conducted.



There are still major gaps in the EVPs practices such as standardization of the practices. For example, there is no specific dosage for most ailments, chickens are treated collectively, and harmful effects or risks involved in the use of EVPs are yet to be scientifically studied. Lastly, medicinal plants are also not grown at large scale to support their sustainability rather farmers rely on their natural occurrence in the environment. Moreover, the knowledge is hidden to the few members of the community mainly household heads and knowledge holders. This means EVPs are at risk of extinction. Hence, to preserve EVPs with their beneficial health alternatives to chicken health management, their sustainability should be prioritized. This forms part of efforts of the fight against climate change and negative effects of conventional medicines to the environment and human health. Nonetheless, IP rights must be observed for communities and knowledge holders to benefit from the commercialization of the plants, as custodians of the indigenous knowledge.

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## **Conflict of interest**

The authors declare no conflict of interest.

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