Acta Scientific Veterinary Sciences (ISSN: 2582-3183)

Volume 4 Issue 9 September 2022

Case Study

Dwindling Ethnoveterinary Alternative Use Among Fulani Pastoralists: A Case Study

Babalobi Olutayo* and Olurounbi Deborah

Department of Veterinary Public Health and Preventive Medicine, Faculty of Veterinary Medicine, University of Ibadan, Ibadan, Oyo State, Nigeria

***Corresponding Author:** Babalobi Olutayo, Department of Veterinary Public Health and Preventive Medicine, Faculty of Veterinary Medicine, University of Ibadan, Ibadan, Oyo State, Nigeria.

DOI: 10.31080/ASVS.2022.04.0498

Received: July 21, 2022

Published: August 23, 2022

Abstract

EVM (Ethnoveterinary Medicine), the scientific term for traditional animal health care, encompasses the knowledge, skills, methods, practices, and beliefs about animal health care among members of a community. In Nigeria, pastoralists are known to treat animal diseases with herbs and other traditional medical practices before the advent of conventional medicine. EVM medical practice is widespread among pastoral herdsmen and village livestock keepers in Nigeria. While there is research recognition of the need to modernize and commercialize age-long tradition as herbal and EVM alternatives to current western veterinary medicine, it is a paradox that younger Fulani pastoralists are more in support of the use of packaged modern medication methods that are available, though expensive. This article is a 2016 study that sought to test EVK among Fulani pastoralists who have migrated to southwest Nigeria, specifically of the migrants of Eruwa, Ibarapa LGA, Oyo State Nigeria. The study area is sub-urban Eruwa town (7°32'59" N27°0'0"E), headquarters Ibarapa East LGA, Oyo State, South West Nigeria, where Fulani Pastoralists have settled for decades. Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA) tools used in this study were semi-structured interviews, triangulation, and focus group discussions. A simple stratified sample collection method was used in the sample size determination. Two members of staff from the Faculty of Veterinary Medicine, University of Ibadan rural field clinic- the Eruwa Veterinary Field Station EVFS served as key informants in identifying important clusters of livestock owners and entry points. Twenty (20) individual interviews and twenty (20) group interviews were carried out. This study has shown that Foot-and-Mouth Disease, CBPP, Skin disease, Trypanosomosis and Helminthosis were the major diseases/ health problems of epizootiological importance in the study area. Results indicate that there is rich EVK among elderly Fulani pastoralists in Eruwa, and poor knowledge of EVM among the younger generation. Conventional medicines have been so abused and thus creating problems of drug resistance. This is common among the pastoralists of Eruwa, as the conventional drug is available in the Kara cattle market they go weekly and they treat their animals themselves most of the time.

Keywords: Ethnoveterinary Alternative Use; Fulani Pastoralists; Case Study; Eruwa; Oyo State; Nigeria

Abbreviations

CBPP: Contagious Bovine Pleuro- Pneumonia; EVK: Ethnoveterinary Knowledge; EVM: Ethnoveterinary Medicine; EVR: Ethnoveterinary Research; EFVS: Eruwa Veterinary Field Station; DVM: Doctor of Veterinary Medicine; FCVSN: Fellow, College of Veterinary Surgeons, Nigeria ; FMD: Foot- and-Mouth Disease; MPVM: Masters in Preventive Veterinary Medicine; MVPH: Masters in Veterinary Public Health; PE: Participatory Epidemiology (more correctly known as Participatory Epizootiology); PRA: Participatory Rural Appraisal; PhD: Doctor of Philosophy; RRA: Rapid Rural Appraisal

Introduction

Fula or Fulani or Fulbe (the latter being an Anglicization of the word in their language, Fulɓɓe) are an ethnic group of people spread over many countries, mainly in West Africa (but also in Central Africa and also in Sudan in North Africa). The Fulani form the largest pastoral nomadic group in the world. The Fulani are engaged in long-distance trade, generally involving cattle, with their Hausa colleagues. Often the Hausa are also butchers who control West African cattle markets by controlling access to Fulani cattle [1].

Pastoralism is a form of animal husbandry where domesticated animals known as livestock are released onto large vegetated outdoor lands for grazing, historically by nomadic people that moved around with their herds. The species involved include cattle, camels, goats, yaks, llamas, reindeer, horse and sheep [2]. Fulani herdsmen or Fulani pastoralists are nomadic or semi-nomadic Fulani people whose primary occupation is raising livestock [3]. It is estimated that between 12-13 million nomadic pastoralists in Nigeria.

In Nigeria over the last decade, Fulani pastoralists have become bandits, attacking communities and farmlands, all over the country but especially in the middle belt, to access to grazing land for their animals [4].

EVM (also referred to as ethnoveterinary research EVR) is from the phrases:

- "Ethno": classification of human beings [5].
- "race, culture", from the Greek 'ethnos' 'people, nation, class, caste, tribe; a number of people accustomed to live together [6].

Veterinary: relating to the diseases, and treatment of farm and domestic animals [7], practice of caring for a patient, managing the diagnosis, prognosis, prevention, treatment, palliation of their injury or disease, and promoting their health [8].

Veterinary medicine is the branch of medicine that deals with the prevention, management, diagnosis, and treatment of disease, disorder, and injury in animals [9].

Thus, EVM among Fulani pastoralists, refer to the prevention, management, diagnosis, and treatment of disease, disorder, and injury in farm and domestic animals by the Fulani pastoralists.

Over the centuries people have developed their own ways of keeping animals healthy and productive using age old home remedies, surgical and manipulative techniques, husbandry strategies and associated magico-religious practices. Taken together these constitute what is now known as EVM [10].

In Nigeria, Fulani herdsmen and others who keep animals as a means of livelihood have been involved in the treatment of animal diseases prior to the advent of modern medicine [11]. Anti - parasitism is the highest mean of form of Fulani veterinary self-medications in this regard [12]. The era of treating EVM and any other EVK as systems with suspicion and labelling it as myth, superstition and witchcraft are long gone. The role of EVK in livestock development is beyond dispute [13], hidden in the grey literature [14]. Traditional medical and veterinary practices remain relevant and vital in almost all cultures in Nigeria due to absence or inadequate provision of modern medical services especially in hard-to-reach rural areas [15] particularly among rural pastoralists in the livestock-keeping northerners [16].

EVM in future may be increasingly linked to discussions and research on ecosystem health. EVM is now increasingly integrated into "participatory epidemiology" which seeks to improve epidemiological surveillance in remote areas and encourage community participation in disease control [14]. EVM has grown recently because these practices are much less prone to drug resistance and have much fewer damaging side effects on the environment than conventional medicine.

Participatory epidemiology (PE) is an emerging branch of veterinary epidemiology which is based on the principles and methods of Participatory Rural Appraisal (PRA). PE is used in a very similar way to PRA but focuses on animal health issues rather than taking a broad view of problems in a given community (as is the case with PRA). PE is the use in Veterinary Medicine of participatory approaches and methods to improve understanding of animal diseases and veterinary services, and to design solutions to disease problems with livestock keepers [17]. PE draws heavily on systems of learning and action such as Rapid Rural Appraisal and Participatory Rural Appraisal' including, ethno-veterinary survey and its use has been upheld and promoted by both the Food and Agricultural Organization FAO and the International Office of Epizootics OIE [18].

Between 2004 and 2012 when the conference paper was presented [19], the first author has trained and also supervised eight

Masters PE projects, given five PE presentations at local and international conferences and have six PE journal publications and applied in research including:

- Participatory Epizootiology Research of the Igangan Grazing Reserve in Ibarapa Agro-Pastoral zone Of Southwest Nigeria. Senate Research Grant 2007 SRG/FVM/2006/9A. Category A-Individual Research Projects.
- Participatory Base-line Research Survey and Training at the Eruwa Veterinary Field Station, Ibarapa Agro-Pastoral Zone, Oyo State, Southwest Nigeria. University of Ibadan Senate Research Grant 2007SRC/FVM/4B/2006. Category B- Inter-Department, Multidisciplinary Research Project.

EVM is thus in danger of extinction because of rapid changes in communities all over the world. Most of these systems are unique and are often known only to a few individuals and communities.

Many communities nowadays use a mix of local and modern practices. The folk health practices largely remain undocumented and are passed on from one generation to the other by word of mouth [20].

Since colonial times, scientists had always taken note of indigenous knowledge of animal health and diagnostic skills before implementing their Western-technology projects, ignoring EVK in today's development would mean losing a very important and special component in life history of mankind that definitely would have made a difference for better! [21].

Study objective

To assess the knowledge of EVK among elderly pastoralists (family heads) and younger generation pastoralists in the study area.

Justification

Many Fulani pastoralists have great undocumented traditional knowledge about animal diseases, herbal treatments and herbal formulations. EVM information is in danger of extinction because of the current rapid changes in communities all over the world [20]. There is a growing acceptance of ethno-veterinary medicine, that some of these practices are therapeutic, as such should be documented to avoid the loss of the knowledge.

Research area

The study area is Eruwa, Ibarapa East LGA, Oyo state, Nigeria. Eruwa (7°32'59" "N27°0'0\"" E) is a town and the headquarters of Ibarapa East LGA located in Oyo state, South West of Nigeria. It is bounded in the north by Iseyin; in the east by Ibadan and in the south by Ogun state. It is 72 km south west of Ibadan and 60 km north east of Abeokuta.

Research Location - See figure 1 below.

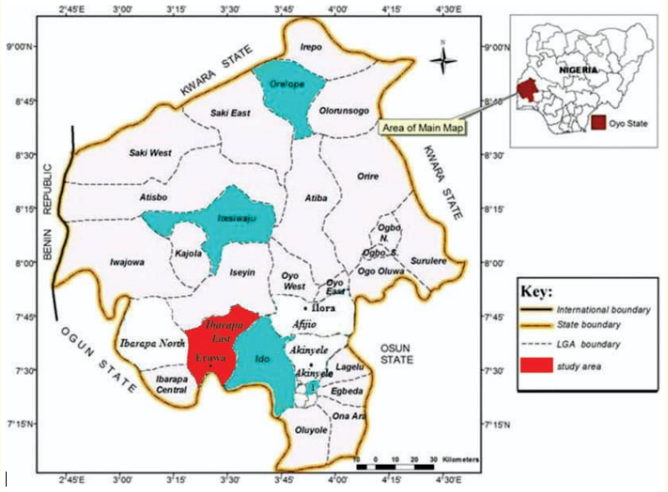

Figure 1: Study site/Research location (Source: Google Map).

Materials and Methods

Preparation

The location of the Eruwa Veterinary Field Station EVFS was identified in Eruwa within Ibarapa East Local Government Area of Oyo state. A team was formed to carry out the assessment process. The team consists of the members of staff of EVFS. Prior to the assessment process, adequate preparation was made involving the development of appropriate semi structured questionnaire and checklist, identification of key informants and entry point, gaining their approval for interviewing and recording, also for taking pictures. The key informant, Alfa Maud is an elderly Fulani Family head in Opete community, Eruwa. The appraisal team took time to explain the importance of the research.

Pre-test was carried out before the main research to know he culture, lifestyle of the people as well as to know who and what question to include or remove during the course of the research.

Materials

Transport, Stationeries, Customary gifts for the community members, Samsung SII phone for recording and taking pictures, Power bank were the major material input that went into the implementation of this research.

Methods

- Survey Method Used in Gathering Information
- Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA)
- Data acquisition and methods
- Basis for selection of respondents.

Selection of head of families

The cultural life style of the Fulani pastoralists is the basis used in selection of respondents. Fulani pastoralists live as extended families in clusters together; there is always a Family Head which is the eldest man, or patriarch of the family, other elderly people, the middle aged, younger generation and children.

The eldest and head of the family is accrued the honour of being the decider, and in sensitive cases, which the interview about their traditional heritage is, they prefer to let the eldest or the family head be consulted for such information. Also, the elderly being the repository of information in traditional heritages, it served as a basis for the choice of elderly pastoralists.

Selection of younger pastoralist

However, in cases where younger pastoralists who have religious leaders as parents or who work with them were encountered, they also were interviewed because Alfas are known to have the knowledge in abundance and they transfer it to their protégés intentionally or unintentionally.

Sample size determination

Simple stratified sample collection method was used in Sample size determination of Family Heads.

Key informant ⟶ Community ⟶ Family Heads

Primary sources

Interview with key informants

Two members of staff from the EVFS who were very familiar with the communities and the pastoralists, and a religious leader in the community served as served as key informants. They helped in identifying important clusters of livestock owners as well as entry point.

Individual interviews

Two Head of families each were selected for the various villages (communities). The settlements covered were Opete, Abule Igan, Ayegbede, Abule Meje, Abule Meji, Idi Ata, Abule Olota, and Sunbare.

Sixteen (16) individual interviews were carried out with the head of families, and four (4) individual interviews for younger pastoralists. A total of twenty (20) individual interviews were carried out.

Group interviews

Two (2) group interviews each were carried out among elderly pastoralists and younger pastoralists respectively.

Ten (10) elderly pastoralists and ten (10) younger pastoralists participated in each of the group interviews respectively. A total of twenty (20) pastoralists participated in the group interviews.

Direct observation

Observation of the daily activities and management practices of the pastoralists was carried out from through a walk in the community. The appraisal team did this with me and explained what was seen.

Secondary sources

- Map of Oyo state showing the location of Eruwa
- Report on Eruwa East Local Government Area.

These were obtained from the internet on Google.

- Participatory tools
- Semi structured interviews

One of the main tools of PE is the semi-structured interview. In semi-structured interview interviews a checklist of subjects to be covered is used as a point of reference rather than a questionnaire.

The appraisal team made use of an open-ended question (checklist) which allowed participants the opportunity to introduce topics and issues. As the participants introduced topics, probing question were asked to obtain more details and check information for internal consistency.

- Clinical examination
- Clinical examination of some sick animals
- Triangulation

Triangulation is the process of describing and analysing situations using a variety of methods and types of data. It is a way of cross-checking information by taking the results of one method and comparing them to the results of a different method or existing data. Triangulation was an important mechanism for ensuring the validity of the findings of this research. The information derived from individual and group interviews, key informants, and direct observation on the field were cross-checked to build a picture of the issues under investigation.

Focus group discussions

There may a range of experiences and opinions among members of the community or there may be sensitivity in divulging information to outsiders or to others within the community, this is where a focus group discussion can be useful. The discussion topics chosen were fewer than the general inventory. Separate sessions for the different two (elderly and younger pastoralists) groups were done and their contributions were recorded carefully.

Matrix ranking

This tool is used to assess a range of different issues against selected criteria in the checklist and state the levels to which they feel each issue ranks among other issues.

Duration of study

- The study was carried out over the duration of two months, April-May, 2016.
- The study area was Eruwa, Ibarapa East LGA, Oyo state, Nigeria.

Study site

Eruwa –see Figure 1: Study site/Research location.

The key informant helped to identify clusters of Fulani Communities and Families.

The communities are Opete, Abule Igan, Ayegbede, Abule Meje, Abule Meji, Idi Ata, Abule Olota, Sunbare.

Family Heads (The elderly) are the target population with a few younger generations as the control group.

Simple stratified sample collection method was used in Sample size determination of Family Heads.

Key informant: Community → 2 out 3 Family Heads.→

Simple quantitative methods of data analysis were also used.

Analysis was done in percentages.

Results

Livestock ownership among the Fulani pastoralists in case study area was Cattle (100%), Sheep (95%), Goat (75%), Guinea Fowl (60%) and Turkey (05%). The most common diseases (vernacular name in italics) and the percentage respondents affected were Ìlàsè/Lasèlasè (Foot- and- Mouth disease) -90%, Samore (Trypanosomes)-65%, Aràn (Helminthosis)-60%, Guyan(Skin disease)-60% and Henre (CBPP)-50%.

The disease conditions in which either Ethnoveterinary, Orthodox Veterinary practice or both are preferred were Fracture (100%), Lack or insufficient milk production (100%) and Dystocia (85%); while Tuberculosis (100%) and Trypanosomiasis (80); and Wound treatment (75%) The disease conditions in which either Ethnoveterinary, Orthodox Veterinary practice or both are preferred were Fracture (100%), Lack or insufficient milk production (100%) and Dystocia (85%); while Tuberculosis (100%) and Trypanosomiasis (80); and Wound treatment (75%) and Mange (8%) respectively.

The preferred method of treatment was orthodox drug (100%), both (100%) and EVM (80%). Reasons given by respondents include for Orthodox Veterinary drug users were - fast action, easy to use (no arduous preparation) and that some plants are hard to get; for those that use both- serve as First aid to one another, complementary action and synergy, if one doesn't work, the other is tried; and same reason for those that exclusively use EVM i.e. - serve as First aid to one another, complementary action and synergy, if one doesn't work, the other is tried.

Modern Veterinary Medicine was more readily accessible, most efficacious and most preffered though most expensive than EVM (see Appendices for Tables 1 to 5).

Livestock	No of respondents
Cattle	100%
Sheep	95%
Goat	70%
Guinea Fowl	60%
Turkey	05%

Table 1: Livestock ownership.

S/N	Most common disease	Number of respondents
1	**Ìlàsè**/Lasèlasè (Foot and Mouth disease)	90%
2	Samore (Trypanosomes)	65%
3	Gunyan (Skin disease)	60%
4	Aràn (Helminthosis)	60%
5	Henre (CBPP)	50%

Table 2: Most common diseases (Vernacular name in Italics).

S/N	Method of treatment	Number of respondents	Reasons
1	Orthodox Veterinary drug	100%	Fast action. Easy to use (no arduous preparation). Some plants are hard to get.
2	EVM	80%	Cheap Readily available Long lasting therapeutic effect
3	Both	100%	Serve as First Aid to one another Complementary action and Synergy If one doesn't work, the other is tried

Table 3: Preferred method of treatment between orthodox drug and EVM.

S/N	Method of treatment	Disease	Percentage of respondent
1	Orthodox	Tuberculosis Trypanosomiasis	100% 80%
2	Ethnoveterinay	Fracture Lack or insufficient milk production Dystocia	100% 100% 85%
3	Both	Wound treatment Mange	75% 80%

Table 4: Conditions or diseases in which either Ethnoveterinary, Orthodox Veterinary practice or both is preferred.

Criteria	Modern Veterinary Medicine	EVM
Readiness	Most ready	Less ready
Accessibility	More accessible	Most accessible
Preference	Most preferred	More preferred
Cost	More expensive	Less expensive
Efficacy	Most efficacious	More efficacious

Table 5: Comparison between orthodox veterinary medicine and EVM.

Discussion

On probing further on the frequency of the use of the two remedies (Orthodox and EVM), it is discovered they have knowledge of it, but hardly practice it.

During the focus group discussion among the elderly, it was mentioned that younger generation are not interested, and do not know the EVM practice as the elders do and the elderly are also fast abandoning the practice of EVM due to the advantages gotten from Ocerthodox veterinary medicine It was said that they have grown lazy and it is hard to revert to the strenuous methods of plucking plants (in the case of plants), then preparing it and then having to repeat the process for long time has discouraged their frequent use of EVM.

Traditional Veterinary practices have several advantages over orthodox medicine. In most, they are easily available, cheap, accessible, and culturally appropriate [21].

However, EVM has not been totally abandoned and from Table 3, the two remedies are often mixed.

Cost, inaccessibility and other problems like side effects associated with conventional western animal health care system have encouraged constant dependence on such traditional rural wisdom in this field [20].

Giving reasons that EVK was said to be a common knowledge in the olden days among the Eruwa Fulani pastoralists because the white people were available only twice in the year to treat and vaccinate the livestock so, they had to care for their animals using EVM all year round hence the parents passed the knowledge down actively to the children.

In the absence of funds, farmers face the challenge of scarcity, erratic supply and/or prohibitive costs of synthetic drugs or veterinary services and they usually revert back to more appropriate and sustainable traditional systems of animal health care [21].

Now however, Orthodox is common and moderately available, fast in action and there is no need for preparation.

However, during the Focus group discussion among younger generation, all is not lost as some common knowledge like Traditional remedy to Low milk production, Fracture, Wound is common knowledge.

As to the classification of diseases based on clinical signs, Eruwa Fulani name the diseases according to the clinical sign observed e.g. Ìlàsè in which cracks in the feet is one of the prominent clinical signs.

Conventional medicines have been so abused and thus creating problems of drug resistance. This is common among the pastoralists of Eruwa, as conventional drug is available in the Kara and they treat their animals themselves most of the time. Traditional Veterinary practices have several advantages over orthodox medicine. In most, they are easily available, cheap, accessible, and culturally appropriate [22].

Cost, inaccessibility and other problems like side effects associated with conventional western animal health care system have encouraged constant dependence on such traditional rural wisdom in this field [20].

However, not all animal health problems are treated by EVM such as viral diseases e.g. Rinderpest and Foot- and- Mouth Disease (FMD). Such problems in the line of orthodox medicine have made scientists renew interest in EVM. A few herbal medicines have withstood scientific testing, but others are used simply for traditional reasons to protect, restore, or improve health [23].

General observations and studies show that the farmers are using several EVM practices for curing diseases while others are based on superstitions and mythological religious faiths or there is hardly any basis to be considered as effective treatment [20].

The fact that Orthodox veterinary drug is fast in action, already made, widely available, and affordable to them has influenced the choice of both the elderly and the younger generation, making them use more of the Orthodox or modern than the traditional. Fulani pastoralists are very adaptive and receptive to other cultures; they spoke Yoruba, the language of Eruwa fluently in answering the interview questions.

Contrary to the persistent claims that pastoralism as a system of production and way of life is no longer viable, pastoralism continues, although in many new forms [24].

Conclusion and Recommendations

Conclusion

- This study has shown that Foot - and- Mouth Disease, CBPP, Skin disease, Trypanosomiasis and Helminthosis are the major diseases and health problems of epizootiological importance in Eruwa.
- There is rich EVK among Elderly Fulani pastoralists in Eruwa, and poor knowledge of EVM among the younger generation respectively.
- Some plants and other EVM products that are being used in treatment of diseases among Fulani pastoralists in Eruwa have been identified and documented.

Recommendations

Conventional medicines have been so abused and thus creating problems of drug resistance. This is common among the pastoralists of Eruwa, as the conventional drug is available in the weekly *Kara* markets and they treat their animals themselves most of the time. Traditional Veterinary practices have several advantages over orthodox medicine. As indicated in other studies, EVM practitioners perceive ethnoveterinary medication as easily available, cheap, accessible, and culturally appropriate with long-lasting therapeutic Herbal ethno medication is a veritable alternative to orthodox medication.

Since the concept of alternate medicine and plural medical practices are gradually being recognized, the Government should harness EVK as a resource by encouraging Pharmaceuticals to patent and supply already made EVMs to farmers to cut cost of production, thus improving Livestock production in Nigeria.

Prevent extinction of medicinal plants by enacting a law in which a tree is planted for every medicinal tree cut down. Farmers should be encouraged, also given incentives to farm these medicinal plants as a form of cash crops.

Establishment of Communications and Educational arm of Veterinary Public Health and Preventive Medicine Department that create awareness among farmers for EVM system through workshop, Seminars, training, so results of researches can be got across to the farmers from which we got the knowledge in the first place.

Rare EVM plants should be listed and preserved.

Acknowledgements

- Contact persons: Dr Lawal, Mr Akingboye and Mr Ogunleye, members of staff of Eruwa Field Veterinary Station.
- Key informant: Alfa Amuda, an elderly Fulani Family head in Opete community. The contact persons above connected with the Key informant
- Goggle internet for Map of Oyo state showing the location of Eruwa and Report on Eruwa East Local Government Area.

Bibliography

1. Anter T. "Who-are-the-fulani-people-their-origins" (2011).
2. Wikipedia. "Fulani Herdsmen" (2022a).
3. Wikipedia (2022b).
4. Iro IS. "From Nomadism to sedentarism: An analysis of development constraints and public policy issues in the socio-economic transformation of the pastoral Fulani of Nigeria". University Graduate School in African Studies Department, Howard University, Washington, D. C; 1995 (1994).
5. https://en.wiktionary.org/wiki/Special:Search?search=Ethno&fulltext=1&ns0=1
6. https://www.google.com/search?q=ethno&rlz=1C1RFPM_enNG929NG929&oq=&aqs=chrome.1.35i39i362l8.68588679j0j7&sourceid=chrome&ie=

7. https://www.google.com/search?q=Veterinary&rlz=1C1RFPM_enNG929NG929&oq=Veterinary&aqs=chrome...69i57j35i39j69i60l3j69i65l3.43236j0j4&sourceid=chrome&ie=UTF-8

8. https://en.wikipedia.org/wiki/Medicine

9. https://en.wikipedia.org/wiki/Veterinary_medicine

10. McCorkle CM. "Back to the future: Lessons from ethnoveterinary RD & E for studying and applying local knowledge". *Agriculture and Human Values* 12.2 (1995): 52-80.

11. Nwude N and Ibrahim MA. "Plants used in traditional veterinary medical practice in Nigeria". *Journal of Veterinary Pharmacology and Therapeutics* 3.4 (1980): 261-273.

12. Ibrahim MA., *et al*. "Screening of West African plants for anthelmintic activity". A paper presented at the 5th International Symposium on Medicinal Plants, University of Ife, Ile-Ife, Nigeria, 13 to 15 July, (1983).

13. Martin M., *et al*. "An annotated bibliography of community animal healthcare". ITDG Publishing, London; (2001): 611.

14. Mathias E. "EVM: harnessing its potential". *Veterinary Bulletin* 74.8 (2004): 27N-37N.

15. Arowolo RO and Awoyele MO. "Traditional method of veterinary practices in South-Western Nigeria". In: Proceeding of the First Workshop on Traditional African Medecine, 22-24 March, 1982, Ibadan, Nigeria (1982).

16. Alawa J P., *et al*. "Ethnoveterinary medical practice for ruminants in the subhumid zone of northern Nigeria". *Preventive Veterinary Medicine* 54.1 (2002): 79-90.

17. Catley A. "Participatory Epidemiology: A Guide for Trainers". African Union/Interafrican Bureau for Animal Resources, Nairobi (2005).

18. Mariner J. "Manual on participatory epidemiology: Methods for the collection of action-oriented epidemiological intelligence (FAO animal health manual)" (2000).

19. Babalobi Olutayo Olajide. "Eight years (2004-2012) of teaching participatory epidemiology at the University of Ibadan, Nigeria". PENAPH First Technical Workshop, Chiangmai, Thailand, 11 – 13 December (2012).

20. Sri Balaji N and Vikrama Chakravarthi P. *Veterinary World* 3.12 (2010): 549-551.

21. Mathias-Mundy E and McCorkle M C. "EVM: An annotated bibliography". Bibliographies in Technology and Social Change, No. 6, Technology and Social Change Programme, IOWA State University, Ames, IOWA 50011 USA (1989).

22. Mathias and McCorkle. "Traditional livestock healers". *Revue Scientifique Et Technique* 23.1 (2004).

23. World Health Organization (WHO). IT'S (1993) Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines, Manila (1993).

24. Andy Catley., *et al*. "Open access book: 'Pastoralism and Development in Africa'" https://pastres.org/2022/07/15/pastoralism-book/.