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TRADITIONAL METHODS OF LIVESTOCK DISEASES MANAGEMENT AMONG HERDERS IN ADAMAWA STATE, NIGERIA

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Abstract

This study analyzed the traditional methods of livestock diseases management among cattle herders in Adamawa State, Nigeria. Primary data were collected by the used of questionnaire administered to randomly selected 363 respondents. Data collected were analyzed using percentages and regression analysis. Result of the analysis showed that 87.9% of the respondents were above 40 years of age and 80% of the respondents had more than 24 years of cattle herding experience. The most common diseases in the study area were foot and mouth disease and diarrhea. Use of herbs (98.3%) and hygiene (98.9%) were the most commonly used control methods. The result of the regression analysis gave $R^2$of 96% and it revealed that there was a positive relationship between the coefficient of age, number of cattle owned and number of cattle affected by diseases at 5% level of significance. Deforestation was the major constraint to utilization of control methods. The study concluded that traditional control methods were well established and utilized by the respondents. The research recommended that investigationshould be undertaken by research institutes to ascertain the constituents of the herbs use by the herders and the precise dosage to be use in the treatment of cattle diseases. There is also need for extension workers and services to be strengthened so as to incorporate the traditional methods used by the herders.

Keywords: Traditional, livestock, disease, control

INTRODUCTION

Livestock production is a source of employment and livelihood to many people in the developing countries of sub-Saharan Africa. The industry provides continuous sources of essential food products (meat, milk, other dairy products), generates animal power and organic manure for arable farming in rural areas. In Nigeria, among all the livestock species domesticated, cattle are the most prominent and important in terms of animal protein supply, value and biomass among others. They are a form of capital that have shaped the lifestyle and cultures of many people. Cattle are essential in enabling the use of natural resources for sustainable livelihoods. It contributes to food security for both rural and urban areas and also contributes to household finances in many ways, as it can be a primary source of savings, income, credit, insurance, loan, gifts and investments. Among the nomadic Fulani pastoralists, cattle serve as index of social prestige (Ikhatua, 2000).

More than half of the total livestock population of Nigeria is permanently resident in the northern part of the country due to abundant land for grazing. Transhumance is the dominant system of cattle production. The animals are predominantly in the hands of the nomadic cattle herders who hold over 90% of the Nigeria's 19.9 million cattle (Usman, 2016). For centuries, cattle herders used a considerable wealth of traditional knowledge in cattle diseases management. These knowledge practices are developed by the herders through observation and real life experiences over a period of time, communicated orally from one generation to the other with the ultimate aim of molding their thought for the sole purpose of ensuring survival and progress. These knowledge practiceshas been the only methods available to cattle herders before

the introduction of veterinary medicine in Nigeria. But with the coming of modern veterinary medicine into the country, the traditional methods of cattle diseases control were relegated to the background and described as stagnant for the new technologies to be adopted. This may be for the assumption that, any innovation or technological breakthrough made by farmers on their own was thought to be accidental and to have developed unsystematically. It is commonplace to regard information or practice that was derived from the traditional knowledge of the people as inferior to those of modern veterinary practices. This was true especially in matters that dealt with health delivery systems (human and animals).

It was not long after the introduction of the modern animal health care system in Nigeria that the system was plagued by many problems. These include inadequate manpower, logistics and inputs, scarcity and erratic supply of veterinary services, increasing cost of veterinary drugs, poor communication facilities and other modern techniques. Due to these problems, the dependence on modern veterinary medicine alone cannot solve most of the animal health problems. Many have gone back to the use of traditional methods of livestock diseases management.

Adamawa state is one of the principal livestock producing states in Nigeria. The state has estimated 3.2 million heads cattle with abundant traditional knowledge for the control of cattle diseases (Ministry of Agriculture, 2016). The herders are familiar with these practices, they understand, handle and maintain them better than introduced modern practices and technologies. The traditional knowledge are drawn from local resources that are cheap and less dependent on outside supplies that can be costly, scarce or unavailable (Bamiboye and Kuponiyi, 2010). These resources were not documented. For instance, the study conducted in the state was mainly on documentation of parasites and diseases affecting livestock without recourse to their traditional control methods despite lots of traditional knowledge and capacity in areas of diseases control which needs to be harnessed and documented.

OBJECTIVE OF THE STUDY

The main objective of the study was to analyze the traditional methods of livestock diseases management among herders in Adamawa State, Nigeria. The specific objectives of the study were to; describe the socio-economic characteristics of the respondents; identify the traditional control methods of livestock diseases used by the respondents; ascertain the relationship between socio-economic characteristics of the respondents and use of traditional control methods and identify the constraint to utilization of traditional control methods of diseases management.

METHODOLOGY

The Study Area

The study was conducted in Adamawa State, Nigeria. The state lies between latitudes 7^0 N and 11^0 N of the equator and longitudes 11^0 E and 14^0 E of the Greenwich meridian (Adebayo and Tukur, 1999). It has a tropical climate marked by distinct dry and wet seasons and mean annual temperature is about 34.6^0c. The annual rainfall of the area ranges between 760mm in the northern part of the state to 1000mm in the southern part and has a landmass of 7,282.2 km^2. The study area has a population of 3,168,101 persons in 2006 (4,117,676 people, as at 2016 based on 2.9% growth rate) UNFPA-Nigeria (2010).

Sampling Technique

Seven out of the 21 Local Government Areas of Adamawa state were purposively selected based on the concentration of registered cattle herders. The list of registered members was obtained from the officials of their association. Based on the list obtained, respondents were randomly selected proportionate to the number of registered members from each of the Local Government Area selected using Taro Yammana's formula as adopted by (Usman *et al*., 2015). The formula is expressed as;

$n = N/1+N\,(e)^2$

Where;

n = number of respondents

N= Population of the study

e = error

In all, 400 respondents were randomly selected. However, out of the 400 questionnaires administered, 363 (91.0%) questionnaires were retrieved and used for the study

Data Analysis

Regression analysis was employed to ascertain the relationship between socio-economic characteristics of the respondents and the utilization of the control methods. Frequencies and percentages were used to analyze the socio-economic characteristics of the respondents, traditional control methods and constraints to the use of traditional control methods.

RESULTS AND DISCUSSION

1.1: Socio-economic Characteristics of the Respondents

Result on Table 1 shows that none of the respondents is below 30 years of age. About 12.1% of the respondents were between the ages of 30-39 years, while 25.3% were above 59 years. The result shows that majority (59.5%) of the respondents were above 49 years of age. Older people may have tendency of being strict on the use of the methods. This assumption stems from the fact that older people may be less adventurous and less favourably disposed towards trying new things, as opposed to younger ones (De Bono, 1993). Hence, older herders may have low expectation of benefits derived and less favourable attitudes towards use of modern veterinary practices. The management system of cattle by respondents reveals that87.6% practiced extensive system of management while 10.7% practiced semi-intensive and only 1.7% practiced intensive system of livestock management. This indicated that 87.6% of the respondents were nomadic by nature moving over long distances in search of pasture and water and sometimes moving away from suspected disease infested locations.

Result of the extension visits to the respondents was also presented in Table 1. The result reveals that about 48% of the respondents did not had any extension visit, while 18.7% had 2 visits in a year and only 3.9% had up to 12 visits in a year. Those 3.9% that indicated a visit in every month are herdsmen that are close to local government headquarters and they had to personally call the extension workers to their herds. The result implies that there were inadequate extension services to the cattle herders, because the frequency of contact between herdsmen and extension agents shows that extension service as related to cattle herding was very low.

Table 1: Socio-economic Characteristics of the Respondents (n = 363)

Socio-economic variable	Frequency	Percentage (%)
Age (years)		
30-39	44	12.1
40 – 49	103	28.4
50 – 59	124	34.2
>59	92	25.3
Herding experience (years)		
< 25	72	19.8
25-34	107	29.4
35-44	112	30.8
45-54	51	14.0
>54	22	6.0
Management Practices		

Intensive	6	1.7
Semi-intensive	39	10.7
Extensive	318	87.6
Extension Contact		
Once a month	14	3.9
Once in 2 months	5	1.4
Once in 6 months	68	18.7
Once a year	103	28.4
Not at all	173	47.7

Source: Field Survey, 2015

1.2: Number of Cattle Owned by the Respondents, Affected by Diseases and Diseases Affecting Cattle

Number of cattle owned by the respondents is presented in Table 2. About 48% of the respondents owned between 41-80 heads of cattle, while 28.4% owned less than 40 heads of cattle only 1.1% owned more 160 heads of cattle. From the result it can be seen that about 72% of the respondents owned more than 40 heads of cattle. According to Ikhatua (2000),cattle serve as index of social prestige **a**mong the nomadic Fulani pastoralists apart from the economic gain. This could be the reason why they accumulated the cattle.

Result on Table 2 also reveals that 44.9% of the respondents had between 31 – 60 heads of their cattle affected diseases and only 0.5% had more 120 heads of their affected by diseases. The result shows that all the respondents complained of occurrence diseases among their cattle. This may be as a result of extensive management system practiced by the respondents moving over long distances in search of pasture and water. In the process their cattle may be infected or aggravate the already existing infections in their herds (Inuwa, 2012). The common diseases encountered as indicated by the respondents were Foot and Mouth disease, Bloat and Contagious bovine pleura-pneumonia among others.

Table 2 Number of Cattle Owned, Affected by Diseases and Diseases Affecting the Cattle

Variable	Frequency	Percentage (%)
Number Cattle Owned		
≤ 40	103	28.4
41-80	173	47.7
81-120	73	20.1
121-160	10	2.8
>160	04	1.1
No. Cattle Affected By Diseases		
≤ 40	103	28.4
41-80	163	44.9
81-120	41	11.3
121-160	10	2.8
>160	02	0.5

Source: Field Survey, 2015

Traditional Control Methods of Cattle Diseases

Many herders manage and treat their animals without any inputs that cost money, especially if the illness is common and can be diagnosed easily. In most cases they relied on experience gained over time to arrive at a type of ailment. This is common with diarrhea, skin diseases and foot and mouth disease. The symptoms according to the respondents include frequent defecation for diarrhea, mucous dropping from mouth, fever, blisters on the teats and between the toes for foot and mouth disease. The result obtained compared favourably with the finding of a similar study conducted by Naso (2010) in Gambia. These methods of control are;

Hygiene

About 99% of respondents practiced this control method. According to respondents, it involves keeping the environment clean by weeding or cutting of shrubs and grasses and clearing their surroundings. Walter and

Dietrich (1992) reported similar finding in study conducted in Somalia. The diseases control by this method are CBPP, Tuberculosis among others. Epu (2010)assert that herders maintained cleanliness in and around enclosure in order to prevent spread of disease.

Table 3: Traditional Control Methods Used by the Respondents (n=363)

Control Methods	Frequency	Percentage (%)
Hygiene	359	98.9
Movement away from infected area	349	96.1
Bush burning	160	44.1
Use of Holy books	278	76.6
Using hot object to create scare	301	82.9
Incantations (Spiritual)	118	32.5
Isolating affected animals	351	96.7
Use of smoke	363	100
Dietary supplement to sick animals	363	100
Use of Herbs	363	100

Source: Field Survey, 2015

Movement away from the infected area

Ninety six percent of the respondents practiced this method. It involves leaving an area for another when they notice the presence of diseases especially in the case of sudden death of cattle or where they believed that there is evil spirit in the area. In the studies conducted in Somalia, Walter and Dietrich (1992) reported that most herders move away from an area if they suspect the presence of evil spirit or infection. Moving away may have advantages to the herders, but it may also result to rising conflicts between resource users.

Use of holy books

About 77% of the respondents practiced this method (Table 4.5). Verses from the holy Qur'an are read over the animals in the morning and evening for protection or read in a container with water to give to sick animal to drink. Sometimes these verses were even written on a paper and rapped up into an amulet to be worn by the animal(s) for protection or therapy against ailment (Plate 4.2). Padmakumar (1998) pointed out that, there are two main indigenous methods of treating disease by pastoralists in India, these methods according to him are magic- religious healing, mostly done by holy Qur'an and use of herbs. Adekunle *et al.* (2002) found out that 48.1% of

their respondents practiced this method in a study they conducted in Kogi and Niger states, Nigeria.

Use of Herbs

About 98% of the respondents use various herbs to control cattle diseases. It involved cutting of leaves, stem or bark, roots, seeds of herbs and boiling them for the animals to drink. It is sometime dried, grounded and added to fed or dried grounded soaked in drinking water or mixed with oil to rub on skin. For example, oil extract from the seed of Vitellariaparadoxa is used in controlling treatment of brucellosis, mastitis, ring worm, mange, foot and mouth disease and open wounds. While *Vitellaria paradoxa l*eaves is used in the treatment of CBPP. Similarly, stem bark of *Detarium microcarpum* is used in the treatment of pneumonia and open wounds, also stem bark, roots and leaves are use in the treatment of diarrhea, Mange and brucellosis (Table 4).

Table 4: Diseases Affecting Cattle and Traditional Herbs Used In Treating Cattle Disease in the Study Area

Disease	**Plant**	**Part of plant used**	**Mode of administration**
Diarrhea	*Adansoniadigitata*	Leaves	Oral
	Acacia nilotica	Seed	Oral
	Khayasenegalensis	Stem bark	Oral
	Stereospermumkunthianum	Stem bark	Oral
	Detariummicrocarpum	Stem bark, roots, leaves	Oral
	Annonasenegalensis	Stem bark	Oral
	Tamarindusindica	Leaves	Oral
	Azadirachaindica	Leaves	Oral
	Prosopisafricana	Roots	Oral
	Leptadeniahastata	Whole legume	Oral
	Vignaunguiculata	Leaves	Oral
Anthrax	*Maeruaangolensis*	Leaves, stem bark	Oral
	Nicotiatabacum	Roots and leaves	Oral
	Boswelliadalzilii	Leaves	Oral
	Piliostigmareticulatum	Bark	Tie to the head of the animal
Black quarter	*Boswelliadalzilii*	Leaves	Feed to animal
	Boswelliadalzilii	Leaves	Oral
	Piliostigmareticulatum	Bark	Tie to the head of the animal
Streptothricosis	*Aframomum Moleguetta*	Oil from the seed	Tropical
	Parkiabiglobosa	Stem bark	Tropical
CBPP	*Balanitesaegyptiaca*	Leaves	Oral
	Vitellariaparadoxa	Leaves	Feeds to animals
Lumpy skin disease	*Oncobaspinosa*	Leaves	Feeds to animal
	Guierasenegalensis	Leaves	Oral

Brucellosis	*Strigahermontheca*	Whole part	Feed to animals
	Balanitesaegyptiaca	Seed	Tropical
	Detariummicrocarpum	Roots and leaves	Tropical
	Khayasenegalensis	Stem bark	Tropical
	Oncobaspinosa	Stem bark	Feeds to animals
	Khayasenegalensis	Stem bark	Feeds to animals
	Piliostigmareticulatum	Stem	Tie to the neck of affected animal
	Vitellariaparadoxa	Seed	Tropical
	Piliostigmareticulatum	Bark	Tie to the head of the animal
Tuberclosis	*Citrus aurantifolia*	Fruits	Oral
	Allium sativa	Bulb	Oral
	Allium sativa	Bulb	Oral
	Jetrophacurcas	Leaves	Feed to animal
	Allium sativa	Bulb	Oral
	Carisaedulis	Leaves	Oral
Ring worm	*Vitellariaparadoxa*	Stem	Tropical
	Ricinuscommunis	Stem	Tropical
	Khayasenegalensis	Stem bark	Tropical
	Khayasenegalensis	Stem bark	Add to feeds
	Calotropisprecera	Whole plant	Tropical
Mastitis	*Ziziphusspina-christi*	Leaves	Tropical
	Vitellariaparadoxa	Seeds	Tropical on the udder
	Aspsragusrececosus	Leaves	Tropical as paste on the udder
	Ecliptaprostaste	Leaves	Tropical as paste on the udder
	Khayasenegalensis	Seed	Tropical on the udder
	Ricinuscommunis	Leaves	
	Boswelliadalzilii	Leaves	Tropical as paste on the udder
Mange	*Piliostigmareticulatum*	Leaves	Tropical
	Adansoniadigitata	Leaves	Tropical
	Detariummicrocarpum	Roots	Oral
	Aframomummoleguetta	Seeds	Tropical
	Calotropisprecera	Roots	Tropical
	Vitellariaparadoxa	Seeds	Tropical
Poor milk laid down	*Calotropisprecera*	Stem	Tropical
	Ricinuscommunis	Stem, leaves	Oral
	Carcia papaya	Roots, leaves	oral
	Crimiumzylanicum	Whole climber	Oral
	Parkiabiglobosa	Seed	Feeds to animals
	Psidiumguajava	Leaves and stem	Oral

	Musa sapientum	Fruits	Oral
Open wounds	*Vitellaria*	Seed	Tropical
	Boswelliadalzilii	Stem bark	Tropical
	Calotropisprecera	Whole plant	Tropical
	Detariummicrocarpum	Stem bark	Tropical
	Ricinuscommunis	Seed	Tropical
	Ricinuscommunis	Stem bark	Tropical
	Adansoniadigitata	Stem	Tropical
	Crimiumzylanicum	Whole climber	Tropical
	Oncobaspinosa	Stem bark	Tropical
	Arachyshypogeal	Shell	Tropical
Bloat	*Nicotianatabacu*	Whole plant	Intramuscular injection
	Adansoniadigitata	Leaves	Oral
	Strigahermontheca	Whole plant	Oral
	Tamarindusindica	Seeds	Oral
	Arachishypogeal	Seeds	Oral
	Boswelliadalzilii	Stem bark	Feed to animal
	Stereospermumkunthianum	Stem bark	Oral
	Detariummicrocapum	Stem bark	Oral
Food and mouth disease	*Sorghum bicolar*	Roots	Tropical
	Acacia nitolica	Seed	Tropical
	Hibiscus sabdarifa	Leaves	Tropical
	Zea mays, pennisetumglaucum	Grain	Oral and tropical
	Allium sativa and allium cepa	Bulb	Tropical
	Lawsoniainermis	Leaves	Tropical and paste
	Leptadenia hastate (formally L. lancifolia)	Leaves	Oral and tropical
	Khayasenegalensis and ziziphusspinachristi	Leaves	Oral and tropical
	Ziziphusmauritania	Leaves	Oral and tropical
	Balamitesaegyptiaca	Fruits	Oral
	Adansoniadigitata	Stem bark	Tropical
	Mimosa pigra	Stem bark	Tropical
	Mauritania	Stem bark	Oral and tropical
	Piliostigmareticulatum	Leaves	Tropical
	Jetrophacurcas	Whole plant	Tropical
	Khayasenegalensis	Stem bark	Tropical
	Sesamum	Plant	Tropical
	Citrus aurantifola	Leaves	Tropical
	Prosopisafricana	Leaves	Oral and tropical
	Parkiabiglobosa	Stem and leaves	Tropical
	Vitellariaparadoxa	Seeds	Tropical

To foster love between dam and calf	*Asparagus flagellaris*	Aerial parts	Tropical on the calf
Fracture of bone	*Debregeasisdealbata*	Sticks from the plant	Reposition and immobilized the fracture part
Fixation of fractured mandibular	*Acacia nilotica*	Fresh sticks	Reposition and immobilized
Boils	*Tamarindusindica*	Stem bark	Tropical

Source: Field Survey, 2015

RESULT OF THE REGRESSION ANALYSIS

The socio-economic characteristics affecting the utilization of traditional control methods were determined by OLS regression analysis, which is shown in Table 5. Double log was selected as the lead equation based on the coefficient of determination (R^2), and the statistical significance of the estimated regression coefficients. The R^2 was 0.96, which means that 96% of the variation in the dependent variable was explained by the various independent variables in the model.

Table 4 Result of the Regression Analysis

Variable	Coefficient	Standard error	T-value
Age ($X_{1)}$	1.194	0.121	9.863***
Management practices (X_2)	0.270	0.115	2.346**
Experience (X_3)	0.663	0.325	2.040**
No. of Cattle owned (X_4)	0.239	0.051	4.709***
No. of Cattle Affected(X_5)	18.219	3.569	5.105***
Extension Visits (X_6)	0.081	0.145	0.560 ^{NS}
Constant	0.836		
R^2	0.96		
Adjusted R^2	0.94		
F-ratio	4.19		

Source: Computed from Field Survey, 2015

*** = Significant =at 1%; ** = Significant =at 5%; NS= Not significant

Analysis of the result in Table 4 shows that coefficient of age (X1), number of cattle owned by the respondents (X4) and number of cattle affected by diseases (X5) were positive and statistically significant at 1% level. This implies that, as the herder's age increases, the more the tendency of the respondent being adhere to the use of traditional control methods. Age may influence the use of traditional control methods of cattle diseases. Older people may have tendency of being strict on the use of the methods. This assumption stems from the fact that older people may be less adventurous and less favourably disposed towards trying new things, as opposed to younger ones (De Bono, 1993). Hence, older herders may have low expectation of benefits derived and less favourable attitudes towards use of modern veterinary practices.In corroborating this position, David (2012),asserted that old people are more likely to adhere to use of

indigenous control methods of cattle diseases as it may be difficult to convince them to accept modern veterinary practices compared to young herders.

The number of cattle owned by the respondents (X4) and use of traditional control methods shows that, the higher the number of cattle owned by herder, the more the likelihood of the herders using traditional methods of diseases control. This could be because there is tendency of having diseases occurrence among their cattle most especially with extensive management system practiced by the respondents.

Coefficients of Management system (X2) and Experience (X3) were positively and significantly related to the use of traditional control methods of cattle diseases control at 5% level. The interpretation of this result is that, herders practicing extensive management system have more tendency of using traditional control methods of cattle diseases. This could be because the cattle are more exposed to diseases and the herders too have easy access to herbs since they are always in the bush with their cattle. The positive and significance relationship of years of experience implies that, as the herders experience increases, so also their knowledge on cattle diseases control methods and the ability to make use of the knowledge. Experience implies more familiarity, specialization and perfection with the practice of traditional methods, which could encourage their adherence to these methods.

Constraint to Utilization of Traditional Knowledge

Problems that inhibit utilization of traditional knowledge by the respondents were presented in Table 5. Deforestation rank first among all the problems confronting the respondents. This could be as a result increased in human activities as a result of population increase which results to clearing of forest for housing, farms and other human activities. Lack of government recognition rank second in the constraints to utilization of traditional knowledge of diseases and parasites control. Unlike modern veterinary medicine where there are research centers veterinary clinics and other logistics support, traditional knowledge people have no support, assistance or recognition from government. The constraint that ranks third was western education which many youths are exposed to. Akullo *et al.* (2007) reported that, the exposure of young generation to western education and other modern training have shifted youths attitudes away from using traditional knowledge; some youths feel it is time consuming, dirty, exhausting and sometimes dangerous to hunt for herbs in the forests and bushes than the modern technique which they see it as easier to manage. Concealment of the knowledge was another problem. Mostly traditional people share the knowledge only to their trusted children who are mostly in western education school.

Table 5:Constraints to Utilization of Traditional Control Methods

Constraint	*Frequency	Percentage
Deforestation	359	98.9
Lack of Government recognition	349	96.1
Western education	278	76.6
Concealment of knowledge	363	100
Depletion of herbs	351	96.7

Source: Field Survey, 2015

CONCLUSION

Based on empirical evidence of the study, the following conclusions were drawn: majority of the respondents were aged more 50 years of age, majority are well experienced in cattle herding and used of traditional control methods of livestock diseases. It is therefore rational and easy for the herdsmen to practice traditional methods of cattle pests and diseases control on their herds. This knowledge system can be used as a foundation for the success of all sustainable animal health care programmes and also serve as a source of pride to the herdsmen to stimulates their willingness to participate in development projects.

In view of the finding of this study, the following recommendations were made:

i. Traditional knowledge system should be incorporated in the modern teaching of veterinary medicine since the knowledge is well accepted by herders.

ii. Investigations need to be undertaken by research institutes to the constituents of the herbs ascertain the precise dosage to be use in the treatment and control of cattle diseases.

iii. There is a greater need for extension workers and services to be strengthened so as to incooperate the indigenous methods used by the herders. In this case, both access to extension service and the frequency of contacts between extension agents and herders should be strengthened.

REFERENCES

Adebayo, A.A. and Tukur, A.L. (1999). Adamawa State in Maps, Paraclete Publishers, Yola. P3.

Adekunle, O A., Oladele, O. I. and Olukaiyeja, T. D. (2002). Indigenous Control Methods for Pests and Diseases of Cattle in Northern Nigeria, Livestock Research for Rural Development. 14(2).http://www.lrrd.org/lrrd14/2/adek142.htm.

Bamiboye, E.O. and Kuponiyi, F.A. (2010). The Characteristics of Indigenous Knowledge System Influencing their Use in Rice Production by Farmers in Ekiti State, Nigeria. Ozean Journal of Social Sciences 3(1): 39-50.

David J S. (2010).Ethno-botanical Survey of Medicinal Plants in Babungo Northwest Region, Cameroon. Journal of Ethnobiology andEthnomedicine1746-4269-6-8 www.ethnobiomed.com/article/10.1186/1746 /4269/6/8.

De-Bono,K.G.(1993).Individual Differences in Predicting Behavioural Intentions from Attitude and Subjective Norm. The AmericanJournalofSociaPsychology133(6):825-832.

Epu, P.G.H. (2010). Facilitating Innovation for Development. Journal of Research and Applied Sciences.6 (3): 129-132.

Ikhatua,U.J. (2000). The Nigerian Livestock Industry- A Sleeping Giant? 56th University of Benin Inaugural Lectures Series.

Inuwa, M. (2012). Nigerian Livestock Resources, the Need to Harness. A Review. Journal of Agro-science. 3(2): 98-111

Usman et al. (2016) Traditional Methods of Livestock Diseases Management among Herders in Adamawa State, Nigeria

Ministry of Agriculture (1991). Monthly Report. Government Printing Press, Yola.

Naso, U. (2010) Farmers' Participation in Indigenous Methods of Mixed Farming in Gambia. Journal of Forestry and Applied Sciences.6 (3): 129-132.

Padmakumar, V. (1998). Farmers' Reliance on Ethno-veterinary Practices to Cope With Common Cattle Ailments. In: Indigenous Knowledge and Development Monitor (6) 2 July. P. 20

UNFPA-Nigeria (2010). United Nations Fund for Population Activities, Adamawa State Report. http://nigeria.unfpa.org/pdf /adamawafar.pdf. Accessed August 30, 2012

Usman,I. S., A. U. Mani and I. D. Mohammed (2015). Traditional Foot and Mouth Disease Control Methods among Nomadic Cattle Fulanis in Adamawa State, Nigeria. Alexandria Journal of Veterinary Science. 45:71-78.

Walter, A and Dietrich, F. (1992). Role of Traditional Medicine Among Nomads of Somalia. Traditional Veterinary Practice in Africa.GTZNo. 243 Eschborn Germany