

## **Participatory evaluation of livestock impediments in some pastoral settings in Katsina State, Nigeria**

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**Target Audience:** Researchers in the field of Veterinary medicine and animal production and policy makers.

### **Abstract**

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*Formal system of investigating livestock impediments seems to be of limited value in rural communities in developing countries. Participatory epidemiological (PE) tools were used on 4 focus groups in Katsina State, Nigeria to investigate pastoralists' perspectives of their livestock. Data were subjected to descriptive statistics, Friedman's test and Kendal's coefficient of concordance. Cattle constituted the largest proportion of livestock kept, followed by goats, sheep, and poultry among others. Benefits derived from such animals included manure, means of livelihood, draft, and farm traction. Cattle rustling, lack of watering points and diseases were identified as factors militating against livestock production. Most prevalent livestock diseases identified included PPR, anaplasmosis, fasciolosis, round worms, CCPP, brucellosis, tick infestation, foot rot and arthritis. Signs of small ruminant diseases identified were consistent with the modern veterinary knowledge of such diseases. Traditional management of brucellosis included, firing of the knee in case of hygroma, then application of 'Rai dore' (*Senna occidentalis*) and drenching of affected animals with its solution. Some believed in chanting some verses from the Holy Qur'an on afflicted animals. Pastoralists were knowledgeable about their livestock and should be given a voice to enhance understanding and solving of animal health problems in their localities using PE.*

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**Key words:** Participatory, epidemiology, Livestock, impediments, Katsina, Nigeria.

### **Description of Problem**

Formal system of investigating barriers to profitable livestock production seems to be of limited value especially in resource poor communities in developing countries (1). In view of this, the Participatory epidemiology (PE) approach was developed to overcome constraints in applying conventional epidemiology and formal research in such countries. The PE is an emerging branch of Veterinary Epidemiology that involves a

systematic use of participatory approaches and methods to find a solution to epidemiological problems and provide options for animal disease control (2, 3). It learns from the local knowledge of people in rural communities, with the view of disease control programme that are both acceptable to the stakeholders and effective. This branch of epidemiology takes into cognizance that people in local communities especially in the developing world are very knowledgeable about the

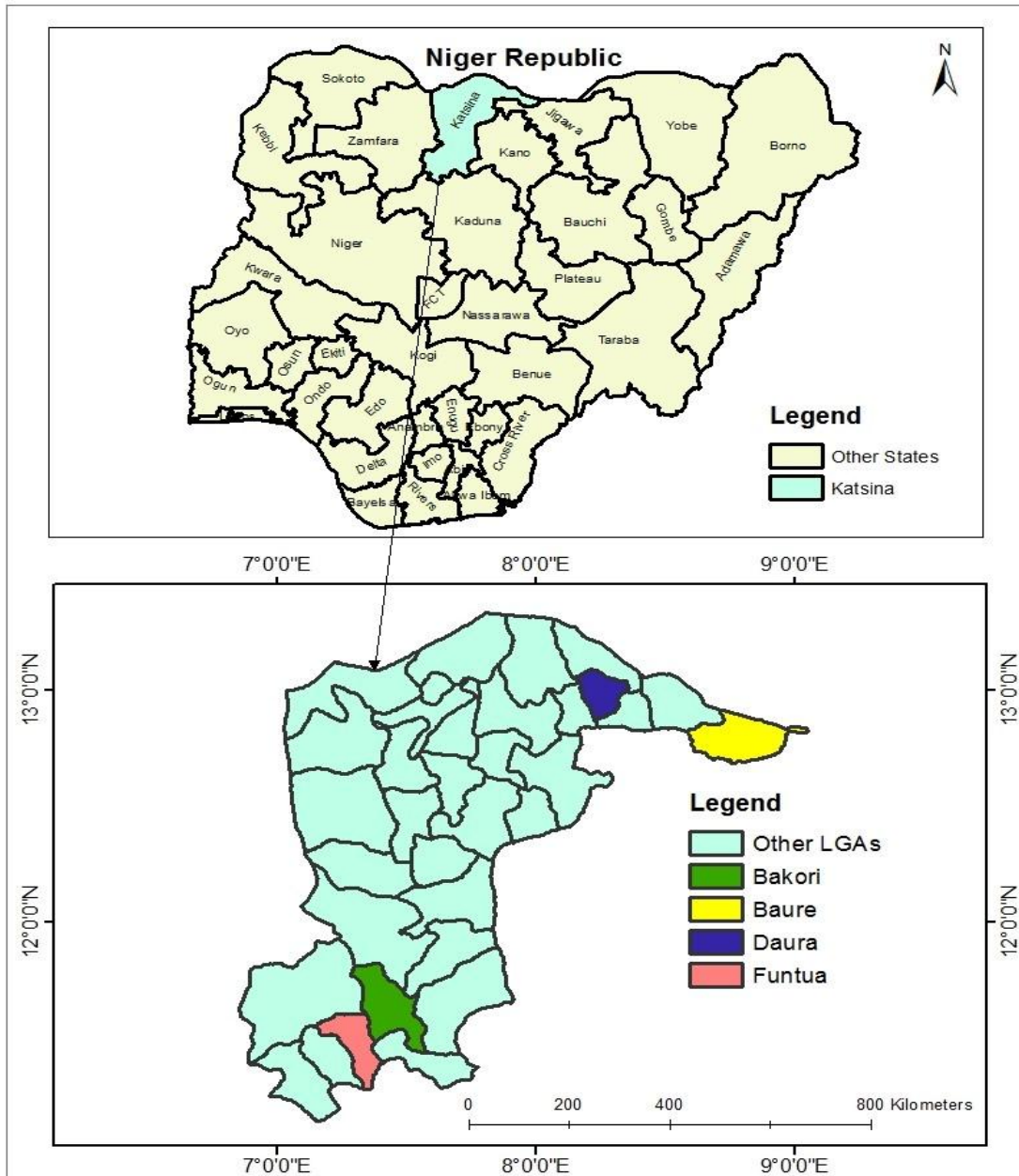
animals they keep, diseases and other militating factors against these animals. This form of knowledge is known as 'existing veterinary knowledge' (EVK) (4). This knowledge is peculiar to each community where local language terms are used, their knowledge on livestock diseases are often consistent with the modern veterinary knowledge of such diseases. In most instances, they are able to link common clinical presentations to a particular disease, describe epidemiological patterns of disease, identify the key pathological lesions of a certain disease at post mortem, and identify vectors and reservoirs of certain diseases. This study was set to investigate pastoralists understanding of livestock diseases especially brucellosis, the economics of livestock species kept by pastoralists and major factors

militating against livestock production in the villages under study.

## **Materials and Methods**

### **Study Area**

The study was conducted in Katsina State of Nigeria. For the purpose of this study, 4 Local Government areas (LGAs) were randomly selected from the 34 LGA making up Katsina State (Fig. 1). Katsina State is located between latitude  $11^{\circ} 20'$  and  $13^{\circ} 20'$  N and longitude  $6^{\circ} 45'$  and  $8^{\circ} 15'$  E. It shares its northern border with Maradi Province in the Niger Republic and Kaduna State to the South. It also shares border to the East with Jigawa and Kano States and Zamfara States to the West (5). The vegetation in Katsina State is the Sudan Savannah type. The State occupies a land mass of about 23,850 square kilometers with a human population of about 5,801,586 (6).



**Fig 1: Map of Nigeria showing Katsina State with study areas  
Formation of PE Team and focus group Participants**

Participatory epidemiology team of 3 was formed. This consisted of an interviewer/facilitator, a livestock officer-in-charge of the LGA in question who was saddled with the responsibility of a key

informant and a recorder and the Veterinarian in charge of the LGA in question. The respondents/participants were selected amongst members of the community in question. Such respondents comprised mostly

of pastoralists of various age groups. Emphasis was placed on pastoralists that keep small ruminants. Interviews were conducted in one district from each of the selected LGA in the State based on ease of accessibility.

### **Field work and use of participatory epidemiology tools**

Visits to villages were scheduled in line with the convenience of all participants. Locations and timing of the interviews were arranged prior to the visit by the key informant. Each focus group comprised of an average of 10 participants. Of all the PE tools, those that best suited the information sort were used. A combination of tools were used in some villages with probing questions to ascertain consistency where necessary. Open ended interviews were conducted and its consistency was maintained with the aid of a check-list as described by Mariner and Roeder (7). Interviews were conducted in Hausa Language which was later translated into the English Language.

### **Determination of husbandry problems and predominant small ruminant diseases**

Participants in the villages visited were asked in a Semi Structured Interview to list the following:

- a. All animal species they kept in their community.
- b. Problems militating against livestock production in their community.
- c. Major diseases affecting livestock in general and small ruminants in particular.

The listed items were written individually on pieces of (63.5×52.2cm) cardboard paper, after which simple ranking tool was employed where a representative of the group was asked to rank the listed items. Animal species were ranked based on population, problems militating against livestock production and diseases affecting livestock were ranked in

order of importance, starting from the most important to the least. Economic importance of each listed animal species was also investigated in a SSI. Time was given for all the participants to come to a consensus before the information was recorded in a log book. Names of the identified diseases were given in Hausa/Fulani language after which they were translated to English language by the Veterinarian in charge of the LGA in question.

### **Probing of livestock species kept by participants**

Proportional pilling was used to verify the previous information given by the pastoralists. The method described by Catley *et al.* (8) was used. This involved drawing of circles on a cardboard paper corresponding to the number of animal species mentioned previously, after which a sketch of each animal species was drawn in each of the circles. One hundred maize grains were provided as counters for which they were asked to pile relative population of each species. Time was given to allow for agreement among all participants on the distribution of counters before results were recorded.

### **Determination of diagnostic ability of pastoralists on brucellosis and other Small Ruminant diseases**

To find out the pastoralists' understanding of clinical indicators for small ruminant diseases, matrix scoring method was used. Simple matrices were drawn on a (63.5×52.2cm) cardboard paper with diseases written in their local names on the top axis (x-axis) as mentioned by the pastoralists with their major clinical signs (indicators) written on the vertical axis (y-axis). For each clinical indicator, participants were allocated 30 counters (maize) (9) and were asked to score each indicator on how it relate to a particular disease. They were given some time to come to

a consensus amongst themselves before it was recorded.

#### **Determination of animal health care and existing ethnoveterinary practices of pastoralists**

Semi Structured Interview was used where pastoralists' focus groups were asked to mention various ways they use in treating common livestock diseases. The information given was documented in a log book. They were further asked where applicable to identify various herbs they use in treating these livestock ailments. Pictures of identified herbs were taken.

#### **Probing of information and expressions obtained**

Transect walk was done across the villages after the other activities were completed. It was used to make direct observation of the village settlement and to verify some of the information given by the pastoralists. It also gave an opportunity of members of the team to make informal interviews with other rural dwellers not involved in the initial interviews. Information on the community life and management/production systems were observed and recorded. Clinical cases of

diseases were observed and pictures were taken where necessary.

#### **Statistical analysis of data**

Descriptive statistical analysis was used to describe basic features of the data from participatory epidemiology using 3 main statistical approaches that included distribution of data, Central tendency and Dispersion. Also, data were exported to SPSS version 17.0 (2009) where Kendall's coefficient of concordance (W) was used to measure levels of agreement among different informant groups. Other data were presented as pictures and charts.

#### **Result**

##### **Species of animals kept, their estimated population and risk of brucellosis spread**

As revealed by simple ranking and probed by proportional piling, cattle constituted the largest proportion (ranked 1<sup>st</sup>) of livestock species kept by pastoralists in Katsina State. This was followed by goats (ranked 2<sup>nd</sup>), sheep (ranked 3<sup>rd</sup>), poultry (ranked 4<sup>th</sup>), camels (ranked 5<sup>th</sup>) and Donkeys (ranked 6<sup>th</sup>) (Plate 1). These animals were largely on extensive system of management with only few herds managed on semi-intensive system.



Plate I: Proportional pilling of animals kept by pastoralists in Katsina State.

### Economic importance of animal species

The economic benefits derived from the animal species kept by pastoralists in Katsina State as deduced from a SSI included manure (manure), means of livelihood, draft, farm traction, source of emergency fund, festivities, meat and milk/milk products.

With regards to cattle, matrix scoring showed that manure, means of livelihood and draft power scored 6 each while farm traction scored 5, milk/milk products scored 3, festivities and meat scored 2 and emergency fund scored 0. For sheep, the highest score of 11 was allocated to festivities, emergency fund scored 8, meat scored 5, means of livelihood and manure scored 4 and 2 respectively, draft, farm traction, milk/milk products all scored 0.

As for goats emergency fund scored 11, means of livelihood and meat score 5, festivities scored 4, milk/milk products and manure scored 3 and 2 respectively while 0 score was allocated to draft and farm traction. With regards to poultry, emergency fund was allocated 15 scores, festivities scored 7, meat and means of livelihood scored 5 and 3 respectively while manure, draft, farm traction, milk/milk products all scored 0. As for donkey, all the variables had scores of 0 except for draft with a score of 30. For camel, draft scored 6, means of livelihood, farm traction, festivities, milk and milk products all scored 5, meat scored 4 while 0 score was allocated to manure (Plate II).

ANIMALS KEPT IMPORTANCE	CATTLE	SHEEP	GOAT	POULTRY	DONKEY	CAMEL
FERTILIZER	6	2	2	0	0	0
MEANS OF LIVELIHOOD	6	4	5	3	0	5
DRAFT	6	0	0	0	30	6
FARM TRACTORS	5	0	0	0	0	5
EMERGENCY FUND	0	8	11	15	0	0
FESTIVITIES	2	11	4	7	0	5
MEAT	2	5	5	5	0	4
MILK/MILK PRODUCTS	3	0	3	0	0	5

MATRIX SCORING RESULT OF ECONOMIC IMPACT OF DIFFERENT ANIMAL SPECIES KEPT IN KATSINA STATE, NIGERIA.  
17/4/16

Plate II: Matrix scoring for economic impacts of animal species kept by pastoralists in Katsina State, Nigeria.

### Factors militating against livestock production

Using the SSI, pastoralists in Katsina State identified 7 factors as the major husbandry problems militating against livestock production in their villages (Table 1). These included cattle rustling which was ranked 1 ( $Z = 2.17$ ) and this was followed by effects of transhumance (Rank = 2;  $Z = 2.07$ ),

lack of watering points (Rank = 3;  $Z = 0.79$ ), lack/inadequate shelter (Rank = 4;  $Z = -0.3$ ), diseases (Rank = 5;  $Z = -1.05$ ), cost of medication (Rank = 6;  $Z = -1.58$ ) and feeding (Rank = 7;  $Z = -2.1$ ). The median score for husbandry problems that affect livestock production was significantly different ( $P = 0.0125$ ).

**Table 1: Scores for estimated husbandry problems that affect livestock production as reported by herdsmen in Katsina State, Nigeria.**

Problem	Mean (%)	Median (%)	Range (%)	Z-Score	Rank
Cattle Rustling	3.3	3	3	2.17	1
Effects of Transhumance	3	3	2	2.07	2
Lack of watering Points	2	2	4	0.79	3
Lack/Inadequate Shelter	1	1	2	-0.3	4
Diseases	0.8	0	3	-1.05	5
Cost of Medication	0.3	0	1	-1.58	6
Feeding	0	0	0	-2.1	7

H = 16.24; df = 6; p = 0.0125

**Small ruminant diseases**

Semi structured interviews of participants in the selected villages in Katsina State revealed 9 diseases/ conditions as commonly affecting small ruminants. These included Gishu/Gurda (PPR) (Rank 1 = ; Z = 2.78), Saifa (anaplasmosis) (Rank = 2; Z = 1.86), Balku/Hanta (fasciolosis) (Rank = 3; Z = 0.41), Matsattsaku (Round worms) (Rank 4 = ;

Z = 0.24), Huhu (CCPP) (Rank = 5; Z = 0.02), Bakkale/Bari (brucellosis) (Rank = 6; Z = -0.29), Kaska/koti (tick infestation) (Rank 7 = ; Z = -0.45), Ciwon kofoto (foot rot) (Rank = 8; Z = -1.14) and Kumburin Guiwa (arthritis) (Rank = 8; Z = -1.14) as revealed by pairwise ranking. The median scores for these small ruminant diseases were significantly different (P value = 0.0176) (Table 2).

**Table 2: Scores for estimated prevalence of small ruminant diseases as reported by herdsmen in Katsina State, Nigeria**

Disease	Local Names	Mean (%)	Median (%)	Range (%)	Z-score	Rank
PPR	Gishu/Gurda	2.8	3	1	2.78	1
Anaplasmosis	Saifa	2.3	3	4	1.86	2
Fasciolosis	Balku/Hanta	0.8	0	2	0.41	3
Round worms	Matsattsaku	0.5	0	1	0.24	4
CCPP	Huhu	1.3	0	5	0.02	5
Brucellosis	Bakkale/Bari	0.5	0	2	-0.29	6
Tick Infestation	Kaska/koti	0.3	0	1	-0.45	7
Footrot	Ciwon kofoto	0	0	0	-1.14	8
Arthritis	Kumburin Guiwa	0	0	0	-1.14	8

H = 21.54; df = 8; p = 0.0176

**Pastoralists' diagnosis of small ruminant diseases**

From the study, the interviewees associated signs of 'Balku/Hanta' (fasciolosis) to be high morbidity 3 (0-6), high mortality 9 (0-18), seasonal occurrence 3 (0-6), inappetence 8.5 (3-15), abortion 2 (0-3), fever 6 (0-12), diarrhoea 7 (5-8), liver involvement

20 (10-30) and oculonasal discharges 3 (0-7) (Table 4.26). They also identified signs of 'bakkale' (brucellosis) to be high morbidity 3 (0-6), high mortality 2.5 (0-5), inappetence 0 (0-6), abortion 20 (10-30) and retained placenta 4 (0-8). With regards to 'ciwon kofoto' (footrot), they associated it with high morbidity 4 (0-8), high mortality 3 (0-5),



seasonal occurrence 17 (15-20), inappetence 1.5 (0-3), limping 22.5 (15-30) and fever 3.5 (0-7). Signs they associated to ‘gishu/gurda’ (PPR) included high morbidity 8 (10-25), high mortality 20 (15-25), seasonal occurrence 10 (0-20), inappetence 20 (15-25), abortion 6 (0-12), respiratory distress 18 (5-30), mouth erosion/ discharges 20 (15-25) salivation 5.5 (0-12), fever 17.5 (10 -25), diarrhoea 23 (15-30) and oculonasal discharge 20 (15-25). As for ‘huhu’ (CCPP), its indicators were high morbidity 4 (0-6), high mortality 1.5 (0-3), seasonal occurrence 18 (15-20), inappetence 10 (5-15), abortion 1.5 (0-3), respiratory distress 15.5 (5-25) mouth erosion/salivation 12.5 (5-20) and fever 15 (10-20). ‘Saifa’

(anaplasmosis) was linked to high morbidity 7.5 (0-15), high mortality 17.5 (15-30), seasonal occurrence 4 (0-10), inappetence 13 (5-20), respiratory distress 5.5 (0-10), fever 6.5 (0-12), diarrhoea 8 (5-10) and oculonasal discharges 2.5 (0-5). High morbidity 18.5 (6-25), high mortality 4 (2-6), seasonal occurrence 18 (15-20), inappetence 2 (0-4), diarrhoea 20 (15-25) and oculonasal discharges 9 (0-18) were signs associated with ‘matsattaku’ (Round worms) (Table 4.24) Kendall’s coefficient (*W*) of concordance showed strong agreements for these indicators between the focus groups in Katsina State (Table 3).

**Table 3: Matrix scores of clinical indicators for characterization of small ruminant diseases by pastoralists in Katsina State, Nigeria.**

Clinical Indicators ( <i>W</i> )	Diseases						
	Balku/Hanta (Fasciolosis)	Bakkale (Brucellosis)	Ciwon kofoto (Foot rot)	Gishu/Gurda (PPR)	Huhu (CCPP)	Saifa (anaplasmosis)	Matsattsaku (Round worms)
High morbidity (0.641****)	3 (0-6)	3 (0-6)	4 (0-8)	18 (10-25)	4 (0-6)	7.5 (0-15)	18.5 (6-25)
High mortality (0.723****)	9 (0-18)	2.5 (0-5)	3 (0-5)	20 (15-25)	1.5 (0-3)	17.5 (15-30)	4 (2-6)
Seasonal Occurrence (0.722****)	3 (0-6)	0 (0-0)	17 (15-20)	10 (0-20)	18 (15-20)	4 (0-10)	18 (15-20)
Inappetance (0.604**)	8.5 (3-15)	0 (0-6)	1.5 (0-3)	20 (15-25)	10 (5-15)	13 (5-20)	2 (0-4)
Abortion (0.721****)	2(0-3)	20 (10-30)	0 (0-0)	6 (0-12)	1.5 (0-3)	0 (0-0)	0 (0-0)
Retained Placenta (0.250*)	0 (0-0)	4 (0-8)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
Respiratory distress (0.670**)	0 (0-0)	0 (0-0)	0 (0-0)	18 (5-30)	15.5 (5-25)	5.5 (0-10)	0 (0-0)
Mouth erosion/salivation (0.563**)	0 (0-0)	0 (0-0)	0 (0-0)	5.5 (0-12)	12.5 (5-20)	0 (0-0)	0 (0-0)
Limping (0.800****)	0 (0-0)	0 (0-0)	22.5 (15-30)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
Fever (0.544**)	6 (0-12)	0 (0-0)	3.5 (0-7)	17.5 (10 -25)	15 (10-20)	6.5 (0-12)	0 (0-0)
Diarrhoea (0.846****)	7 (5-8)	0 (0-0)	0 (0-0)	23 (15-30)	0 (0-0)	8 (5-10)	20 (15-25)
Liver involvement (0.8564****)	20 (10-30)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
Oculonasal discharges (0.789**)	3 (0-7)	0 (0-0)	0 (0-0)	20 (15-25)	0 (0-0)	2.5 (0-5)	9 (0-18)

Cells showed median scores (range) for clinical sign against a corresponding disease; maximum obtainable score = 30; *W* = Kendall’s coefficient of concordance (\**P* < 0.05; \*\**P* < 0.01; \*\*\**P* < 0.001). PPR= Pestes de petit Ruminante



Plate III: Hygroma (blue arrow) and mark due to firing on the left knee (black arrow) as a method of treatment of brucellosis in cattle in Zamfarawa village in Bakori LGA of Katsina State

#### **Pastoralists' Existing Veterinary knowledge**

Using the SSI as a PE tool, pastoralists in the villages visited reported that, sequel to lack/inadequate Veterinary care in most of the villages in Katsina State, they resorted to using herbs and other traditional means in treating livestock ailments. They also strongly believed that these traditional treatment methods were more effective, readily available and relatively cheaper than the orthodox medicine. For traditional treatment of brucellosis in Bakori and Funtua LGAs located in Southern part of Katsina State, firing of the knee in case of

hygroma was the practice (Plate III), after which a powder of 'Rai dore' (*Senna occidentalis*) (Plate IV) was applied on the wound site and left to heal naturally. Some other pastoralists in the same area reported drenching the affected animal with a solution of the same powder. However, in Baure and Daura LGAs of the same State (Katsina State), pastoralists believed that the cure for brucellosis was achieved by recitation of some verses of the Holy Qur'an on the afflicted animal.



Plate IV: ‘Rai dore’ (*Senna occidentalis*), plant with the leaf (arrow), which is used for traditional treatment of brucellosis in Rafin Kanya Ward of Funtua LGA of Katsina State

### **Discussion**

This study has demonstrated that cattle constituted the largest proportion of livestock species kept by pastoralists in Katsina State, Nigeria. This may be because pastoralists attach more prestige and economic significance to cattle rather than to small ruminants which in some cases are the properties of women and children. Besides, small ruminants are more involved in day to day consumption, festivities and are mostly presented as gifts which consequently may account for their lower population (10). Among the small ruminant species, goats were found to have a higher population than sheep. This may not be unconnected to the fact that goats have more multiple births than the sheep (11). Also, the

ovine species are more involved in festivities like ‘Sallah’ and naming ceremonies in the Northern part of Nigeria where this research was conducted.

The study has further demonstrated that, the pastoralists derive several economic benefits from different livestock species they keep. These livestock species are generally a means of survival in most pastoralists settings visited. During the dry season when farming activities are minimal, cattle, sheep and goats settle on their farmlands and consequently fertilize such farmlands thereby reducing the cost and potential dangers involved in the use of inorganic manures (125). The study also showed that work bulls were used for draft and farm traction and also served as sources of income for the owners as they are being lent to

other farmers for these purposes. In general, most of the animal species kept by pastoralists have multiple economic advantages, except for donkeys which were only used for draft. This report is in agreement with Khan *et al.* (13) who reported that donkeys are mostly used for transportation of a variety of goods.

Pastoralists in Katsina State identified cattle rustling, effects of transhumance, lack/inadequate watering points, lack/inadequate shelter, diseases, cost of medication and feeding as husbandry problems that affected livestock production. Of these problems, cattle rustling was ranked 1 by the pastoralists interviewed. This agrees with Suleiman *et al.* (14) in a study in neighboring Kaduna State who also identified cattle rustling as a serious problem that could have a grave impact on the sustainability of pastoralism if left unchecked. However, from studies in Uganda and Kenya, cattle rustling was said to have a bearing with loss of population resilience and was therefore devised as a means of wealth redistribution amongst pastoralists (15).

Pastoralists in their own way seem to have some understanding of epidemiology. They could observe that whenever transhumance from neighboring villages in the Niger Republic had a stopover in their villages most of their livestock species became sick, though they were not able to identify specific diseases brought about by these transhumance.

Also, the interviewees reported using many plants for the treatment of livestock diseases which could be due to transfer of traditional knowledge from the old to the young folk as reported by Kaltungo (16); Buhari (17); Abdullahi *et al.* (18). Their knowledge on treatment against brucellosis which is known to them as “bakkale” was however low as they reported only very few remedies used against the disease. This could be due to the insidious nature of the disease and as such affected animals may not be often

presented for medical attention even though, at the long run, it has a high economic impact.

The findings in this study agree with those of other researchers who reported that despite limited level of formal education of pastoralists, they are key in helping researchers in the investigations relating to knowledge of local diseases, their symptoms and local remedies to such diseases. They also help in designing plans and initiatives to help in surmounting their local problems (19, 20).

A lot of information was generated through the use of PE which ordinary structured questionnaire would not have done.

### **Conclusion and Applications**

1. Participatory Epidemiology could be a handy technique in obtaining reliable information directly from sources.
2. Participatory Epidemiology is a fast method of gathering information from rural areas which is also cheap and ensures confidence of the respondents from whom the information is sourced.
3. Involvement of the local community in PE research allows for follow-up plans and intervention strategies with active participation of target communities.
4. Participatory Epidemiology stands to reveal rare source of traditional knowledge that can be used to develop orthodox medical approach in animal health care delivery.

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