

GF-TADS Africa PROGRESSIVE CONTROL OF TRANSBOUNDARY ANIMAL DISEASES





Food and Agriculture Organization of the **United Nations**



World Organisation for Animal Health Founded as OIE



The use of participatory epidemiology in the surveillance of contagious bovine pleuropneumonia (CBPP) and other priority bovine diseases in Nigeria

Dr. Nma Bida Alhaji (DVM, PhD) FCVSN Africa Centre of Excellence for Mycotoxin and Food Safety, Federal University of Technology, Minna, Nigeria

Introduction

- Contagious bovine pleuropneumonia (CBPP) is an infectious and contagious respiratory disease of cattle caused by *Mycoplasma mycoides* subsp. *mycoides* (Mmm), previously further specified as Small Colony (SC) type.
- It is characterized by sero-fibrinous interlobular edema and heparization of lung in acute to sub-acute cases and capsulated lesions (sequestra) in chronically infected cattle.
- CBPP is an WOAH listed disease and second most important transboundary disease of cattle after rinderpest.

- CBPP is associated with massive economic losses to cattle industry. It impacts animal health and poverty of livestockdependent people through decreased animal productivity, reduced food supply for households, and the cost of control measures in Africa.
- Pastoral communities in Africa live in some of the most underdeveloped environments in the world. Although these communities are reliant on their livestock as a source of social and economic well-being, conventional veterinary services are poor and basic information on the epidemiology of important livestock diseases is limited.

- Epidemiological research and disease surveillance in such pastoralist areas are difficult because human populations are relatively small and highly mobile, and they move their livestock across large areas with few roads and means of modern communications.
- In such situations, conventional approaches to veterinary research and disease surveillance require considerable flexibility and commitment.
- Given the resource and logistical constraints in such pastoral areas, pastoralists themselves are a valuable source of disease information.

- One useful approach for improving disease surveillance in rural hard-to-reach areas of developing countries is by the use *Participatory Epidemiology* (PE) techniques.
- PE is the application of participatory methods to epidemiological research and disease surveillance
- It uses participatory rural appraisal (PRA) tools to collect epidemiological data or intelligence information contained within communities through observations, existing veterinary knowledge and traditional oral history to improve understanding of animal health issues.

- PRA tools are range of methods for data collection and learning from local people. They play roles in defining, analyzing and solving their epidemiological problems. The tools include: (i) Semi-structured interview; (ii) Key informants; (iii) Probing; (iv) Mapping; (v) Diagramming; (vi) Transect; (VII) Seasonal calendar; (viii) Timelines; (ix) Ranking, scoring and piling such as proportional piling and matrix scoring.
- In Nigeria, PE approach was conducted using PRA tools in 9 Fulani pastoral communities of Lapai, Eyagi, Lemu, Paiko, Kuta, Bosso, Wushishi, Bobi grazing reserve and Borgu, to collect semi-quantitative data from piled and ranked cattle diseases relative to their impacts in the pastoral communities.

- These targeted populations were seasonally mobile, with scattered herds of local breeds of cattle *(Bunaji, Rahaji* and *Bokoloji)*, domiciled in the remote areas of the country.
- Average number of herds that formed a pastoral community was 28, each managed by herd head or owner (a man, his wives and children, or an elderly widow and her children). Average number of animals in a herd was 82 cattle of variable ages.

SGE3Advocacy and Informed consent

- Advocacy visits were made to each community two weeks prior to the proposed participatory exercise and the necessary permission was obtained from *Dikkos* or *Ardos* (Fulani community leaders).
- Key informants were told that the surveillance was only meant to investigate impacts of cattle diseases in pastoral communities using their existing veterinary knowledge and perceptions about cattle diseases, and would be used to design control strategies.
- Informed consents of respondents were verbally obtained before commencement of each section of participatory exercise in a community and none declined to participate in the exercise.

SGE3 CBPP Participatory data collection

- CBPP was not specifically mentioned to avoid bias. PE was conducted by an appraisal team trained on PE application.
- They used PRA tools of *semi-structured interview* (SSI), key informants, proportional piling, and triangulation.
- Qualitative and semi-quantitative data were collected by use of these techniques.

Key informants and semi-structured interview (SSI)

 Key informants were the traditional Fulani pastoral leaders or elders in the communities who according to Fulani tradition, are considered to be more knowledgeable than other community members on animal health and production. They led other pastoralists in their respective communities to the group participatory exercises.

- SSIs began with introduction of the appraisal team and explanation of the purpose for the investigation to the participants.
- During each session of the SSI, which ran for about three hours, general information about cattle diseases encountered in the communities was discussed.
- In order to facilitate discussion, the appraisal team asked questions that began with more general topics on cattle management followed by areas on specific cattle diseases. These were guided by a checklist of open-ended questions that standardized discussions, and questions were probed depending on the key informants' response.
- Mentioned diseases were probed and expanded descriptions of their clinical and epidemiological manifestations obtained.

- Interviews were conducted using the local languages of Hausa and Fulfulde (local languages used for communication).
- Detailed descriptions of CBPP and other priority cattle diseases in each pastoral community were collected and recorded.

Proportional piling

- Materials used in this exercise included counters (pebbles), flip charts, and permanent markers.
- In each community, pastoralists were asked to give a list of ten most important diseases perceived to be affecting their cattle within a ten-year period preceding the time of the interview.

- The pastoralists often used local disease names to identify diseases. When they provided syndromes rather than specific names of diseases, probing was done to characterize the syndrome whilst trying not to guide them.
- Once the respondents and appraisal team had compiled the list of diseases, ten circles were drawn by the pastoralists on flip charts, each representing a mentioned disease.
- Pastoralists were given 100 pebbles and instructed to pile in the circles proportionally according to perceived impact of each disease to the herders, in terms of loss in milk and meat production, to mention but a few.

• The appraisal team then counted the pebbles placed in each circle to give a proportion that determined impact and rank of the disease in that community.

Triangulation

- Data obtained from each participatory exercise in each community were cross-checked and, if inconsistent, were further debated among the participants until a consensus or agreement is arrived at.
- The studied nine pastoral communities' results were also compared, that is triangulated, at the end of the participatory exercises, analyzed, and mean outcomes of perceived impacts of CBPP and other priority cattle diseases obtained.
- The participatory (semi-qualitative) reports obtained from the *Fulani* participants were finally validated by the appraisal team.

SGE3 CBPP Data management and analysis

- Data arising from each PE exercise were recorded in a field note-book and the results of exercises that created visual representations were captured on a digital camera.
- Data obtained were qualitative and semi-quantitative in nature; the former were discussed during SSI without being subjected to formal statistical analyses, while the later, mostly from the piling and ranking exercises, were entered into a Microsoft Excel® 9 database, stored, and analyzed using Kendall's Coefficient of Concordance W statistic, a non-parametric statistics.

Outcomes

- Proportional piling, matrix scoring and seasonal calendars were useful tools extensively used to confirmed verbal descriptions provided in the SSIs and probed deeply to obtain meaning and extent or importance of CBPP and other priority cattle disease/conditions in the communities investigated.
- During the transects, medicinal plants, plants used as feed and those that are poisonous to cattle were observed and documented.

Proportional Pilings

The mean proportional pile for relative burden of CBPP among other priority cattle diseases in the nine pastoral communities was 12.5% (Fig. 1).
 The agreement by pastoralists on CBPP burden was strong (W = 0.6855) and statistically significant (P<0.001) (Plate 1). Pastoralists called CBPP *Ciwon-huhu* in *Hausa* language and *Huttu* in *Fulfulde*, denoting lung disease associated with respiratory distress and cough.



6% (6 piles) **Figure 1.** Mean proportional pilies of the relative impacts of CBPP and some cattle diseases/conditions in pastoral communities of Nigeria. Numbers in parenthesis are average piles of each disease in the communities. Superscripts *H* (*Hausa*) and *F* (*Fulfulde*) are the local names for the diseases/conditions presented during the PE exercises

••••

CBPP Ciwon huhu^H, Huttu^F 12.5% (13 piles)



Dermatophilosis *Kirchi^H, Ngunya^F, Garje^F* 8% (8 piles)

Lumpy skin disease Bolla^F 8% (8 piles)



Plate 1. Proportional piling exercise of CBPP and other priority cattle disease conditions by pastoralists in a pastoral community in Nigeria

Matrix Scoring

- Matrix scores of ffifteen clinical signs against six major diseases/conditions, including CBPP by the pastoralists in each pastoral community are presented in plate 2.
- Pastoralists in the communities scored CBPP to be associated with difficulty breathing, anorexia, emaciation, swollen forelimb joints, cough, and death with mean matrix scores of 20 piles, 2 piles, 2 piles, 4 piles, 19 piles, and 5 piles, respectively, against these signs (Fig. 2).
- There was strong agreement among the pastoralists on clinical manifestations of CBPP (W = 0.6687), and the agreement was statistically significant (P<0.0001) (Plate 2).

Diseases	Trypanosomiasis	FMD	СВРР	Fascioliasis (Ciwon- hanta)	Brucellosis (Bakkale)	Dermatophilosis (Kirchi)
Clinical signs	(Samore)	(Boru, Chabo)	(Ciwon huhu)			
acrimation	(13.3)	0	0	0	0	0
Salivation	0	(12.8)	0	0	0	0
Difficult breathing	0	0	(19.7)	0	0	0
Nouth lesions	0	(15.0)	0	0	0	•• (2.4)
Feet lesions	0	(16.3)	0	0	0 (0.2)	(3.6)
Anorexia	(3.6)	(5.0)	•• (1.7)	(3.5)	• (1.0)	•• (2.1)
Emaciation	(3.8)	(5.1)	•• (1.9)	(3.3)	• (1.1)	(3.6)
Abortion	•• (1.5)	0	0	0	•• (1.7)	0
Swollen forelimbs joints	0	0	(3.6)	0	•••••• (14.8)	0
Cough	0 (0.2)	0	(18.6)	0 (0.2)	0	0
Grinding of teeth	0	0	0	(16.3)	0	0
Ficks, scars on skin and rough hair coat	(2.5)	0 (0.1)	0	(2.7)	0	(11.7)
Hard feces	0	0	0	(18.3)	0	0
Eating of sand	0 (0.3)	0	0	(16.9)	0	0
Death	(3.2)	(3.6)	••••• (4.5)	••• (2.7)	(2.2)	•• (2.1)

Figure 2. Mean matrix scores of fifteen listed clinical signs of six common cattle diseases, including CBPP, in the pastoral communities of Nigeria. The black dots represented the mean scores (number of pebbles) piled during the matrix scoring.



Plate 2. Matrix scoring exercise of clinical signs of CBPP and other priority cattle disease conditions by pastoralists in a pastoral community in Nigeria

SGE3 CBPP Seasonal Calendars

- Participants named two major seasons: dry season (October to March) and rainy season (April to September) in their pastoral calendar.
- However, they subdivided these two seasons into four sub-seasons for the occurrences of cattle diseases in their communities, namely: *Kaka* or early dry season (October to December), *Rani* or late dry season (January to March), *Bazara* or early rainy season (April to June), and *Damina* or late rainy season (July to Sept.).
- CBPP occurred in all seasons, but occurrence was more in *Kaka* or early dry season (Fig. 3, (Plate 3)).
- Pastoralists' agreement on the seasonal occurrence of CBPP among some priority cattle diseases was strong (W = 0.8719) and statistically significant (P<0.01).

Seasons	Early rainy season (Bazara)	Late rainy season (Damina)	Early dry season (Kaka)	Late dry season (Rani)	
Diseases/conditions					
Trypanosomiasis (Samore ^H ,	••••	••••	• • • • (4 0)	••••(6.6)	
Shammol ^F)	(3.1)	()	(4.0)		
Fascioliasis	• • • •	• • • •	• • • •	••	
(Ciwon-hanta ^H , Heri ^F)	(3.9)	(8.5)	(3.6)	(1.9)	
Brucellosis	• • •	• •	• • • •	• • • • •	
(Bakkale ^H , Yande ^F)	(2.9)	(2.1)	(3.7)	(4.9)	
(FMD	• • • •	• • • •	• • • • •	• • •	
(Boru ^H , Chabo ^F)	(3.5)	••••(9.1)	(5.2)	(2.5)	
СВРР	• • • •	• • •	• • • •	• • • • •	
(Ciwon-huhu ^H , Huttu ^F)⁺	(4.2)	(2.6)	(7.8)	(5.5)	
Dermatophilosis	• • •	• • • •	• •	•	
(Kirchi ^H , Ngunya ^F , Garje ^F)	(2.7)	(7.8)	(2.2)	(0.7)	
Rift valley fever (Gabi-gabi ^F)	••	• •	••	• • •	
	(2.1)	(2.1)	(2.3)	(2.6)	
Lumpy skin disease (Bolla ^F)	•	•••	(0.1)	(0.0)	
	(1.1)	(3.2)			
Black quarter (Harbi-daji ^H , Ladde ^F)	• (0.5)	(0.0)	• (0.5)	• (1.3)	

Figure 3. Mean seasonal calendar scores of CBPP and other priority cattle diseases/conditions in the nine pastoral communities of Nigeria. Numbers in parenthesis are the average scores

Plate 3. Seasonal calendar scoring exercise `for seasonal occurrence of CBPP and other priority cattle disease conditions by pastoralists in a pastoral community in Nigeria

Conclusion

- The participatory epidemiology exercises have shown that high proportions of Fulani pastoralists in Nigeria possessed satisfactory existing knowledge about CBPP and other priority cattle diseases.
- They have perceived and identified them to be one of the most important cattle diseases in pastoral herds of Nigeria.
- CBPP has high impact, partly due to absence of effective approach to surveillance as well as prevention and control strategies in the marginalized rural areas.
- Participatory epidemiology should used as surveillance technique for the identification and control of trans-boundary animal diseases in Africa.

References

- Alhaji, N.B., Ankeli, P.I., Ikpa, L.T., Babalobi, O.O. (2020): Contagious Bovine Pleuropneumonia: Challenges and Prospects Regarding Diagnosis and Control Strategies in Africa. Veterinary Medicine: Research and Reports, 11:71-85. <u>https://doi.org/10.2147/VMRR.S180025</u>
- Babalobi, O.O., Alhaji, N.B. (2018): Review of Participatory Epizootiology Research of Contagious Bovine Pleuropneumonia at the Department of Veterinary Public Health and Preventive Medicine, University of Ibadan, Nigeria (2007-2015). Journal of Animal Science and Veterinary Medicine, 3(3):65-74.
- Alhaji, N.B., Babalobi, O.O. (2017): Economic Impacts Assessment of Pleuropneumonia Burden and Control in Pastoral Cattle Herds of North-Central Nigeria. Bulletin of Animal Health and Production in Africa, 65(2):235-248.
- Alhaji, N.B., Babalobi, O.O., Salihu Saidu, S. (2016): Using sero-positivity to assess geospatial burden of contagious bovine pleuropneumonia on pastoral cattle herds of north central Nigeria. *Pastoralism: Research, Policy and Practice* 6:20-22 <u>http://dx.doi:10.1186/s13570-016-0067-8</u>
- Alhaji Nma Bida, (2015). Epidemiology of contagious bovine pleuropneumonia in Niger State, Nigeria. PhD Thesis, University of Ibadan, Ibadan, Nigeria

Thank You



GF-TADS Africa PROGRESSIVE CONTROL OF





Food and Agriculture Organization of the **United Nations**



World Organisation for Animal Health Founded as OIE

