Manuscript Details

Manuscript number	MAEVET_2016_313_R2
Title	Perceptions, circumstances and motivators affecting the implementation of contagious bovine pleuropneumonia control programmes in Nigerian Fulani pastoral herds
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Abstract

Contagious bovine pleuropneumonia (CBPP) is an infectious disease of cattle which substantially contributes to poor productivity of the sub-Saharan pastoral livestock sector. In Nigeria and most of the West African countries, limited public funding for CBPP control have necessitated farmers to bear a bigger burden of managing the disease. Understanding the factors influencing decision of farmers to implement disease control programmes is therefore a key element in informing future policies aimed at improving CBPP management. This study explored perceptions of Nigerian Fulani pastoral herdsmen on the responsibility for cattle healthcare, and identified their circumstances and motivations in implementing CBPP management programmes. Field data were collected from 191 pastoral farmers using a semi-structured, interviewer-administered questionnaire. The results indicated that younger farmers were more likely than their older counterpart to accept the responsibility for CBPP management ($p < 0.01$). This may signal future prospects for improved CBPP management where upcoming farmers could be encouraged to implement CBPP control programmes and uphold the costs. 13.6% of the farmers had no intention of implementing any CBPP control programme on farm, while 81.2% either had a positive intention or implemented at least one programme aimed at controlling CBPP. Intention to implement CBPP control programmes was significantly associated with educational attainment of farmers ($p < 0.01$) and their access to CBPP control services offered by trained veterinarians ($p < 0.01$). Farmers with negative attitudes towards implementing CBPP control programmes could be motivated to change their perspectives by advice from trusted sources and improved access to veterinary services. Conversely, farmers with positive attitudes towards implementing CBPP control programmes were more likely to be motivated by affordable veterinary services and advocacy on specific CBPP control programmes. As such, the former group of farmers will be more likely to benefit from programmes which focus on providing credible information from trusted sources, such as extension agents, veterinarians or successful peers. On the contrary, interventions targeting the latter group of farmers should prioritize cost-effective delivery of improved CBPP control technologies.

Keywords	Animal health, Contagious bovine pleuropneumonia, Fulani cattle, Nigeria, Pastoral livestock, Sub-Saharan Africa
Taxonomy	Pastoral Support, Animal Health Economics, Social Epidemiology, Food Animal Veterinary Medicine

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Suggested reviewers	Pablo Alarcon Lopez, Joshua Onono

Submission Files Included in this PDF

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Veterinary Epidemiology Economics and Public Health Group,

Royal Veterinary College, AL9 7TA

London, United Kingdom

22nd December 2016

The Editor-in-Chief,

Preventive Veterinary Journal (PVM),

Dear M.D. Salman,

Cover Letter

I am sending you our manuscript entitled “Perceptions, circumstances and motivators affecting the implementation of contagious bovine pleuropneumonia (CBPP) control programmes in Nigerian Fulani pastoral herds”, an original research paper for possible publication in PVM. CBPP is a transboundary animal disease currently confined to sub-Saharan Africa where public funding for its control has considerably reduced over the past decades. The manuscript reported on a study which explored perceptions of pastoral farmers on the responsibility for controlling the disease, with the aim of identifying motivational factors that can be targeted for improving private resource utilization in managing the disease.

The study identified two categories of farmers, each set with different perceptions and motivations for controlling CBPP; those with positive attitudes and those with negative attitudes towards disease control on farm. The significance of this finding is that different interventions can be developed for the different subsets of farmers. For instance, farmers

with negative attitudes about CBPP control are more likely to benefit from programmes which focus on providing credible information from trusted sources, such as veterinarians or successful peers. In contrast, policies targeting farmers with positive attitudes toward CBPP management should prioritize cost-effective delivery of improved control technologies.

The study integrated methods from human behavioural sciences and social anthropology in addressing an important transboundary animal health problem in a changing African veterinary business landscape. As such, we believe readers of PVM would be interested in this manuscript. We confirm that this manuscript has not been published elsewhere and is not under consideration by another journal. All authors have approved the manuscript and agree with its submission to PVM.

Yours sincerely

Abubakar

Reviewer comments	Responses/Changes made
Reviewer 1	
1) Introduction	
L87-89: This is an expression and not research question. A research question should end with question mark.	The expression was rephrased as a question which ends with question mark
L107-109: The statement here indicates that TBP presents difference between intention and action as well as identified intrinsic factors that influence intention to change behaviour. These variables could be subjective and therefore require hypothesis statement(s) for assessment.	In this regard, the objective of the research was to identify factors which may influence intention. As such, only qualitative data on this aspect was collected and was presented as narratives from respondents, rather than quantities that can be subjected to statistical tests of hypothesis.
Materials and Methods	
L122-168 Conceptual Framework: According to the authors, assessment of psycho-social factors affecting the implementation of CBPP control programmes in herds in their study was based on the pathway to disease control model. However, they failed to present the general schema for the overall conceptual framework model in the 'Results' section. This is needed to illustrate the pathways of the four phases (no intention to implement; intention to implement; implemented programme; and sustained programme implementation) through which behavioural change influence CBPP control programme in herds. It will also show how the intention to implement a CBPP control programme is determined by the internal circumstances of the individual farmer. Authors should revise the manuscript with framework and explantion of the model included.	The schema has been presented in figure 1. Indeed, two were presented in the original manuscript but another reviewer suggested the other one should be removed.
L184-185: '……to test the study hypothesis'. Which hypothesis??? Authors didn't state any hypothesis.	The statement was modified to read …..to answer the research question

L199-203: For the benefit of the Preventive Medicine journal audience that cannot access the book, authors should state Pfeiffer, 2010 formula used for estimation of sample size, its margin of error and confidence level. Also, the 45% contingency is outrageous for non-response. Use 5% or 10% contingency or lower the degree of precision.	The suggested statement was inserted. 10% contingency was adopted while the precision was lowered to 4.5%.
204-224: I am not comfortable with the stratified sampling method used because there is only one identified population characteristic, which is the type of husbandry management system (agro-pastoralism) in all the 23 Local Government Areas. What are the characteristics used to stratify the target population into sub-populations (strata)? Even with the used stratified approach, authors did not indicate final probability method used for selection of households or respondents in each stratum. Willingness to participate is not a probability sampling approach. Not even a non-probability approach. I will suggest the replacement of 'stratified method' with 'multistage approach'. Whatever, the final selection should in such a way that every participant has equal chance of being selected.	The method of sampling, Stratified sampling was replaced with multistage approach
L225: Change ''Interview Design' to 'Questionnaire Design'.	Interview Design was changed to "Questionnaire Design"
L229-230: Four enumerators were recruited – trained by the lead author – and administered the questionnaires.	The revised statement now reads, "Four enumerators were recruited – trained by the lead author – and administered the questionnaires."
L231: Enumerators were recruited from ……	The revised statement now reads, "Enumerators were recruited from ……"
3) <u>Results</u> I strongly suggest that authors should include table(s) in the 'Results' section that will present outcomes of all variables from Chi-square tests and multivariable ordinal logistic regression models. These will give the audience a	We believe adding another table with Chi-square test results amounts to repetition of the text with already reported the Chi-square tests and their corresponding p-values.

better forum for assessment of predictive variables that significantly influenced perceptions of responsibility for managing CBPP amongst Fulani pastoral herdsmen in Nigeria.	
Reviewer 2	
Materials and Methods:	
Please provide additional information about the sample size jus tification and the "formula" used to determine sample size.	Additional information was provided in the revised manuscript regarding sample size justification. Formula for calculating sample size was inserted
When describing household enrollment, it is not clear how the "next" household was designated? Was this geographically? Was there a list? I still do not have a good feel for the sizes of individual participating villages (e.g., are there typically 10 households per village or 1000 households per village). Please, at least, provide a range.	In the revised manuscript, the statement was rephrased to read, "the next household which most closely neighboured the declining household was approached until the required number of households in the village was met". Data on household size was not collected during the survey as it is not of interest to the survey objectives. However, a table containing the number and cattle herd sizes of surveyed households was inserted in the new manuscript.
Line 261 and 284…Please clarify what is meant by "farmer characteristics". Are the authors referring to the information collected in the 4-part questionnaire?	In the revised manuscript, the statement was rephrased to read, "Chi-square test was used to analyse association between farmer characteristics (age, education status, main livelihood source and access to animal health services) and assignment of responsibility for CBPP management."
Line 283…It would be helpful to have a more detailed description of the authors' ordinal logistic regression model building/assessment strategy for farmer characteristics associated with level of control program implementation. Results:	The ordinal logistic regression described in Section 2.5.3 was unconditional and univariable. As such, the model did not require variable elimination strategies or tests for compounding variables. However, the method used for assessing proportional odds assumption was stated in the revised manuscript (Line 292).
The authors need to state that age was the only significant variable for the	In the revised manuscript, the relevant paragraph (Lines 318 – 331) was written and

"placing responsibility" outcome. It is still not clear what other exposure variables were assessed (characteristics in table 1?). If data are not being provided for non-significant outcomes, at the very least, the assessed "farmer characteristics" need to be provided.	the farmer characteristics analysed were specified.

Highlights:

- Majority of farmers had positive intentions of implementing CBPP control programmes
- Educated farmers with access to quality vet service are more likely to control CBPP
- Younger farmers are more likely to accept responsibility for managing CBPP on farm
- Access to vet services motivate farmers with negative attitudes about managing CBPP
- Affordable programmes motivate farmers with positive attitudes about managing CBPP

Title:

Perceptions, circumstances and motivators affecting the implementation of contagious bovine pleuropneumonia control programmes in Nigerian Fulani pastoral herds

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Abstract:

Contagious bovine pleuropneumonia (CBPP) is an infectious disease of cattle which substantially contributes to poor productivity of the sub-Saharan pastoral livestock sector. In Nigeria and most of the West African countries, limited public funding for CBPP control have necessitated farmers to bear a bigger burden of managing the disease. Understanding the factors influencing decision of farmers to implement disease control programmes is therefore a key element in informing future policies aimed at improving CBPP management. This study explored perceptions of Nigerian Fulani pastoral herdsmen on the responsibility for cattle healthcare, and

identified their circumstances and motivations in implementing CBPP management programmes. Field data were collected from 191 pastoral farmers using a semi-structured, interviewer-administered questionnaire. The results indicated that younger farmers were more likely than their older counterpart to accept the responsibility for CBPP management ($p < 0.01$). This may signal future prospects for improved CBPP management where upcoming farmers could be encouraged to implement CBPP control programmes and uphold the costs. 13.6% of the farmers had no intention of implementing any CBPP control programme on farm, while 81.2% either had a positive intention or implemented at least one programme aimed at controlling CBPP. Intention to implement CBPP control programmes was significantly associated with educational attainment of farmers ($p < 0.01$) and their access to CBPP control services offered by trained veterinarians ($p < 0.01$). Farmers with negative attitudes towards implementing CBPP control programmes could be motivated to change their perspectives by advice from trusted sources and improved access to veterinary services. Conversely, farmers with positive attitudes towards implementing CBPP control programmes were more likely to be motivated by affordable veterinary services and advocacy on specific CBPP control programmes. As such, the former group of farmers will be more likely to benefit from programmes which focus on providing credible information from trusted sources, such as extension agents, veterinarians or successful peers. On the contrary, interventions targeting the latter group of farmers should prioritize cost-effective delivery of improved CBPP control technologies.

Keywords:

Animal health, Contagious bovine pleuropneumonia, Fulani cattle, Nigeria, Pastoral livestock, Sub-Saharan Africa

1 Introduction

Contagious bovine pleuropneumonia (CBPP) is a respiratory tract infection of cattle caused by the small colony biotype of *Mycoplasma mycoides* subspecies *mycoides* (Nicholas et al., 2008). The disease is largely confined to sub-Saharan pastoral regions where it compromises cattle productivity due to high morbidity and mortality which impact directly on livelihoods and food security. In 12 of the sub-Saharan countries affected by the disease, CBPP morbidity and mortality losses were estimated at €30 million (Tambi et al., 2006). More recent calculations from Kenya alone suggest that the annualized impact of CBPP on the livestock economy was about US$7.6 million (Onono et al., 2014).

Strategies for the control of CBPP as outlined by Food and Agriculture Organisation of the United Nations include: stamping out (test and slaughter), cattle movement control and mass vaccination (Geering and Amanfu, 2002). However, due to logistical and technical difficulties in implementing animal movement control and the financial resources required to compensate farmers during test and slaughter campaigns, mass vaccination appears to be the most realistic option for managing CBPP in the endemic countries. Antimicrobial treatment of CBPP cases are discouraged because of fears, though unconfirmed, that treated animals could become carriers and may be sources of outbreak to susceptible bovine populations (Amanfu, 2009). Nonetheless, pastoralists and field veterinarians reported that antimicrobial treatment of infected animals minimize morbidity and mortality losses (Danbirni et al., 2010; Okaiyeto et al., 2013). The joint Food and Agriculture Organisation, World Organisation for Animal Health, African Union Inter-Bureau for Animal Resources and International Atomic Energy Association Consultative Group Meeting on CBPP recommended that antimicrobials may be used for managing the disease

66 within a holistic strategy that involves other CBPP control options (FAO, 2006).

67 CBPP was introduced into the Fulani pastoral areas of Nigeria in 1924 and has remained an
68 endemic disease in the region (Oluokun, 1976; David-West, 1980; Suleiman et al., 2015b; Alhaji
69 and Babalobi, 2016; Alhaji et al., 2016). This area accounts for more than 90% of the 20 million
70 head of cattle raised in the country (Bourn et al., 1992b). There has not been any integrated
71 country-wide CBPP control in place in Nigeria in the last two decades. This has been attributed
72 to limited resources available to both Federal and State Veterinary Departments (Aliyu et al.,
73 2000; Fasanmi, 2004). In addition, there is no synergy of disease control activities undertaken
74 by federal veterinary authorities which are in charge of CBPP surveillance and the State
75 veterinary services that are responsible for vaccination programmes (Suleiman et al., 2015b).
76 There is also a wide variation in the frequency, coverage and timing for the annual vaccinations
77 in different States. Each of the 19 States within pastoral regions of the country implements a
78 separate CBPP vaccination programme for which coverage vary from 10% (Aliyu et al., 2000) to
79 39% (Tambuwal et al., 2013); much less than the recommended 75% required to maintain herd
80 immunity (Mariner et al., 2006). In the past, these programmes offer vaccination services at no
81 cost to farmers. As such, majority of farmers came to view animal healthcare and disease
82 management as public responsibilities. In more recent years, governments only procured the
83 vaccines and while veterinary charged farmers the fees for the logistics of vaccination.

84 Given these circumstances, it can be assumed that a substantial part of CBPP management
85 investments are left to the affected farmers. Have pastoralists accepted this responsibility to
86 make private decisions and investments on the healthcare of their livestock assets? An
87 understanding of the drivers influencing the acceptance of CBPP management responsibilities

among pastoral farmers and their motivations for implementing disease control programmes would provide answer to this question and inform formulation of future policies aimed at supporting farmers to improve CBPP management.

Several studies were conducted on Masaai pastoral systems on farmer preferences for CBPP vaccines (Kairu-Wanyoike et al., 2013), willingness to pay for the vaccines (Kairu-Wanyoike et al., 2014a), choice of CBPP control services provider (Onono et al., 2013), as well as knowledge, attitudes and practises of herdsmen regarding the disease (Kairu-Wanyoike et al., 2014b). These studies contribute to a better understanding of the socio-economic factors influencing the uptake of CBPP vaccination in herds. However, intention (and actual implementation of appropriate CBPP intervention measures) is an act of behavioural change and cannot be explained by socio-economic factors alone since psycho-social factors also have effect on the uptake of behaviours (Ajzen, 1985). To our knowledge, no study investigated the influence of psycho-social factors on the implementation of CBPP control programmes under pastoral settings.

The theory of planned behaviour (TPB) (Ajzen, 1985) is a human behavioural science framework that has widely been applied to veterinary medicine in circumstances where behavioural change is needed to improve animal health outcomes (Ellis-Iversen et al., 2010; Alarcon et al., 2014; Wera et al., 2016). TPB illustrates the difference between intention and action (e.g. implementation of a CBPP control programme) and identified internal (intrinsic) circumstances that influence intention to change behaviour (Ajzen, 1985). This theory has been expanded and adapted to fit different animal health problems and production systems. Ellis-Iversen et al. (2010) proposed a pathway to disease control model which expanded the TPB by incorporating

110 external (extrinsic) circumstances that influence the progression towards implementation of a
111 control programme once intent is obtained. The present study applied the pathway to disease
112 control model to: (1) explore the perception of responsibility for CBPP control among pastoral
113 farmers; (2) identify internal and external circumstances which influence the implementation of
114 CBPP control programmes in pastoral herds; and (3) identify motivating factors associated with
115 different stages in the implementation of CBPP control programmes.

116 2 Materials and Methods

117 This section outlines the conceptual framework for the research, the study population, the
118 interview design and interpretation.

119 2.1 Conceptual Framework

120 In this study, assessment of psycho-social factors affecting the implementation of CBPP control
121 programmes in herds was based on the pathway to disease control model (Ellis-Iversen et al.,
122 2010). CBPP control programmes considered in the study were preventive annual vaccination
123 and antimicrobial treatment of clinical cases. The pathway to disease control model proposed
124 that behaviour change (which in this study is implementation of CBPP control programme in
125 herds) is a gradual process that progresses through four phases: (1) no intention to implement;
126 (2) intention to implement; (3) implemented programme; and (4) sustained programme
127 implementation. The intention to implement a CBPP control programme is determined by the
128 internal circumstances of the individual farmer.

2.1.1 Internal Circumstances

According to Ellis-Iversen et al.'s (2010) model, internal circumstances can be broadly classified into: (1) attitude, (2) subjective norm, and (3) belief in self-efficacy.

Attitude, in this study, is defined as the perception of pastoral farmers about the responsibility for controlling CBPP in herd and the benefit of CBPP control programmes in reducing disease losses. It is based on personal perceptions of positive and negative behavioural outcomes. For example, a positive attitude indicates that pastoral farmers believe it is their responsibility to control CBPP in herds and that a particular CBPP control programme is beneficial in reducing disease losses. These positive attitudes could be a reason to implement the programme. Conversely, a negative attitude indicates that pastoral farmers believe it is not their responsibility to control CBPP in herds. This negative attitude could be the reason why farmers do not implement a CBPP control programme in herd.

Subjective norm is concerned with the perceived pressure or expectations of close social contacts to implement a given CBPP control programme. The opinions of fellow farmers, community leaders or animal healthcare providers may influence the decision of pastoral farmers to implement the programme.

Self-efficacy reflects the belief of pastoral farmers about their resources and ability to undertake a certain CBPP control programme, such as money required to purchase CBPP vaccines and pay for the vaccination.

2.1.2 External Circumstances

After intention is acquired, extrinsic (external) factors are more likely to determine the progression into implementation of a CBPP control programme than individual perceptions. This is because actual programme implantation (action) is not entirely under volitional control (Ajzen, 1985). According to the pathway to disease control model, three aspects of farmers' operating environment influence progress from intention to implementation of a disease control programme: (1) community and industry; (2) culture and society; and (3) knowledge, skills and ability.

Community and industry; these reflect traditional customs, taboos or stigmas within pastoral community and or the livestock industry that affect implementation of CBPP control programme. For instance, if an action violates communal decision or norm, it is unlikely to materialise regardless of positive attitudes or beliefs.

Culture and society; these are concerned with regulatory, moral or ethical pressure from the upstream of the livestock value chain, such as cattle buyers, consumers of cattle products or the society in general. For instance, market discrimination of sick animals could motivate farmers to treat CBPP infected animals rather than sell them.

Knowledge, skills and ability; these factors involve access to and availability of information, equipment or technical skills required to implement a given CBPP control programme.

2.2 Description of Study Population

The study was carried out in the north-western State of Kaduna which is located on the sub-

168 humid agro-climatic belt of West Africa. The State has a total land area of 43,000 km^2, more than
169 40% of which is utilized for crop and livestock production (Bourn et al., 1992b; Olugbemi and
170 Erinle, 1996). According to estimates from the Food and Agricultural Organisation of the United
171 Nations, 65,5382, pastoral cattle are raised in Kaduna State (GLiPHA, 2015). Kaduna State was
172 purposely selected for the study because of two reasons; (1) relatively good access roads into
173 pastoral settlements and (2) the State is a key area for many pastoral research and development
174 projects due to its good pasture resources, and host to livestock markets as well as facilities for
175 livestock training and research: National Animal Production Research Institute, Nigerian
176 Institute for Trypanosomiasis and Onchocerciasis Research, Institute for Agricultural Research,
177 National Agricultural Extension and Research Liaison Services, Nigerian Institute of Leather and
178 Science Technology and Faculties of Agriculture and Veterinary Medicine of the Ahmadu Bello
179 University. Many pastoral communities settled around these facilities and enjoyed free CBPP
180 control services as parts of research or development projects. As such, pastoral communities in
181 Kaduna State represent a relatively suitable population to answer the research question.

182 The backbone of this pastoral community is represented by the customary systems and their
183 traditional authorities which comprised the Emir (locally known as Sarki), District Head (locally
184 known as Hakimi) and Village Head (locally known as Ardo) in downward order of authority. The
185 Ardo is in direct contact with pastoralists and their approval is necessary for outside agents to
186 establish any form of research contact with individuals or households under their domains. Agro-
187 pastoralism is the major system of livestock production in the area. Under this system, cattle
188 from different households co-grazed on the same pasture which is owned by government.
189 Livestock mobility is limited; usually few kilometres within village neighbourhoods (Bourn et al.,

190 1992b). At lean seasons or in conditions of fodder deficit, herdsmen sold small stocks to
191 purchase supplementary feeds. Therefore, unlike transhumant or nomadic pastoralists who can
192 migrate to better pastures far away, agro-pastoralists keep relatively smaller herd sizes.

193 **2.3 Sample Size Calculation and Selection of Villages**

194 The sample size was calculated using a formula for determining sample sizes for population
195 survey (Pfeiffer, 2010, p. 75, formula used for estimation of sample size, its margin of error and
196 confidence level):

197 $$Sample\ size = \frac{z^2 x\ p\ x\ (1-p)}{d^2}$$

198 Where:

199 z = z-value (i.e. 1.96 for 95% confidence)

200 P = apriori prevalence

201 d = desired precision (4.5%)

202 The formula gave a sample size of 171 households based on apriori prevalence of 10% of
203 households whose herds experienced CBPP in the area (Suleiman et al., 2015a). The sample size
204 was increased to 200 to cater for a possible 10% non-response rate.

205 A multistage sampling approached was adopted for the selection of pastoral households in the
206 present study. In Kaduna Sate, there are 23 sub-divisions called Local Government Areas (LGAs)

each of which has a number of villages. Prior to the field work, there was no relevant secondary record to construct any meaningful sampling frame for the study; neither was data available on the relative sizes of pastoral communities in the respective LGAs. Nonetheless, the LGAs were first characterised based on history of CBPP occurrence as reported by resident veterinary officers. Five LGAs where CBPP outbreaks occurred within 12 months preceding the study were then selected for the study. This is in order to pre-select LGAs with more recent experience on CBPP. The list of all villages within the selected LGAs was considered as the primary sampling frame and a total of 14 villages where pastoralism was the main livelihood activity were selected. Two of the 14 villages refused to participate in the study because their respective Ardos perceived the survey as not relevant to their most immediate needs. A census of all pastoral households in the 12 villages was conducted to obtain a secondary sampling frame (Suleiman, 2016) and numbers were assigned to households. The number of households selected per village was proportional to the total number of pastoral households in the village (Table 1). For each of the villages, a list of random numbers for participating households was generated using random number table. Enumerators visit selected households and sort their consent to participate in the study after they were informed of the study objectives and benefits of participation. In the instance where household head declined to participate, the next household which most closely neighboured the declining household was approached until the required number of households in the village was met. However, only men participated in the survey because women, for customary reasons, were not allowed to have conversations with strangers.

LGA	Village	Number of registered households	Number of surveyed households	Average herd size (range)
Zaria	Dallatu	244	14	4.4 (2 – 32)
	Kafin mardanni	520	29	24.7 (2 – 65)
	Tankarau	306	17	19.0 (1 – 40)
	Kwaba	Declined participation		
Soba	Gimba	182	10	8.5 (1 – 32)
	Tashan icce	360	20	7.7 (1 – 30)
	Kinkiba	655	37	7.3 (2 – 130)
	Maigana	291	16	15.9 (2 – 80)
	Awai	182	10	8.5 (1 – 32)
Igabi	Zangon Aya	274	15	8.9 (3 – 35)
Giwa	Tashan zomo	151	8	10.1 (1 – 35)
	Sabon fegi	143	8	15.6 (5 – 40)
	Kudingi	127	7	6.5 (2 – 30)
Kubau	Anchau	Declined participation		

Table 1 Number and cattle herd size of Fulani pastoral households by villages selected for participation in the survey in Local Government Areas (LGAs) of Kaduna State, Nigeria

2.4 Questionnaire Design

A face to face, semi-structured, interviewer-administered questionnaire was used to collect data from selected participants. The questionnaire was administered in Hausa which was the dominant language of the area. Responses were recorded on paper and audio files. Audio records of responses were subsequently referred to when paper versions were not clear. Four enumerators were recruited – and trained by the lead author – to administer the questionnaires. Enumerators were selected from the local government livestock officers who had long working experience and established trust relationships within the pastoral communities. This was a deliberate approach adopted in order to enhance cooperation, facilitate identification of eligible households and encourage respondents to provide complete and accurate responses, particularly on questions that may be potentially sensitive. Questions contained in the

questionnaire were adapted from Ellis-Iversen et al. (2010) which investigated the perceptions, circumstances and motivators that influence implementation of zoonotic control programs on cattle farms and Onono et al. (2013) which assessed factors influencing the choice of CBPP control services providers to Massai pastoralists. The questions were initially presented to local veterinary officers and some pastoral farmers through focus group discussions (Suleiman et al., 2015a) and subsequently modified to fit the local situation of the study area. The final questionnaire (Supplementary material) was divided into four sections. Section one contained questions that explored demographic characteristics of respondents (age, education, source of livelihood and access to animal healthcare provider) herd structure and husbandry practise, in a manner that both interviewer and the respondent would be accustomed to the interview setting. Section two made up of questions on knowledge of CBPP risks and implementation of CBPP measures in herds. Section three asked questions regarding motivators for implementing CBPP control programmes. Finally, section four asked respondents to assign general and financial responsibilities for CBPP management to different stakeholders in the livestock sector. This study protocol was approved by the Ethics and Welfare Committee of Royal Veterinary College, University of London, details on this had already been published in (Suleiman et al., 2015a).

2.5 Interpretation of interviews and data analysis

2.5.1 Responsibility for CBPP Management in Herd

Pastoral farmers were classified based on the section of society (government, pastoralists or other stakeholders) they assigned the general and financial responsibility for CBPP management. Percentages were used to summarise number of respondents assigning

responsibility for CBPP control to sections of the society. The variable “age of respondents”, being a continuous variable was initially assessed for normality using Shapiro Wilk test and later transformed into categorical variable “age group”. Chi-square test was used to analyse association between farmer characteristics (age, education status, main livelihood source and access to animal health services) and assignment of responsibility for CBPP management.

2.5.2 Circumstances Influencing CBPP Control in Herds

The pathway to disease control model was used to illustrate and describe obstacles to CBPP control identified throughout the interview. Psycho-social factors that may impact on herd CBPP control can be elicited directly or derived from pastoral farmers’ beliefs underlying those factors (Ajzen, 1985). In the present study, derived measures, similar to the approach utilised in Ellis-Iversen et al. (2010) were adopted. Any factor mentioned by a respondent during interviews was therefore classified as internal or external and displayed in the appropriate box in the model (Figure 1).

2.5.3 Implementation of CBPP Control Programmes

Respondents were asked what herd health measures were implemented in herd within 12 months preceding the interview. The application of any proactive or reactive measure intended to manage disease was interpreted as showing intention to control disease, while carrying out of any specific CBPP control programme (CBPP vaccination and or antimicrobial treatment of clinical cases of CBPP) was interpreted as implemented CBPP control programme. Farmers who did not apply any proactive or reactive measure intended to manage disease were considered as having “no intention” to control CBPP. Farmers who applied any proactive or reactive

285 measure intended to manage disease were considered as having “intention to control CBPP”.
286 Farmers who implemented CBPP vaccination programme or antimicrobial treatment of clinical
287 cases of CBPP were considered as having “implemented CBPP control programme”. Percentages
288 were used to summarise number of respondents at different levels of intention to control CBPP.
289 Ordinal logistic regression model at 5% significant level was used to analyse for unconditional
290 associations between farmer characteristics (age, education status, main source of livelihood
291 and access to animal healthcare) and level of implementing CBPP control programmes on farm.
292 Proportional odds assumption was checked with approximate likelihood-ratio test.

293 ***2.5.4 Motivators for implementing CBPP control programmes***

294 Respondents were asked what would be needed to encourage them to implement CBPP control
295 programme in their herds. Percentages were used to summarise number of respondents that
296 mentioned (and did not mention) any factor considered to be potential motivator that may
297 influence CBPP programme implementation. Potential motivators mentioned by respondents
298 were included for analysis. Potential motivating factors were initially screened by selecting only
299 those which showed statistically unconditional associations with the outcome variable at a
300 liberal significance level of 20% (Dohoo et al., 2009; see pages 369 - 374). Univariable ordinal
301 logistic regression was used for this purpose. When the identified motivator was significantly
302 associated with the outcome variable, the motivator was included in a multivariable ordinal
303 logistic regression model. The multivariable model was derived by stepwise elimination of
304 variables with p-values larger than 0.05. The level of implementing CBPP control programme
305 was fitted as the outcome variable and potential motivators were fitted in as explanatory
306 variables. Likelihood-ratio tests were used to assess differences between models when a non-

307 significant variable was removed from the model. Variables were checked for collinearity; with
308 intention to drop or combine variables if collinearity was observed. Proportional odds
309 assumption was checked with approximate likelihood-ratio test. STATA software version 10 was
310 used for all statistical analyses (STATA Corp., College Station, TX).

311 **3 Results**

312 **3.1 Perception of Responsibility for CBPP Management**

313 Of the 200 pastoral household heads interviewed, responses from nine (4.5%) household heads
314 were excluded from the analyses. Of the nine excluded responses, five were from respondents
315 who did not provide any detail on farmer characteristics; one respondent declined to continue
316 with the interview after responding to only the first section of the questionnaire; while paper
317 records of three respondents had blank answer spaces which could not be filled from audio
318 records because they were not audible.

319 Characteristics of farmers included in this study were: age, education status, main source of
320 livelihood and access to animal healthcare services (Table 2). One hundred and seven
321 respondents (56.0%) believed that government should take some form of responsibility for CBPP
322 management in pastoral areas (Table 3). Of these respondents, 97 farmers (90.7%) believed that
323 government alone should take full responsibility for CBPP management. However, a total of 84
324 (44.0%) respondents were of the opinion that some form of responsibility for managing CBPP in
325 pastoral areas rest with farmers. Out of these farmers, 75 (89.3%) advocated that farmers should
326 take sole responsibility for the healthcare of their cattle. Two pastoral farmers said that other
327 stakeholders in the industry including livestock traders and butchers should also contribute

toward CBPP management. Of the farmer characteristics analysed, age was the only variable significantly associated with placement of general responsibility for CBPP management (Pearson's chi-square=86.01, p <0.01). The odds of placing responsibility for CBPP management on the government was higher for farmers 35 years or older, compared to younger farmers (Odds Ratio (OR): 30.8, 95% CI: 13.1-72.4).

Farmer characteristics	Level	Number of respondents (%)
Age group	Under 35	64 (33.5)
	35 to 45	60 (31.4)
	Over 45	57 (29.8)
	Undeclared	10 (5.3)
Formal education	Yes	41 (21.5)
	No	145 (75.9)
	Undeclared	5 (2.6)
Livelihood mainly cattle farming	Yes	101 (52.9)
	No	70 (36.7)
	Undeclared	20 (10.4)
Most accessible animal healthcare provider	Veterinarian	39 (20.4)
	Para-veterinarian	67 (35.1)
	Drug vendors	23 (12.0)
	Ethno-veterinary practitioner	47 (24.6)
	Undeclared	15 (7.9)

Table 2 Characteristics of 191 Nigerian Fulani pastoral farmers interviewed about the perceptions of responsibility and motivations for implementing CBPP control programmes, 2014

	Number of respondents assigning responsibility to this group	Number of respondents assigning responsibility to this group only
Which level of society has the main responsibility to avoid CBPP occurrence in the community?		
Government	107	97
Pastoralists	84	75
Other stakeholders	2	1
Which level of society has the main responsibility to finance CBPP control actions in the community?		
Government	164	42
Pastoralists	135	10
Other stakeholders	9	1

Respondents can fall into more than one response category (i.e. total responses were greater than 191 for number of respondents)

Table 3 Opinions of 191 Nigerian Fulani pastoral farmers on the responsibility for managing CBPP in herds

One hundred and sixty four (85.9%) respondents placed the responsibility for financing CBPP prevention and control on the government. However, 49 (29.9%) farmers with this opinion proposed a shared financing scheme for which government and the industry contribute equally; while 42 (25.6%) farmers said government alone should finance CBPP control activities in pastoral herds. One hundred and thirty five (70.7%) farmers agreed that they should contribute in financing CBPP control efforts. Of these farmers, 10 (7.4%) reported farmers should take full financial responsibility for CBPP management in their respective herds. Eleven pastoralists were not sure what part of the society should finance CBPP control programme. None of the farmer characteristics analysed was associated with placement of financial responsibility for managing CBPP.

3.2 Circumstances hindering the implementation of CBPP Control Programme in Herds

During the interviews, respondents mentioned a total of 18 factors could potential as barriers to implementing CBPP control programmes in herds. These were displayed in the appropriate boxes on the pathway to disease control model in Figure 1. Six of the 12 external factors preventing the implementation of CBPP control programmes were rooted within the pastoral communities and animal health sector. Lack of collaboration among farmers and between communities was the most commonly mentioned barrier to implementing CBPP control programmes. One hundred and eight respondents mentioned this problem; mainly expressing concerns about lack of information sharing between farmers on their respective herd CBPP situation. Some respondents emphasized the need for fellow herdsmen to inform one another as soon as they noticed signs that may be indicative of contagious disease outbreak. A comment by one respondent suggested the need for herdsmen to share information regarding their herd health status in order to identify and isolate affected herds at grazing or watering areas:

"If I noticed that my herd was affected [with CBPP], I would not allow them to co-graze with other herds," (Pastoral farmer, 47, Kafin Mardanni).

One farmer blamed poor cooperation among farmers for their inability to report disease outbreaks to authorities, emphasizing that without cooperation, it would be impossible for them to implement measures that required collaborative efforts, such as organising mass vaccinations that could benefit the whole community. Another farmer believed that with collaboration, pastoralists would be better able to develop contacts with veterinary officers and solicit for information and advice.

377 The quality of veterinary services and products was also perceived as an obstacle to CBPP control
378 programme implementation. One hundred and ten respondents commented on the quality of
379 services they received from animal healthcare providers. Concerns were raised on substandard
380 drugs sold to farmers. A respondent noted:

381 *"Whenever I see signs [of CBPP], I will purchase [veterinary drugs], but you just have to be lucky*
382 *because sometimes they work, other times, they do not. I think it depends on the [effectiveness]*
383 *of the medicine" (Pastoral farmer, 25, Sabon-Fegi).*

384 The internal circumstances of farmers which hindered their intention to implement CBPP control
385 programmes related to social norms; perceived "lack of government attention to pastoral
386 areas", "unwillingness of veterinarians to visit pastoral communities", "not promoting CBPP
387 control programmes by animal healthcare providers" and "limited cooperation among farmers".
388 Ninety-eight herdsmen narrated episodes of veterinarians' unwillingness to visit pastoral herds.
389 A respondent recalled:

390 *"In the past, [veterinary officers] used to come to our herds frequently, with medicines for [FMD],*
391 *[CBPP] and [brucellosis], but not anymore" (Pastoral farmer, 60, Dallatu).*

392 Other internal circumstances that inhered on-farm CBPP control related to perceived belief in
393 self efficacy; "CBPP vaccination control measures were not effective when carried out in one
394 herd only" as well as attitudes toward CBPP management in general; "CBPP management was
395 not the responsibility for farmers".

3.3 Levels of Implementing CBPP Control Programmes in Herds

Twenty-six (13.6%) farmers were classified as having no intention of implementing CBPP control programmes in herd. Ninety-two (48.2%) farmers intended to implement CBPP control programmes but did not implement any CBPP control programme in herd. A total of 63 (33.0%) farmers had implemented at least one CBPP control programme within the last 12 months preceding the study. Ten (5.2%) of the interviewed farmers were classified as missing values either because interviewers did not ask relevant questions or record of responses were not clear; thus removed from further analysis. The level of implementing CBPP control programmes in pastoral herds was significantly associated with educational attainment (Pearson's chi-square= 47.1, $p < 0.01$) and type of animal healthcare provider farmers were most accessible to (Pearson's chi-square = 32.8, $p < 0.01$). Pastoral farmers who had no formal education were less likely to implement CBPP control programmes compared to farmers who had formal education (OR: 0.07, 95% CI: 0.03-0.18). The odds for implementing CBPP control programmes were lower in herds whose most accessible animal healthcare provider was a para-veterinarian (OR: 0.34, 95% CI: 0.11-0.53), drug vendor (OR: 0.16, 95% CI: 0.06-0.45) or ethno-veterinary practitioner (OR: 0.19, 95% CI: 0.08-0.45) compared to herds for which a veterinarian was the most accessible animal healthcare provider.

3.4 Motivators for implementing heard health programmes

Ninety-seven farmers (53.6%) would implement a CBPP control programme if advised to do so by extension educators or other sources of animal health information they could trust. Of these farmers, only three reported implementing CBPP control programmes in herds. Ninety-eight farmers (54.1%) would be motivated to implement a programme if a veterinarian or someone

technically competent would visit their herds to perform the required activities. Of these farmers, only two had implemented a CBPP control programme in the last 12 months preceding the study. A total of 119 farmers (65.8%) would be motivated to implement a CBPP control programme if cost would be affordable. Sixty one (51.2%) of these farmers had implemented a CBPP control programme in their respective herds. In addition, 122 farmers (67.4%) would implement a programme if it was promoted by their animal healthcare provider. Of these farmers, only one had no intention of implementing CBPP control programme in herd. The multivariable ordinal regression model showed that these trends were statistically significant (Table 4). Advice from extension educators and veterinarians' herd visit would more likely motivate pastoral farmers who did not intend to implement CBPP control programmes in their herds. In contrast, affordable veterinary services, promotion of specific CBPP control programmes by a competent animal healthcare provider would more likely motivate farmers who either intended to implement a programme or had already implemented the programme.

	No of respondents	Distribution within implementation level			Multivariable model output		
		No intention	Had intention	Implemented programme	OR	95% CI of OR	*p*-value
What would be needed from Government Livestock Department to encourage you to take specific actions towards controlling CBPP in your herd?							
Advice from extension educator	97	24	70	3	0.03	0.01-0.13	< 0.01
Did not mention advice from extension educator	84	2	22	60	1.00		
Affordable CBPP control costs	119	4	54	61	8.42	2.84-24.92	< 0.01
Did not mention affordable CBPP control costs	62	22	38	2	1.00		
What would be needed from animal healthcare providers to encourage you to take specific actions towards controlling CBPP in your herd?							
Veterinarians' herd visit	98	22	74	2	0.03	0.01-0.11	< 0.01
Did not mention veterinarians' herd visit	83	4	18	61	1.00		
Promotion of CBPP control programmes	122	1	63	58	6.89	2.21-21.53	0.01
Did not mention promotion of CBPP control programmes	59	25	29	5	1.00		

Table 4 Motivators associated with implementation of CBPP control programmes in 181* Nigerian Fulani pastoral herds, 2014

Proportional odds likelihood ratio test = p <0.001; Pseudo R^2 (Nagelkerke) = 59.5%; CI = confidence interval, OR; odds ratio. *Data from 10 farmers were excluded due to missing responses

4 Discussion

The present study explored perceptions of pastoral cattle farmers on the responsibility for CBPP management in pastoral herds and identified circumstances and motivations for implementing CBPP control programmes. A semi-open ended interviewing method was adopted to collect field data. This approach was a deliberate decision because open ended questions were seen to mirror natural conversation settings which were more likely to generate accurate information than close-ended questions that supplied predetermined responses (Groves et al., 2009). The decision to recruit local government officials as interviewers was taken so that the study benefit from the existing mutual respect and trust relationships between the local livestock officers and the pastoral farmers. This was anticipated to be essential for generating honest responses especially from questions that might be potentially sensitive. The recruitment of pastoral farmers was based on their willingness to participate in the study after they were informed of the study objectives. This might have introduced representation bias in which farmers who were more interested in animal health issues might have been overrepresented. Finally, the study only recruited pastoral farmers; as such, results presented in this paper did not reflect the views of non-pastoral farmers who constituted about 10% of cattle producers in Nigeria.

Nevertheless, the study found that about 5% of pastoral farmers accepted full financial responsibility for managing CBPP in herds, while 40% placed the general responsibility for CBPP management on the pastoral community. This observation could indicate a changing farmer perception regarding the responsibility for CBPP management and cattle health in general. Until the late 1990s, when the veterinary services industry was privatised, Nigerian pastoral farmers

456 had benefited from free CBPP vaccinations under a cattle taxation regime (known locally as
457 *Jangali*) in which the government provided animal healthcare services and grazing facilities to
458 pastoral communities (Kerven, 1992; Iro, 1994; Adebayo, 1995). As such, this historic policy
459 intervention explains why most pastoral farmers viewed CBPP management as a government
460 responsibility. The fact that younger farmers were more likely to accept responsibility for CBPP
461 management further supports the assumption that pastoral cattle sector had begun to accept
462 responsibility for animal healthcare. This finding could possibly indicate positive prospect for
463 enhanced CBPP management in herds where pastoral farmers can be encouraged to implement
464 CBPP control programmes and uphold the costs.

465 This study showed that both internal (such as the perception that CBPP management was not
466 the responsibility of farmers) and external (such as lack of knowledge on CBPP control
467 programmes) circumstances influenced the perceptions of farmers regarding CBPP
468 management in herds and their intention to implement disease control programmes. The
469 relative impact of these circumstances depended on the level of intent to implement CBPP
470 control programmes. Farmers who had no intention of implementing CBPP control programmes
471 identified advice from competent sources and access to veterinarians as motivators that
472 influence them to consider taking action. Farmers in this category were mainly constrained by
473 normative beliefs; including the perception that animal healthcare was a responsibility for the
474 government and a perceived lack of cooperation among farmers to collaborate for community
475 based CBPP management activities. As long as their attitudes towards CBPP management
476 remain negative, external support is unlikely to result in improved CBPP control in herds. These
477 pastoralists are more likely to be influenced by interventions that intended to demonstrate

478 successful CBPP management experiences. In this regard, interventions aimed at; (1) supporting
479 pastoral farmers to form cooperative societies that would be better able to organise community
480 wide CBPP control programmes and (2) enhanced uptake of CBPP control technologies should
481 focus on providing objective information from trusted sources that have the capacity to
482 influence farmer beliefs; such as extension agents, veterinarians or successful peers.

483 Most of the pastoral farmers who intended to implement CBPP control programmes or had
484 actually implemented programmes identified affordable veterinary services and promotion of
485 specific CBPP control programmes as motivations to improve in-herd CBPP management. High
486 cost of CBPP control services had been identified as one of the major reasons for maintenance
487 of CBPP in pastoral herds (Leonard, 2003; Muuka et al., 2013; Onono et al., 2013). In Nigeria,
488 difficulties in establishing government vaccination centres in pastoral areas were responsible for
489 the high cost of CBPP control technologies (Bourn et al., 1992a). A study on CBPP control service
490 providers to pastoral areas of the country reported that farmers travelled an average of 34km
491 to seek competent CBPP control services and obtain credible animal health advice (Suleiman,
492 2016). In order to improve the uptake of CBPP control services, it is advised that animal health
493 authorities in Nigeria and other countries with similar veterinary business landscapes consider
494 implementing CBPP vaccination programmes through private veterinary platforms. Since private
495 providers are largely motivated by profit, this approach has the potential to improve access to
496 CBPP control services in pastoral areas at competitive prices. Studies in Zambia (Muuka et al.,
497 2013) and Botswana (Boonstra et al., 2001) have demonstrated that private sector involvement
498 in the provision of CBPP control technologies has the potential to sustain better control of the
499 disease in endemic regions.

5 Conclusion

This study revealed that 81.2% of the Fulani pastoral herdsmen demonstrated progressively positive attitudes towards managing CBPP in herds. Perception of responsibility for managing the disease was significantly influenced by the age of farmers with younger farmers accepting more responsibility than their older counterpart. Intention to implement CBPP control programmes was significantly associated with educational attainment of farmers and their access to services offered by trained veterinarians. The pathway to disease control showed that farmers with positive intentions to control the disease could be incentivised by cost effective CBPP control options and advocacy on recommended strategies to manage the disease. Conversely, attitudes of farmers who did not intend to control the disease could be changed through improved access to better animal health information and services.

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Complicit of Interest

None

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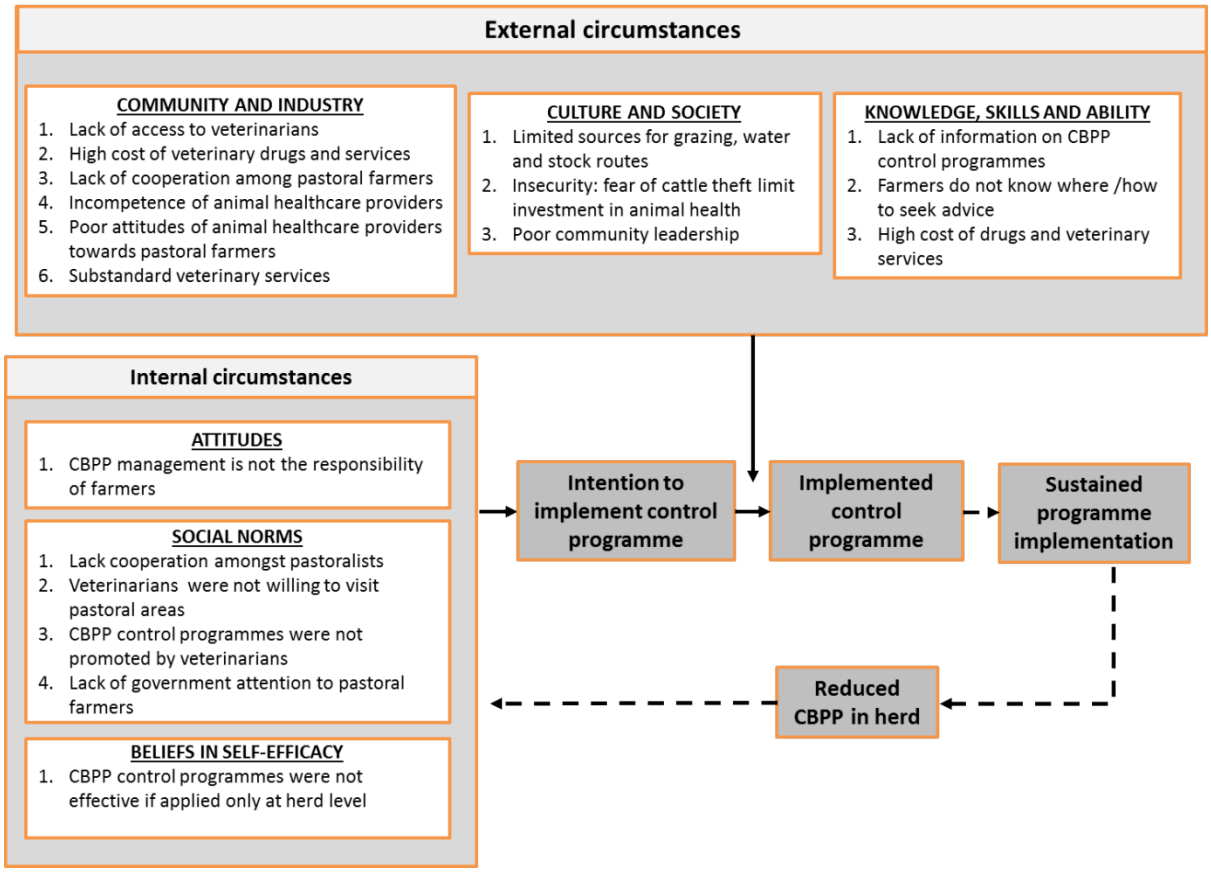

Figure 1 Circumstances affecting the implementation of CBPP control programmes in 191 Nigerian Fulani pastoral herds. Dotted lines indicate links which are not examined in this article.

Date_____ Interviewer Initials_____

Questionnaire ID_____ Village_____

LGA_____

Instructions to Interviewer

1. Politely introduce yourself and the purpose of your visit to the household.
2. Assure the respondent that answers to the questions will be kept confidential and read to them the sections "**Objectives of the Survey**" and "**To the Respondent**" below.
3. In the event the respondent declines to give the interview, do not insist. Instead, ask for reason (s) for their refusal and record them here:
   _____
   (Use a new questionnaire for each household visited, unless the space above is not filled)
4. Please, remember to thank the interviewee before you leave.

Objectives of the Survey

This interview was intended to understand motivations of farmers to implement CBPP control programmes in herds. The information you provide will help in identifying the best way to support farmers in managing the disease in their herds.

To the Respondent

This survey is part of a Post-graduate degree work at the University of London. Data provided in this questionnaire will be treated as strictly confidential and will be used to achieve the stated objectives of the survey only. You may choose not to participate or withdraw from the interview at any time.

Respondent and Husbandry data

1) Age_____ 2) Herd size_____

3) Education level of household head (*please tick the appropriate option*)

No formal education

Primary

Secondary

Post-secondary

4) Main source of livelihood of the household head (*please tick the appropriate option*)

Cattle keeping

Other_____

5) Who does the following activities in your household?

a. Herding and milking of cattle: woman ( ) man ( ) son ( ) daughter ( ) hired worker( )
b. Sale of milk: woman ( ) man ( ) son ( ) daughter ( ) hired worker ( )
c. Purchase of cattle: woman ( ) man ( ) son ( ) daughter ( ) hired worker ( )
d. Sale of cattle: woman ( ) man ( ) son ( ) daughter ( ) hired worker ( )
e. Treatment of sick cattle: woman ( ) man ( ) son ( ) daughter ( ) vet ( )

6) **Interviewer:** Fill in the following table by asking the respondent about the most accessible animal healthcare providers, their location, average time taken to reach their premises and back, average distance covered to the premises:

Provider	Location	Distance (Km)	Time (Hours)
Government vet			
Para-veterinarian			
Ethno-veterinarian			
Others (Specify)_____			

Herd Health Problems

7) What are the health problems affecting your herd?

a. _____
b. _____
c. _____
d. _____

8) Which of the health problems mentioned in question 7 above affect your herd the most? (*Circle the letter in question 7 corresponding to the most important health problem*)

9) What is/are the reason (s) for your choice? (*You may tick more than one option*)

a. It causes severe clinical signs
b. It incurred higher control costs
c. It occurs more frequently
d. Other reason_____

10) What measures did you take in the past year to prevent disease occurrence in your herd?

a. _____
b. _____
c. _____
d. _____

11) What disease(s) did your herd encountered in the past year?
a. _____
b. _____
c. _____

12) (*If CBPP is not mentioned)* ask the respondent if they experienced CBPP in the past year *(otherwise, go question 12*)

13) (*If CBPP was experienced*) what measures did you take against CBPP when you notice its signs?
a. _____
b. _____
c. _____

13) Which of the measures in question 13 above did you prefer to take in responding to the disease your herd? (*Circle the letter correct answer from the options above*)

14) When you notice signs of CBPP disease in your herd, how long do you wait before you take any measures?
_____

15) How long do you wait before you change to another measure?

_____

16) How long you manage sick animals before you consider selling them?

_____

Motivations for CBPP Control

17) Do you worry your cattle may get CBPP from other cattle in your area?

_____
_____
_____
_____

18) What would be needed to encourage you to take specific actions towards controlling CBPP in your herd?

a. From community leaders

_____
_____

b. From your animal healthcare provider

_____
_____

c. From governments livestock department

_____
_____

d. From fellow pastoralists

_____
_____

e. From other stakeholders (*please specify*)

_____
_____

19) What would be needed to encourage you to take specific actions towards controlling CBPP in your community?

e. From community leaders

_____
_____

f. From your animal healthcare provider

_____
_____

g. From government livestock department

_____
_____

h. From fellow pastoralists

_____
_____

e. From other stakeholders (*please specify*)

_____
_____

Responsibility for CBPP Control

20) Would you feel that you have any social responsibility in preventing CBPP in your community?

Why?

_____
_____

If none, why not?

_____
_____

Who else, if anyone is involved?

_____

_____

21) Which level of society has the main responsibility to avoid CBPP occurrence in the community? (*Respondent may tick more than one option*)

a. Pastoralists
b. Livestock traders and butchers
c. Government Livestock Department
d. Animal healthcare providers
e. Others _____

22) Which level of society has the main responsibility to finance CBPP control actions in the community? (*Respondent may tick more than one option*)

f. Pastoralists
g. Livestock traders and butchers
h. Government Livestock Department
i. Animal healthcare providers
j. Others _____

23) What proportions should be paid by different levels of society for actions (such as vaccinations) needed to control CBPP in your herd, (*tick the appropriate box*)?

	One-quarters	Half	Three-quarters	Full
Myself				
Government Livestock Department				
Cattle traders and butchers				
Animal healthcare providers				
Others_____				

Do you have anything else to add to this discussion?

_____
_____

Are there any questions you would like to ask the interviewer?

Thank you for your time