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Protecting Livestock – Improving Human Lives

Promoting Access to Contagious Caprine Pleuropneumonia (CCPP) Vaccine and Vaccination in Tanzania

Baseline Study in Manyara Region

Prepared by:
Prof. Philemon Wambura*, Dr. Mirende Kichuki and Dr. Sultan J. Hussein*****
*Mycoplasma expert-SUA; **Field sample collection and laboratory analysis-SUA; ***Team Leader Field Investigation-Manyara

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1. Executive Summary

Contagious caprine pleuropneumonia (CCPP) is a highly contagious and severe respiratory disease of goats. It is characterized with high morbidity of up to 100% and mortality of 70% (Rurangirwa et al., 1987, Centre for food security and Public health 2011). The disease is caused by the bacteria called *Mycoplasma capricolum* subspecies *capripneumoniae.*

CCPP is widespread in most of the eastern and central African countries. The disease has been suspected to be present in Tanzania since the early 1980's (Nyange and Mbise, 1983; Msami, 1991) and was confirmed by isolation of *Mycoplasma capripneumonia* in 1998 (Msami et al., 1998). During this period the disease was confirmed in Arusha, Dar es Salaam, Kilimanjaro and Tanga (Kusiluka et al., 2000). Since then there has been increasing numbers of reports of CCPP suspected outbreaks in many parts of the country including Manyara region.

The widespread occurrence of the disease in Tanzania indicates lack of systematic control measures to contain the disease. Vaccination has been shown to be the most effective method for controlling CCPP since it provides effective prophylaxis and is affordable to farmers (ref). Despite this, use of the vaccine against CCPP in Tanzania is limited. GALVmed expressed the intention to minimize the socio-economic losses caused by CCPP by ensuring sustainable availability of the vaccine. As a first step towards achieving this goal, GALVmed funded execution of a CCPP baseline study in Manyara region which would support formulation of a comprehensive CCPP vaccination programme.

Therefore, the study was carried out in order to i) establish the extent of the CCPP problem in Mbulu, Babati, Hanang, Kiteto & Simanjiro districts, ii) understand the knowledge, attitudes and practices (KAP) on the methods of prevention of CCPP, iii) understand the CCPP control measures that are currently being used in the districts, iv) establish the status of CCPP vaccine distribution and use. Results from the study would form the basis for the GALVmed long-term objective of promoting access to CCPP vaccine and vaccination in Africa. Subsequently, the study was conducted involving activities that included: selection and training of enumerators, administering households questionnaires to 120 households per district, collection of information from existing Agrovet shops in the districts, collection of information from two District Veterinary officers and five Ward Extension Officers , collection of blood samples from

goats in selected households and collection of information from the Officer-In- charge of the northern Zone Veterinary Investigation Centre (VIC) in Arusha . A total of 60 villages comprising 582 households, of the planned 600 households (representing 97%) from the districts namely; Mbulu (9 villages), Babati (11 villages), Hanang (13 villages), Kiteto (14 villages) and Simanjiro (13 villages) respectively were studied.

The results showed that the majority of respondents from households keeping goats were aware of the occurrence of CCPP in their respective areas and did receive livestock extension services; these results also indicated that extension services were given by a range of extension workers. Despite the foregoing information, 33% of the goat raising respondents from households keeping goats was unaware of provision of the livestock extension services and 16% were not aware of providers of these extension services within their areas! The percentages of those who knew about inclusion of training on goat husbandry during extension services and the ones who did not were about the same**.**

The results suggest that respondents from households keeping goats were very much aware of conditions that affected the health of their goats and that the respiratory diseases significantly affected their goats and, in particular, they were aware that CCPP was a serious disease of goats. The results also revealed that respondents attempted or sought treatment of CCPP affected goats and only a small percentage would vaccinate against CCPP. The household responses also suggest that the majority of households were not aware or conversant with vaccination as an option to prevent CCPP occurrence in their areas. Moreover, CCPP vaccine availability also seemed to be a limiting factor**.** Respondents from households keeping goats and Agrovet shop owners indicated that access to the CCPP vaccine was either difficult or very difficult or not accessible at all.

The results from the VIC confirmed that CCPP affected all age groups of goats in the past 5 years (since 2008) in Manyara region, and that the VIC capacity to diagnose CCPP was limited to histopathological examination and Complement Fixation Test (CFT).

The Findings from respondents owning Agrovet shops confirmed that CCPP and Pest des Petitis ruminants (PPR) vaccines have been sold in the region for about 5 years (since 2008) but the CCPP vaccine supply by Agrovet shops has been limited to a few shops despite indications by 80.8% of respondents that farmers specifically requested CCPP vaccines. The Agrovet shop owners' reasons for the low sales or uptake of the CCPP vaccine included the following: i) farmers' unawareness of the CCPP

vaccine, ii) unavailability of the vaccine, iii) lack of government approval for use of the vaccine, iv) lack of appropriate cold chain facilities including power supply interruptions, v) lack of demand of the product by farmers, and vi) perceived unprofitability of the product among others. This calls for strategic planning to address these shortcomings.

On average, each livestock extension worker covered more than 5,200 goat-keeping households, which translated to between 5,000 and 42,000 goats per person. This result means that, at the higher end of the goat numbers, the livestock personnel involved would be overstretched and actually not be able to provide effective support to the clientele in their area**.**

A high number of livestock health personnel had encountered and were conversant with goat respiratory conditions; their claim of knowledge of CCPP was largely based on clinical signs and post-mortem examinations but there seemed to be no supporting laboratory confirmation. The calculated / estimated CCPP morbidity and mortality rates in this study, based on the criteria used by the livestock extension workers to diagnose CCPP, were low in comparison to the high morbidity and mortality normally quoted in various literatures.

Various livestock extension workers expressed preference for different CCPP vaccination intervals, and also indicated that CCPP vaccine sources were diverse and uncoordinated.

The serology results obtained provided a good initial base for studying the CCPP epidemiology and development of appropriate CCPP control strategies in Tanzania. This baseline study has demonstrated the potential for researchers at relevant institutions in Tanzania to *characterize* appropriateness of currently available CCPP vaccines with respect to circulating *M. capripneumoniae* strains in CCPP affected areas. Such investigation may avoid use of ineffective vaccines imported from abroad as well as avoiding complications relating to the importation and registration of CCPP vaccines.

The field and laboratory results obtained in the study have confirmed presence of CCPP in the Manyara region and isolation of *M.capripneumoniae* from Simanjiro district implies that there was an active CCPP infection during the study period. The results obtained should help chart ways forward for Tanzania Government to institutionalise use of quality and reliable CCPP vaccine eventually leading to effective control of CCPP and hence help to increase goat's productivity.

Observations made on the findings from the study have identified gaps in both knowledge and actions commensurate with effective management of CCPP. Recommendations have been made to address the gaps focusing on the following broad areas: i) mobilization of relevant stakeholders to ensure effective delivery of the livestock extension services including education on goat husbandry practices, ii) changing the mind-set of treating CCPP to that of prevention through vaccination and/or isolation and restriction of goat movements, iii) improving CCPP diagnosis through introduction and institutionalization of better newer techniques at the Arusha VIC, iv) investigations to elucidate the reasons for poor uptake of the CCPP vaccination exercise in Manyara and commensurate remedies, v) investigations to define an appropriate number of goats to be covered by a livestock health personnel in the region, vi) introduction and increasing of laboratory techniques for supporting differential diagnosis of the many respiratory diseases encountered in the region, vii) a study to determine the optimal CCPP vaccination interval within the Tanzania context, viii) regulation of supply and use of CCPP vaccine in Tanzania, ix) undertaking CCPP epidemiological studies with the aim to developing and implementing effective CCPP control actions, and x) implementation of strategic actions aimed at characterizing Tanzania M. capripneumoniae isolates for optimal CCPP management in the country.

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Abbreviations & Acronyms

CAWHs	Community Animal Health Workers
CCPP	Contagious caprine pleuropneumonia
cELISA	Competitive Enzyme-linked Immunosorbent Assay
CFT	Complement Fixation Test
ELISA	Enzyme-linked Immunosorbent Assay
CIRAD	Centre de recherche français qui répond (French Agricultural Research Centre for DVS International Development)
DVO	District Veterinary Officer
DVS	Director of Veterinary Services / Directorate of Veterinary Services
Hr	Hour
OD	Optical Density
PI	Percentage Inhibition
GIT	Growth Inhibition Test
LFO	Livestock Field Officer
MAb	Monoclonal Antibody
NGO	Non Governmental Organization
OIE	World Organisation for Animal Health
PBS	Phosphate Buffered Saline
PCR	Polymerase chain reaction
PPLO	Pleuropneumonia Like Organisms
PPR	Peste des Petits Ruminants
REA	Restriction enzyme analysis
rRNA	Ribosomal Ribonucleic Acid
SE	Standard Error
TAD	Transboundary Animal Disease
TANESCO	Tanzania Electricty Supply Company
TVLA	Tanzania Veterinary Laboratory Agency

VIC	Veterinary Investigation Centre

2. Introduction and Background

2.1 The Disease

Contagious caprine pleuropneumonia (CCPP), is a highly contagious respiratory disease of goats, and is considered to be one of the most severe diseases for this species. Infected animals become very sick and mostly die, with high morbidity reaching 100% and mortality of 70%. CCPP has been reported to affect only goats (Thiaucourt and Bšlske, 1996) and it does not cause disease in sheep, neither spontaneously nor experimentally (McMartin et al., 1980). However, there are some reports describing the isolation of *M. capricolum subsp. capripneumoniae* from healthy sheep in Kenya that have been in contact with goat herds affected by CCPP (Litamoi et al., 1990), and from sick sheep mixed with goats in Uganda suffering from the disease (Bšlske et al., 1995) and detection of antibodies in sheep in Ethiopia (Hadush et al., 2008) make sheep to be suspected potential carrier of *Mycoplasma capricolum subsp. Capripneumoniae, the causative agent of CCPP.*

The disease is spread by inhalation of infectious respiratory droplets (aerosol) and in some cases some goats may be infected without showing signs of illness. The clinical signs of the disease includes; very high fever (41^0C), lethargy, unwillingness to eat, coughing, and difficulty in breathing. Infected animals may have frothy nasal discharge and stringy salivation. Postmortem examination generally reveals fibrinous pleuropneumonia accompanied with increased pleural fluid, adhesions and enlarged oedematous mediastinal lymph nodes. Deaths generally occur within 7 to 10 days but can be as rapid as 2 to 3 days. Human beings are not known to be at risk of developing the disease.

The objectives of the investigation were, through a baseline study:

1. To establish the extent of the CCPP problem in selected districts (Mbulu, Babati, Hanang, Kiteto & Simanjiro);
2. To understand the stakeholders' knowledge, attitudes and practices on the methods of prevention of CCPP;
3. To understand the CCPP control measures that are currently being used in the districts; and
4. To establish the status of CCPP vaccine usage and distribution: types and source of vaccines used as well as quality control and systems for vaccination programs (if any).

The long-term objective is to promote sustainable access to CCPP vaccine and vaccination with a view to reducing goat production losses attributed to CCPP infections thereby contributing towards improvement livelihoods of households with goats.

2.2 CCPP Occurrence

Isolated cases of CCPP incidences were reported in Mbulu district in 2004, 2005 and Kiteto and Simanjiro districts in 2003, 2004 respectively **(*Kusiluka, 2000***). Although the disease had been identified in Manyara region since 2003, only Kiteto, Simanjiro and Babati districts have attempted to vaccinate their goats, mostly through NGOs/CBOs but with little government intervention, whilst Mbulu and Hanang districts have not yet vaccinated their goats against the disease.

2.3 CCPP Control

CCPP can be controlled by application of treatment during the outbreak, restricting animal movements, slaughtering infected animals and vaccination (Thiacourt et al., 1996). However, CCPP is refractory to commonly used antibiotics with development of carrier status and therapy is generally unavailable or too expensive for many low-income farmers which make this option increasingly less successful. Eradication of CCPP can be best achieved by the slaughter of affected and in-contact animals, but this is not always practical because the governments are unable to compensate farmers, especially in developing countries such as Tanzania. The best promising solution for controlling CCPP is vaccination which is safe and generates better immunity, thus providing effective prophylactic measures affordable particularly to low-income farmers. Currently, there appears to be no clear policy on vaccination against CCPP in Tanzania. While there is real demand for the CCPP vaccine in the Manyara region, there is no reliable vaccine supply and clearly defined vaccination programmes for those that need it. However, prior to this study it was generally known that some households have been using the vaccine purchased privately by individuals or NGOs to protect their stock against CCPP. The Government of Tanzania has been making various efforts to control CCPP through education of farmers on how to prevent entry of the disease into their flocks and treatment of the affected animals with antibiotics. Vaccination against CCPP though practiced in some parts of the country is not widespread. It is mainly done by individual farmers who can access vaccines from various sources because there is no specific programme designed for vaccination of goats against the disease. Similarly, there is no surveillance programme for CCPP or

quality control of the vaccination initiatives being implemented by the individual farmers or private institutions.

2.4 Economic Significance of CCPP

CCPP is a highly contagious and fatal disease of goats, which is widespread in most of the eastern and central African countries. It causes tremendous socio-economic losses through high morbidities and deaths, which results in loss of income from sales of live animals and animal products (meat, milk and skins) and reduced productivity of the affected animals in the form of reduced weight gains and decreased milk production. Tanzania is one of the countries that have been severely affected by CCPP. Since the official confirmation of the disease in the country in late 1998 (Msami et al, 1998), the disease has spread to various parts of the country and has now reached endemic status (Kusiluka et al., 2007; Noah et al., 2011; Swai et al., 2013) . Because CCPP is a transboundary animal disease (TAD), which can easily spread to other countries through uncontrolled movement of animals, it is a major constraint to international trade in the affected countries. Presence of CCPP in Tanzania therefore poses a serious threat to the goat industry in the entire southern African region.

2.5 Intervention purpose

If control of CCPP has to be of practical value to individual farmers and the nation as a whole, there is a need of initiating a systematic nationwide vaccination programme supported by a comprehensive monitoring and evaluation in order to ensure that the vaccination programme meets the necessary quality standards. Such initiative requires collaborative efforts between the Government and other stakeholders in the livestock sector.

The Global Alliance for Livestock Veterinary Medicines (GALVmed) a not-for-profit organization decided to complement the efforts of the Government of Tanzania in minimizing the socio-economic losses caused by CCPP through promotion of appropriate vaccination programmes supported with an effective quality control system. Evaluation of the benefits of vaccination against CCPP in the Manyara region was undertaken and lessons gathered from the baseline study are expected to form the basis for formulating a more comprehensive vaccination programme. Thus the baseline study, endeavoured to i) assess the magnitude of the CCPP problem in Mbulu, Babati, Hanang, Kiteto & Simanjiro districts, ii) knowledge, attitudes and practices of the livestock owners concerning CCPP; iii) methods of prevention and control

of the disease that are currently in place, including vaccination programmes - vaccine types and sources, and quality control systems for such programmes.

3. Project Target area, Methodology and Expected Outputs

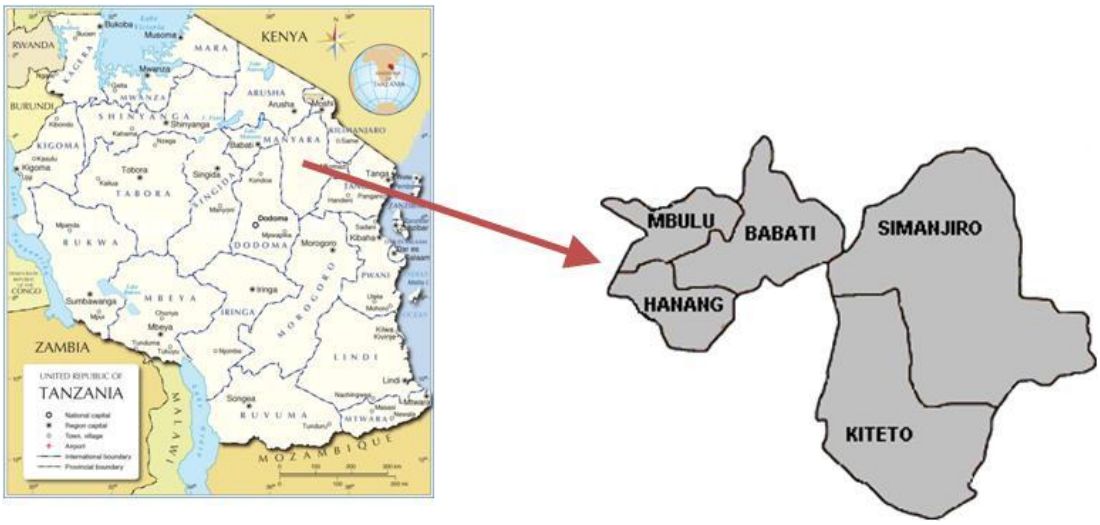

Figure 1: Map of Manyara region showing districts involved in the baseline study

3.1 Target area

The baseline study was carried out in five districts of Manyara region in northern Tanzania. The five districts include Babati, Kiteto, Hanang, Mbulu and Simanjiro. The region is bordered by Arusha region to the north, Kilimanjaro and Tanga regions to the east, Dodoma region to the south and Singida region to the west. The region has a total of human population of 1,425,131; cattle 1,439,947, goats 934,547; sheep 415,094; chicken 879,373 (indigenous); chicken 18,672 (exotic); pigs 98,045 and donkeys 83,219. It has an area of 50,921 square kilometers which include 49,576 square kilometers of dry land and 1,260 kilometers covered with water, 29 divisions, 123 wards, 393 villages and 1,540 hamlets / households (*Investment and Social Economic Profile Manyara Region, August, 2013*). This is in accordance with the census obtained in Manyara Region.

The relevant detailed district statistics are summarized in Tables 1 and 2 respectively. The main livelihood activity of the populations in Babati, Hanang and Simanjiro districts is livestock farming under

pastoralist and agro-pastoralist systems. In addition to the two systems, there are hunters and gatherers in Kiteto and Mbulu. The main livestock species kept include cattle, goats, sheep and local chickens.

Table 1: Manyara districts profile for CCPP baseline study: Human & goat populations, relation households, divisions, wards & villages)

	District				
	Babati	Hanang	Kiteto	Mbulu	Simanjiro
Human population	405,500	178,693	244,669	320,279	275990
Density/sq km	61	25.5	-	55	-
Growth rate p.a.	3.8%	3.2 %	-	-	-
Households	62,692	44,196	45,692	38,729	44,196
HH with goats	20,891	20,491	17,850	23,246	17,455
Area Sq Km	6,069	3,436	16,645	4,350	3,814
Wards	29	18	19	32	25
Villages total	108	52	58	110	65
Villages studied	11	13	15	9	13

Table 2: Manyara districts profile for CCPP baseline study: Human & goat populations, types of goats in relation to households, divisions, wards & villages

Items	Kiteto	Simanjiro	Babati (M)	Babati (W)	Mbulu	Hanang
Human Population	244,669	275,990	93,108	312,392	320,279	178,693
Number of households	45,692	42,196		62,692	38,729	44,196
Number of indigenous goats	227,619	222,594	20,721	65,621	205,233	184,904
Number of exotic/improved goats	1,871	816	356	3,851	45	2,783
Number of households keeping goats	17,850	17,455		20,891	23,246	20,494
Number of villages	58	65	13	95	110	52
Number of wards	19	25	13	21	32	18
Divisions	7	5	2	4	5	6
Area (Sq km)	**16,645**	**3,814**	**461**	**5,608**	**4,350**	**19,941**

Source: Investment and Social Economic Profile Manyara Region, August, 2013.

3.2. Methodology of the baseline study

The plan for the CCPP baseline study in the aforementioned 5 districts involved a series of activities that aimed at: selection and training of enumerators (at least 10 enumerators per district); pre-testing of questionnaires; administering of the questionnaires to 120 households per district; collection of information from existing Agrovet shops in the district (6 Agrovet shops per district); collection of information from two District Veterinary Officers and five Ward Extension officers; collection of blood samples from goats in selected households (80 samples per district), and collection of information from the in-charge of the Zonal Veterinary Investigation Centre.

3.2.1. Selection of the villages and Households

Before implementation of the baseline study, the five districts were involved in the planning, which involved identifying and mapping the villages and households that had experienced CCPP outbreaks. Villages and households selection for the baseline study was based on the number of goats that the villages possessed, the number of households keeping the goats (at least a minimum of 5 goats per household) and background history of the CCPP disease incidences in the area including the morbidity

and mortality rates. During the orientation / training of the enumerators, the relevant district officials provided information regarding the CCPP status within the last 5 years.

A total of 60 villages comprising 582 households out of an estimated planned 600 households (representing 97%) from 5 districts of Manyara Region namely; Mbulu (9 villages), Babati (11 villages), Hanang (13 villages), Kiteto (14 villages) and Simanjiro (13 villages) respectively, were targeted in the baseline study.

The interviews were carried out by trained enumerators from each district. Prior to the interviews in the respective households, a pre-testing exercise was conducted in a few selected households to familiarize enumerators with the questionnaires before implementation of the actual exercise. The pre-testing exercise was done in all the districts.

Figure 2: A photograph showing an enumerator interviewing a woman in Ming'enyi pastoral village of Hanang district during the CCPP baseline study in 2013

Enumerators were distributed in a sub-village, each to a selected household where both the interviews and blood samples collections were conducted. In each case, selected goats were clinically examined for CCPP clinical signs by paravets supervised by Dr. Sultan and Dr. Kichuki and depending on the findings; a

blood samples were collected followed by recording the animal and owners' particulars in a note book. Depending on the clinical findings, a minimum of 5 or more blood samples would be collected from the household. Challenges to implementation of the baseline study included impassable terrain, long distances, baseline study planned activities unexpectedly coinciding with either community/public meetings or other social functions thus resulting in either delays in implementation or total cancellation of the activities.

Figure 3: A photograph showing a technician from the VIC-Arusha taking blood from the jugular vein of a goat in Masieda village in Mbulu district during the CCPP baseline study in 2013

3.2.2 Serology for antibody detection of M. *capripneumoniae* by cELISA

A monoclonal antibody (MAb 4.52)-based competitive enzyme-linked immunosorbent assay (cELISA), obtained from a commercial supplier (CIRAD, Montpellier, France), was used for the detection of specific antibodies to *M. capricolum subsp. capripneumoniae* bacterium. All serum samples tested in the study were processed in duplicate as per the standard protocol. Briefly, the ELISA plates (Nunc Immuno1-Maxisorb, Cat. A39454) were coated with a purified lysate, a 1:3,000 dilution of *M. capricolum subsp.*

capripneumoniae antigen (50 µl/well) derived from Madin–Darby bovine kidney cell culture, and the plates were incubated at 37 °C for 1 hr with constant agitation. Unbound antigen was washed away using washing buffer (0.01 M, pH 7.4±0.2 plus 0.05%Tween 20), followed with the addition of 45 µl of blocking buffer to each of the wells (PBS containing 0.5 % *M. capricolum subsp. capripneumoniae* negative control serum and 0.05 % Tween 20). Eleven microliters of the test and control serum samples (negative, weak positive, and strong positive) were then added (in duplicate), followed with the addition of 110 µl of MAb (except to the conjugate control wells) at a concentration of 1:100 in blocking buffer.

The plates were then incubated for 1 hr ± 5 min at 37 °C (±3 °C) with a gentle agitation. All of the wells were washed with a 300 µl of washing solution two times. Anti-mouse IgG horseradish peroxidase conjugate, diluted 1:100 in blocking buffer, was added to each well (100 µl/well), and the plates were incubated for 30 min (±3min) at 37 °C (±3 °C). Substrate solution (TMB-9) was added to each well (100 µl/well) and incubated for 20 min at 37 °C (±3 °C) in a dark place. Stop solution (100 µl) was then added into each well with a gentle agitation allowing 60 min for a color reaction to develop. The ELISA microplates were read with an immunoscan reader (Flow Laboratories, UK) with an interference filter of 450 nm.

The reader was connected to a computer loaded with ELISA Data Interchange software, which was used to automate the reading and calculation of the percentage inhibition (PI) values. The optical density (OD) values were converted to percentage inhibition using the following formula: PI=100− (OD control or test serum/OD MAb control) ×100. The samples with PI≥60 % (cutoff point) were considered positives for *M. capricolum subsp. capripneumoniae* infection.

3.2.3 Isolation of *M. capripneumoniae*

3.2.3.1 Preparation of the media

The media used for microbiological study were Hayflick's medium broth and CCPP solid diagnostic medium. Hayflick's medium containing 25% horse and porcine serum and pyruvate here in abbreviated as H25P (Bölske *et al*., 1996) were used for isolation of *M. capripneumoniae* The broth H25P medium is composed of 17.5 g of Bacto PPLO Broth without crystal violet (Difco Detroit); 650 ml of glass distilled water; 100 mL of yeast extract (Sigma, St. Louis); 125 ml of horse and 125 mL of porcine serum

inactivated at 56ºC 250 mL; 4 mL of 50% w/v glucose (Merck, Darmstadt); 8 ml of 25%w/v sodium pyruvate (BDH, Poole); 4 mL of 5% w/v thallium acetate.

The CCPP diagnostic medium (Mycoplasma Experience UK) was prepared as per instructions from the supplier. The components of the medium included an agar, a diluents and a freeze-dried supplement which were contained in bottles but the individual volumes not indicated. The total volume of the medium when the components are mixed amounted to 25 ml. To reconstitute the medium, the agar was melted in boiling water at 100^0C and allowed to cool slightly to 50^0C and then placed in a 50^0C water bath. The diluent was added to the freeze-dried supplement, the mixture was agitated gently until the supplement was completely dissolved, then placed in 50^0C water bath for 15 minutes. The reconstituted supplement was then added to the agar and mixed thoroughly and 4ml of the mixture was dispensed into Petri dishes then dried in an incubator at 37^0C for 10 minutes and inoculated.

3.2.3.2 Isolation of Mycoplasma

Although we did not take samples for isolation of the *M. capripnuemoniae during* the baseline study; samples for isolation were provided by our colleague from the Tanzania Veterinary Laboratory Agency (TVLA) who had taken samples from Simanjiro district on 11th August 2013, the period which coincided with the period of the baseline survey. The samples collected included pleural fluid, affected lung portion and mediastinal and bronchial lymph nodes. Affected lung portions and mediastenal and bronchial lymph nodes were cut and decontaminated by immersing in absolute alcohol then flaming and thereafter peeling off the surface. About 10 g of the tissue was cut into small pieces and placed in a stomacher bag and 3.6 mL of grinding medium (H25P without horse serum) was added. The sample was grounded in the stomacher for 5 min then the suspension was recovered. For each sample of the homogenized tissue and pleural fluid, a ten- fold serial dilution to 10^{-4} was prepared in the H25P medium.

The inoculated broth was incubated at 37^0C. The culture were examined daily for evidence of growth, which was manifested by a colour change from red to yellow due to acid production from fermentation of glucose and the appearance of floccular materials at the bottom of the culture tube or a swirl from the bottom when it was agitated (OIE, 2004). After evidence of growth in the broth, the 10^{-2} dilution was subcultured into another set of broth and inoculated on the CCPP diagnostic medium agar for

observation of colonial morphology. The broth culture was observed for growth and the 10^{-3} and 10^{-4} dilutions showing growth were pooled and frozen for further studies.

The inoculated solid media were incubated at 37^0C in a humid anaerobic jar with 5% carbon dioxide supplied by candle (OIE, 2014). Humidity was maintained by placing cotton wool soaked in sterile water. The media was observed under stereomicroscope for evidence of growth from day 3. The inoculated media was observed for 21 days for evidence of Mycoplasma colonies. The characteristic Mycoplasma colonies were subcultured onto the CCPP diagnostic medium and H25P broth and incubated at 37^0C overnight to allow multiplication of the organisms after which serial dilutions were made as described above. The 10^{-2} dilutions was subcultured on to the solid medium and used in the disc growth inhibition test for identification of the *Mycoplasma* isolates.

3.2.4 Identification of mycoplasma isolates

Identification of Mycoplasma isolates was done by using disc Growth Inhibition Test (GIT) (*Jones and Wood, 1988*).

3.2.4.1 Preparation of discs

Discs were prepared by placing 1 drop of sterile rabbit hyperimmune antiserum on all 6 mm dry and sterilized antibiotic assay discs. The discs then dried at 37ºC for 24 hr and stored until use.

3.2.4.2 Procedures for the GIT

Plates containing the CCPP diagnostic medium H25P broth were flooded with 0.5 mL of 10G2 broth culture and the plates were tilted carefully to ensure that the fluid spreads all over the surface and the excessive broth was sucked off. The plate was allowed to dry at room temperature for 15 min and then the discs were placed on the media, when the disc had been moistened the plates were incubated at 37^0C. Growth inhibition was observed daily under a stereomicroscope for presence of growth and an inhibition zone. The size of the inhibition zone was measured using ruler from the edge of the disc to where normal colonies started to grow and recorded. The presence of 4-5 mm inhibition zone around the discs impregnated with hyperimmune sera against *M. capripneumoniae* was considered to be a positive for *M. capripneumoniae* growth (Jones and Woods, 1988). The isolates were further confirmed in PCR and Restriction Enzyme Analysis reactions

3.2.4.3 Molecular diagnosis of Mycoplasma

This method is based on a PCR system by which a segment of the 16S rRNA gene from all mycoplasmas of the *M. mycoides* cluster can be amplified. The PCR product is then analyzed by restriction enzyme cleavage for the identification of *M. capripneumoniae* DNA. PCR and restriction enzyme analysis were also applied to clinical samples from the lung, lymph node, pleural fluid and cultured broth. As expected, mycoplasmas belonging to the *M. mycoides* cluster were detected by the PCR. Restriction enzyme analysis of the PCR products was then applied for the identification of *M. capripneumoniae.*

3.2.4.5 DNA extraction

The broth was used for PCR/REA test and extraction method described below was adopted from Sepa Gene® extraction protocol.

DNA extraction was carried out according to the above protocol. Briefly,1ml of broth and pleural fluid was mixed in 700 µl of sterilized PBS centrifuged at 6613 g for 10 minutes at 4^0C. The supernatant was transferred into a new Eppendorf tube and centrifuged at 6613 g for 30 minutes at 4^0C. The supernatant was discarded; 50 µl of solution I were added to the pellet and the homogenate was incubated at room temperature (20 – 25^0C) for 10 minutes. Thereafter, 50 µl of solution II were added to the pellet mixed by pipetting without making bubbles and solution III was added and mixed briefly. This was followed by addition of 200 µl of solution IV to the mixture. The content was shaken by vortex mixer until the mixture was uniformly turbid (milky in colour), centrifuged at 5635 g for 15 minutes at 4^0C. The supernatant was transferred into a new tube and 30 µl of solution V was added followed by 330 µl of isopropanol and mixed uniformly by tilting. The mixture was incubated at -80^0C for 5 minutes, and then centrifuged at 6613 g for 30 minutes at 4^0C and the supernatant discarded. The pellet was washed with 70% chilled ethanol and air dried and 30 µl of Tris-EDTA (TE) buffer was added. The DNA concentration was measured by a spectrophotometer and standardized at 100 ng/5 µl.

3.2.4.6 Polymerase chain reaction

The PCR machine used was Takara PCR thermal cycler Dice (Takara, BIO INC Shiga).

The sequences of the primers were as follows:

MmF 5´-CGA AAG CGG CTT ACT GGC TTG TT-3´

MmR 5´-TTG AGA TTA GCT CCC CCT CAC AG-3´

The PCR cycle comprised of denaturation, annealing and extension steps and a segment from 16S rRNA gene was amplified to obtain a 548 kb PCR product.

The tubes were placed in the thermocycler at 94^0C for 4 minutes to prevent initial non-specific annealing of primers. Thereafter 35 PCR cycles were performed each cycle comprising the following steps: 95^0C for 45 s, 55^0C for 1 minute and 72^0 C for 1 minute. The PCR reaction was finalized by the elongation step at 72^0C for 7 minutes.

3.2.4.7 Analysis of the PCR product

The visualization of the PCR product was done by agarose gel electrophoresis. Then 10 µl of the PCR product added to 5 µl of loading buffer was analyzed by electrophoresis in a 1.5% agarose gel with 0.5 µl of ethidium bromide per ml. In each analysis, one well on the gel was loaded with 1 kb ladder as a molecular marker and was run in electrophoresis machine at 120V for 30 minutes then viewed in UV light to observe the bands.

3.2.4.8 Restriction enzyme analysis

The PCR products were then digested without further purification by REA with *Pst*I as follows; 1 µL of the PCR product was mixed in a 0.5 mL Eppendorf tube with 2 µL of 10X restriction buffer, 0.2 µL of bovine albumin serum, 0.5 µL of PstI and sterile deionized water added to make a 20 µL volume. The digestion mixture was mixed thoroughly by pipetting and centrifugation for a few seconds followed by incubation at 37^0C for 4 hours. Then 4 µL of 6X loading buffer was added to the PCR product. The digested PCR product were analysed by Agarose gel 2% electrophoresis at 120V for 30 min, then viewed in UV light to observe the bands, the photos were taken by using digital camera Olympus.

3.2.5. Timelines, activities implemented period

The implementation of the CCPP baseline study was carried out in 5 districts of Manyara region by a team comprising personnel from SUA, a field team leader and selected enumerators in each district. A summary of the actions undertaken in different locations is given in annex 1.

3.3 Baseline study and data analysis

GALVmed developed in partnership with "Bases & Datos" a data capture and analysis software named "Lili-Lite" that was used for the recording and analysis of the data from households, Agrovet shops, and animal health services providers and VIC during the baseline study. The software is designed to accommodate questionnaires in English and Swahili. The data was submitted by the field team investigator to Bases & Datos for analysis and report generation and thereafter, the analysed data was returned as pdf documents from which the CCPP baseline study draft report has been generated.

4. Results

The results given below represent findings from the questionnaires administered to i) households, ii) zonal veterinary investigation centre (Arusha), iii) Agrovet shops and iv) Ward Extension Officers in form of DVOs and Ward Extension officers in the study area. In addition, the results also include findings from laboratory activities conducted concurrently in the same baseline study period in the Manyara region. The questionnaire results are given first followed by the laboratory results.

4.1 Households

All 582 households responded to the question on the number of goats they possessed; the average number of does per household was 47.

Three hundred ninety five households out of 595 indicated that they were aware of livestock extension services, which sometimes included education in their areas while 198 were unaware. Those aware were 66.4 ±3.8% and not aware were 33.4 ±3.8%. The results show that a third of the respondents were unaware of provision of livestock extension services and thus unlikely to seek provision of these services even if they needed them.

Results indicated that livestock extension services including education were provided by various extension workers as shown in table 1 below. Some of the respondents reported that no one provided such services while some noted that they did not know of provision of these services in their areas. This indicates that livestock extension services including education are largely provided by Government based personnel.

Table 3: Provision of livestock extension services according to households

Respondents from households keeping goats	% and SE	Extension service provider
35	5.9% (±1.89)	Government Veterinarian
196	32.9% (±3.78)	Government Para veterinarian
301	50.6% (±4.02)	Livestock Extension Officer
9	1.5% (±0.98)	Private Veterinarian
18	3% (±1.38)	Private Para veterinarian
181	30.4% (±3.7)	Veterinary Input Shop (Pembejeo Shop)
80	13.4% (±2.74)	Community Animal Health Worker (CAHWs)
8	1.3% (±0.93)	NGO Service Provider
11	1.8% (±1.08)	Others
97	16.3% (±2.97)	Nobody
1	2% (±0.33)	Don't know

Two hundred thirty six out of 582 (39.7±3.9%) respondents from households keeping goats reported that the extension service included training on goat husbandry while 250 or 42 ±4% reported training was not included. Ninety one respondents representing 15.3 ± 2.89% said that extension services did not exist and 9 or 1.5% ± 1 said that they did not know if it is included. The findings indicate that about 40% of the respondents affirmed that extension services that included goat husbandry were provided while slightly more than 42% did not. However, the training on goat husbandry practices was mainly given to farmers who have been provided with exotic breeds of goats but no training was given to farmers who keep indigenous goats.

With regard to goat night, 340 out of 595 (57.1 ± 4%) households respondent households reported to house their goats at night while 254 (42.7 ±4%) kept them in kraals and one (0.2 ± 0.3%) left goats to roam at night. Essentially, the results show that nearly all households confined their goats at night.

Of the respondents interviewed on diseases most affecting their goats, 87.6 ±2.6% ranked respiratory diseases, while 50.4 ±4% reported digestive system diseases, 38.5 ±3.9% noted sudden death and 28.7±3.6% other diseases but 0.2 ±3.6% did not know the diseases that affect their goats. These results indicate that the majority of household members are aware of conditions that generally affect the health of their goats.

On knowledge of CCPP, 568 out of 593 or 95.5 ± 1.7% indicated they knew the disease while 25 or 4.2±1.7% did not know it.

Figure 4: A sick goat with signs consistent with CCPP in Mureru village Hanang district

With respect to the CCPP clinical signs and symptoms, 93.1 ±2% of the respondents noted coughing, 90.8 ±2.3% difficult breathing, 81.7 ±3% nasal discharge and 53.9 ±4% death. The main findings are summarised in Table 4 below. While it is difficult to be certain that household members actually could distinguish CCPP from a host of other respiratory disease, the majority clearly knew the main clinical signs relating to CCPP.

Table 4: Signs and symptoms of CCPP according respondents from respondents from households keeping goats

Respondents from households keeping goats	% and SE	CCPP clinical signs
403	67.7% (±3.76)	Loss of appetite
379	63.7% (±3.86)	High fever
384	64.5% (±3.84)	Lagging behind the flock
540	90.8% (±2.33)	Difficult breathing
554	93.1% (±2.04)	Coughing
486	81.7% (±3.11)	Nasal discharge
306	51.4% (±4.02)	Ocular discharge
376	63.2% (±3.88)	Depression
161	27.1% (±3.57)	Excessive noise (bleating)
321	53.9% (±4.01)	Death
30	5% (±1.76)	Others
2	0.3% (±0.47)	Don't know

Two hundred seventy two out of 573 (45.7 ±4%) of the respondents reported observing similar CCPP clinical signs in sheep while 228 (38.3 ± 3.9%) could not. It is worth noting that reporting of similar signs in sheep does not conclusively confirm that sheep were suffering CCPP; further investigations to conclusively confirm that reports of CCPP in sheep are needed.

Three hundred sixty six out of 577 (61.5 ±3.9%) of respondents ranked CCPP as a very serious disease in comparison to other goat diseases, 120 (20.2 ± 3.2%) ranked it as serious and 69 (11.6 ± 2.6%) as not serious while 22 (3.7 ±1.5%) could not know how to rank it. Again, here it is difficult to be sure that this ranking by members of the households in Manyara region strictly reflects actual CCPP situations; it is probably more likely to be a reflection of ranking for a combination of respiratory diseases. With regard to action taken on noticing that goats have clinical signs consistent with that of CCPP, 82.5±3% would treat the affected goats with veterinary drugs, 41.7±4% would refer them to a livestock field officer for further assistance but 31.4±3.7% would separate affected goats from the rest of the herd. Only 7.7±2.1% indicated would vaccinate with CCPP vaccine. A summary of the main findings is given in Table 5. The findings reflect a concern by the households for their goats in connection with contracting a feared disease. The results also revealed an apparent low level of awareness of vaccination against CCPP as a preventative measure.

Table 5: Actions taken by households when they detect CCPP

Respondents from households keeping goats	% and SE	Actions upon detecting CCPPP
187	31.4% (±3.73)	Segregate affected goats from the non-affected ones within the herd
491	82.5% (±3.05)	Treat affected goats with veterinary drugs
46	7.7% (±2.15)	Vaccinate affected goats using CCPP vaccine
248	41.7% (±3.96)	Call Livestock Field Officer to my herd for assistance
127	21.3% (±3.29)	Report occurrence of the disease to the LFO/DVO/DVS
52	8.7% (±2.27)	Move the non-affected goats to my relative's/neighbor's herd
40	6.7% (±2.01)	Slaughter all the affected goats and sell the meat to villagers
5	0.8% (±0.73)	Kill all the affected goats and bury their carcasses
36	6,1% (±1.92	Other actions taken
6	1% (±0.8)	Don't know

On prevention of occurrence of CCPP into the herd, 51.8 ±4% of the respondents preferred use of prophylactic treatment of goats at risk while 38.8±3.9% would restrict importation of goats from affected areas. Overall findings on this issue are given in Table 6.

Table 6: Actions taken by households to prevent occurrence of CCPP in a herd

Respondents from households keeping goats	% and SE	Action to prevent CCCPP occurrence
304	51.1% (±4.02)	Restriction of movement of animals to the affected areas
231	38.8% (±3.92)	Restriction of importation of animals from the affected areas
79	13.3% (±2.73)	Vaccination of animals at risk
308	51.8% (±4.02)	Prophylactic treatment of animals at risk
77	12.9% (±2.7)	Other methods
52	8.7% (±2.27)	Don't know
7	1.2% (±.87)	Not applicable

Regarding prevention of introduction of CCPP into their areas, 51.8±4% of respondents reported that they would use prophylactic treatment, 49.9±4% restriction of movement of goats, 38.8±3.9% restriction of importation of goats, and 13.3±2.7% would vaccinate goats at risk. A summary of the findings is given in Table 7.

Table 7: Methods taken by households to prevent CCPP into the village

Respondents from households keeping goats	% and SE	Methods to prevent CCPP entry into the village
297	49.9% (±4.02)	Restriction of movement of animals to the affected areas
231	38.8% (±3.92)	Restriction of importation of animals from the affected areas
58	9.7% (±2.38)	Vaccination of animals at risk
308	51.8% (±4.02)	Prophylactic treatment of animals at risk
65	10.9% (±2.51)	Other methods
58	9.7% (±2.38)	Don't know
13	2.2% (±1.17)	Not applicable

When asked what was used to treat goats the last time they were affected by CCPP like diseases, 76.3±3.4% reported that they bought veterinary medicines from Agrovet shops and treated, 37±3.9% called a local government paravet, 12.6±2.7% called local government veterinarian, 11.9±2.6% called a community animal health worker while 9.2 ±2.3% used traditional/home remedies. The overall results are summarised in Table 8. These results reflect the concern that the owners had for their goats and their willingness to consult with those they perceive might know better how to deal with the goat health.

Table 8: Actions taken by households to deal with CCPP in goats

Respondents from households keeping goats	% and SE	Actions to combat CCPP in goats
55	9.2% (±2.33)	Treat with traditional medicines/home remedies
31	5.2% (±1.79)	Seek help from neighbours
71	11.9% (±2.6)	Contact CAWHs
220	37% (±3.88)	Contact Local Govt paravet or Livestock Inspector
29	4.9% (±1.73)	Contact Local Private paravet or Livestock Inspector
75	12.6% (±2.67	Contact Local Government Vet
14	2.4% (±1.22)	Contact Private Veterinarian
454	76.3% (±3.42)	Buy medicines from the veterinary inputs shop (Pembejeo shop)
9	1.5% (±.98)	Sell immediately to butchers/dealers
10	1.7% (±1.03	Do nothing
1	0.2% (±0.33)	Don't know
3	0.5% (±0.57)	Not applicable

It was also revealed that, in general, 94.8 ± 1.8% bought veterinary medicines to treat sick goats while 5.2±1.8% bought vaccines and 2.5±1.3% neither bought medicines nor vaccines. The high percentage of those willing to buy remedies for their sick goats reflects the value they attach to their goats while at the sametime the low vaccination percentage could be an indication of unawareness and/or unavailability of the vaccine in the study areas.

Five hundred and six out of 577 (85±2.9%) of the respondents indicated they had not vaccinated against CCPP while 68 (11.4±2.6%) had in the last five years but 3 (0.5±0.6%) did not know about the vaccination. Despite the indication that only about 0.5% of households were unaware of ccpp vaccination, this result shows that over 80% presumably aware of CCPP vaccination had not vaccinated their goats.

Sixty five out of 595 respondents had, on average, vaccinated their goats 1.62 times in the last 5 years. Twenty seven out of 86 (4.5±1.7%) of the respondents reported that the government provided vaccination services free or with charges while 38 (6.4 ±2%) reported paying for the vaccination but 21 (3.5±1.5%) did not know if it was free or charged. These figures seem to indicate the poor

communication to the communities in the Manyara region about CCPP vaccines and vaccinations. The poor communication was exemplified by the fact that during the baseline study, it was found that the DVOs of Mbulu and Hanang districts did not allow vaccination against CCPP because the vaccine was not registered in the country, while DVOs in other remaining three districts in Manyara region allowed vaccination.

Table 9 summarises where respondents previously procured medicines and vaccines. About seventy percent (70.1% ±3.7%) of the respondents obtained medicines/drugs from Agrovet shops, 15.8±2.9% veterinary centres, 6.0±2.2% government paravets / livestock inspectors, 4.5±1.7% government veterinarians, and 2.9±1.3% community animal health workers. These results indicate that the main source of medicines and vaccines for goats were Agroshops, followed by veterinary centres, and minimal from individual government officers or CAWHs.

Table 9: Location where households purchase animal health products

Respondents from households keeping goats	% and SE	Animal health products suppliers
94	15.8% (±2.93)	Veterinary Centre
27	4.5% (±1.67)	Government Veterinarian
417	70.1% (±3.68)	Veterinary Input Shop (Pembejeo Shop)
2	3%	Livestock Dealers
51	6% (±2.25)	Government Para veterinarian/Livestock Inspector
17	2.9% (±1.34	Community Animal Health Workers
2	3% (±0.47)	NGO Service Provider
4	7% (±0.66)	Other Farmers
22	3.7% (±1.52)	Others
0	0% (±0)	Don't know
10	1.7% (±1.03)	Not applicable

Sixty six out of 595 (inset %) respondents, on average, vaccinated their goats 1.59 times within a period of the last 12 months. This is almost equal to the recommended vaccination n regimen of two times a year.

Thirty four out of 349 (5.7±1.9%) respondents indicated that they paid for CCPP vaccine less than TShs 450/=, while 3 (0.5±0.6 %) paid between TShs 450/= and 500/= but 4 (0.7±0.7%) paid more than TShs 500/=per individual goat vaccination dose. A detailed summary of responses is given in Table 10. These results show that the cost of vaccination per animal is in the region of TShs. 450-500.

Table 10: Range of cost of CCPP vaccination per animal

Respondents from households keeping goats	% and SE	Price
34	5.7% (±1.87)	<TShs. 450
3	0.5% (±0.57)	TShs. 450 - 500
4	0.7% (±0.66)	>TShs. 500
8	1.3% (±0.93)	Don't know
300	1.3% (±0.93)	Not applicable

Ease of access to the CCPP vaccine was rated as follows: 211 out of 577 (35.5±3.8%) respondents found access difficult, 106 (17.8±3.1%) reported access was very difficult while 252 (42.4±4%) indicated it was not at all available. The results are summarised in Table 11. These findings suggest that generally access to CCPP vaccine is not easy.

Table 11: Ease of accessibility to CCPP vaccine in the Manyara region

Respondents from households keeping goats	% and SE	CCPP vaccine accessibility
0	0% (±0)	Very Easily Available
0	0% (±0)	Easily Available
211	35.5% (±3.84)	Difficult to access
106	17.8% (±3.07)	Very Difficult to access
252	42.4% (±3.97)	Not Available at All
8	1.3% (±0.93)	Not applicable

When asked if CCPP vaccine was not available in their area would they buy it from elsewhere? Five hundred sixty out of 578 (94.1±1.9%) reported that they would while 14 (2.4±1.2%) would not. It is clear from the results that the majority of households would be willing to buy the CCPP vaccine from where they could access it.

Sixty eight out of 579 or 11.4 ±2.6% reported that their neighbours vaccinated against CCPP while 386 (64.9±3.8%) noted that the neighbours did not vaccinate but 121 (20.3±3.2%) did not know if neighbours vaccinated. These results further confirm what has already been noted in the foregoing that vaccination was currently not the main method of control measure against CCPP in the Manyara region.

Two hundred seventy out of 579 or 45.4±4% interviewees indicated that CCPP cases were first detected in either their herd or village less than 2 years back while 170 (26.8±3.6%) that it was 2-5 years but 108 (18.2±3.1%) said more than 5 years; the remaining 25 (4.2±1.6%) did not know when CCPP was first reported. The findings are summarised in Table 12. Assuming that CCPP is not being confused with other goat respiratory infections/diseases, based on these results it can be concluded that CCPP has been the Manyara region for more than 5 years.

Table 12: The period CCPP cases were first detected in a herd or village

Respondents from households keeping goats	% and SE	Period
270	45.4% (±4)	< 2 years
170	28.6% (±3.63	2-5 years
108	18.2% (±3.1)	> 5 years
25	4.2% (±1.61	Do not know
6	1% (±.8)	Not applicable

Regarding how CCPP was introduced into their areas, 70.4±3.7% believed that it was through communal grazing and watering, 45.4±4% attributed it to movement of goats back and forth between locations/herds, 31.9±3.7% goat mixing at livestock markets and 9.4±2.3% through the dowry practice. Additional ways of introduction of CCPP into their areas are recorded in Table 13. The results reveal that members of the interviewed households believe that mixing of infected with uninfected stock whether by communal grazing, watering, markets, kraals, etc significantly contributed to introduction of CCPP into their previously CCPP-free areas.

Table 13: Modes of CCPP introduction into the area

Respondents from households keeping goats	% and SE	Method of CCPP introduction
419	70.4% (±3.67)	Communal grazing & watering of clean & infected goats
190	31.9% (±3.75)	Mixing of clean & infected goats at animal markets
56	9.4% (±2.35)	Infected dowry goats into clean herds
98	16.5% (±2.98)	Newly purchased infected goats into clean herds
112	18.8% (±3.14)	Infected goats from neighbours /friends /relatives for safe custody in clean herds
271	45.5% (±4)	Temporary goat relocation to infected premises and return to base
159	26.7% (±3.56)	Household migration from one area to another
40	6.7% (±2.01)	Others
62	10.4% (±2.45)	Don't know
5	0.8% (±.73)	Not applicable

On the question of how many goats became sick in a herd during CCPP outbreak(s), based on answers from 541 respondents, it was computed that on average 29.02 goats did. This figure of 29 goats should be considered broadly more as average for serious respiratory diseases rather than necessarily being specifically for CCPP.

On average, 12.69 goats per herd were lost during CCPP outbreaks; this information is derived from answers of 496 respondents.

4.2 Technical Vet (VIC)

The Arusha VIC confirmed that it normally receives samples from goats from the Manyara region.

The VIC indicated that field samples are delivered refrigerated irrespective of the number of days the samples may take from the field to the VIC. A summary of the responses is indicated in Table 14.

Table 14: Samples packing and transportation from the field to VIC

Number of VICs	% and SE	Packaging & transportation method
0	0% (±0)	Same day without preservation
0	0% (±0)	> 1 day without preservation
1	100% (±0)	Same day refrigerated
1	100% (±0)	1 to 3 days refrigerated
1	100% (±0)	> 3 days refrigerated
1	100% (±0)	Frozen
0	0% (±0)	Others

With regard to the techniques used to diagnose CCPP, the VIC reported as indicated in a summary of the findings in Table 15.

Table 15: Diagnostic method used to detect CCPP in the laboratory

Number of VICs	% and SE	Diagnostic methods
0	**0% (±0)**	**Microbiology**
0	**0% (±0)**	**Immunohistochemistry**
0	**0% (±0)**	**ELISA**
0	**0% (±0)**	**PCR**
1	**100% (±0)**	**histopathology**
1	**100% (±0)**	**Others** (e.g. CFT, Latex agglutination test)

From the results, CCPP is mainly diagnosed by histopathological examinations while complement fixation test is used for laboratory confirmation. It was found that most of the respiratory diseases are not serologically diagnosed (Table 16).

Table 16: Respiratory diseases diagnosed by serological methods

Number of VICs	% and SE	Disease
0	0% (±0)	CCPP
0	0% (±0)	PPR
0	0% (±0)	Maedi Visna
0	0% (±0)	Mycoplasma ovipneumoniae
1	100% (±0)	Others (e.g. Pasteurellosis)

From the results, it was reported that there had been several suspected cases of CCPP in the last 5 years and samples were collected and submitted for diagnosis of CCPP. Some of the suspected CCPP cases were laboratory confirmed by the VIC in the last 5 years. In the last 12 months, the VIC reported having diagnosed 8 cases of the respiratory diseases complex. According to the VIC, the positive cases of CCPP were diagnosed in all age ranges (Table 17).

Table 17: The age ranges of CCPP cases

Number of VICs	% and SE	Age range
1	100% (±0)	< 5 month old
1	100% (±0)	6 to 12 months old
1	100% (±0)	1 to 2 years old
1	100% (±0)	> 2 years old
0	0% (±0)	Don't know
0	0% (±0)	Not applicable

The VIC indicated that goat farmers were mainly using CCPP vaccine supplied by livestock dealers and NGOs dealing with livestock. A summary is given in Table 18. Usually the frequency of vaccination is once per year (This is done once the vaccine is available in the district) and the dose of vaccine used is I ml per head (The bottle of CCPP vaccine contains 100 doses for 100 animals).

Table 18: VIC perspective of CCPP vaccine supplier

Number of VICs	% and SE	Vaccine supplier
0	0% (±0)	Veterinary Centre
0	0% (±0)	Government Veterinarian
0	0% (±0)	Veterinary Input Shop (Pembejeo Shop
1	100% (±0)	Livestock Dealers
0	0% (±0)	Government Para veterinarian/Livestock Inspector
0	0% (±0)	Community Animal Health Workers
1	100% (±0)	NGO Service Provider
0	0% (±0)	Other Farmers
0	0% (±0)	Others
0	0% (±0)	Don't know
0	0% (±0)	Not applicable

4.3 Agrovet shops

Two out of 26 (7.7±10.2%) respondent in the category of owners of Agro shops confirmed having sold goat vaccines in the last 5 years while 24 (92. 3±10.2%) had not. This clearly shows that very few Agrovet shops were engaged in selling of vaccines for goats diseases in the study districts.

On whether the Agrovet shops sold other livestock or poultry vaccines, 8 out of 25 (30.8±17.7%) respondents reported that vaccines were not demanded by clientele, another 8 (30.8±17.7%) of respondents reported that they did not have vaccine handling facilities while 3 (11.5±12.3%) did not find selling vaccines profitable. The remaining 6 (23.1±16.2%) did not express reasons for not trading in vaccines. A summary of the responses is given in Table 19. These results suggest that apparent lack of demand by farmers for the CCPPP vaccine and lack of appropriate cold chain facilities are the main reasons why the vaccine was not readily on the market in Manyara region.

Table 19: Agrovet shops' reasons why vaccines were not sold

Agrovet respondents	% and SE	Potential reasons
8	30.8% (±17.74)	Vaccine not demanded by clients
8	30.8% (±17.74)	No vaccine handling facilities
3	11.5% (±12.28)	Not profitable
6	23.1% (±16.2)	Do not know

Of the Agrovet shops that had cold chain facilities, the majority had electric refrigerators followed by solar fridges and a few with either kerosene or kerosene-gas facilities while 8 respondents did not have any cold chain facility. Details are provided in Table 20.

Table 20: Cold chain facilities for vaccine and clinical samples storage

Agrovet respondents	% and SE	Cold chain facilities
1	3. 8% (±7.39)	Electric Refrigerator and generator
10	38.5% (±18.7)	Electric Refrigerator without generator
0	0% (±0)	Gas refrigerator
0	0% (±0)	Dual electric/gas refrigerator
4	15.4% (±13.87)	Solar fridge
1	3.8% (±7.39)	Kerosene fridge
2	7.7% (±10.24)	Dual kerosene / gas fridge
2	7.7% (±10.24)	Freezer
8	30.8% (±17.74)	Do not have any

Concerning national electric power supply interruptions during the month prior to the interviews, the findings revealed that 16 respondents out of a total of 26 experienced an average of 2.38 power cuts during the month preceding the baseline study interviews; interruptions were mainly attributed to electric power rationing by TANESCO, the national electric power supplier.

Twenty five out of 26 or 96.2±7.4% Agrovet shop respondents confirmed that they sold other livestock and poultry vaccines besides CCPP vaccine while 1(i.e. 3.8±7.4%) did not. This result indicates that Agrovet shops operators are willing to trade in vaccines and the apparent low involvement in trading in CCPP vaccine might be reversed if the conditions proved favourable to its uptake.

When asked which products Agrovet shops sold for goats, all 26(100%) sold antibiotics, dewormers and vitamins while only 6 (23.1±16.2%) sold vaccines and 24 (92.3±10.2) also sold other products; results are summarised in Table 21. In comparison to other products Agrovet shop operators trade in, vaccines in general seem not to be as attractive and the reasons for this needs to be explored and addressed.

Table 21: Products sold by Agrovet shops for goats

Agrovet respondents	% and SE	Products
6	23.1% (±16.2)	Vaccines
26	100% (±0)	Antibiotics
26	100% (±0)	Dewormers
26	100% (±0)	Vitamins
24	92.3% (±10.24)	Others
0	0% (±0)	Do not sell any

Agrovet shops respondents that sold CCPP vaccine were 3 out of 24 (11.5±12.3%) did while 21(80.8±15.5%) did not; the apparent low level involvement in CCPP vaccine sales by many Agrovet shops might in part be due to unavailability of the vaccine in those areas.

It was estimated that on average just over 8,660 doses of CCPP vaccine had been sold in the past 5 years. The results are based on 3 out of 26 respondents who had chance to be interviewed. Bearing in mind the population of goats in the Manyara region and the confessed threat of CCPP during the baseline study interviews it is clear that sale of CCPP vaccine.

It was also estimated that on average just over 3, 0460 doses of PPR vaccine had been sold in the same past 5 years. These results were also obtained from the 3 out of 26 respondents who had been interviewed. The results suggest that demand for CCPP vaccine was greater than that of PPR vaccine.
Only 1 (3.8±7.4%) of Agrovet shop respondents mentioned that the country of CCPP vaccine production was Kenya, indicating that knowledge on source and probably use of the vaccine is rather limited even among the potential vaccine distributors (Table 22).

Table 22: Possible Country for CCPP Vaccine Production

Agrovet respondents	% and SE	CCPP vaccine production country
1	3.8% (±7.39)	Kenya
0	0% (±0)	Ethiopia
0	0% (±0)	Jordan
0	0% (±0)	Others
1	3.8% (±7.39)	Not applicable
7	26.9% (±17.05)	Don't know

Seven Agrovet shops respondents indicated that each CCPP vaccine vial (bottle) contained 100 doses. The price per vial of 100 CCPP vaccine doses ranged from TShs. 40,000/= to TShs. 50,000/= with an average cost per vial of TShs. 47,500/=.

Twenty one out of 26 (80.8±15.1%) Agrovet shop respondents reported that farmers specifically requested buying CCPP vaccine while 5 (19.2±15.1%) did not receive requests from the farmers. On the other hand, twelve out of 26 (46.2±19.1%) Agrovet shop respondents reported that farmers specifically requested for PPR vaccines while 14 (53.8±19.1%) did not get such requests. The results here indicate

that many farmers had become aware of the CCPP vaccine and were interested in buying it; the results also suggest that the farmers distinguished between the vaccines for the two diseases, CCPP and PPR.
On the question of demand for CCPP vaccines, 19 out of 26 (73.1±17%) Agrovet respondents said there were demands for the vaccines by either the farmers or vets, while only 7 (26.9±17%) indicated that there no demands. The result indicates a high demand for the vaccine.

Reasons for not selling the CCPP vaccines by Agrovet shops were found to be as follows: 15 out of the 26 (57±19%) of shop respondents believed that farmers were not aware of the CCPP vaccines, 5 (19±15%) noted that government was not allowing the sale of CCPP vaccine, 4 (15±13.7%) it was related to availability of the vaccine from the source/supply while 10 (38±18%) were not aware of any reasons. The results are summarised in Table 23. Thus the majority of the respondents thought awareness of the vaccines among farmers was the main reason for low vaccine uptake.

Table 23: Reasons preventing sell of CCPP vaccine by Agrovets

Agrovet respondents	% and SE	Reasons for not selling CCPP vaccine
10	38. % (±18.)	There are no reasons
5	19.% (±15.5)	Government not allowing sale of CCPP vaccine
15	57.% (±18.9)	Farmers not aware of the CCPP vaccine
4	15.% (±13.7	Unavailability of the CCPP vaccine
0	0% (±0)	Don't know

When asked if the Agrovet shops always got the CCPP vaccines when they ordered them, 2 (7±10.4%) of the shop respondents indicated they got their vaccine orders as placed while 14 (53±19.6%) did not get vaccine as ordered; the results are summarised in Table 24. Clearly, over half of the potential CCPP vaccine distributors felt that their vaccine orders were not satisfactorily handled; there may be a need to understand the cause of that to ensure satisfactory delivery.

Table 24: Availability of CCPP vaccines in Agrovet shops

Agrovet respondents	% and SE	CCPP vaccine availability
2	7.% (±10.4)	Yes
14	53.% (±19.6)	No
0	0% (±0)	Don't know
9	Not applicable	Not applicable

Two out of 25 (7±10.4%) Agrovet shop respondents indicated private firms as suppliers of the CCPP vaccine, 1 (3±7.9%) reported government as the supplier while it was not applicable to 22 (84±13.7%) of the respondents (summary results in Table 25). The high percentage who could not indicate a supplier of the CCPP vaccine in the Manyara region suggests a very low interest in the CCPP vaccine by the majority of Agrovet shops.

Table 25: CCPP vaccine suppliers to Agrovet shops

Agrovet respondents	% and SE	Vaccine suppliers
0	0% (±0)	Vaccine dealer
0	0% (±0)	NGO
1	3.% (±7.9)	Government
2	7.% (±10.4)	Private company
0	0% (±0)	Don't know
22	84.% (±13.7)	Not applicable

4.4 Veterinarians/Ward extension officers

With respect to the number of goat-keeping households a livestock personnel oversees, it was noted that generally the number of goats per household range from 5 to 25 which translates to between 5000 to 42,000 goats meaning that on average each personnel covers 5,234 goat-keeping households.

Twenty four out of 25 (96±7.7%) of animal health personnel reported observing goat herds with respiratory disease signs such as coughing, labored breathing, and fever in the last 12 months while only 4±7.7% did not; details are summarised in Table 26. This result suggests that respiratory diseases in goats were common in the Manyara region.

Table 26: Observations of lesions compatible with CCPP

Veterinarians/ Ward extension officers respondents	% and SE	Lesions compatible with CCPP
19	76% (±16.74)	Yes
1	4% (±7.68)	No
5	20% (±15.68)	Did not do PM exam of the goat
0	0% (±0)	Don't know
0	0% (±0)	Blood
0	0% (±0)	Others
16	64% (±18.82)	Not applicable

Table 27: CCPP Vaccination programme options

Agrovet respondents	% and SE	Vaccination frequency
2	8% (±10.63)	At every CCPP outbreak
3	12% (±12.74)	< 1 year
16	64% (±18.82)	Once by year
4	16% (±14.37)	> 1 year
0	0% (±0)	Don't know

Twenty two out of 25 or 88±12.7% animal health personnel respondents also observed other clinical signs with respiratory diseases while only 3 (2±12.7%) did not. Nineteen out of 25 (76±16.7%) respondents affirmed having encountered a suspected case of CCPP in goat herds at some stage of their work while 6 (24±16.7%) reported they had not. Based on clinical experience of the animal health personnel, the results suggest that CCPP was a common disease encountered by a high percentage of these personnel.

Based on responses from 25 respondents, a CCPP average morbidity rate of 28.5% was calculated for the areas visited. On average the CCPP mortality rate in the affected goats was estimated at 11.5%. This estimation was derived from answers of 19 out of 25 respondents. These figures seem to be rather low, in contrast to what is commonly quoted in literature, namely that CCPP infected animals become very sick and mostly die, with high morbidity reaching 100% and mortality of 70%.

On observations of lesions compatible with CCPP, 19 out of 25 (76±16.7%) respondents indicated they had observed lesions compatible with CCPP while 4±7.7% did not but 20±15.7% did not perform post mortem examinations. The results indicate that the majority of the respondents performed postmortem examinations on goats while nearly a quarter did not; the reasons why they could not perform the postmortem exams are not given.

According to Animal Health personnel no laboratory samples were collected by themselves for transmission to laboratories such as the VIC (Table 27). While it is understandable that many animal health personnel might have correctly indentified a respiratory syndrome in the goats, it is unclear how they could be very certain that the clinical disease encountered was CCPP with virtually no laboratory confirmation.

Table 28 : Samples for laboratory analysis

Veterinarians/ Ward extension officers **respondents**	**% and SE**	**Samples collected**
0	0% (±0)	Lung
0	0% (±0)	Swabs
0	0% (±0)	Mucus
0	0% (±0)	Whole animal

On action taken by farmers on detection of CCPP in their household, 19 respondents representing 76±16.74% of the interviewees indicated the farmers would opt to treat affected goats with veterinary drugs while 12 respondents i.e. 48±19.58% would segregate affected goats from non-affected ones within the herd but only 4 respondents (16±14.37%) would vaccinate goats using CCPP vaccine and 1 or 4±7.68%) would move the non-affected goats to a relative's herd. With respect to sheep being affected by CCPP, 48±19.6% of respondents agreed while 40 ±19.2% did not but 12±19.7% did not know. According to the responses 3.3% of sheep had been affected by CCPP. These results probably reflect the apparent limited awareness of the vaccination option to control CCPP.

All respondents would recommend to the farmers the use of the CCPP vaccine if it was made available in their respective areas/districts.

Sixteen or 64±18.8%f respondents would opt for annual vaccination programme while 4 respondents preferred a more than once a year vaccination programme and 3 respondents preferred a frequency of less than once a year programme; 2 wished to have their goats every time there would be an outbreak. The responses of veterinarians and extension officers interviewed regarding the source of vaccine for users in Manyara region were as follows: i) 32 ±18.3% believed it was from private firms, ii) 20 ±15.7% from NGOs, iii)16 ±14.4% from Government and iv) 4 ±7.7% from local vaccine dealers. The responses suggest that local vaccine suppliers/dealers played a minor role in the CCPP vaccine supply.

On the issue of whether farmers were willing to use the CCPP vaccine all animal health workers interviewed affirmed that farmers would be willing to use the vaccine.

On obstacles to the use of the CCPP vaccine in Manyara region, (Table 28) 80 ±15.7% of the veterinarians and extension officers indicated that availability was the main challenge while 52 ±19.6% suggested high price and 40 ±19.2% felt farmers' lack of awareness of the vaccine. All challenges noted above play a part and need to be addressed.

Table 29: Obstacles to use of CCPP vaccine

Veterinarians/ Ward extension officers respondents	% and SE	Obstacles to the vaccine use
20	80% (±15.68)	Availability of the vaccine
10	40% (±19.2)	Farmer awareness
1	4% (±7.68)	Prefer other control measures (e.g. medication)
6	24% (±16.74)	Government policy
3	12% (±12.74)	The number of doses is too high. Because a bottle contains doses for 100 goats and for a goat keeper with 10 goats seemed to be expensive
13	52% (±19.58)	High cost of CCPP vaccine vial
2	8% (±10.63)	Informal importation of CCPP vaccine
2	8% (±10.63)	Unclear policies on paying or not paying for CCPP vaccine
0	0% (±0)	Don't know

4.5 Serology

The results in Table 30 below shows that Kiteto district had the highest seroprevalence of CCPP with 77.5% seropositive goats while Mbulu district had the lowest CCPP seroprevalence of 29.3% in Manyara region. It is also noted that the two villages, Mwitikira and Kiperesa with the highest CCPP seroprevalence of 100% are in the same district (Table 31). However, Kisimangiri village in Hanang district had the lowest seroprevalence of CCPP indicating 0% meaning that among the sampled goats no goat had seroconverted in this village (Table 31).

Table 30: Overall CCPP seroprevalence in Manyara Region

SN	District	Goats sampled	Seropositive goats	Percentage positive
1	Mbulu	82	24	29.3
2	Babati	100	65	65.0
3	Hanang	81	44	54.3
4	Kiteto	80	62	77.5
5	Simanjiro	56	40	71.4
	Total	**399**	**235**	**58.9**

Moreover the overall seroprevalence of CCPP in Manyara region was 58.9% indicating that exposure to the CCPP causal agent is widespread in goats in this region (Table 30). Detailed results by village for each of the districts are given in Tables 31 as shown below.

Table 31: Seroprevalence of CCPP by Villages

District	Village	Goats sampled	Seropositive goats	% positive
Mbulu	Masieda	31	10	32.3
	Silaloda	11	4	36.4
	Qaloda	4	1	25.0
	Dongobesh	6	2	33.3
	Gidim	5	2	40.0
	Garkawe	10	3	30.0
	Harar	10	1	10.0
	Gidmadoy	5	1	20.0
	Subtotal Mbulu	***82***	***24***	***29.3***
Kiteto	Bwagamoyo	25	19	76.0
	Namelock	10	9	90.0
	Mwitikira	10	10	100.0
	Katikati	10	9	90.0
	Kiperesa	4	4	100.0
	Loolera	5	1	20.0
	Lengatei	16	10	62.5
	Subtotal Kiteto	***80***	***62***	***77.5***
Hanang	Kisimangiri	10	0	0.0
	Mureru	15	13	86.7
	Balangidalalu	10	3	30.0
	Mogitu	10	5	50.0
	Ming'enyi	7	6	85.7
	Gidagamond	20	12	60.0
	Gendabi	9	5	55.6
	Subtotal Hanang	*81*	*44*	*54.3*
Babati	Sangaiwe	15	14	93.3
	Ngolei	16	12	75.0
	Kakoi	17	13	76.5
	Mamire	14	8	57.1
	Mwikasi	5	4	80.0
	Endagile	5	3	60.0
	Gijedabung	5	4	80.0
	Gedamar	17	6	35.3
	Secheda	6	1	16.7
	Subtotal Babati	***100***	***65***	***65.0***
Simanjiro	Ruvu Remit	20	19	95.0
	Losokonoi	26	14	53.8
	Lerumo	10	7	70.0
	Subtotal Simanjiro	***56***	***40***	***71.4***

4.6 Isolation, cultivation and identification of Mycoplasma ssp from Manyara region

There was growth in CCPP diagnostic medium; from the seventh day of incubation, red colonies with dark grains of pigmentation and red crystalline deposits shown in Fig. 3 were detected using a stereomicroscope. These red colonies were confirmed to be isolates of *M. capripneumoniae* by a growth inhibition test (GIT). Detailed investigations yielded results showing that one of the three samples from Simanjiro district cultured was positive for *M. capripneumoniae*.

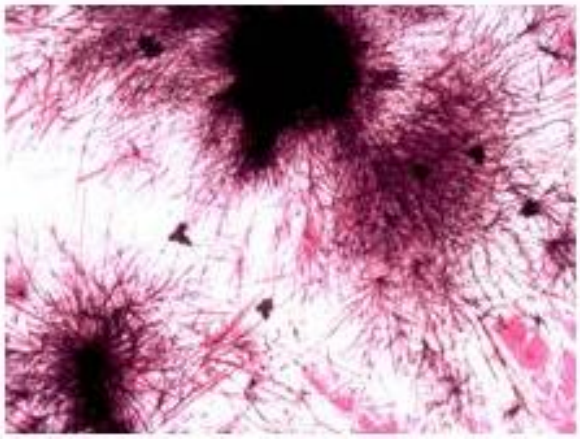

Figure 5: Mycoplasma capripneumoniae colony in CCPP diagnostic medium

The PCR products were visualized in Agarose gel where 548 bp was observed Fig. 4.

The digestion of PCR product produced three fragments of 548 bp, 420bp and 128 bp. The presence of three bands, the uncleaved 548-bp fragment and the two cleavage products of 420 and 128 bp, confirmed that *M. capripneumoniae* was present in the sample. The uncleaved DNA fragment of 548 bp originates from the rrnB operon of *M. capripneumoniae*, which lacks the restriction site for PstI in this *Mycoplasma.*

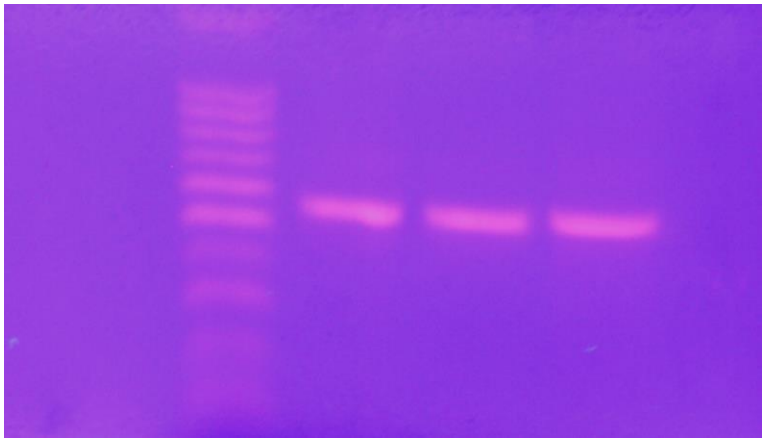

Figure 6: PCR product viewed in the Agarose gel sample

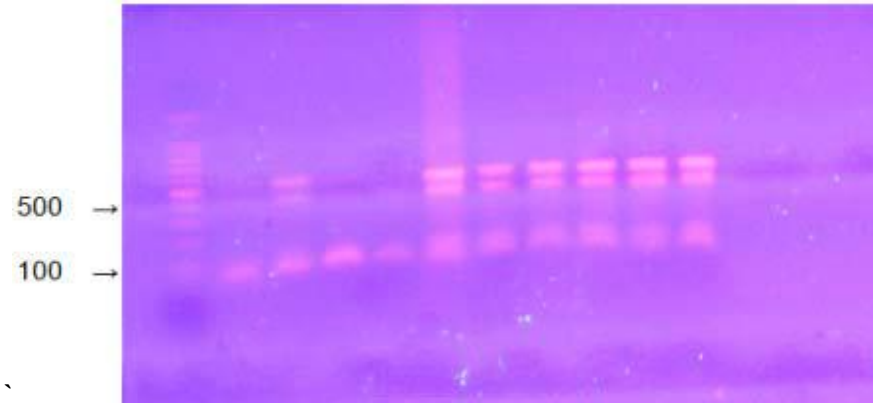

Figure 7: Restriction enzyme analysis viewed in the Agarose gel

5. Challenges

The main purpose of the baseline study was to assess and establish the status of CCPP and CCPP vaccine usage and distribution. The findings confirmed either previous exposure of goats to *M. capripneumoniae* and/or presence of CCPP in the areas visited and indicated the limited/inadequate supply and distribution of the vaccine to the farmers. However, through this baseline study it was not possible to obtain clinical samples for culture and characterisation of the circulating *Mycoplasma* spp from all the 5 districts involved in the survey; availability of characterized *M. capripneumoniae* isolates from the area would make it easier to determine effectiveness of currently available CCPP vaccines in controlling the disease in the area. To overcome this challenge the investigating team obtained some clinical samples collected by other workers in the area; in the future it may become necessary to make isolate of *M.*

capripneumoniae from the other districts to ensure that vaccine strain(s) are suitable for CCPP control in those districts. Despite the above challenges, the results obtained so far should be beneficial to the authorities for reviewing and recommending appropriate quality reliable CCPP vaccine for control of the disease in the Manyara region.

6. Discussion and Conclusions

The findings in this baseline study confirm that CCPP exists in the Manyara region. The isolation and confirmation of presence of *M. capripneumoniae* from Simanjiro district implies that there was active CCPP infection during the baseline study.

The household issues focused on i) livestock extension services including education, ii) goat night accommodation, iii) goat diseases with particular emphasis on CCPP including its prevention and control.

6.1 Households

In the baseline study, the results showed that a third of the respondents were unaware of provision of livestock extension services including training on goat husbandry practices and thus unlikely to seek provision of these services even if they needed them. These results also indicate that extension services were given by a range of livestock health personnel where the majority seems to be livestock extension field officers, followed by government paraveterinarians, CAWHs and Government Veterinarians. It is also evident from the results that there were a small percentage of private veterinarians and private paraveterinarians providing these services in the Manyara region. The presence of various categories (government and private sector) of livestock extension providers in the region is an opportunity which if tapped for example in vaccine distribution and vaccination could help to prevent many diseases including CCPP.

Furthermore, despite the foregoing information 33% among the respondents from households keeping goats were unaware of provision of the livestock extension services including training on goat husbandry practices and 16% were not aware of providers of these extension services within their region. This could be probably because no specific efforts are made to train goat keepers on good husbandry practices. During the baseline study, it was observed that majority of the goat keepers who received training were those who introduced to improved breeds of goats. Training on good husbandry practices

to indigenous goat keepers is minimal or completely lacking. Deliberate effort is needed to mobilise relevant stakeholders in order to ensure effective delivery of livestock extension services including training of indigenous goat keepers on good husbandry practices.

Fifty seven percent of the respondents housed their goats at night while 42% kept them in kraals, only a small percentage left the goats to roam freely at night. This finding clearly suggest that households need to secure their goats at night to avoid potential theft of or goat wandering and getting lost; moreover, the housing of goats at night also additionally serve to reduce exposure to inclement weather at night particularly in cases of respiratory conditions that were indicated as being a major factor concerning goat health in the region. This imply that traditional indigenous goat keepers particularly women and children who are usually manage goats introduced to good husbandry practices and construction of simple goat houses using available local materials.

Respiratory diseases ranked highest among other diseases. From the results it was clear that respondents were knowledgeable about the clinical signs related to CCPP such as coughing, difficult breathing, nasal discharge and death caused by CCPP. Majority of the respondents reported CCPP to be a very serious disease. The results suggest that households were very much aware of conditions that affect the health of their goats; the respiratory diseases significantly affected their goats and in particular they were well aware of CCPP being a serious disease**.** Many respondents complained about unsuccessful treatment results of goats with CCPP clinical signs, thus preferring vaccination as a control mechanism. However, vaccine availability was the major limitation of vaccinating their goats against CCPP. This therefore calls for formation of public private partnership in order to make the vaccine available and accessible by goat keepers, mostly remotely located in hard to reach terrain.

Most respondents could only recall the introduction of CCPP in their area for the past two years. This is because there are no written records under the pastoral management system of indigenous goats. Thus farmers loose memories as time passes. The fact that 70% of respondents believed that CCPP was introduced into their village through communal grazing and watering points could form good bases for educating these farmers on biosecurity and biocontainment methods of preventing their goats from being infected by CCPP and possibly other diseases. Different methods were used to prevent the introduction of the disease into the herd such as use of prophylactic treatment of goats at risk,

restriction of importation of goats from affected areas and vaccination against CCPP. The percentage of respondents vaccinating against CCPP is small and the awareness of this method of CCPP control is low; however, CCPP vaccine availability also seems to be a limiting factor. When the disease was already introduced into the herd, majority of the farmers used veterinary drugs to treat their goats and few would separate the sick goats from the rest of the herd including seeking further assistance from livestock field officers. The results generally suggest that respondents would attempt or seek treatment of CCPP affected goats and only a small percentage would vaccinate against CCPP. The household responses also suggest that the majority of households are not aware or conversant with vaccination as an option to prevent CCPP occurrence in their areas. Sensitization campaigns where advantages of vaccination over that of CCPP treatment and appropriate ways of preventing the spread of the disease could be explained to farmers will form the most sustainable control methods of the disease.

Overall, all potential customers of CCPP vaccine in the Manyara region indicated access to the vaccine was either difficult or very difficult or not accessible at all! However, despite the accessibility constraints 94% of respondents indicated their willingness to buy the vaccine even if it was outside of their routine environment. The results in this section clearly indicate a serious need to improve vaccine availability for vaccination against CCPP in the control of the disease to goat farmers.

6.2 Veterinary Investigation Centre

The results from the VIC confirm that CCPP affected all age groups of goats in the Manyara region during the past 5 years, and that the VIC capacity to diagnose CCPP is limited to histopathological examination and CFT. Noting that CCPP is rampant in the Manyara region and probably in several other districts within Tanzania, additional improved CCPP diagnostic techniques need to be introduced and institutionalised in the Arusha VIC.

6.3 Agrovet shops

Results from the Agrovet shop owners confirmed that CCPP and PPR vaccines have been sold in the region for about 5 years but the CCPP vaccine supply by Agrovet shops has been limited to a few shops despite indications by 80.8% of respondents that farmers specifically requested CCPP vaccines. It also appears that during the same period the demand for CCPP vaccine was greater than for PPR vaccine. The reasons from Agrovet shop respondents for the low sales or uptake of the CCPP vaccine appear to

be many: i) farmer unawareness of the CCPP vaccine, ii) unavailability of the vaccine, iii) lack of government approval of use of the vaccine, iv) lack of appropriate handling facilities including power supply interruptions, v) lack of demand of the product by farmers, and vi) perceived unprofitability of the product among others. Strategic planning is required for these needs to be addressed. A concerted effort by all stakeholders is needed in order to resolve the outlined challenges. Other reasons observed were lack of clearly defined CCPP vaccine importation and distribution chain in the country. It is also no clear if the vaccine in question is registered in Tanzania. This has led into some DVOs to restrict vaccination of goats in their respective districts.

6.4 Veterinarians/Ward extension officers

On average each livestock personnel covered 5,234 goat-keeping households, which translates to between 5,000 and 42,000 goats in Manyara region. This result means that, at the higher end of the goat numbers, the livestock personnel would be overstretched and actually not be able to provide effective support to the clientele in their area. A more detailed study of this aspect is needed to arrive at an appropriate number of goats to be covered by livestock health personnel in the region.

A high number of livestock health personnel had encountered and were conversant with goat respiratory conditions; their claim of knowledge of CCPP is largely based on clinical signs and post-mortem examinations but there does not seem to be supporting laboratory confirmation. The calculated / estimated CCPP morbidity and mortality rates are low in comparison to the high morbidity and mortality mentioned in the introduction and normally quoted in various literature; reasons for this could be due to a combination of factors, inaccurate recollections from respondents, confusion with other diseases/conditions, and gradual development of a CCPP endemic status in the areas visited. Future investigations may be necessary within the broader CCPP epidemiological investigations to clarify the true situation.

The livestock health personnel affirmed that the preferred approach to control CCPP occurrence by the farmers then was treatment with drugs; however, the farmers were also aware of other control methods, namely isolation of affected goats and vaccination. The respondents preferred CCPP annual vaccination to any of the other alternatives indicated above. It is necessary for the DVS with other

stakeholders to undertake a study that determines the optimal CCPP vaccination interval within the Tanzania environment.

In this baseline study it was found that there are multiple sources of the CCPP vaccine for users in Manyara region, with the private firms was believed to be the main source of the vaccine. Other sources identified were NGOs; government and local vaccine dealers. From this, the CCPP vaccine sources seems to be diverse and uncoordinated; in order to streamline vaccine sources and use, government will need to regulate this product closely and all stakeholders will need to address issues of vaccine availability and farmer awareness of the role of the vaccine in the prevention of CCPP outbreaks.

6.5 Serology

A total of nearly 400 samples were collected from goats in Manyara region of which 235 were shown to have been exposed to the causative agent of CCPP. The overall seroprevalence of CCPP in the Manyara region was 58.9% with a range from 29% in Mbulu District to 77.5% in Kiteto District indicating that exposure to the CCPP causal agent was widespread in goats in this region. Noting the geographical location of Kiteto District in relation to Kiteto and Simanjiro districts, it seems that there has been more exposure to CCPP in the latter two districts than in Mbulu and Hanang districts; the reasons for this are unclear but could partly be due to livestock movement routes. For practical reasons, the seroprevalence figure for the region, it is fair to conclude that the whole of Manyara region is now endemic to CCPP although the very high seroprevalence rates seems to suggest that active CCPP infection might have been ongoing during the baseline survey period. The serology results obtained so far provide a good initial base for studying the CCPP epidemiology and development of appropriate CCPP control strategies in Tanzania

6.6 Isolation, cultivation and identification of *M. capripneumoniae* from Manyara region

Isolation of *M. capripneumoniae* from the region was confirmed by i) growth of the organism in the CCPP diagnostic medium, ii) a growth inhibition test (GIT) of *M. capripneumoniae*, and iii) the presence of 3 bands, the uncleaved 548-bp fragment and the 2 cleavage products of 420-bp and 128-bp, present in the sample. The successful cultivation of *M. capripneumoniae* from the samples obtained in Manyara together with the PCR verification of *M. capripneumoniae* from the cultivated products unequivocally confirmed occurrence of CCPP in the Manyara region; it also confirms that there was active *M.*

capripneumoniae infection during the baseline survey exercise. It also demonstrated the potential for researchers at relevant institutions in Tanzania to examine (isolate and characterize) appropriateness of currently available CCPP vaccines in regard to control of CCPP in the different areas of Tanzania; this may avoid complications to the importation and registration of CCPP vaccines in the future.

7. Recommendations

Observations have been made on the findings derived from the CCPP baseline survey in Manyara region; gaps have been identified either in knowledge or actions commensurate with effective management of CCPP or any other animal disease. The recommendations below aim to address some of the shortcomings observed.

1. The results suggest that the majority of respondents were aware of and did receive livestock extension services; these results also indicate that extension services were given by a range of livestock health personnel. Despite the foregoing information, 33% of the goats raising respondents from households keeping goats were unaware of provision of the livestock extension services and 16% were not aware of providers of these extension services within their areas! The percentages of those who knew about inclusion of training on goat husbandry during extension services and ones who did not was about the same. The DVS needs to mobilise relevant stakeholders in order to ensure effective delivery of the livestock extension services including education on goat husbandry practices in the region.

2. The results suggest that respondents from households keeping goats were very much aware of conditions that affect the health of their goats; the respiratory diseases significantly affected their goats and in particular they were well aware of CCPP being a serious disease. The results generally suggest that respondents would attempt or seek treatment of CCPP affected goats and only a small percentage would vaccinate against CCPP. The household responses also suggest that the majority of households are not aware or conversant with vaccination as an option to prevent CCPP occurrence in their areas; moreover, CCPP vaccine availability also seemed to be a limiting factor. All potential vaccine customers indicated that access to the vaccine was either difficult or very difficult or not accessible at all! Sensitization campaigns to change the mind-set of treating CCPP to that of prevention through either vaccination or/and restriction of goat movements as well as isolation of affected goats are needed. Difficulties indicated by

households in accessing the CCPP vaccine and vaccination need to be properly investigated and commensurate solutions devised.

3. The results from the VIC confirm that CCPP affected all age groups of goats in the Manyara region during the past 5 years, and that the VIC capacity to diagnose CCPP is limited to histopathological examination and CFT. Noting that CCPP is rampant in the Manyara region and probably in several other districts within Tanzania, additional improved CCPP diagnostic techniques need to be introduced and institutionalised in the Arusha VIC.

4. These findings confirm that CCPP and PPR vaccines have been sold in the region for about 5 years but the CCPP vaccine supply by Agrovet shops has been limited to a few shops despite indications by 80.8% of respondents that farmers specifically requested CCPP vaccines. It also appears that during the same period the demand for CCPP vaccine was greater than for PPR vaccine. The Agrovet shop respondents' reasons for the low sales or uptake of the CCPP vaccine appear to be many: i) farmer unawareness of the CCPP vaccine, ii) unavailability of the vaccine, iii) lack of government approval of use of the vaccine, iv) lack of appropriate handling facilities including power supply interruptions, v) lack of demand of the product by farmers, and vi) perceived unprofitability of the product among others. Strategic planning is required for these need to be addressed. There is a definite and urgent need for the DVS to conduct investigations that elucidate the reasons for poor uptake of the CCPP vaccination exercise in the region with commensurate recommendations to improve the vaccination figures. A concerted effort by all stakeholders is needed in order to resolve the outlined challenges above.

5. On average each livestock personnel covered over 5,200 goat-keeping households, which translates to between 5,000 and 42,000 goats in Manyara region. This result means that, at the higher end of the goat numbers, the livestock personnel involved would be overstretched and actually not be able to provide effective support to the clientele in their area. The DVS needs to commission a more detailed study of this aspect to arrive at an appropriate number of goats to be covered by livestock health personnel in the region.

6. A high number of livestock health personnel had encountered and were conversant with goat respiratory conditions; their claim of knowledge of CCPP is largely based on clinical signs and post-mortem examinations but there does not seem to be the essential supporting laboratory confirmation. The calculated / estimated CCPP morbidity and mortality rates, based on criteria used by the livestock personnel to diagnose CCPP, are low in comparison to the high morbidity and mortality mentioned in the introduction and normally quoted in various literature. The DVS needs to introduce and increase supporting laboratory techniques for the differential diagnosis of the many respiratory diseases encountered in the region. Future investigations are needed within the broader CCPP epidemiological investigations to clarify the true morbidity and mortality situation.

7. Various livestock field personnel expressed preference for different CCPP vaccination intervals. The DVS in collaboration with other stakeholders needs to undertake a study that determines the optimal CCPP vaccination interval within the Tanzania context.

8. The CCPP vaccine sources seems to be diverse and uncoordinated; in order to streamline vaccine sources and use, the DVS has to regulate supply and use of this product; all stakeholders need to address issues of unavailability of the vaccine and the low farmer awareness of the role of the vaccine in the prevention of CCPP outbreaks.

9. The serology results obtained so far provide a good initial base for studying the CCPP epidemiology and development of appropriate CCPP control strategies in Tanzania. The DVS needs to sanction and support relevant stakeholders in undertaking CCPP epidemiological studies with the aim to developing and implementing effective CCPP control actions.

10. This baseline study has demonstrated the potential for researchers at relevant institutions in Tanzania to examine (*isolate and characterize*) appropriateness of currently available CCPP vaccines with respect to circulating *M. capripneumoniae* in CCPP affected areas and control of CCPP in the different areas of Tanzania; this may avoid complications to the importation and registration of CCPP vaccines in the future. The DVS should convene relevant stakeholders,

discuss, draw up and support implementation strategic actions aimed at characterizing Tanzania *M. capripneumoniae* isolates for optimal CCPP management in the country.

Annex I: Schedule of implementation activities in the districts

District	Implementation dates	Person involvement	Remarks
Mbulu	19th of August to 25th August	Selected enumerators, DVO and Contractors	The time of execution involved orientation, training, pre testing and administering of questionnaires.
Babati	26th of August to 31st August	Selected enumerators, DVO and Contractors	The time of execution involved orientation, training, pre testing and administering of questionnaires.
Hanang	2nd of September to 7th September	Selected enumerators, DVO and Contractors	The time of execution involved orientation, training, pre testing and administering of questionnaires.
Kiteto	9th September to 14th September	Selected enumerators, DVO and Contractors	The time of execution involved orientation, training, pre testing and administering of questionnaires
Simanjiro	16th September to 21st September	Selected enumerators, DVO and Contractors	The time of execution involved orientation, training, pre testing and administering of questionnaires.

Table 32: Manyara districts profile for CCPP baseline study: Human & goat populations, types of goats in relation households, divisions, wards & villages)

	District				
	Babati	Hanang	Kiteto	Mbulu	Simanjiro
Human population	405,500	178,693	244,669	320,279	275990
Density/sq km	61	25.5	-	55	-
Growth rate p.a.	3.8%	3.2 %	-	-	-
Households	62,692	44,196	45,692	38,729	44,196
HH with goats	20,891	20,491	17,850	23,246	17,455
Area Sq Km	6,069	3,436	16,645	4,350	3,814
Wards	29	18	19	32	25
Villages total	108	52	58	110	65
Villages studied	11	13	15	9	13

Table 33: Manyara districts profile for CCPP baseline study: Human & goat populations, types of goats in relation households, divisions, wards & villages)

Items	**Kiteto**	**Simanjiro**	**Babati (M)**	**Babati (W)**	**Mbulu**	**Hanang**
Human Population	244,669	275,990	93,108	312,392	320,279	178,693
Number of households	45,692	42,196		62,692	38,729	44,196
Number of indigenous goats	227,619	222,594	20,721	65,621	205,233	184,904
Number of exotic/improved goats	1,871	816	356	3,851	45	2,783
Number of households keeping goats	17,850	17,455		20,891	23,246	20,494
Number of villages	58	65	13	95	110	52
Number of wards	19	25	13	21	32	18
Divisions	7	5	2	4	5	6
Area (Sq km)	**16,645**	**3,814**	**461**	**5,608**	**4,350**	**19,941**

Source: Investment and Social Economic Profile Manyara Region, August, 2013.

8: CCPP Questionnaires

CCPP questionnaires:
Annex I: Household

CCPP strategy in Tanzania
Questionnaire ID 24/

Target Group: Household responsible for livestock
Date:
Enumerator:

Respondent's Data
Name
Surname Name
District
Village
Sub_village
Address
Mobile phone
Email

General Questions:
1. - Je, una mbuzi wangapi? Usiendelee na swali kama idadi ya mbuzi ni chini ya 5 katika kaya
|_____|_____| Majike

7.-Je, kuna huduma yeyote ile ya ugani katika maeneo yako ikiwa pamoja na elimu ya mbinu bora za ufugaji?
O Ndiyo
O Hapana
O Sifahamu

8. -Nani ambaye anayetoa huduma hiyo ya ugani/elimu?
 Daktari/ Veterinari wa Serikali
 Afisa ugani wa Serikali
 Afisa ugani wa mifugo wa Serikali
 Daktari wa kujitegemea
 Afisa ugani wa kujitegemea
 Duka la dawa la Veterinari/ Pembejeo
 Mhudumu wa Mifugo wa Jamii (MMIJA)
 Mtoa huduma wa Shirika lisilokuwa la kiserikali
 Wengineo
 Hakuna yeyote
 Sifahamu

92.-Kama huduma za ugani zipo, je elimu za ufugaji bora wa mbuzi nazo zinatolewa?
O Ndiyo, elimu juu ufugaji wa mbuzi zinatolewa
O Hapana, elimu juu ufugaji wa mbuzi hazitolewi
O Hakuna huduma za ugani
O Sifahamu

Multiple choice
Unique choice number
5.-Je, wewe unaweka wapi mbuzi zako wakati wa usiku?
O Katika boma
O Katika nyumba
O Nawachia nje / wanakae nje mahali popote
O Sehemu nyingine

93.-Ni ugonjwa gani ambao unashambulia mbuzi zako mara kwa mara?
 Ugonjwa unaoshambulia mfumo wa hewa
 Ugonjwa unaoshambulia mfumo wa chakula
 Vifo vya ghafla
 Kukosa hamu ya chakula/ Kunyong'onyea
 Mengineo
 Sifahamu

9.-Je, unafahamu juu ya ugonjwa wa mbuzi unaoitwa Homa ya mapafu ya mbuzi? Usiendelee na dodoso kama
jibu ni hapana
O Ndiyo
O Hapana

10.-Je, ni dalili gani/zipi za ugonjwa wa Homa ya mapafu ya mbuzi/ugonjwa unaoshambulia mfumo wa hewa?
 Kutokuwa na hamu ya chakula/kula
 Homa kali
 Kubaki nyuma ya kundi la mifugo
 Kupumua kwa shida
 Kukohoa
 Kutoka/kutokwa na makasi puani
 Kutoka/kutokwa na majimaji katika jicho
 Kunyong'onyea/Unyonge
 Kupiga kelele mara kwa mara
 Kifo
 Mengineo
 Sifahamu

14.-Endapo, una Kondoo, je, umeshaona dalili hizo hizo zinazoshambulia mfumo wa hewa katika Kondoo?
O Ndiyo
O Hapana

O Sina Kondoo
20.-Je, unaweza kulinganisha kasi ya ugonjwa wa Homa ya mapafu ya na magonjwa mengine yanayoshambulia
mfumo wa hewa ya mbuzi?
O Hatari sana/kiasi cha juu sana
O Hatari /kiasi cha kawaida
O Siyo hatari sana/ kiasi cha wastani
O Sifahamu

2.-Je, ni hatua zipi unachukua endapo mbuzi wako wanashambuliwa/wamepata na ugonjwa wa Homa ya mapafu
ya mbuzi/ ugonjwa unaoshambulia mfumo wa hewa?
 Kuwatenga mbuzi wagonjwa kutoka katika kundi
ambalo la mbuzi wazima
 Kuwatibu mbuzi waginjwa na dawa za veterinari
 Kutoa chanjo kwa mbuzi wagonjwa kwa kutumia
chanjo ya Homa ya mapafu ya mbuzi
 Kuomba msaada kutoka kwa afisa ugani wa mifugo
 Kutoa taarifa kwa afisa ugani/ daktari wa mifugo wa
wilaya/mkurugenzi wa huduma za Veterinari wa wizara
 Kuwahamisha kundi la mbuzi ambao hawakupata
ugonjwa na kupeleka kwa ndugu zangu/jirani
 Kuwachinja mbuzi wote wagonjwa na kuuza nyama
katika kijiji
 Kuwauwa mbuzi wote wagonjwa na kuzika mabaki
yake chini ya ardhi
 Kuchukua njia nyingine za mbadala
 Sifahamu

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18.-Je, utatumia njia gani ambazo zitasaidia kuzuia maambukizi ya ugonjwa wa Homa ya mapafu ya
mbuzi/ugonjwa unaoshambulia mfumo wa hewa wa mbuzi?
 Kuzuia kwa upelekekaji wa mbuzi katika sehemu
ambazo zina ugonjwa
 Kuzuia kuingiza/kuagiza au kununua mifugo kutoka
sehemu ambapo kuna ugonjwa
 Kutoa chanjo kwa mbuzi ambao wako hatarini na
ugonjwa
 Kutoa dawa za kinga kwa mbuzi ambao wako
hatarini
 Kutumia njia nyingine za mbadala (dawa za ki asili)
 Sifahamu
 Hakuna jibu

3.-Je, njia zipi za kuzuia maambukizi ya ugonjwa wa Homa ya mapafu mbuzi unatumia katika kijiji chako?
 Kuzuia kwa upelekekaji wa mbuzi katika sehemu

ambazo zina ugonjwa
 Kuzuia kuingiza/kuagiza au kununua mifugo kutoka
sehemu ambapo kuna ugonjwa
 Kutoa chanjo kwa mbuzi ambao wako hatarini na
ugonjwa
 Kutoa dawa za kinga kwa mbuzi ambao wako
hatarini
 Kutumia njia nyingine za mbadala
 Sifahamu
 Hakuna jibu

6.-Je, ulitumia aina gani ya tiba/dawa wakati mbuzi zako walipata ugonjwa wa Homa ya mapafu ya mbuzi/
ugonjwa unaoshambulia mfumo wa hewa kwa wakati ule?
 Nilitumia dawa za kiasili
 Niliomba msaada kutoka kwa jirani
 Nilimwita Mhudumu wa mifugo wa Jamii (MMIJA)
 Nilimwita afisa ugani wa mifugo/mkaguzi wa mifugo
 Nilimwita afisa mifugo wa kujitegemea
 Nilimwita daktari wa mifugo wa Serikali
 Nilimwita daktari wa mifugo wa kujitegemea
 Nilinunua dawa kutoka katika duka la dawa la
Veterinari/pembejeo
 Niliwauza kwa anayechinja nyama
 Sikufanya chochote
 Sifahamu
 Hakuna jibu

16.-Je, unanunua dawa au chanjo kwa ajili ya mbuzi?
 Dawa
 Chanjo
 Sinunui dawa wala chanjo

19.-Je, umeshawi kuchanja mbuzi wako juu ya ugonjwa wa Homa ya mapafu ya mbuzi katika kipindi cha miaka 5
iliyopita?
O Ndiyo
O Hapana
O Sifahamu

94.-Je, ni mara ngapi umechanja mbuzi wako juu ya ugonjwa wa Homa ya mapafu ya mbuzi
|_____| Mara
(v 2.0) 19/08/2013 Questionnaire ID 24 Page 3/5
95.-Je, chanjo iliyotolewa ilikuwa ni bure kutoka katika Serikali au umelipia pesa?
O Ndiyo, Ilikuwa bure
O Hapana, nilitowa pesa
O Sifahamu

31.-Ulinunua wapi dawa / chanjo ya ugonjwa wa Homa ya mapafu ya mbuzi wakati uliopita?
 Duka la dawa la Veterinari
 Daktari wa mifugo wa Serikali
 Duka la dawa la Veterinari/pembejeo
 Wakala wa mifugo
 Afisa ugani wa Serikali/mkaguzi wa mifugo
 Mhudumu wa mifugo wa Jamii (MMIJA)
 Mtoa huduma wa mifugo kutoka katika shirika lisilo
la kiserikali
 Wakulima wengine
 Wengineo
 Sifahamu
 Hakuna jibu

32.-Je, ulichanja mbuzi wako dhidi ya ugonjwa wa Homa ya mapafu ya mbuzi mara ngapi wakati uliopita?
|_____| Mara

21.-Je, uliponunua chanjo ya ugonjwa wa Homa ya mapafu ya mbuzi, ulitozwa kiasi gani kwa kila mbuzi mmoja
kwa wakati ule?
O Chini ya Ths 450
O Kati ya Tshs 450 hadi Tshs 500
O Zaidi ya Tshs 500
O Sifahamu
O Hakuna jibu

22.-Je, una maoni gani kwa upatikanaji kwa chanjo ya ugonjwa wa Homa ya mapafu ya mbuzi katika sehemu
yenu/kijiji
O Chanjo inapatikana kwa urahisi sana
O Chanjo inapatikana kwa urahisi
O Chanjo haipatikani kwa urahisi
O Ni vigumu upatikanaji wake
O Haipatikani kabisa
O Hakuna jibu

23.-Kama chanjo ya ugonjwa wa Homa ya mapafu ya mbuzi haipatikani katika sehemu yako, je,unafikiri unaweza
Kununua kama inapatikana kutoka sehemu nyingine?
O Ndiyo
O Hapana
O Hakuna jibu

11.-Je, majirani zako huwa wanachanja mbuzi zao dhidi ya ugonjwa wa Homa ya mapafu ya mbuzi?
O Ndiyo
O Hapana

O Sifahamu
O Hakuna jibu

12.-Ni wakati/mwaka gani ambapo matukio ya maambukizi ya ugonjwa wa Homa ya mapafu ya mbuzi ulitokea
katika kijiji/ kundi lako la mbuzi?
O Chini ya miaka 2
O Miaka 2 hadi 5 iliyopita
O Zaidi ya miaka 5 iliyopita
O Sifahamu
O Hakuna jibu

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13.-Je, kundi la mbuzi wako/ kijiji chako walipataje maambukizi wa ugonjwa wa Homa ya mapafu ya mbuzi?
 Kutokana na kuchanganyika na mbuzi wengine
wakati wa malisho ya pamoja kijijini/ wakati wa kunjwa
maji
 Kutokana na kuchanganyika na mbuzi wengine
wakati wa mnada wa mifugo
 Kuchanganya mbuzi waliotolewa kama mahari na
mbuzi wa kundi langu
 Kuchanganya mbuzi walionunuliwa na mbuzi wa
kundi langu
 Kuchanganya mbuzi wa jirani zangu/ndugu zangu
ambao walikuwa wakitunzwa kwa ajili ya usalama
 Kuwapeleka sehemu nyingine za machungani na
Kuwarudisha tena nyumbani
 Wakati wa kuhamisha mifugo kutoka sehemu moja
na kwenda nyingine
 Mengineyo
 Sifahamu
 Hakuna jibu

15.-Wakati wa mlipuko wa ugonjwa wa Homa ya mapafu ya mbuzi katika kundi, je, ni mbuzi wangapi waliugua?
|_____| Idadi ya mbuzi

30.-Wakati wa mlipuko wa ugonjwa wa Homa ya mapafu ya mbuzi katika kundi, je, ni mbuzi wangapi walikufa?

Annex II: Agrovet

CCPP strategy in Tanzania
Questionnaire ID 24/

Target Group: Agrovet
Date:
Enumerator:

Respondent's Data
Name
Surname Name
District
Village
Sub_village
Address
Mobile phone
Email

General Questions

52.-Je, umeshawahi kuuza chanjo za ugonjwa wa mapafu ya mbuzi katika kipindi cha miaka 5 iliyopita?
O Ndiyo
O Hapana

96.-Kama jibu ni hapana, eleza kwanini hukuweza kujishughulisha na uuzaji wa chanjo hizo?
 Chanjo hazikuwa ni hitaji kwa wateja
 Hakuna sehemu za kuhifadhia chanjo
 Hakuna faida
 Sifahamu

53.-Je, una chombo chochote cha ubaridi cha kuweza kuhifadhi chanjo na sampuli za uchunguzi?
 Jokofu la umeme na jenereta
 Jokofu la umeme bila ya jenereta
 Jokofu la gesi
 Jokofu la umeme/jokofu la gesi
 Jokofu la sola
 Jokofu la mafuta ya Taa
 Jokofu la mafuta ya Taa/Jokofu la gesi
 Jokofu la ubaridi
 Sina chochote

54. -Je, umeme umekatika mara ngapi kwako katika mwezi uliopita?
|_____| Umeme umekatika mara

55.- Je, unauza vile vile dawa za mifugo au chanjo za kuku?
O Ndiyo
O Hapana

99 .-Unauza aina gani za dawa za Mbuzi?
 Chanjo
 Antibiotiki
 Dawa za minyoo
 Vitamini
 Zinginezo
 Siuzi chochote

6.-Je, unauza chanjo za Homa ya mapafu ya mbuzi? (kama jibu liko katika namba za vyupa basi libadilisha liwe
katika namba za dozi)
O Ndiyo
O Hapana

59.-Je, umeuza dozi ngapi za chanjo ya CCPP katika miaka 5 iliyopita?
|_____| Namba za dozi

60. -Je, umeuza dozi ngapi za chanjo ya Sotoka ya mbuzi katika miaka 5 iliyopita?
|_____| Namba za dozi

98.-Je, ni nchi gani chanjo za mapafu ya mbuzi unazoziuza zinatengenezwa?
 Kenya
 Ethiopia
 Jordan
 Zinginezo
 Hakuna jibu
 Sifahamu

56.-Je, kuna dozi ngapi za chanjo ya mapafu ya mbuzi katika chupa moja
|_____| Namba za dozi kwa chupa

57. -Je, chupa moja ya chanjo ya mapafu ya mbuzi inauzwa kiasi gani?
|_____| Shilingi za Kitanzania

66.-Je, wafugaji huwa wanauliza kuuziwa kwa chanjo ya mapafu ya mbuzi katika duka lako?
O Ndiyo
O Hapana
O Sifahamu

58.-Je, wafugaji huwa wanauliza kuuziwa kwa chanjo ya sotoka ya mbuzi katika duka lako?
O Ndiyo
O Hapana
O Sifahamu

62.-Je, wafugaji au madaktari/maafisa ugani huwa wanauliza kuuziwa kwa chanjo ya mapafu ya mbuzi katika
duka lako?
O Ndiyo
O Hapana
O Sifahamu

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Annex III: Technical Vets

CCPP strategy in Tanzania
Questionnaire ID 24/

Target Group: Technical Vets
Date:
Enumerator:

Respondent's Data
Name
Surname Name
District
Village
Sub_village
Address
Mobile phone
Email

General Questions

67. -Je, unasimamia kaya ngapi zenye mbuzi? Usiendelee na swali kama jibu ni hapana
|_____| Namba za mbuzi wanaofugwa

70.-Je, umeshaona dalili zozote katika kundi la mbuzi kama vile kukohoa, kupumua kwa shida na ongezeko la joto
mwaka jana?
O Ndiyo
O Hapana
O Sifahamu

71.-Je, umeshaona dalili nyingine tofauti za ugonjwa unaotakana na mapafu katika kundi la mbuzi?
O Ndiyo
O Hapana
O Sifahamu

72.-Je, umeshaona ugonjwa ambao ulikuwa na dalili kama za Homa ya mapafu ya mbuzi katika kundi la mbuzi?
O Ndiyo
O Hapana
O Sifahamu

73.-Je, unaweza kukisia asilimia ya mbuzi ambao waliugua ugonjwa wa Homa ya mapafu mwaka jana katika
sehemu unayofanya kazi? Kama jibu ni hapana, basi acha wazi au usijaze sehemu hii

63.-Je, kuna sababu zozote zile ambazo zinakwamisha/kuzia uuzaji wa chanjo ya mapafu ya mbuzi?
 Hakuna sababu zozote zile
 Serikali/wizara hairuhusu uuzaji wa chanjo za
mapafu za mbuzi
 Wafugaji hawana uulewa wowote kwa kuwepo kwa
chanjo ya mapafu ya ,mbuzi
 Kuwepo kwa chanjo za mapafu ya mbuzi kutoka kwa
wasambazaji
 Sifahamu

64. -Je, wewe unapata chanjo za mapafu ya mbuzi wakati wowote ule unapotaka kununua/kuagiza?
O Ndiyo
O Hapana
O Sifahamu
O Hakuna jibu

65.-Kama jibu ni ndiyo, je, ni nani ndiye anayekuuzia/kusambazia chanjo za mapafu ya mbuzi?
 Msambazaji wa chanjo
 Shirika lisilokuwa la kiserikali
 Serikali/wizara
 Kampuni binafsi
 Sifahamu
 Hakuna jibu

87.-Je, unaweza kukisia asilimia ya mbuzi ambao walikufa kutokana na ugonjwa wa Homa ya mapafu mwaka jana
katika sehemu unayofanyia kazi? Asilimia inapatikana kutokana na namba ya mbuzi waliokufa kugawa na jumla
ya namba ya mbuzi waliopo (ifahamika na siyo na namba ya mbuzi wagonjwa)
|_____| Asilimia ya waliokufa

74.-Je, ulionana dalili zozote zile ambazo zinathibitisha kwamba ni za ugonjwa wa Homa ya mapafu ya mbuzi
wakati wa uchunguzi katika sehemu zake za ndani baada ya mbuzi kufa?
O Ndiyo
O Hapana

O Sikufanya uchunguzi wa upasuaji wa mbuzi
O Sifahamu

75.-Je, ulichukua sampuli yeyote kwa ajili ya uchunguzi katika maabara?
O Ndiyo
O Hapana

88.-Kama jibu ni ndiyo, je,ni sampuli ipi ulichukua?
O Mapafu
O Maji maji/swabu
O Ute
O Mnyama wote
O Damu
O Sehemu nyingine
O Hakuna jibu

89.-Kama jibu ni ndiyo, je, ulipeleka sampuli maabara?
O Ndiyo
O Hapana
O Hakuna jibu

91.-Kama jibu ndiyo, je ulihifadhi vipi sampuli hiyo wakati wa kuisafirisha?
 Niliisafirisha siku hiyo hiyo bila ya kuhifadhi
 Ilikaa zaidi ya siku moja bila ya kuhifadhi
 Siku hiyo hiyo iliifadhiwa katika jokofu
 Kuanzia siku 1 hadi 3 ilihifadhiwa katika jokofu
 Zaidi ya siku 3 ilihifadhiwa katika jokofu
 Iligandishwa katika jokofu
 Njia nyinginezo
 Hakuna jibu

76.-Je, uchunguzi wa maabara kwa kutumia vifaa husika ulithibitisha kuwa ni ugonjwa wa Homa ya mapafu ya
mbuzi?
O Ndiyo
O Hapana
O Sifahamu
O Hakuna jibu

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77.-Je, ulitoa ushauri gani katika kaya za wafugaji baada ya kuthibitishwa kwamba ulikuwa ni ugonjwa wa Homa
ya mapafu ya mbuzi?
 Kuwatenganisha mbuzi ambao ni wagonjwa kutoka
mbuzi ambao ni wazima
 Kuwatibu mbuzi wagonjwa kwa kutumia dawa za

vetenari
 Kutoa chanjo kwa mbuzi waliopata
ugonjwa/wagonjwa kwa kutumia chanjo ya ugonjwa wa
Homa ya mapafu ya mbuzi
 Kuwahamisha mbuzi ambao hawakupata
Ugonjwa/wazima kwa ndugu/jirani zangu wawe pamoja
katika kundi la mbuzi wao
 Kuwachinja mbuzi ambao wamepata ugonjwa na
kuuza nyama katika kijiji
 Kuwauwa mbuzi wote waliopata ungonjwa na kuzika
mabaki yao chini ya ardhi
 Zilitumika njia nyingine
 Hakuna kitu kilichofanyika/kutumika
 Sifahamu
 Hakuna jibu

78.-Je, katika uzoefu wako, Kondoa vile vile walishapata ugonjwa wa Homa ya mapafu ya mbuzi?
O Ndiyo
O Hapana
O Sifahamu

79. -Je, waweza kukisia asilimia ya Kondoa ambao walipata ugonjwa huu?
|_____| Asilimia ya Kondoo waliopata
Ugonjwa

68.-Je, waweza kutoa ushauri kwa wafugaji wa mbuzi juu ya matumizi ya chanjo ya Homa ya mafua endapo
chanjo inapatikana?
O. Ndiyo
O .Hapana, kwanini?
O Chanjo haipatikani

69.-Kama jibu ni ndiyo, je wewe unashauri njia gani ya kampeni itumike?
O Kila wakati wa mlipuko wa ugonjwa
O Chini ya mwaka mmoja
O Kila mwaka mmoja
O Kila baada ya mwaka 1
O Sifahamu

84.-Je, chanjo ya Homa ya mapafu ya mbuzi inayotumika inatoka kwa msambazaji yupi?
 Msambazaji wa chanjo
 Shirika lisilokuwa la kiserikali
 Serikali
 Kampuni binafsi
 Jibu mbadala namba 5
 Jibu mbadala namba 6
 Jibu mbadala namba 7

 Sifahamu
 Hakuna jibu

85.-Katika maoni yako, je unafikiri kwamba wafugaji wanahitaji/wako tayari kutumia chanjo ya Homa ya mapafu
ya mbuzi?
O Ndiyo
O Hapana
O Sifahamu

86.-Je, unafikiri kuna kikwazo gani kinachokwamisha matumizi ya chanjo ya Homa ya mapafu ya mbuzi katika
Kijiji/sehemu yenu?
 Kutokuwepo kwa chanjo ya Homa ya mapafu ya
mbuzi
 Uhamasishwaji juu ya chanjo kwa wafugaji
 Kuna tiba mbadala inayotumika na wafugaji (dawa
za ki asili)
 Sera za Serikali
 Namba za dozi katika chupa ni kubwa
 Bei ni kubwa
 Uagizaji wa Chanjo unaotumika siyo wa uhalali
 Chanjo iko katika kundi chini ya mamlaka ya
Serikali na hivyo kuna sehemu nyingine za Wilaya
inatolewa bure
 Sifahamu

Annex IV: VIC

CCPP strategy in Tanzania
Questionnaire ID 24/

Target Group: VIC
Date:
Enumerator:

Respondent's Data
Name
Surname Name
District
Village
Sub_village
Address
Mobile phone
Email

General Questions

33.-Je, unapokea sampuli za ugonjwa za mbuzi? Kama jibu ni hapana, usiendelee na dodoso
O Ndiyo
O Hapana

34.-Je, sampuli zinahifadhiwa vipi wakati wa kuzisafirisha kutoka katika sehemu zilipochukuliwa? Kwa kawaida
Zinachukua siku ngapi mpaka zifike katika maabara,je, huwa kunatokea na uchelewashaji wowote?
 Siku hiyo hiyo bila ya kuhifadhi
 Zaidi ya siku 1 bila ya kuhifadhi
 Huifadhiwa katika jokofu siku hiyo hiyo
 Kuhifadhiwa katika jokofu kati ya siku 1 hadi 3
 Kuhifadhiwa katika jokofu zaidi ya siku 3
 Kugandishwa
 Njia nyinginezo

35.-Je, mnatumia njia gani za kiufundi za ki maabara katika utambuzi wa ugonjwa wa Homa ya mapafu?
 Njia za kimaiko biolojia/microbiology
 "Inmuno histochemistry"
 "ELISA"
 PCR
 "Anatomopathology"
 Njia nyinginezo

36.-Je, mnatumia "Serology" kwa kuchunguza ugonjwa wa mapafu? Kama vile
 Homa ya mapafu ya mbuzi
 Sotoka ya mbuzi
 Maedi visna
 Mycoplasma ovipneumoniae
 Diseases 4
 Diseases 5

41.-Je, umepokea sampuli ngapi zenye dalili/matukio ya ugonjwa wa mapafu katika miezi 12 iliyopita?
|_____| Namba za matukio/"Cases"

37.-Je, kumeshakuwa na dalili zozote zile zinazoashiria uwepo wa ugonjwa wa Homa ya mapafu ya mbuzi katika
kipindi cha miaka 5 iliyopita?
O Ndiyo
O Hapana

40.-Je, kumeshakuwa na dalili zozote zile zilizothibitisha kuwepo kwa ugonjwa wa Homa ya mapafu ya mbuzi
katika kipindi cha miaka 5 iliyopita?
O Ndiyo
O Hapana

42.-Kama jibu ni Ndiyo, je, idadi ngapi za "Case"/ matukio ambayo yamegundulika katika kipindi cha miaka 5
iliyopita?
|_____| Namba za matukio/"Cases"

43.-
 Chini ya umri wa miaka 5
 Kati ya umri wa miezi 6 hadi mwaka 1
 Kati ya umri wa mwaka 1 hadi miaka 2
 Zaidi ya umri wa miaka 2
 Sifahamu
 Hakuna jibu

44.-Je, unafahamu kama wafugaji wanatumia chanjo ya Homa ya mapafu ya mbuzi?
O Ndiyo, wanatumia
O Hapana, hawatumii
O Sifahamu

45.-Kama jibu ni ndiyo, je,ni nani msambazaji wa chanjo ya Homa ya mapafu inayotumika?
 Kituo cha Veterinari
 Daktari wa Veterinari wa Serikali
 Duka la dawa na pembejeo za Veterinari
 Duka la dawa na pembejeo za mifugo
 Afisa ugani wa Serikali/ Wakaguzi wa mifugo
 Wahudumu wa Mifugo wa Jamii (WAMIJA)
 Watoaji wa huduma kutoka Shirika lisilokuwa la

Kiserikali
 Wakulima wengine
 Wengineo
 Sifahamu
 Hakuna jibu

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