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Gendered effects of Contagious Bovine Pleuropneumonia (CBPP) occurrence and control in a pastoral community in Ijara sub county, northeastern Kenya



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Gendered effects of contagious bovine pleuropneumonia (CBPP) occurrence and control in a pastoral community in Ijara sub county, northeastern Kenya

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Contents

Figures	v
Abbreviations and acronyms	vi
Acknowledgments	vii
Introduction	1
Literature review	3
How men and women are affected by livestock diseases occurrence and control	3
Methodology	5
Study area	5
Research design and methods of data collection	6
Data analysis	6
Ethical consideration	6
Results and discussion	7
What women and men perceived to be the effects of CBPP occurrence on households	7
Characteristics of an ideal CBPP vaccine that women and men preferred the most	8
Impacts of eradicating CBPP through regular vaccination anticipated by women and men	10
Conclusion and recommendations	14
References	15
Appendix	18

Figures

Figure 1: Map of study area showing the study sites	5
Figure 2: Perceived effect of CBPP occurrence on households by gender	8
Figure 3: Most preferred characteristics of an ideal CBPP vaccine by women and men	9
Figure 4: Perceived and anticipated positive and negative effects of eradicating CBPP for women	11
Figure 5: Perceived and anticipated positive and negative effects of eradicating CBPP for men	12

Abbreviations and acronyms

CBPP	Contagious bovine pleuropneumonia
PACE	The Pan African programme for the Control of Epizootics
KALRO	Kenya Agricultural and Livestock Research Organization
ILRI	International Livestock Research Institute
CIFSRF	Canadian International Food Security Research Fund
VIDO	Vaccine and Infectious Disease Organization
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus group discussion
ASF	Animal source foods
AU-IBAR	African Union-InterAfrican Bureau for Animal Resources
IFAD	International Fund for Agricultural Development
COMESA	Common Market for Eastern and Southern Africa
MEMR	Ministry of Environment and Mineral Resources
NEMA	National Environment Management Authority
AI	Avian influenza

Acknowledgments

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Introduction

Contagious bovine pleuropneumonia (CBPP), also known as cattle lung disease, is one of the most important infectious cattle diseases in Africa. The Pan African programme for the Control of Epizootics (PACE) identified CBPP as the second most important transboundary disease¹ in Africa, after Rinderpest (Tambi *et al.* 2006). CBPP is a disease of great economic significance to cattle keepers because of its implications on the following: food security through loss of protein sources; increased production costs due to costs of disease control; disruption of livestock/product trade; inhibiting sustained investment in livestock production and debilitating pain in affected cattle and death of cattle (Tambi *et al.* 2006). Elimination of the disease permits the animal to achieve its potential productivity. Successful eradication of CBPP can eliminate any future control cost of vaccination, treatment, quarantine and movement control, which benefit producers and the nation. Control of CBPP is, therefore, important as a way to salvage the losses and increase the incomes of cattle owners (Tambi *et al.* 2006).

Vaccination is the most preferred strategy for controlling CBPP. Currently, the only available CBPP vaccine in Kenya is the live attenuated T1/44 strain, which has numerous shortcomings. They include dependence on the cold chain, limited ability to stimulate an adequate immune response and post-vaccination reactions (Tulsane *et al.* 1996). Because of the limitations of the current vaccine, scientists from Kenya Agricultural and Livestock Research Organization (KALRO), International Livestock Research Institute (ILRI) and Vaccine and Infectious Disease Organization (VIDO) in Canada were in 2012 funded by the Canadian International Food Security Research Fund (CIFSRF) to develop a new CBPP vaccine with fewer shortcomings than T1/44. The new vaccine is expected to elicit a stronger immune response that lasts longer, cause less adverse reactions and not require refrigeration.

The proposed vaccine is expected to enhance the effectiveness of CBPP control, with a possibility of its eradication in a foreseeable future. In addition to the laboratory vaccine development component, the CIFSRF study had a gender and socio-economic component investigating factors associated with occurrence and control of CBPP (Wesonga *et al.* 2011). Among the factors included gendered perceptions of the effects of CBPP occurrence on households; preferred characteristics of an ideal vaccine by gender; and the gendered perceptions and anticipated impacts of eradicating CBPP through regular vaccination. This inquiry was intended to provide the hitherto absent, but much needed, evidence to demonstrate if and how the existing gender differences translate into perceptions of the effects of CBPP occurrence and its control. The results from this study will inform the vaccine development process in the laboratory as well as delivery of vaccine to end users on gender considerations that may improve vaccine delivery. Once considered, women and men are most likely to benefit equally/equitably from the vaccine currently under development.

¹ Transboundary animal diseases are defined as diseases of significant, trade and/or food security importance for a considerable number of countries. They can easily spread to other countries and reach epidemic proportions; and their control/management including exclusion requires cooperation between several countries (Otte *et al.* 2004).

Lack of gender analysis of sex-disaggregated data from livestock owners has denied stakeholders in the livestock industry the opportunity to enhance livestock production and productivity optimally. Work on gender in agriculture has demonstrated that including women and providing them equal resources as men in agriculture can narrow the current gender yield gap, which stands at 20–30% and is mainly due to differences in resource use (FAO 2011). “Bringing yields on the land farmed by women up to the levels achieved by men would increase agricultural output in developing countries between 2.5 and 4%. Increasing production by this amount could reduce the number of undernourished people in the world in the order of 12–17%” (FAO, The State of the Food and Agriculture 2011). According to FAO 925 million people are currently undernourished in 2010, representing almost 16% of the population of developing countries (FAO 2010). Closing the gender gap in agricultural yields could bring that number down by as much as 100–150 million people (FAO 2011).

Recognizing and identifying the effects of CBPP occurrence on women and men and identifying gender gaps in effects of CBPP disease and benefits associated with interventions in CBPP provides a first step towards closing the gender gap in benefits of controlling CBPP. The main objective of this study was to explore how pastoral women and men from Ijara subcounty are affected by CBPP occurrence and how they benefit from CBPP control. Answers to the following questions were sought.

- a. How do women and men perceive the effects of CBPP occurrence on their households?
- b. What characteristics in a CBPP vaccine would men and women prefer the most?
- c. What do women and men perceive to be the impacts of eradicating CBPP through regular vaccination?

This paper is organized into five main sections. After this introduction is section 2, which is constituted by a literature review that focuses on the gender-specific effects of livestock disease occurrence and control; in section 3, we describe the methodology; in section 4 we present results and discussion. The paper ends with a conclusion and gender-specific recommendations from the study.

Literature review

How men and women are affected by livestock diseases occurrence and control

Livestock diseases are a major constraint and cause devastating impacts on the livelihoods of many poor livestock keepers. Owing to their economic and ecological marginality, poor livestock keepers are more vulnerable to the effects of livestock diseases because of the high cost of disease control and limited access to suitable animal health and production inputs (FAO 2002). Economic threats for livestock keepers associated with livestock diseases can be broadly classified into three categories: first, losses in production through death or sickness of the animal, losses in productivity that include reduction in weight, milk yields, fertility and draft power, and losses in profitability caused by disease in terms of financial and time investments during treatment (Perry *et al.* 2002; FAO 2002; AU-IBAR 2013); second, because animal health and livestock and livestock product markets are intertwined, diseases can cause disruptions to local markets, international trade and rural economies due to control measures aimed at containing the spread of diseases, such as culling, quarantines, and animal movement bans (FAO 2002; Morgan and Prakash 2006); and third, livestock diseases threaten the livelihoods of poor livestock keepers and the different players in livestock value chains (Birol *et al.* 2011).

Livestock act as natural and financial capital, contributing to women's and men's diets and livelihoods through income generation and home consumption, acting as live banks, imparting social status, and providing draught, transport, and manure, especially for resource-poor men and women farmers (World Bank *et al.* 2009). Yet an estimated 30% of livestock production in developing countries is lost because of disease (Upton 2004). Animal diseases, particularly transboundary animal diseases such as CBPP, are an ongoing threat to women and men livestock producers, processors and consumers as well as to markets (Otte *et al.* 2004). The impact of livestock disease on the livelihoods and food security of poor livestock producers and processors, particularly women, is of great concern because they are less resilient to disease-related shocks such as losses in market, animals, and domestic animal diversity since they have less access to compensation and restocking programs (World Bank 2005).

Animal diseases have significant and measurable effects on human welfare (FAO 2002). Many of these have been described in considerable detail by (Schwabe 1984), particularly the importance of animal products in human nutrition, the social benefits of livestock and the impact of food-borne infections and zoonotic diseases.

Milk yield is particularly susceptible to the chronic nature of CBPP, and women manage milk in many of the pastoralist communities where the disease is a problem. Women decide how much milk to give to children and to other people within the household (Nassens 2011; Nori 2010). Interventions to control animal diseases should take into account the existing gender roles of women and men. A sick cow to a man may represent a shortage of money spent on treatment and inability to sell it, whereas to a woman, it may represent hunger because of a drop in milk yield (Waithanji *et al.* 2015a). Kristjanson *et al.* (2010b), found no published evidence that women lose animals to disease at a higher rate than do men, but this has not been investigated systematically, nor have women- and men-managed

animals been compared. Given women's limited access to livestock-related inputs and services, it is possible that they lose more of their self-managed animals, which could decimate their asset base.

A study done on the impact of avian influenza (AI) on household income by (Velasco *et al.* 2008), indicated that women who cared for and managed the chickens stated that when chicken die because of AI, women lose the income that they would have earned from selling poultry. The disease also has implications for the access to poultry meat as food for the family. Women's limited time and mobility and not attending trainings on poultry production and care, rendered women poultry keepers more vulnerable to income losses, and more so to AI infection compared to men (Velasco *et al.* 2008). Phan Van Luc *et al.* (2007) reported that women are involved in all aspects of poultry production (raising, transporting, selling and slaughtering) and are, therefore, directly impacted by the adverse economic and social effects of AI and related bio-security control measures, as well as the human health risks.

Vaccine technologies appear to have the potential to transform the livestock sector especially if poor livestock farmers are involved in vaccination, which can enhance the efficiency of production of Animal Source Foods (ASF) (Heffernan *et al.* 2008). Vaccine technology adoption can be motivated in both women and men by occurrence of frequent outbreaks. Among women, vaccine adoption can be motivated by the anticipation of increased household food security owing to enhanced milk production associated with absence of disease and motivation stories/testimonies on improved child-health associated with absence/eradication of disease (Waithanji *et al.* 2015a). Animal disease control and livestock products have been shown to have considerable impacts on improving child nutrition among poor people, particularly in pastoralist communities, in which 75% or more of general and child nutrition is, based on milk and livestock products (FAO 2002).

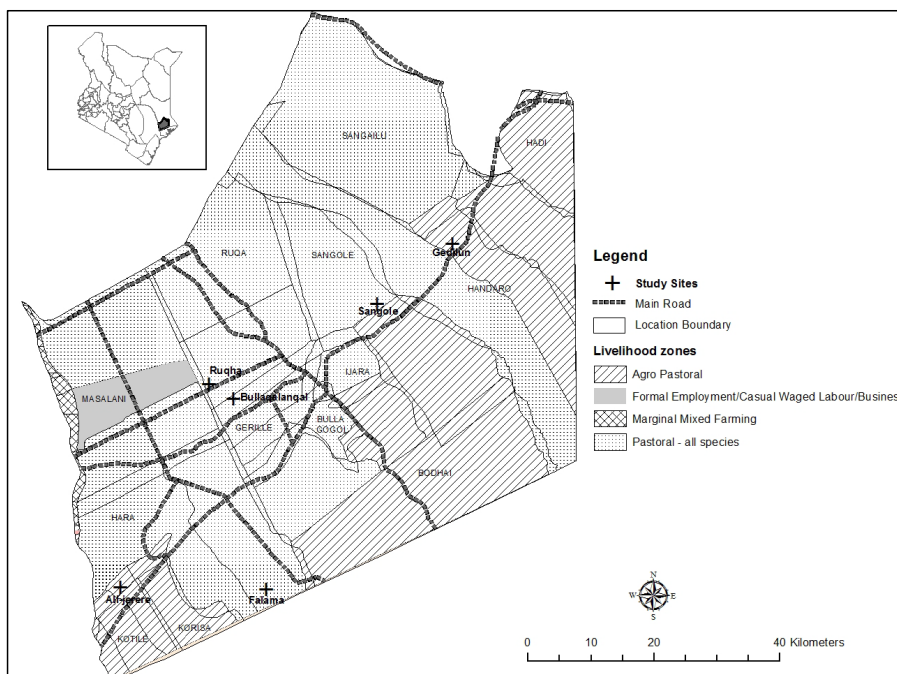
Among men, vaccine adoption can be motivated by the anticipation of increased household wealth owing to increased annual sales of livestock associated with absence of disease and motivation stories/testimonies on improved wealth associated with absence/eradication of disease (Waithanji *et al.* 2015a). Adoption of the vaccine technology can, moreover, be motivated in both men and women by less adverse post vaccination side effects (Waithanji *et al.* 2015a). The current CBPP vaccine continues to elicit adverse reactions in vaccinated cattle. Sori (2005), demonstrated that post-vaccinal reaction affected the vaccinated animals with a 1.02% overall attack rate and 0.17% mortality. This therefore affects men's participation in live cattle markets and economic losses such as reduction in milk produced affecting women's participation in milk markets. Consequently, in some cases this has contributed to owner reluctance to present animals for vaccination in certain areas (Thiaucourt *et al.* 2000; Teshale 2005). Perceptions on the effect of a vaccine in its totality can determine the acceptability of a vaccine. For example, if one perceives more positive outcomes from vaccination, they are likely to accept it more than if they perceive more negative outcomes (Waithanji *et al.* 2015a).

Methodology

Study area

The study was carried out in five locations of Ijara subcounty of Garissa county (Figure 1). The area is arid with vegetation cover dominated by shrubs and grass and is a habitat for wildlife. There are two main seasons; wet season (Gu) which occurs from April to June and also from October to December and the dry season (Hagar) which occurs from July to September and also from January to March. Ijara is characterized by poor roads, education and health facilities, and communication infrastructure. The main residents of Ijara are Somalis of the Abdalla clan, most of who practice the Islam religion. They are polygamous, marrying up to four wives at any one time as allowed by their faith. Praying, fasting, gifting livestock to the poor and pilgrimage to Mecca (Hajj) are among the main religious obligations practiced widely in this community. Cattle, sheep, goats, donkeys and chicken, are the main livestock species owned. Cattle are the most preferred species because they are associated with several benefits, which include selling cattle products (milk and ghee) and live cattle at markets by women and men respectively.

Figure 1: Map of study area showing the study sites.



(Source: Waithanji *et al.* 2015b).

Research design and methods of data collection

A cross-sectional research design was used in this study. Ijara subcounty was purposively selected because CBPP is endemic in the area yet most households depend on cattle for their livelihoods. A total of 12 sex-disaggregated focus group discussions (FGDs) constituted by six men only and six women only groups were conducted. A total of 127 women and men discussants were interviewed (Table 1). Men and women discussants described what they perceived to be the effects of CBPP occurrence on households, the characteristics they would have liked to see in an ideal CBPP vaccine, and what they perceived to be anticipated impacts if CBPP were to be eradicated through good vaccine coverage and regular vaccination.

Table 1: FGDs composition

Name of location	Number of women	Number of men
Gedilun	12	11
Sangole	8	12
Ali-jarere	9	12
Falama	12	8
Ruqha	10	11
Ruqha bulaqalanqan	10	12
Total	61	66

Data analysis

Qualitative data was analysed inductively as well as using the NVIVO computer based software whereby most frequently used words or groups of words used to describe a phenomenon were presented in a word cloud. Participatory impact diagrams were used to illustrate what women and men anticipated to be the impacts of CBPP eradication on their livelihoods and wellbeing. Verbatim quotes from individuals participating in FGDs were recorded and the identity of the individuals concealed by assigning them fictitious names.

Ethical consideration

Before the focus group discussions were conducted, a brief description of the purpose of the study was provided to the discussants. The study also sought informed consent of the discussants before they were interviewed and discussants were assured of their confidentiality and that the information they provided was solely for research purposes. All the focus group discussants participated voluntarily. The research team employed research assistants from the local communities who were skilled in interviewing and who understood the Somali language.

Results and discussion

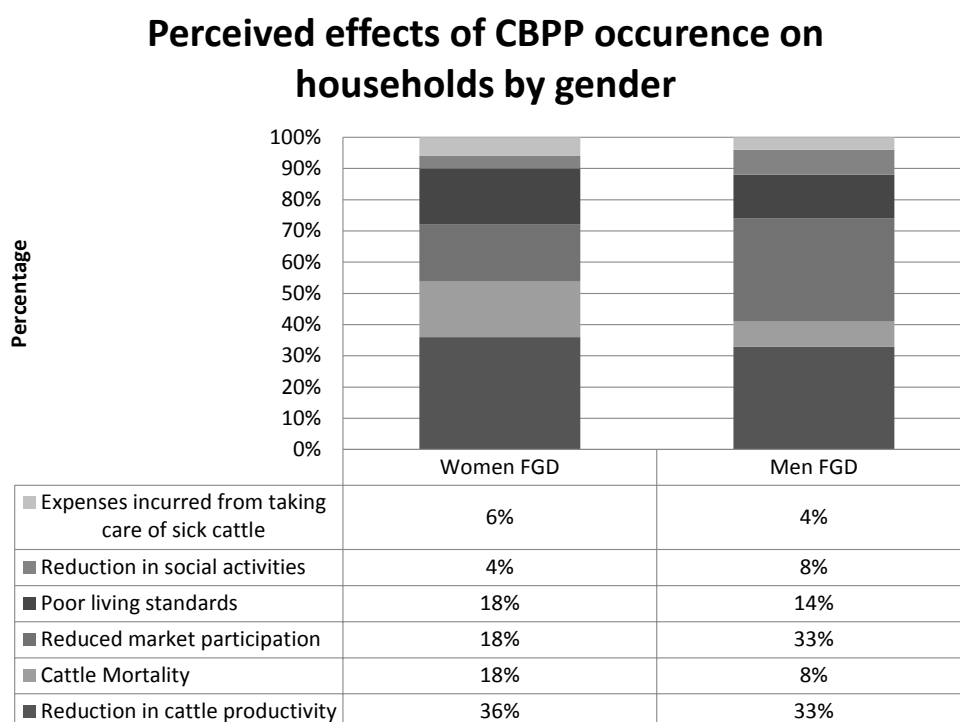
What women and men perceived to be the effects of CBPP occurrence on households

Both women and men perceived the following to be the main effects of CBPP occurrence on households: Reduction of cattle productivity, poor living standards, cattle mortality, reduction in social activities such as gifting and wedding ceremonies in the community and an increase in expenses incurred in providing care for sick cattle as presented in Figure 2 below. The main gender differences in perceptions were seen in market participation, cattle mortality and a reduction in social activities in the community. Results from the women FGDs revealed that women perceived cattle mortality, which included death of cattle and abortions by sick cattle, as a more important effect of CBPP occurrence as compared to the findings from the men FGDs (Figure 2). Cattle mortality was associated with increased hunger and food shortage. Women were more likely to perceive severity of hunger than men, mainly because it was their role to assure food security in the household. It was very clear that CBPP was a very important disease affecting cattle owners as shown in the following excerpt:

“... CBPP is the most important cattle disease in this area because it is killing all our cattle” (Aisha, women FGD, Gedilun, sub-location).

Livestock such as cattle may be distributed among household members to prevent or alleviate malnutrition, because they provide milk, and meat, which contain high-quality protein. It is increasingly recognized that animals under women's control are more likely to improve family nutrition than similar assets held by men (Miller 2001). More men than women FGDs perceived a reduction in market participation as an effect of CBPP occurrence on households (Figure 2). Marketing of live cattle is mainly the responsibility of men while marketing milk is exclusively the preserve for women. Sick cattle and their products do not sell well in markets while recovered, but emaciated, cattle tend to fetch a lower price in markets causing a reduction in income. The presence of CBPP in the herd usually results in trade barriers imposed on cattle and cattle products by disease-free countries according to men FGDs. A report by (IFAD 2009), states that CBPP affects market participation by limiting cattle owners to tap into both local and global markets, because of stringent sanitary standards for international trade in animals and animal products. This limits export of livestock products to profitable international markets. A report by COMESA (2009) identified Garissa as the largest market in eastern Africa and a key outlet to the Kenya Somalia cross-border livestock trade.

Figure 2: Perceived effect of CBPP occurrence on households by gender.



Reduction in social activities was perceived by men as an important effect of CBPP occurrence than by women. Marriages are important social activities for men in this community because a Muslim man can marry up to four wives as long as he has cattle wealth. Cattle are the main source of bride wealth or dowry. For majority of the men, however, CBPP causes cattle death and affects social activities, which are highly dependent on cattle wealth. It was evident that marriage is an important part of culture in Ijara subcounty as illustrated in the excerpt below:

“... The number of marriages in the community will reduce, because cows are a source of payment for dowry” (Ibrahim, men FGD, Alijerere, sub-location).

A report by the FAO (2012) states that livestock play an important role in many communities especially in many traditional societies because livestock are necessary and/or a requirement for entering into marriages. Livestock such as cattle continue to be part of bride-wealth or dowry and are considered to be important assets for many households.

Studies have shown that livestock have important cultural meanings, and their exchange through gifts builds social capital (Twinamasiko 2002; Miller 2001). The results also depicted that cattle owned by women were gifted to the *Duksi*² Sheikh as a token of appreciation for educating their children on Islam. Gifting of cattle to religious leaders is an important part of Ijara community culture. Pastoralists culturally exchange livestock as gift.

Characteristics of an ideal CBPP vaccine that women and men preferred the most

Women and men discussants were informed that scientists were developing a new CBPP vaccine and the scientists would like to know the characteristics of the vaccine that both men and women would prefer the most, which could be included in the anticipated vaccine whenever possible. NVIVO word clouds were used to illustrate the

² *Duksi* refers to non-formal Islamic institutions that emphasize the teaching of Quran and other Islamic values (Aden 2013).

most frequently mentioned words describing most preferred attributes. According to women discussants, the most preferred characteristic of an ideal vaccine would be one which is less reactive. A reactive vaccine was associated with the tail falling off, a reduction in milk yields and abortions (Figure 3). These attributes constitute indicators of an unsafe vaccine. A reduction of milk yields also affects the amount of milk distributed by women for household consumption and sale in markets. According to Teshale (2005), a drop in milk production and weight as well as abortions are among the side effects of the current vaccine in use today.

Figure 3: Most preferred characteristics of an ideal CBPP vaccine by women and men.

Women FGD

Men FGD



Affordability was the second most preferred characteristic of an ideal vaccine for women discussants (Figure 3). This is exemplified using the following excerpt:

"... The new CBPP vaccine should cost less than 25 Kenya Shillings because we have to vaccinate all our cattle against CBPP"
(Rehema, women FGD, Ruqha bulaqalanqala, sub-location)

In a study on the willingness to pay for the new CBPP vaccine, women and men cattle owners were asked how much they were willing to pay for the new vaccine under development. Among the attributes suggested included a vaccine that would elicit a stronger immune response that lasts for longer than the current six months and causes less adverse reactions. The results of the study indicated that women were willing to pay KSh 174/ dose per year for the new vaccine. This amount of money was significantly ($p < 0.1$) less than what men were willing to pay, KSh 228 (Waithanji *et al.* 2015b). Gender is likely to affect affordability of vaccines because women, compared to men often do not have equal amounts of money or resources that can be converted to money owing to the gendered differences in access and control of resources. Moreover, women from the study sample had significantly ($p < 0.01$) less cattle wealth than men (Waithanji *et al.* 2015b).

The third characteristic of an ideal vaccine preferred by women discussants was that cattle owners would vaccinate cattle annually or every two or three years or more (Figure 3). These characteristics represent the attribute 'efficacy'. Literature indicates that the protection rate of the current CBPP vaccine at three months post vaccination is 67%.

Revaccination at six months after the first dose produced protection rate of 95.5% (Mariner and Catley 2004; Bamhare 2001; Wesonga and Thiaucourt 2000; Yaya *et al.* 1999).

According to men, the most preferred characteristic was a vaccine that would eradicate CBPP completely (Figure 3). This characteristic represented an efficacy concern that will, hopefully, be addressed by the new vaccine under development. Discussants in one of the six men FGDs stated that:

“... We want a vaccine that will eradicate CBPP completely, a vaccine that is as effective as the Rinderpest vaccine” (Ali, men FGD, Falama, sub-location).

The second most preferred characteristic of an ideal vaccine according to men discussants was one that had no or very slight post-vaccination reactions. Sori (2005), demonstrated that post-vaccinal reaction affected the vaccinated animals with a 1.02% overall attack rate and 0.17% mortality.

Impacts of eradicating CBPP through regular vaccination anticipated by women and men

Discussants were asked to envisage a hypothetical situation where CBPP has been eradicated in the subcounty through vaccination. Women and men described how their lives might change both in positive and negative ways. The responses were documented and then represented artistically in participatory impact diagrams (Figure 4 and 5). The impact diagram begins with the CBPP vaccine at the centre. All the positive and negative impact illustrations of CBPP eradication are represented on the right and the left side of the impact diagram respectively.

Five women discussant groups stated that one of the positive impacts of eradicating CBPP would be an increase in cattle production and productivity characterized by more milk and calves (Figure 4). An increase in milk yield according to six women discussant groups enhanced milk consumption by household members. A study by Bbalo (1991) demonstrated positive changes over a 10-year period following CBPP control and this included herd value and milk production. According to six women discussant groups, an increase in milk yield was associated with an increase of women's participation in milk markets and an increase in their incomes. All six women discussant groups stated the following:

“...With increased cattle numbers, our participation in milk markets increases and so does our incomes” (Nadia, women FGD, Sangole, sub-location).

All six discussant groups stated explicitly that men were likely to become exceedingly jealous of the women's wealth from the increased milk sales as follows:

“... Our husbands are likely to become very jealous of us if we become rich from selling milk because we will be able to afford to buy nice clothes and look beautiful” (Asha, women FGD, Rugha, sub-location)

“...With increased incomes our husbands usually feel bad and do not appreciate the fact that we dress very well and look attractive” (Rukia, women FGD, Falama, sub-location)

According to five women discussants groups one of the perceived positive impacts of eradicating CBPP would be going for Hajj³ owing to increased cattle wealth.

“... An increase in cattle wealth will provide a chance for good and obedient wives to be taken by their husbands to “HAJJ” (Rehema, women FGD, Falama, sub-location)

³ The annual Hajj pilgrimage is one of the world's largest gatherings, as hundreds of thousands of people flock to Mecca, Saudi Arabia, to participate in one of Islam's five pillars of faith (Huffington Post 2014).

Going for Hajj was also a very significant achievement also for men discussants, but going for Hajj is expensive. According to Webb (2009), going for Hajj is one of the obligations in Islam for every Muslim male or female, provided he or she is physically and financially able to do so. Two of the men discussant group stated that:

“...If we have increased cattle wealth we can afford to go for “HAJJ” and take our wives with us” (Ishmael, men FGD, Alijerere, sub-location)

Figure 4: Perceived and anticipated positive and negative effects of eradicating CBPP for women.

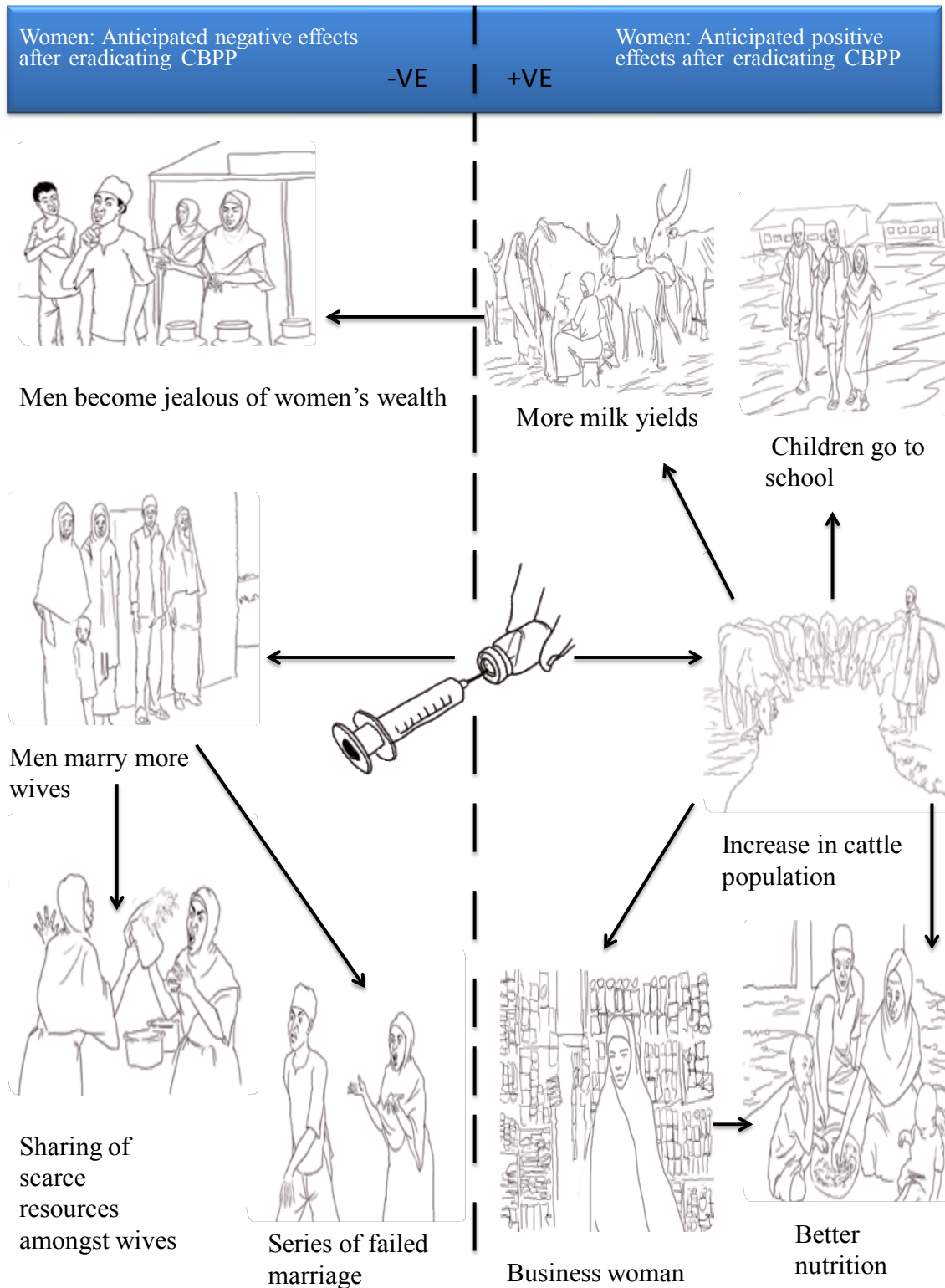
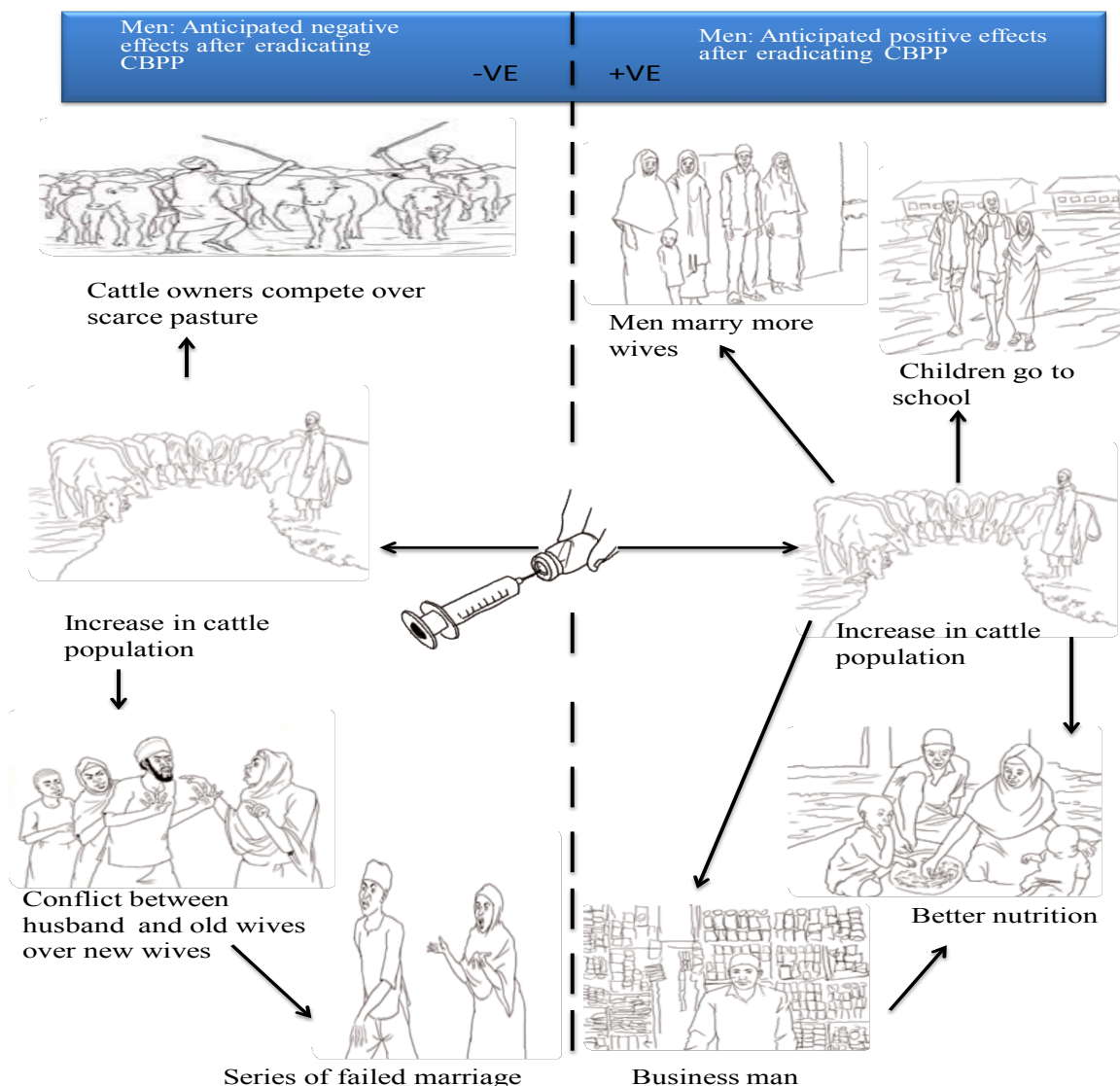


Figure 5: Perceived and anticipated positive and negative effects of eradicating CBPP for men.



Findings from both women and men discussant groups showed that eradication of CBPP may result in the improvement of wellbeing in terms of better nutrition and improved health status among men, women, and children and other household members (Figure 4 and 5). Transboundary diseases such as CBPP can often have significant negative implications on food security and nutrition especially for poor pastoral communities that do not have supplementary income and supplies. Ensuring food security is one of the main benefits of eradicating transboundary diseases because livestock contribute to food security and nutrition as sources of proteins and micronutrients for many pastoral communities (FAO 2004).

Results from both women and men discussant groups showed that eradication of CBPP can lead to the following perceived and anticipated positive impacts: increased cattle wealth; cattle owners can build better permanent stone houses; reduced financial constraints to educating their children and can even take them to private schools; and that their families can seek medical care from private hospitals and they could diversify their incomes by opening business such as shops (Figure 4 and 5). Livestock are assets women can easily own and/or control and sell to meet emergency and family health needs. Livestock such as cattle, provide income, create employment opportunities, food and nutrition security and also act as a safety net for poor households not to fall into poverty. Literature indicates that women spend their money derived from livestock and livestock products on their children school fees and their health (Njuki and Sanginga 2013). A study has shown that control of CBPP is important because cattle offer people

employment as stock traders as well as butchers (Windsor and Wood 1998). Based on the existing gendered roles, selling cattle provides men with an opportunity to provide proper homes and school fees for good education from sale of cattle (Quisumbing 2003).

Negative effects associated with eradication of CBPP according to women discussants included an increase in the number of marriages in the community. Five out of the six women groups stated that there would be an increase in the number of marriages because men are polygamous and Islam religion allows them to marry more than one wife. Women discussants complained that not only would they have to share scarce household resources with the new wives and husbands will have to intervene when wives are in disagreement and this may cause a strain in the relationship with his first wife leading to divorce. The older wives would have to share the time they spent with their husbands with these new wives (Figure 4). Older wives from five women discussant groups confessed the following:

“...We feel ignored by our husbands because they spend more time with their newer, younger, wives” (**Nuri, women FGD, Sangole sub-location**).

All six men discussant groups stated that one of the positive impacts of eradicating CBPP was associated with an increase in cattle production and productivity, which resulted in more calves being born (Figure 5). The advantages of increased cattle wealth among others was that older and younger men in the community could marry and remarry. Four men discussant groups stated that Islam allows a man to have up to four wives simultaneously as long as he can take care of them all financially.

“...The more cattle wealth a man has, the more women he can marry”. (**Swaleh, men FGD, Sangole, sub-location**)

Regarding divorce, two men discussant groups said that when a man marries another wife, his old wife complains that he is spending too much time with his new wife. This causes conflict between the husband and his old wife/wives over the new wife/wives as showed in Figure 5. This is illustrated by the following statement:

“...We husbands are really stressed and we suffer from high blood pressure because of the fighting between old and new wives” (**Mohammed, men FGD, Gedilun, sub-location**)

According to men discussants, if married men fail to get along with their old wives, the marriages usually fail and they divorce (Figure 5). When husbands and wives fail to resolve their differences, the husband may resort to divorce as permitted by the Shariah (law) of Islam (al-Qaradawi, undated). Women, on the other hand, cannot directly obtain a divorce. A woman who finds unbearable problems in her marriage can only have it annulled after many appeals to an Islamic court, and then only with the support of her birth family (Barnes and Boddy 1994). Eradication of CBPP reduces cattle mortality (FAO 2004), and consequently increases the cattle numbers, which skews benefits in favour of men because they can use the cattle wealth to marry more wives.

Discussants from two other men FGDs reported that eradicating CBPP would increase men's participation in live cattle markets, but because of the generalized increase in cattle population, demand for cattle in markets was likely to drop. Excess supply of cattle in the market is likely to affect the value of cattle and the livelihoods of cattle owners negatively. Another negative impact of eradicating CBPP according to two men FGD discussant groups was that cattle owners may be forced to compete over pasture due to increase in cattle numbers. Ijara sub county is arid with vegetation cover dominated by shrubs and grass. Pastoralists rely heavily on the available scarce pasture for their livestock (MEMR and NEMA 2013).

The main differences in anticipated impacts of eradicating CBPP were in relation to marriage. For men having more cattle wealth was an opportunity for them to marry more than one wife, while for women this meant they would have to share scarce resources such as household items and a man's time with the new wives. Women and men discussants however acknowledged that marrying more wives resulted in a series of failed marriages in the community because of increased conflict between old wives and new wives as well as conflict between old wives and their husbands.

Conclusion and recommendations

Men and women perceived the effects of, and were affected differently by, CBPP occurrence because of gender norms and relations in the prevailing culture. Women perceived cattle mortality to be the greatest effect of CBPP occurrence because it represented food shortage and a decline in income derived from milk sales. Men perceived reduction in participation in cattle markets, resulting from illness and death of cattle due to CBPP, to be the greatest effect of CBPP occurrence. This is because men traditionally sell cattle and controlled the income generated from cattle sales. These findings reveal the necessity of engendering studies on effects of livestock diseases because it enables scholars to use the information obtained to model gender sensitive and sometimes specific interventions to prevent occurrence of the disease or mitigate its effects when it occurs.

A vaccine that is safe, efficacious and affordable is more likely to be adopted by both men and women, but for women safety and affordability, and for men efficacy and safety, were the two most important attributes for an ideal CBPP vaccine. This difference can be explained by the fact that women have fewer livestock assets and less money than men because of cultural gender norms that allow women mainly usufruct rights and men full rights to cattle belonging to the household in order to sustain patriarchal hierarchies of power. Scientists developing the new CBPP vaccine should take into account these three attributes as disregarding any has, sometimes gender related, implications. For example, disregarding affordability will reduce the adoption by women, whereas disregarding efficacy will reduce adoption by men. Disregarding safety will reduce adoption by both women and men.

From an exercise of imagining a hypothetical scenario where CBPP has been eradicated, women and men agreed that there would be great benefits from CBPP eradication through, consistent vaccination. The fact that about 96% of households owning cattle vaccinate their cattle, and in addition that about 83% of the cattle are vaccinated each year (Waithanji *et al.* 2015b), the study participants were already convinced that the vaccine is important. The benefits of eradicating CBPP supersede the challenges, but being aware of the challenges can help involve the elders and religious leaders in advising married men and women on ways of maintaining healthy relationships when wealth sets in. Without the knowledge on benefits and challenges, efforts to eradicate CBPP may be thwarted by men and women who refuse to vaccinate, in order to preserve their marriages, because they associate CBPP eradication with failed marriages.

References

- Aden, R. 2013. Determinants of implementation of Islamic integrated education programme in pre-public school in Habaswein District, Wajir County, Kenya. A Research Project Submitted in Partial Fulfillment of the Requirements for Degree of Master of Education in Curriculum Studies, University of Nairobi.
- Al-Qaradawi, Y. (Undated). *The Lawful and Prohibited in Islam*. Available at: <http://thequranblog.files.wordpress.com/2010/06/the-lawful-and-the-prohibited-in-islam.pdf> (accessed on 3/12/2014).
- African Union-InterAfrican Bureau for Animal Resource (AU-IBAR). 2013. Impact of livestock diseases in Africa. Available at: <http://au-ibar.org/vacnada-livestock-diseases?showall=&limitstart> (accessed 29/11/2014).
- Bamhare, C. 2001. CBPP Surveillance in Vaccinated Areas: Namibia Experience with CBPP Vaccines Prepared from the T1-44 and T1-SR Strains: In *Proceedings of the Second Meeting of the FAO-OIE-OAU-IBAR-IAEA Consultative Group on Contagious Bovine Pleuropneumonia (CBPP), 24-26 October, 2000*. Rome, Italy, Food and Agriculture Organization of the United Nations (FAO), Rome, Italy.
- Barnes, V. L. and Boddy, J. 1994. *Aman the story of a Somali girl*. New York. Pantheon books.
- Bbalo, G. C. 1991. An Epidemiologic and Socio-economic Assessment of the Control of Contagious Bovine Pleuropneumonia (CBPP) in Western Province, Zambia. Suggestions as to future Strategies. MSc. Dissertation. University of Reading: Reading, UK.
- Biro, E., Ndirangu, L. Roy, D and Yakhshilikov, Y. 2011. Assessing the Livelihood Impacts of a Livestock Disease Outbreak. An Alternative Approach. Discussion Paper No. 1081, Washington DC, USA: International Food Policy Research Institute.
- COMESA. 2009. Hidden Value of the Hoof: Cross-border Livestock Trade in Eastern Africa. Policy Brief no. 2, February 2009. Comprehensive African Agriculture Development Programme.
- FAO (Food and Agriculture Organization of the United Nations). 2012. Invisible guardians: women manage livestock diversity. Rome, Italy: FAO.
- FAO (Food and Agriculture Organization of the United Nations). 2011. The State of food and agriculture. Women in agriculture: Closing the gender gap for development. Rome, Italy: FAO.
- FAO (Food and Agriculture Organization of the United Nations). 2010. The State of Food Insecurity in the World: Addressing food insecurity in protracted crises. Rome, Italy: FAO.
- FAO (Food and Agriculture Organization of the United Nations). 2002. Improved animal health for poverty reduction and sustainable livelihoods. Rome, Italy: FAO.
- FAO (Food and Agriculture Organization of the United Nations). 2004. Development programmes must take account of gender roles that shape the small-scale livestock sector. Rome, Italy: FAO.
- Heffernan, C., Thomson, K. and Nielsen, L. 2008. Livestock vaccine adoption among poor farmers in Bolivia: Remembering innovation diffusion theory. *Vaccine*, 26, 2433 – 2442. doi:10.1016/j.vaccine.2008.02.045.
- Huffington Post. 2014. *Hajj 2014, Islam's Pilgrimage to Mecca: Facts, History and Dates of the Muslim Holiday*.
- IFAD (International Fund for Agricultural Development). 2009. *Livestock and pastoralists. Livestock thematic papers*. Rome, Italy: IFAD.
- Kristjanson, P., Waters-bayer, A., Johnson, N., Tipilda, A., Njuki, J., Baltenweck, I., Grace, D. and Macmillan, S. 2010b. *Livestock and women's livelihoods: A review of the recent evidence*. Discussion Paper 20. Nairobi, Kenya: ILRI.

- Lewis, P. 1994. *Islamic Britain: Religion, politics and identity among British Muslims*, London: I.B.Tauris.
- Mariner, J. C. and Catley, A. 2004. The Dynamics of CBPP Endemism and Development of Effective Control Strategies: In *Towards Sustainable CBPP Control Programmes for Africa. Proceedings of the Third Meeting of FAO-OIE-AUI/IBAR-IAEA Consultative Group on Contagious Bovine Pleuropneumonia* 12-14 November 2003. Rome, Italy.
- MEMR and NEMA. 2013. Ijara District: Environment Action Plan 2009-2013.
- Miller, B. 2001. Rights to Livestock. In *Empowering Women to Achieve Food Security*. Quisumbing, A. and Meizen-Dick, R. (eds). Washington DC, USA: International Food Policy Research Institute.
- Mlengeya, T. 1995. Current status of Contagious Bovine Pleuropneumonia (CBPP) in Tanzania: In *National Conference of the Tanzanian Veterinary Medical Association*. 15 May 1995. Arusha, Tanzania. 3: 1-11. Department of Veterinary Services, Dar-es-Salaam, Tanzania.
- Morgan, N. and Prakash, A. 2006. International livestock markets and the impact of animal disease. *Revue scientifique et technique International Office of Epizootics*, 25 (2): 517-528.
- Nassens, J. 2011. Antimicrobials and improved diagnostics towards integrated control of CBPP. Available at: <http://www.ilri.org/node/1165> (accessed 12/12/2014).
- Njuki, J. and Sanginga, P. 2013. Gender and Livestock: Key issues, challenges and opportunities. In *Women, livestock ownership and markets: Bridging the gender gap in eastern and southern Africa*. Jemimah Njuki and Pascal Sanginga (Eds). New York: Routledge.
- Nori, M. 2010. Along the Milky Way: Marketing Camel Milk in Puntland, Somalia. *European Journal of Development Research*. Vol. 22 Issue 5, p696
- Otte, J., Nugent, R. and McLeod, A. 2004. *Transboundary animal diseases: Assessment of the social impacts and institutional responses*. Rome, Italy: FAO.
- Perry, D., Randolph, F., McDermott, J., Sones, R. and Thornton, K. 2002. *Investing in Animal Health Research to Alleviate Poverty*. Nairobi, Kenya: ILRI.
- Phan Van Luc., Le Thi Mong Phuong., Pinnors, E., Purcell, T., Son, T.T. and Trung, P.Q. 2007. The economic impact of highly pathogenic avian influenza-related biosecurity policies on the Vietnamese poultry sector. In: *Future of Poultry in Viet Nam after HPAI*. FAO Workshop Proceedings. 2007.
- Quisumbing, A. 2003. What have we learned from research on intra-household allocation. In A. Quisumbing (ed.) *Household decisions, gender and development: A synthesis of recent research*. Washington, DC: IFPRI.
- Schwabe, C.W. 1984. *Veterinary medicine and human health*. 3rd edition. Baltimore, USA, Williams and Wilkins.
- Sori, T. 2005. Contagious Bovine Pleuropneumonia (CBPP) Post-Vaccinal Complication in Ethiopia. *International Journal of Applied Research in Veterinary Medicine* 3(4), 344-350.
- Tambi, N. E., Maina, W. O. and Ndi, C. 2006. An estimation of the economic impact of contagious bovine pleuropneumonia in Africa. *Revue scientifique et technique International Office of Epizootics*, 25(3):15-17.
- Teshale, S. 2005. Contagious Bovine Pleuro-pneumonia (CBPP). Post-vaccinal Complication in Ethiopia. *Bulletin of Animal Health and Production in Africa*, 53: 242-250.
- Thiaucourt, F., Dedieu, L., Maillard, J. C., Bonnet, P., Lesnoff, M., Laval, G. and Provost, A. 2003b. Contagious Bovine Pleuropneumonia: Vaccines, Historic Highlights, Present Situation and Hopes. *Developments in Biological Standardization*, 114: 147-160.
- Thiaucourt, F., Yaya, A., Wesonga, H., Huebschle, O.J.B., Tulasne, J.J. and Provost, A. 2000. Contagious bovine pleuropneumonia: A reassessment of the efficacy of vaccines used in Africa. *Annals of the New York Academy of Science*, 916: 71-80.
- Thomson, G. 2005. *Contagious bovine pleuropneumonia and poverty: A strategy for addressing the effects in sub-Saharan Africa*. DFID Animal Health Programme, Centre for Tropical Veterinary Medicine, University of Edinburgh, UK.
- Tulsane, J., Litamoi, J.K., Morein, B., Dedieu, L., Palya, V.J. and Yami, M. 1996. Contagious bovine pleuropneumonia vaccines: the current situation and the need for improvement. *Revue Scientifique et technique Office International des Epizootie*. 15 (4), 1373-1396.
- Twinamasiko, E. K. 2002. Development of an Appropriate Programme for the Control of Contagious Bovine Pleuropneumonia in Uganda. Ph.D. Thesis. University of Reading: Reading, UK.

- Upton, M. 2004. "The Role of Livestock in Economic Development and Poverty Reduction. Pro-Poor Livestock Policy Initiative Working Paper 10, Rome, Italy: FAO.
- Velasco, E., Dieleman, E., Supakankunti, S. and Phuong, T. 2008. *Gender Aspects of the Avian Influenza Crisis in Southeast Asia: Laos, Thailand and Vietnam*. London, United Kingdom: HTSPE Ltd
- Waithanji, E., Wanyoike, S. and Liani, M. 2015a. The role of gender and other socioeconomic factors in the adoption of the Contagious Bovine Pleuropneumonia (CBPP) vaccine. Discussion Paper 29. Nairobi, Kenya: ILRI. <https://cgspace.cgiar.org/handle/10568/56926>
- Waithanji, E., Mtimet, N. and Muindi, P. 2015b. Delivery of, and the gendered willingness to pay for the Contagious Bovine Pleuropneumonia Vaccine. Discussion Paper 31. Nairobi, Kenya: ILRI. <http://hdl.handle.net/10568/67322>
- Webb, P. 2009. The Hajj before Mohammed: Journeys to Mecca in Muslim Narrative of Pre-Islamic History. In: *Hajj: Collected Essays*. London, United Kingdom: British Museum, pp. 6-14.
- Wesonga, H., Soi, R., Potter, A. and Gerdts, V. 2011. The socio-economics of CBPP and its control by vaccination: A gendered study of the factors that influence the acceptability and adoption of the CBPP vaccine by livestock keepers.
- Wesonga, H and Thiaucourt, F. 2000. Experimental Studies on the Efficacy of T1SR and T1/44 Vaccine Strains of *Mycoplasma mycoides* subspecies *mycoides* (small colony) Against a Field Isolate Causing Contagious Bovine Pleuropneumonia in Kenya-Effect of a Revaccination. *Revue d'Élevage et de Médecine Vétérinaire des Pays Tropicaux*, 53: 313–318.
- Windsor, R. S. and Wood, A. 1998. Contagious Bovine Pleuropneumonia: The Costs of Control in Central/Southern Africa. *Annals of the New York Academy of Science*, 849:299-306.
- World Bank, FAO and IFAD. 2009. *Gender in Agriculture Sourcebook*. Module 14: Gender and livestock. Washington, DC: World Bank.
- World Bank. 2005. *Gender Issues in Monitoring and Evaluation in Rural Development: A Toolkit*. Internal report, June, Washington, DC: World Bank.
- Yaya, A., Golsia, R., Hamadou, B., Amaro, A. and Thiaucourt, F. 1999. Comparative trial of two vaccinal strains for CBPP, T₁44 and T₁SR, in Cameroon. *Revue d'élevage et de médecine vétérinaire des pays tropicaux*, 52:171–179.

Appendix

FGD checklist: Social and economic factors that influence acceptability and adoption of CBPP vaccine by livestock owners/keepers

Gender of the group:

Name of location:

Number at beginning:

Number at end:

Number lasting throughout the FGD:

Date of FGD

Start time:

Finish time:

I. Background information:

- a. Proportion of women, men and children in the community (proportion piling)
- b. Characterization of community members by wealth:
List the wealth categories
By proportion piling demonstrate the distribution of the population according to main wealth categories used by the community (categories should not exceed five, but must be at least two)
For each category mentioned, list the identifying characteristics
- c. Proportion of people of different marital status in the community (proportion piling for each status)

Marital status	Men	Women
Married		
Single never married		
Divorced		
Widowed		
Other (explain)		

Explain the proportions

- d. On average, how many times does a man re-marry in his lifetime? (Group may also give a range and explain the variation)

Explain.

- e. What is the average family size? (Family consists of a man, his wives and children or a woman and her children)
- Male headed household
 - [Dejure] Female headed household (divorced, widowed, or single never married)
- f. Do your daily routines change in the year, or do you do the same things all year round? If they change, when do they change?
- g. Roles and responsibilities
- On an average day what do you do from when you wake up to when you go to sleep?
(Activity clock – make two clocks if there is a distinct variation in seasons)
- h. Clan/sub-clan composition of community (List clans and sub-clans available)
- i. What proportions of the population constitute five of the largest clans/sub-clans? (Proportion piling)
- j. Clan/sub-clan composition of FGD (headcount by show of hands)

2. Livestock distribution in the community

- a. What are the main livestock species in this community (list)?
- b. How is each species distributed among the five dominant communities (proportion piling)? —decide on number of species to consider depending on proportion
- c. Preference of livestock owned by men/women in the community (pairwise ranking)

Cattle

3. Ownership of cattle by women and men

- a. What is the average number of cattle in an average wealth MHH and FHH?
MHH
FHH
In a MHH and FHH, what proportion of cattle are owned by:
- Men
 - Women
 - Others
 - Who are the others
- b. What do you mean when you say that a man owns cattle? What does/can he do with the cattle he owns that makes/can make you confirm that he is the owner? (wait for spontaneous responses and if having difficulty ask (probe) if they can give them away or sell them without consulting, who to consult, if there is a disagreement whose decision carries the day, etc.)

- c. What do you mean when you say that a woman owns cattle? What does/can she do with the cattle she owns that makes/ can make you confirm that he is the owner? (*wait for spontaneous responses and if having difficulty ask (probe) if they can give them away or sell them without consulting, who to consult, if there is a disagreement whose decision carries the day, etc.*)
- d. [*If joint ownership was not mentioned, ask if cows can be jointly owned*] When you say cattle are jointly owned by women and men, what do you mean?
- e. What are the benefits for women who own cattle?
 - Who else benefits when women own cattle?
 - In what ways?
- f. What are the benefits for men who own cattle?

4. Cattle related roles and responsibilities

- a. What cattle related activities are conducted in a household? (List)
- b. Of these, which are done by
 - men only
 - women only
 - children only and
 - a combination of two or more of the above categories

5. Cattle diseases

- a. What are the common cattle diseases in this community?
 - Which are more important? (pairwise ranking)
 - For the five most important, how are they controlled – vaccination, treatment or both?

6. Contagious bovine pleuropneumonia (CBPP)

[Prior to the interview, obtain the different names of this disease in local dialect from KII – give a few names and ask the FGD participants to provide the rest. Agree on what name to use to refer to the disease and use it to discuss the following]

Knowledge of disease, its control and sources of information

- a. What are the signs of the disease (CBPP)?
- b. How are you able to tell that it is CBPP and not another disease?
- c. Is it possible to confuse it with other diseases? Which ones, and why?
- d. When did the last CBPP outbreak occur?
- e. How did you learn about the outbreak?
- f. Is this how you normally obtain information on disease outbreaks?

- How else are you able to obtain information on disease outbreaks?
- How [else] would you like to be informed about disease outbreaks in general?
- How do you control CBPP?

Vaccination

- a. Of the cattle owning households, what proportion vaccinate their cattle if an outbreak is reported?(proportion piling)
- b. Discuss the proportions – why they are high and/or low?
- c. Why don't the non-vaccinating households want to vaccinate?
- d. For vaccinating households:
 - Who decides whether to vaccinate or not?
 - o Why?
 - o If joint decisionmaking and there is conflict of interest between decision makers, whose decision is taken? Why?
- e. For households with men-only and women-only cattle, are they all vaccinated or not vaccinated or are there variations?
 - What are the variations? [See if they relate to the ownership status]
- f. What are the benefits of vaccinating against CBPP?
- g. What are the challenges of vaccinating against CBPP?
- h. What are the alternatives to vaccinating against CBPP? (List)
 - What alternative is most popular?
- i. What are the benefits of the most popular alternative to vaccinating against CBPP?
- j. What are the challenges of the most popular alternative to vaccinating against CBPP?
- k. If you were to recommend a most appropriate vaccine against CBPP, what would be its most desirable characteristics? (List and rank)

Impact of CBPP outbreak

- a. How is a household impacted by an outbreak of CBPP? Explain in detail what happens to an average wealth household from when they are told that their cattle have contracted CBPP to when they finally bring the outbreak under control
 - What immediate measures are taken and by who? (List action and for each action, the actor(s) on affected and other herds – while specifying the others)
 - Why for each measure?
 - What does one mean when they say that the outbreak is now under control?
 - On average, how long does it take to bring an outbreak under control?
 - How long does it take to go back to normal production and productivity levels?

Impact of vaccinating against CBPP (PID)

What are the anticipated (positive and negative) impacts on households that vaccinate their cattle? Impacts are seen 10–15 years after eradicating disease through vaccination [*Let the group talk for about five minutes without interrupting them—the interpreter should explain what they are saying as they speak and facilitator and note-taker taking notes and probing the conversation through the interpreter*]

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