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**The Influence of Communication Messages on Adoption of Contagious Bovine
Pleuropneumonia (CBPP) Vaccine among Arid and Semi-Arid Lands (ASAL)
Pastoralists in Kenya**

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The Influence of Communication Messages on Adoption of Contagious Bovine Pleuropneumonia (CBPP) Vaccine among Arid and Semi-Arid Lands (ASAL) Pastoralists in Kenya



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Abstract

Purpose: The purpose was to establish influence of communication messages on adoption of Contagious Bovine Pleuropneumonia (CBPP) Vaccine among Arid and Semi-Arid Lands (ASAL) pastoralists in Kenya. Messages were studied under parameters of inoculation site, benefits, required frequency of vaccination and side effects. The focus on the vaccine messaging was informed by the slow pace of adoption of live T1 vaccines currently being used to eradicate CBPP in Kenya. Diffusion of innovation and social learning theories were used to support the study.

Methodology: Study population were pastoralists in Narok South Sub County. 468 respondents inclusive of qualitative and quantitative samples where 440 responded to questionnaire, 24 in focus group discussions, and 4 in key informant interviews participated. Multi stage, purposive, simple random, systematic and stratified sampling techniques were then employed to come up with respondents. Statistical Package for Social Scientists (SPSS) version 20.0 was used to analyze data, which was presented using regression coefficients and ANOVA.

Findings: CBPP messaging influenced respondents to vaccinate although some had more influence than others. Messages on inoculation site, benefits, required frequency of vaccination side effects and communal vaccinations were important for the survival of their cattle and significantly influenced the decisions of respondents to vaccinate against the disease. Moreover, messages helped them to know important information details such as vaccination venues, and costs of vaccination and availability of the veterinary officers. CBPP vaccine messages attributes were key in the success of influencing respondents. However, the messaging ran into already held misinformation by some pastoralists confirming earlier study that vaccination rate was at 20-60% because some skipped the exercise.

Unique Contribution to Theory, Practice and Policy: CBPP vaccine messages and attributes significantly influenced CBPP vaccinations decisions among pastoralists. This study validated diffusion of innovation and social learning theories that innovation-decision process is essentially an information seeking and processing activity in which an individual is motivated to reduce uncertainty about the advantages and disadvantages of the innovation. For policy and practice, this study recommends development of communication plans, and packaging of CBPP vaccine messages for dissemination in the ASALs where disease is prevalent. Considering that CBPP is a trans-boundary disease, these plans and messages could be harmonized across ASAL counties to enable consistency and coherence.

Keywords: *Communication, Messages, Influence, Adoption*

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INTRODUCTION

Communications plays a vital role in adoption of innovation (Rogers 2003, McQuail et al.1981) particularly in acquisition of agricultural technology. Roger's (1962) study on diffusion of innovations, and others (among them Roman 2004, Díaz-Bordenave 1976, Feder et al., 1985, Gafsi et al., 1979, Coleman 1966, Grunig 1971) in ICTs, agriculture, health, education, and economics show how this happens. Rogers (1995) sees diffusion of innovations as a social process in which subjectively perceived information about a new idea is communicated because individuals adopt new innovation based on information they have gathered about it. Rogers (2003) says the innovation-decision process is essentially an information-seeking and information-processing activity in which an individual is motivated to reduce uncertainty about the advantages and disadvantages of the innovation.

CBPP is a highly contagious disease of cattle lung which spreads through direct contact with cough droplets, facilitated by crowding of animals (Provost et al., 1987). Currently, the disease is controlled mainly by use of vaccines, but adoption by smallholder livestock farmers is low at 20- 60 % (Wanyoike, 1999) leaving many pastoralist communities vulnerable to losses. The devastating effect to livelihoods due to sickness and mortality for 24 million people in 19 African countries who rely solely on livestock is estimated at US\$41 million of which US\$6.4 million is attributed to Kenya (Thompson 2005, Tambi et al., 2006). World Organization for Animal Health (OIE 2014, OIE 2008) considers it a notifiable disease, and CBPP infected countries are excluded from international trade of live animals. The presence of this trans-boundary disease is not only a threat to production but also to international market of meat, hides and skins (Kuti, 2012). Its control in Kenya is urgent because it threatens establishment of disease free zones, envisaged in the economic pillar of the country's development blue print Vision 2030. The government has since 1980's and 90's provided pastoralists' cattle, particularly in Arid and Semi-Arid Lands (ASAL) with CBPP vaccinations, but the diseases has not been wiped out of Kenya. This points to a possibility of "vaccine hesitancy", defined by World Health Organization in medicine as a delay in acceptance or refusal of vaccines despite availability of vaccination services (MacDonald 2017). This study was informed by the slow pace of adoption of a T1 vaccine to eradicate CBPP in Kenya.

The study to investigate the role communication messages played in influencing adoption of CBPP was justified (McQuail et al., 1981 and Lowery et al., 1995) because mass communication and research was important in the process of encouraging adoption of innovations where scientific research have to be applied to replace old methods with new technologies

Research Objective

To examine the influence of communication messages on adoption of CBPP vaccine among ASAL pastoralists in Kenya

Research Hypotheses

H₀.1: There is no significant relationship between influence of messages and adoption of CBPP vaccine among ASAL pastoralists in Kenya.

LITERATURE REVIEW

Messages characteristics affects persuasive impact of achieving maximum learning and agreement in individuals. The manner in which the message is organized, the type of appeal given, the number of repetitions, the vividness of language used, and more, can influence the persuasive process (Witte, 1995). It is also important for a message to be simple without being

reductionist (Flay et al., 1990). Short of this, it is likely that the receiver may totally misrepresent the message. McQuail et al., (1993) recommended that the audience ought to know who is communicating to them. When the audience question the authenticity and legitimacy of the message, it is likely to be rejected. Braddocks (1958), says that though message is an important factor of communications, so is the circumstances under which a message is sent, and for what purpose the communicator sends the message. Pannell (1999) says that slow adoption of a new technology may be as a result of a rational wait for more high-quality information about its value to become readily available rather than some intractable attitudinal or social barrier to change. Llewellyn, (2007) support the possibility that characteristics of information quality contribute to whether particular extension information is considered or dismissed. Occasionally, closer attention to information-related factors in adoption decisions can reveal learning-related constraints that may have otherwise have been attributed to sociological or psychological factors deemed to be beyond the potential influence of most agronomy research projects (Baerenklau, 2005). In the case of CBPP vaccine, Waithanji *et al.*, (2015) found that one of the barriers of adoption among women included their inability to access extension information on the disease, its control and benefits.

Variables related to the source of the message e.g. credibility, attractiveness, legitimacy, similarity or power may sound subtle (McGuire, 1969) but they have significant impact on whether an audience takes the message seriously and are motivated to act on it. McQuail *et al.*, (1993) further observed that often the communicator and the receiver get different meanings from a message and yet communication planners frequently overlook this disparity. The result, of course is ineffective communication. When planners take note of such disparities and try to reach a mutual understanding between sender and receiver, then effective communication is possible. Kreps and Thornton (1992) concur with this principle. They observed that

“.....to develop messages, the key attributes of the audience for whom they are intended is important. Messages must appeal to specific audience since those who do not perceive the campaign as personally relevant are unlikely to pay attention, interpret, recall or heed advice offered.....”

Theoretical Framework

The present study draws from two theories, diffusion of innovation (Rogers, 1995) and social learning (Bandura, 1977). In diffusion of innovation theory Rogers (1995) views diffusion of innovations as essentially a social process in which subjectively perceived information about a new idea is communicated. The most important features about the work on diffusion is the weight given to non-media (often personal), sources (neighbours, experts, etc.), the existence often of a campaign situation in which behavioural changes are sought by giving information and trying to influence motivations and attitudes.

On the other hand, social learning theory (Bandura, 1977) was relevant in agriculture because farmers were actively engaged in learning activities to find better technologies. They were associated by what they did and learnt together, and they observed, imitated and compared their own practices to those of other farmers in the neighborhood. In adoption livestock innovations the theory emphasized systemic learning, which occurred through collective engagement with others rather than the isolated activity of an individual and was particularly relevant in situations characterized by complexity, uncertainty, interdependency, having multiple stake holding and controversy (Collins et al., 2009).

Vast literature on adoption of livestock vaccines also exists (Heffernan et al. 2008, Heffernan et al. 2011, Bhattacharyya 1997, Beck et al. 1993, Rezvanfar 2007). In Africa and other developing countries, livestock vaccine adoption literature includes Heffernan et al. (2000), Fandamu et al. (2006), O'Mara (1971), Karanja-Lumumba et al. (2015), Homewood et al. (1975) Homewood et al. (2006), Kairu-Wanyoike et al. (2014), Kairu-Wanyoike et al. (2010), Waithanji et al. (2015) and LID (1998). However, adoption was presumed to be a socio economic issue focusing on gender, poor farmers' "willingness to pay", vaccine delivery issue or a function of the characteristics of the adopters, perceptions and attitudes towards vaccination itself. However, most these studies did not focus on Kenya, and those that did only gave an indication that communication was in one way or another involved in adoption of CBPP vaccine. The continued existence of the disease in the ASALs of Kenya led to the focus on the human problem, particularly on two gaps- did message factors influence adoption of CBPP vaccine? What were the attributes of these messages? The purpose of this study was to close this knowledge gap.

METHODOLOGY

Study Population and Site

The study used mixed method design which entailed merging qualitative and quantitative data to provide findings. The study population were pastoralists of Narok South Sub County. The site was selected for several reasons; first, the respondents owned big number of herds. Secondly, the population had a deep knowledge of CBPP and benefits of its control because 11 out of 16 CBPP outbreaks recorded in Kenya since independence were in Narok South sub-county; principally in Mara and Loita. Also, the study area has been under permanent CBPP quarantine for many years (Wanyoike 1999, Kairu-Wanyoike et al., 2014).

Sample Size and Sampling Techniques

The quantitative sample size for this study was determined according to Pagano and Gauvreau (2006), formula designed for large populations. The sample size was calculated using the following formula;

$$n = \frac{Z^2 \times p \times q \times N}{e^2(N-1) + Z^2 \times p \times q}$$

$$n = \frac{1.96^2 \times 0.5 \times 0.5 \times 62412}{(0.05)^2 (62412-1) + 1.96^2 \times 0.5 \times 0.5}$$

$$n = 381.82$$

$$p = 0.5, q = 0.5, Z = 1.96, e = 0.05 \text{ where}$$

n= sample size, N= entire population, Z= level of significance (1.96 confidence level), E= Expected error, p= Probability of occurrence, q= probability of non-occurrence

The sample size of 382 will be over sampled in order to achieve a response rate of 90 percent using the following formula:

$$\text{Number of tools} = \frac{100}{90} \times 382 = 424 + 16 = 440 \text{ respondents}$$

Sixteen additional respondents were included, as the rule of thumb (Mugenda et al., 1999) was to obtain a big sample as possible. Therefore, size for the entire study totaled 468 respondents inclusive of both qualitative and quantitative samples where 440 responded to the questionnaire, 24 participated in 4 focus group discussions, and 4 respondents in key informant interviews. Multistage- purposive, simple random, systematic and quota sampling was used to achieve adequate representation from mixed farming, agro pastoralists, and pastoralists sub samples. Statistical Package for Social Scientists (SPSS) version 20.0 was used to analyze data and results presented using regression coefficients and ANOVA. Table 1 below is a summary of the sample size including focus group discussion and key informant interviews.

Table 1: Study Sample Size

<i>Div</i>	<i>Pop</i>	<i>H/H</i>	<i>HHs</i>	<i>SL</i>	<i>MF</i>	<i>P</i>	<i>AP</i>	<i>Total</i>	<i>FGDs</i>	<i>KII</i>
Loita	22,873	4,409	136	Olngarua	0	39	41	84	0	0
				Nkopon	0	24	27	52	6	0
Mara	67,365	14,140	304	Sekenani	3	49	0	53	6	0
				Aitong	5	80	0	89	6	0
				Olkinyei	3	49	0	53	0	0
				Siana	7	97	0	109	6	0
										4
Total sample					18	338	68	440	24	4

Key: Div- Division, Pop- Population HH- Households, HHS- Household Sample, SL- sub location, MF-Mixed Farmers, P- Pastoralists, AP- Agro Pastoralists, FGDs- Focus Group Discussions, KII- Key Informant Interviews

RESULTS AND DISCUSSIONS

The results are discussed under parameters of inoculation site, benefits, required frequency of vaccination and side effect messages. Therefore, 94.8% were influenced by messages on benefits, 88.9% agreed with the practice of a collective community decision to vaccinate within a specified time, 88.7 % agreed with assurances messages that veterinary experts were best placed to determine the inoculation site. 80.3% said the vaccine elicited side effects on some cattle, but this did not influence their decision to not to vaccinate. 74.8% heeded to veterinary officers' advisories to vaccinate twice a year. CBPP vaccine messages that influenced adoption are shown in Table 2 below.

Table 2: CBPP Vaccine Messages

Influence of messages	<i>Strongly Disagree (1)</i>	<i>Disagree (2)</i>	<i>Don't Know (3)</i>	<i>Agree (4)</i>	<i>Strongly Agree (5)</i>
People tell me that benefits of vaccinating is to prevent my cattle from getting CBPP	18(4.1)	3(0.7)	2(0.5)	55(12.5)	362(82.3)
I vaccinate twice a year because people have told that this the required frequency of vaccination	18(4.1)	50(11.4)	43(9.8)	197(44.8)	132(30.0)
I have been told that that vets experts are best placed to determine inoculation site so I vaccinate, because that does not worry me	7(1.6)	26(5.9)	17(3.9)	120(27.3)	270(61.4)
Some people say that that CBPP vaccine has side effects on some cattle whose tails fall off, but this has not influenced my decision to not to vaccinate	38(8.6)	42(9.5)	7(1.6)	186(42.3)	167(38.0)
I'm often influenced by a collective decision to vaccinate cattle within a specified time as agreed with the community.	7(1.6)	40(9.1)	2(0.5)	216(49.1)	175(39.8)

*values in parenthesis are percentage.

It is widely acknowledged that pastoralists have a migratory behavior and respondents often drove their herds to graze in distances away as far as Tanzania. This movement exposed their animals to CBPP, a highly contagious disease of cattle lung which spreads through contact with other infected animals. For this reason, all the messages, inoculation site, benefits, required frequency of vaccination and side effect messages were important for the survival of their cattle and significantly influenced the decisions of respondents to vaccinate against the disease. Moreover, CBPP messages helped them to know important information details such as vaccination venues, and costs of vaccination and availability of the veterinary officers. Wanyoike -Kairu et al., (2014) described the days as, “big community events”. Quantitative finding was corroborated by the focus group discussions;

RQ: How would you describe the CBPP vaccination messages the community receives?

R: These messages on vaccination are delivered for us assemble all our animals at a certain point. Our animals graze as far as Tanzania, but we bring them back on time for vaccination so timeliness of vaccination message is of essence to us. Most of CBPP vaccination messages are advisories. We have been told if we don't, government officials will keep our animals under quarantine. It is difficult to miss CBPP vaccination messages because the consequences.

The study's findings corroborated with Birnbaum and Mellers (1983) McGuire (1969), Eagly (1974, Hovland et al., (1949), Petty et al., (1986) among others, that people aggregated the average strength of evidence before making decisions. These innovation decisions were classified (Harris, 1972) into three types: optimal, collective and authority determine adoption. Whereas an 'optimal innovation decisions' was based on individual decision-making irrespective of the wider social system, 'authority innovation decisions' were made by a select

group of powerful individuals while the ‘collective innovation decision’ forged were by group agreement. The two latter decisions seemed to have been applied in Narok South sub county, one by the government which communicated enforcement of vaccinations and quarantines, and the other by the residents themselves who organized themselves to have their animals vaccinated.

Pastoralists were advised (GoK 2003, Wanyoike et al., 2014) to vaccinate twice a year to achieve herd immunity. Although messages on accruing benefits of vaccination were well received by respondents who perceived vaccination to be the solution to CBPP, because “it keeps the disease away for at least 6–12 months”, almost half of the respondents did not comply with the requirement to vaccinate twice a year. But in cases where pastoralists failed to present animals, veterinary officers communicated messages of continued enforcement of the quarantine which was found to be unpopular with the pastoralists. Quarantine is where movement of cattle was restricted within the infected zone and movement was only allowed to designated slaughterhouses. As a result of these fear messages, disease outbreaks sometimes went unreported, deterring 24.9 % respondents from vaccinating (Kairu-Wanyoike et al. 2004, Wanyoike 1999). The scholars summed up results of CBPP vaccine misinformation, “some pastoralists confused vaccination with treatment to the extent that they hid their cattle during vaccinations due to fear of adverse post-vaccination reactions”. This kind of defiance is explained by Heilman and Garner (1975) as a choice left for receivers of “unfavourable” information from powerful source such as government. When threatened by a powerful source, the receivers were left with a choice between two evils: engage in the non-preferred activity (recommendation) or bear the punishment. Othieno (2020) says audience groups can become avoiders and blockers due to lack of adequate information negative impact on their livelihoods. Connolly (2019) further explains this aspect of human behavior through the conspiracy theory. The theory advances that audiences are a suspicious lot especially when a few people or elitists seemed to be pushing an issue construed to benefit them and not the masses. Kairu-Wanyoike et al., (2014), also reported discomfort on the choice of inoculation site on the tail, “for effectiveness, vaccination should through the ribs as it is close to the lungs or in the neck because it is close to the jugular”. In this inquiry, respondents reported being assured that veterinary experts were competent enough to make the determination. This phenomenon is best explained by theory on dissonance (Festinger,1957) as psychologically uncomfortable but respondents seemed found to have sought consonance by convincing themselves that vaccinated cattle survived CBPP outbreaks.

The study results on attributes of CBPP messages were believability (82.1%), trustworthiness (71.1%), use of Kimasaai language (70.6 %), timeliness (68.8%), comprehensibility (64.4%), repetitiveness (58.7 %), approval by kin and community (41.3%) and high appeal (34.9%). Several scholars underscored the importance of message attributes in communication. Eagly (1974) says receivers must understand a message before they accept conclusions while Kelman’s (1958), advanced that compliance with message recommendation depended on comprehension of the arguments and on rewards promised by the message. Responses of the attributes of CBPP vaccine messages were tallied and demonstrated in Table 3 below.

Table 3: Attributes of CBPP Vaccine Messages

Attributes of CBPP vaccine messages	Frequency	%
The advice is usually believable	358	82.1
I usually trust source (people) who advise me	310	71.1
The advice is delivered in language I understand	308	70.6
I'm usually informed on good time for me to prepare for vaccination	299	68.6
The details are usually simple to understand	281	64.4
Sometimes, the advice is delivered repeatedly to remind me	256	58.7
Kin (either husband, wife ,family, community, neighbors) always approve advice to vaccinate	180	41.3
The advice does not alarm me	152	34.9
Others-----	10	2.3
Total	436	100.0

Results on message attributes were corroborated by other experimental studies on persuasion, among them Kelman (1958), Kelman and Hovland (1953), Birnbaum and Meller (1983), Eagley and Chaiken (1975). Muchunku (2015), and Rogers (1995), says it was important for audiences to know who was communicating to them because if they questioned the authenticity and legitimacy of the message, it was likely to be rejected (McQuail et al., 1993). Approval of CBPP vaccine messages by kin and community was reported as important, because (Hovland et al., 1951) acceptance of a messages was associated with social approval. Kimasaai, a language understood by all respondents was particularly an important attribute of CBPP messaging. Local language, (Ochichi 2013, Nabusoba 2012) was effective in development communication and so goes a popular adage, “speak to people in your language, message goes into their mind, but speak to them in their language and it goes to their hearts”. Results on the inquiry on CBPP vaccine messages and attributes are shown in Fig 1 below.

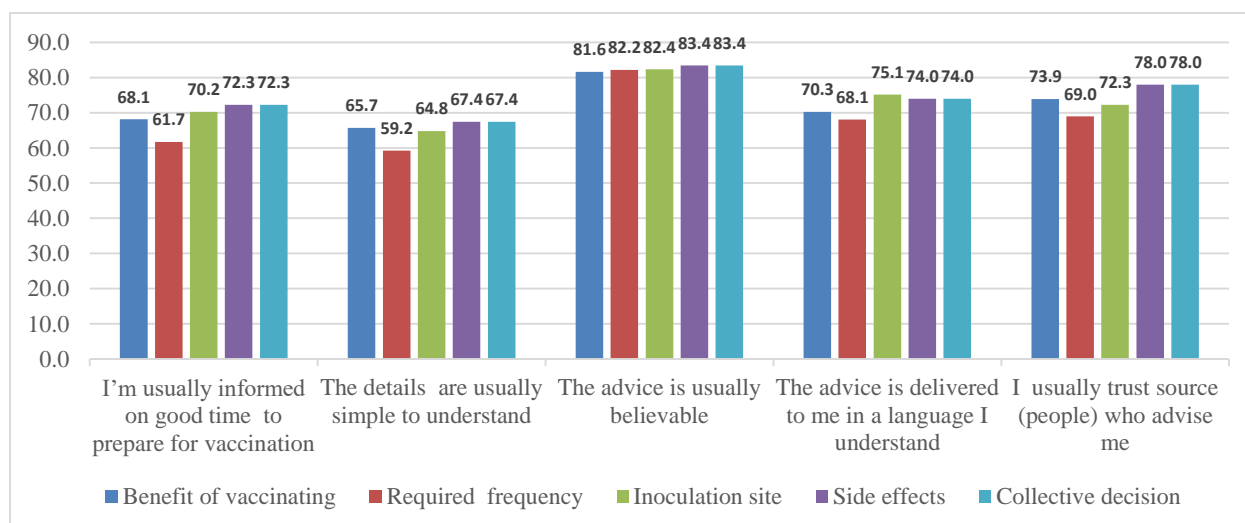


Figure 1: Most Influential CBPP Communication Messages and their Attributes

Respondents (47 %) who did not vaccinate biannually were asked why they did so. They reported the following challenges; clarity (73.7%), distrust for vaccination messengers (59.8%), believability (56.2%), timeliness (47%), repetitiveness (46.8%), disapproval by kin and community (40.5%) and fear appeals (24.9%) of messages. These responses seem support current scientific data of 20-60% adoption of CBPP vaccine in the study area. Witte (1995), and Flay and Burton (1990) say on message attributes, corroborating with the study outcome;

“The manner in which the message is organized, the type of appeal given, the number of repetitions, the vividness of language used, and more, can influence the persuasive process It is also important for a message to be simple without reductionist. Short of this, it is likely that the receiver may totally misrepresent the message”.

Regression Coefficients

Communication messages and adoption of CBPP vaccine were subjected to regression coefficients analyses as shown in Table 4 below

Table 4: Regression Coefficients

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t-test	P-value.
		B	Std. Error	Beta		
1	<i>(Constant)</i>	-.029	.055		-.519	.604
	Communication Messages	.236	.039	-.279	-6.118	.000

Dependent variable: Adoption of CBPP

In table 3 above, the p-value (0.0000) is significant at 1%, this implies that the regression model is highly significant and we therefore conclude that the communication messages significantly influence adoption of CBPP vaccine. Therefore, the model can be defined as;

$Y = -.029 + 0.236X_1$, where Y= Adoption of CBPP and X_1 =Communication Messages. However, this regression model was tested further using ANOVA in order to determine whether it is adequately fit to predict the dependent variable.

Analysis of Variance

The study conducted analysis of variance (ANOVA) to determine how independent variables (communication messages) were influential and useful in predicting the dependent variable, in this case adoption of CBPP vaccine. The result in table 5 below shows that the p-value <0.000 is highly significant at 1%. The study therefore concluded that the communication messages significantly influence adoption of CBPP vaccine and useful in predicting the dependent variable as shown in Table 5.

Table 5: ANOVA Analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	204.016	1	204.016	26.434	.000 ^b
	Residual	3380.448	438	7.718		
	Total	3584.464	439			
a. Dependent Variable: Adoption						
b. Predictors: (Constant), Communication Messages						

Conclusion

The study concluded that CBPP messaging influenced respondents to vaccinate although some had more influence than others. This messaging ran into already held misinformation by some pastoralists confirming an earlier study that vaccination rate was at 20-60% because some skipped the exercise. Messages on communal vaccinations time was confirmed by majority but the few who disagreed with collective community decisions may have been in the category of “optimal innovation decision makers”. CBPP vaccine messages attributes were key in the success of influencing respondents. For example, as a practice animals were grazed distant fields, and the community needed time to bring them to agreed communal vaccination sites. Comprehensibility and believability of CBPP vaccination messages was important in their decisions to drive back the animals for vaccination. Message challenges leading to skipping of vaccinations among included false information about availability of veterinary officers, transmittal of doubtful messages especially drought when cattle weak were to withstand vaccination or had migrated distances away for pasturing. Other respondents were particularly alarmed by advisory messages that vaccine was harmful since some cattle had exhibited serious side effects that led to tails falling off or outright fear of quarantine. This notwithstanding, Government often advised pastoralists to vaccinate twice a year to achieve herd immunity. In extreme case where pastoralists failed to present animals for vaccination Government responded by messages of continued enforcement of quarantine (fitting the definition of high or fear appeal) instilled fear among them.

Recommendation

The study recommends two key areas of focus; First, national and county government needed to develop communication policy for dissemination of CBPP vaccine. Considering that CBPP is a trans-boundary disease, harmonization of these plans across the ASAL counties could enable standardization of messaging to combat the disease. Further, media owners could have a stake in the policy to provide messaging through programming and editorials on CBPP vaccine adoption particularly on vernacular FM stations listed by this study. Secondly, implementation of the policy could be at the two levels of government and targeted messaging could be undertaken on eradication and control of the diseases. Messages could be disseminated through local activities such as *barazas* and other activities such as role play

(drama), field days, and agricultural shows. Opinion leaders could also be trained on basic aspects of the disease reporting and messaging.

Suggestions for Further Research

This study did not pursue influence of vernacular radio stations in an experimental setting on the number of times CBPP vaccine messages were broadcasted, the intervals of exposure, or packaging. Further research could be undertaken under experimental treatment to determine the influence of messages on adoption of CBPP vaccine. Written, audio, and visual messages could be used to determine this.

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