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An assessment of the role of proper health management in reducing goat mortality in Kraals: A case of Napak District in Eastern Uganda

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Poor animal health is reported as one of the major constraints of goat production leading to mortality in pastoral areas like Karamoja Sub-Region in Eastern Uganda. Based in Napak District, this study was aimed at gaining an understanding of the role of proper health management in reducing goat mortality in Kraals. Through convenience sampling, 312 pastoralists out of 388 who own animals in community kraals were reached. The study was carried out using mixed methods approach through structured interviews and focus group discussions to collect both primary and secondary data. The health management index (HMI) as a measure of proper goat health management was constructed using seven routine farm practices (Vaccination, Deworming, Use of Antibiotic, Spraying, Isolation of sick animals, Sanitation and Hygiene and Navel Cord Disinfection). Multivariable regression was conducted using STATA (12) software. The first regression was conducted to find out which socio-economic factors have influence on HMI. It was established that accessibility to training and membership to social groups improve HMP while involvement in other occupation has a negative influence. A second regression was conducted to ascertain if HMI scores affect goat mortality levels. The results revealed a negative and significant influence, implying that an improvement in HMP leads to a reduction in mortality. Enhancing mechanisms which favor practical training and social group formation in form of technology intervention platforms can enhance HMP which will ultimately reduce goat mortality.

Key words: Socio-economic factors, goat health management index, Karamoja, goat, multivariable regression.

INTRODUCTION

Goats are reared to provide meat, income, milk, wool, skins, dowry price and prestige. According to Nipane et al. (2016), goats are raised by every class of society in the world. In Karamoja, it is an important resource; many households depend on them for a livelihood and income (CPRC as cited by Mulabbi et al., 2013). It is essential for poverty alleviation in developing countries (Lernfelt, 2013). Goat rearing is an alternative to agricultural vulnerability risks especially under the present context of climate change (Abebe, 2012). It was reported that goat production is the second most important livestock enterprise only next to cattle (Kalyango, 2012).

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Of the approximately, one billion world goat population, 56% and 30% are found in Asia and Africa, respectively (FAO, 2015; Zvinorova et al., 2016). An estimated 39% of households in Uganda are known to own goats, which demonstrates the importance of goats to the people (MAAIF, 2011). The estimated population of goats in Uganda was about 14.6 million (UBOS, 2014) which has increased by 14% over the last six years from the 2008 livestock census attributable to increasing local and regional demand for better nutrition (Byaruhanga et al., 2015). Goat's population estimate in Napak District currently stands at 250,000 goats, which is either stagnant or decreasing in most cases (Napak District Annual Performance Status Report, 2016). This represents one-eighth of goat population in Karamoja estimated to contribute 16.3% of national goat population (UBOS estimates as cited by Waiswa, 2016). This can be attributed to mortality mainly caused by disease. Muinde et al. (2015), in their study, reported poor animal health as one of the major constraints of livestock production in the whole of Sub-Saharan Africa (SSA). Brian et al. as cited by Idamokoro et al. (2016) argued that livestock keepers are largely unable to access animal health services. Mulabbi et al. (2013) stated that animal diseases and the associated high levels of animal mortalities seen in Karamoja pose a significant threat to the development of small ruminant farming. Right from kidding, the life of both, the does and the fetus are critical and under poor condition without improved animal health management practices, high rate of neonatal mortality, abortion and maternal mortality may occur (Slayi et al*.,* 2014; Idamokoro et al., 2016; Merkine et al., 2017). Webb as cited by Mtama (2016) reported that the mortality rate of goats in communal areas at 40.6% can be improved significantly through effective management practices. Sabapara et al. (2010) recorded that overall mortality was 8.42% in goats under field conditions. These conditions could be compared to those in the kraals in Matany sub-county, Napak District. Therefore, programs that enhance practice of HMP can be encouraged to reduce goat mortality yet Byaruhanga et al., 2013 noted that important health management practices (HMP) are not well documented or practiced. It was against this background that the study was needed in these Karimojong communities particularly at the kraal sites with the aim to gain improved understanding of how to reduce goat mortality through proper goat health management practices (HMP) in kraals. The study specifically wanted to measure the extent to which HMPs are followed, establish the socio-economic characteristics (SEC) of kraal members that influence HMP and finally assess the HMP and goat mortality.

MATERIALS AND METHODS

Description of the study area

The study was conducted in Matany Sub-County, Napak District with an annual rainfall range is 300-1200 mm with a mean of 800 mm. The temperature ranges from 28-33°C during the dry season with January and February being the hottest months. . According to the Napak District Annual Performance Status Report (2016), Matany Sub-County hosts a large number of goats up to 70,000 goats and a large number of kraals during the dry season. This goat population makes about one-third of total population in Napak District. Napak District Hazard, Risk and Vulnerability Profile (2014), however, noted Matany Sub-County registered many risk hot spots for animal and crop diseases mainly high incidence of tick borne diseases in livestock and sorghum brown streak in crops, respectively.

Sampling techniques and sample size

Convenience sampling technique was used to get the respondents from the 33 kraals in Matany Sub-county. The list of kraals was obtained in consultation with the GISO office and a pre-visit was done to develop an understanding of the study area, the best time to conduct interviews, confirm the presence of the kraals and list the kraal members. The research team went with the intention of interviewing the entire 388 kraal members in the 33 identified kraals depending on availability and willingness to participate in the study. However, a total of 312 respondents were accessed and interviewed at the kraals for the study.

Data collection

To prepare for this research, the team was trained for one day on the way to carry out focus group discussion (FGD) and administering structured interviews in Matany Sub-County office. The team of 6 was divided into two teams of 3 members each who visited the kraal sites for 8 days. The teams were interchanged daily to give reliability to the data. Both primary and secondary data were collected for the study. To collect primary data, two tools namely structured interviews and focus group discussion (FGD) were conducted. Structured interviews were administered to 312 respondents. 5 FGDs were conducted consisting of 8 members each guided by 9 open ended FGD guide including reasons for keeping goats, reason for coming to the kraal, causes of goat mortality, evident goat health management practices, merits and demerits of traditional and modern HMP, satisfaction with the current extension services in the kraals, goat health trainings and topics emphasized, major constraints to following goat health management practices, and suggestions to improve following HMP. The questions were rated according to the number of times it is commented on and the individuals that commented. The composition of FGD was mainly of the kraal community that included at least 2 kraal owners, assistant animal husbandry officer, Kraal opinion leaders, Community Animal Health worker (CAHW), and 2 kraal members. The secondary data were collected from postmortem reports from CAHW's leaders, Veterinary during the month of August 2016 – March 2017 and the past studies and literature to make foundation of the study.

Estimation of variables

Estimation of socioeconomic characteristics

The socioeconomic characteristics included; the family size that included all the children, youths, women, and elderly in the same household. The social group participation was recorded as those that were involved in a social groups tagged (1). Those that have attended training in the last three seasons were tagged (1) and otherwise (0). The estimated age was asked to respondents. The

Table 1. The recommendations and scoring criteria.

HMP Recommendation	HMI Score
Deworming -Every 3 month	
Vaccination - Once a year	
Isolation of Sick Animals	1 = if HMP recommendation was followed,
Navel Cord Disinfection – Iodine solution	0 = Otherwise
Spraying	
Sanitary & hygiene measures	
Use of Antibiotics	
TOTAL	7 = if all HMP recommendations were followed

other occupation (1) was measured as commitment other than managing kraal duties or routines. The education level was graded according to levels, that is, none educated (0), informal education (1), Primary (2), secondary (3) and tertiary or university level (4). The income from different sources was summed to get the income level. The gender was stated as either male (1) or female (0) while marital status was taken as married (1) or single (0).

Estimation of health management index (HMI)

The farmers were trained and recommended seven health management practices if reduction in goat mortality is to be achieved. The HMI was estimated by assessing the number of recommendations being implemented by farmers. A farmer who correctly puts into practice a given recommendation is awarded a score of 1. This implies that the maximum score by an individual farmer is 7 if all recommendations are practiced and 0 if none of the recommendations is implemented. The recommendations and scoring criteria are in Table 1.

Estimation of goat mortality

Farmers were asked to estimate the number goats which died as a result of poor health within the past year during August 2016 – March 2017. This number formed the dependent variable for the second regression.

Data analysis

A multivariable regression was conducted in STATA to determine how different socio-economic factors influence the way kraal owners employ proper health management practices as a way of reducing animal mortality. The following econometric regression models were used;HMI = α + βiXi + e……..……..…… (I) Where; HMI = Health Management Index; α = constant; βi = coefficient of parameters of interestXi = independent variables (Socioeconomic characteristics of kraal members); e = Error term

To determine how proper management influences goat mortality, a second regression was conducted. Goat mortality was taken as the dependent variable and HMI as the independent variable. Also included into the regression were the socio-economic characteristics which do not influence HMI. The socio-economic characteristics which have influence on HMI are left out in the second regression to avoid multi-collinearity. For this particular study only age of household head did not influence HMI. The second economic regression model was thus represented as follows;

$$Mort\ (M) = \alpha + \beta_1 HMI + \beta_2 AgeHH + e$$

Where, Mort (M) = Goat Mortality level; α = constant, β_1 = coefficient of HMI, AgeHH = age of the household head, β_2 = coefficient of age of household head and e = Error term

RESULTS AND DISCUSSION

Socio-economic characteristics influence on goat health management practices

In the first regression, HMI was taken as the dependent variable and socio-economic characteristics as the independent variables (Table 2). The high coefficient (0.62) illustrates the importance of trainings to following health management practices. This explains that as a member is trained, they learn to do first hand local diagnosis of health-related conditions, become aware of modern goat HMP and their importance to livestock productivity. This agrees with recent studies on effect of training by Chah et al. (2013); Hundal et al. (2016); and Bashir et al. (2017) who attested a positive and significant relationship. The high coefficient of social group participation (0.55) indicates the importance of participation. This indicates that when involved in social affairs they share information on how to treat the animals, financial loans for purchasing drugs and paying veterinary services. This is consistent with most recent studies by Ntume et al. (2015), Koli and Koli (2016), Nipane et al. (2016). The closely following coefficient (0.53) for marital status implies that those households that are married are likely to practice HMP as there is usually agreement to maintain the livelihood assets, in terms of commitment and ability to send family members for a common cause that is to keep the animals healthy. This was echoed the FGD's conducted.

The low coefficient (0.26) implies that as the farmer's gets education, they are encouraged to practice HMP. This explains that as a member gets educated, they are able to recognize modern practices, basic record keeping, and right dosage and expiry dates of livestock health inputs and adapt to a progressive mind. This is in agreement with Byaruhanga et al. (2015); Vekariya et al.

Table 2. Regression of Socio-Economic Characteristics against Health Management Index.

Dependent variable	Regression coefficient	P values
Goat health management index		
Independent variables		
Livestock Trainings	0.62	0.02
Social Group Participation	0.55	0.03
Marital Status	0.53	0.00
Education Level	0.26	0.00
Family Size	0.18	0.00
Household Income	0.00031	0.00
Other Occupation	-0.60	0.001
Age of Household Head	-0.0076	0.60
Gender of Household Head	0.27	0.1400
Number of Observations = 312		95% Confidence level
R-Squared = 0.72		Adjusted R-Squared = 0.71

Table 3. The frequency of management practices HMI against the registered mortality in the kraals during August 2016 – March 2017.

HMI - goat health management index	Goat mortality
0	238
1	383
2	314
3	910
4	485
5	68
6	433
7	5
Total	2836

(2016) and Koli and Koli (2016). The low coefficient (0. 18) means that family size increase though to a smaller extent affects the decision to practice HMP. This shows that as the family grows in size, more labor is made available for use in following HMP's especially if youths and adults are in the family. This is contrary to most previous studies (Vijay, 2013; Vekariya et al., 2016). The very low coefficient (0.00031) implies that as the kraal members household income increases there is a proportional increase in practicing HMP because they are able to purchase veterinary kits, pay for CAHW's services. This is in agreement with Challa and Tilahun (2014); Koli and Koli (2016); Vekariya et al. (2016); Nipane et al. (2016). The high negative coefficient (-0.60) of involvement in other occupation means that as kraal members get involved in other activities, they get destructed in the routine health management practices. This is in agreement with Gour as cited by Vekariya et al. (2016) but contradicts Nipane et al. (2016; Vekariya et al. (2016). This .The non-significance of age of household head implies that as age increases the practices becomes tedious, laborious and monotonous including passing instructions to shepherds. This contradicts Koli and Koli (2016) and Nipane et al. (2016). The non-significance of gender of the household heads implies that either male or female it does not increase the likelihood to practice HMP. This may be because other factors like rapport, ability to commit and persuade the family members and other workers to practice would be more pronounced than gender of the household head. This is consistent with Legesse et al. (2013) and Challa andTilahun (2014) but contradicts Adams and Ohene-Yankyera (2015).

The effect of proper health management on goat mortality

Table 3 shows the frequency of proper health management practices HMI against the registered mortality in the kraals during August 2016 to March 2017. The regression results of Health Management Index

Table 4. Regression results of Health Management Index against Goat Mortality.

Number of Observations = 312		95% Confidence level
R-Squared = 0.8878	Adjusted R-Squared = 0.8867	
Dependent variable		
Goat Mortality level	Regression Coefficient	P values
Independent Variables		
Goat Health Management Index	-0.9218054	0.000
Age of Household Head	0.031736	0.000
Gender of Household Head	-0.10033	0.378

against Goat Mortality are shown in Table 4. The high coefficient (0.9218) in the second regression indicated as the HMI increases there is a significant reduction in goat mortality because of proper identification of the disease cause, prevention and giving adequate treatment (Alcedo et al., 2015).

The age low coefficient (0.0344) means that as the farmer grows, goat mortality increases by 0.0317; the justification is that the kraal members become weak, get involved in other income generating activities, resist any risk and become reluctant to practice proper health practices. The non-significant coefficient of gender in the second regression means that the gender of household head does not influence goat mortality. This may be because even if the household head is male or female, it does not guarantee reduced goat mortality. This contradicts Adams and Ohene-Yankyera (2015) in a study conducted in Ghana.

Conclusion and recommendations

Overall, the goat HMP is of real importance to reduce goat mortality and farmers stress from the phenomena. The level of compliance to follow goat health management practices positively determines health conditions of the goats. The kraal members followed the practices following the sliding index order of 3 HMP (30%), 6HMP (21%), 4HMP (18%). The study showed the extent of HMP was high; however, it requires effort, resources, time and commitment on the part of goat rearers. The kraal members practiced mainly use of Anti-biotics, deworming and navel cord disinfection. Efforts to improve the practice of spraying, isolation of sick animals with veterinary personnel supervisions, hygiene and sanitation campaigns would go a long way to improve conditions of the kraals, reduce spread of diseases and reinfection and ultimately reduce goat mortality. The socio-economic characteristics have been found to influence practice of HMP. The key characteristics in descending order of significance were; livestock management trainings, social group participation, education level of household head, family size and finally household income. Improving on this SEC will considerably increase the practice of HMP and reduce occurrences of goat diseases. The influence of HMP on goat mortality is evident; the more management practices followed by the farmers, the lower the mortality in the kraals. Farmers should be continuously encouraged through training courses on livestock management, mindset/attitude change, interpersonal skills, and record keeping. The farmers should be supported to practice HMP through increased access to for example Anti-biotics, vaccines, dewormers and disinfectants and acaricides at preferably subsidized prices with provision of credit facilities. Goat mortality is experienced more as the age of the household head increase. This may be due to the HMP tending to become laborious, tedious; also farmers diversify to other activities. Therefore, the youths should be encouraged through youth out-reach activities and trainings to share the socio-economic importance of goat rearing.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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