An Assessment of Tick-Borne Diseases Constraints to Livestock Production in a Smallholder Livestock Production System: a Case of Njiru District, Kenya

Dominic Mureithi
Maasai Mara University

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Mureithi, D.K[1], Mukiria, E.W[2]

[1] *Department of Animal Health and Production, Mount Kenya University, Thika, Kenya*
[2]*Animal Health and Industry Training Institute-Kabete, Kangemi, Kenya*

ABSTRACT

The principle objective of the study was to determine the tick- borne diseases constraints to livestock production in Njiru District, Kenya. The survey was carried out in six locations, clusterly selected and spread across the district. 120 livestock farmers were sampled into the study. Proportion to size sampling was done in all locations for the study. Pre-tested questionnaire was used for data collection. The study results shows that tick infestation affects livestock production especially in the prevalence of tick borne diseases (53 percent) followed by tick infestation worry (45 percent), toxicosis (39 percent), and the cost of tick control especially acaricides costs 37.5 percent and mortality rate of the livestock 20.8 percent. The study results shows that tick infestation negatively affect farmer's livelihood. Tick infestation has impacted in reduction of income of farmers (72.5 percent) and resulted to food insecurity (30 percent) with 1 percent seeking non-farm employment. The tick control measures need to be strategized in the district especially provision of extension services and government veterinary services.

Keywords: tick borne diseases, small holders, production, Kenya

INTRODUCTION

The major tick- borne diseases (TBDs) of cattle in Kenya as evaluated by the economic impact they exert on the farming communities where they occur include theileriosis, anaplasmosis, babesiosis and heart water (Wesonga et al. 2010). Tick- borne diseases (TBDs) and its vectors occur in vast areas of Kenya with devastating impact on livestock productivity. Its epidemiology and impact on livestock (especially cattle) production are determined largely by the prevalence and distribution of the disease and its vectors in the affected areas. The limitations imposed by the tick-borne disease problem continue to frustrate efforts and hamper progress in livestock production, thereby contributing to hunger, poverty and the suffering of entire communities in many districts of Kenyan.(Okuthe and Buyu,2006).

Relatively few studies on animal health and production have been carried out in Njiru district which has a significant livestock population of 735,400 of cattle and small ruminants. The farmers in the district traditionally practice mixed farming, rearing predominantly local breeds of cattle and small ruminants. Njiru district has vast areas of land which has not been occupied for so long providing grazing ground to cattle from neighboring Kajiado County fetching near market like Dagoretti, Kayole, Hurlingham and Njiru slaughter house. Though the district has these many slaughter houses, it does not have a holding ground and so animals that come for slaughter tend to be grazed all over the district for long before slaughter and this bring in some vector-borne diseases. The district does have communal dips but has not been operational thus complicating tick control in the area.

Already a number of farmers particularly in some divisions of the district are keeping improved

***Address for correspondence:**

mureithidominic@gmail.com

breeds of dairy cattle such as Friesians. The transition from rearing of indigenous to improved breeds of livestock, the lack of holding ground has resulted in an upsurge of tick borne- diseases since the improved livestock breeds are more susceptible to ticks and tick-borne diseases.

Therefore, in order to formulate strategies for control of tick borne disease it is important to understand the major constraints to small holder livestock productions

The results of the survey provide information on the risk of tick- borne diseases, their impact on livelihood and livestock production. This in turn can be used as the basis for formulating appropriate control strategies for the tick-borne diseases in the country.

MATERIALS AND METHODS

Study site

The study was conducted in Njiru District, one of the districts in the Nairobi province of Kenya. It lies between latitudes 0.45'S and1.31'S and longitudes 36.45'E and 37.45'E and has a total area of 144.7 km^2. The climatic conditions of Njiru district are bimodal rains with long rains being experienced between March and May and the short rains coming between September and November. The annual rainfall total amounts ranges between 300-700mm/year. The district experiences temperatures ranging between 10-29^{0}c during day time and 7-18 ^{0}c during the night times. A cold spell is experienced during the month of July- August

Selection of farmers for the cross sectional study

A stratified random sampling method was used to select the study farms. Two levels of stratification were applied. First, three administrative divisions of Njiru district were selected. All locations in each division then listed. Then two locations per division were selected using a random-number table. At the second level, in each of the selected locations, a list of all livestock farmers was compiled with the assistance of the area animal health assistant. Using a random number table sampled farmers were selected. Proportion to size sampling was used depending on the size of the listed farmer per given location. A total of 120 pre-tested questionnaires were used to collect data on this study from cattle owners in the study area. The questionnaires was administered to obtain data on tick and tick-borne diseases, their effects on cattle and owners income, treatment of the disease and willingness to participate in the control of the vectors among others. On selection of the study farms, the farmers were notified of the intended survey in writing. Each farm was then visited and the study objectives explained to the farmers. The protocol, objectives and aims of the study was also discussed with veterinary personnel and animal health technician within the study area. The local chiefs and assistant chiefs were also informed.

Data collection

Farm level data were collected using a pre-tested questionnaire. Presenting was done on similar condition to those in actual study. The questionnaires were administered to the head of the household or the person normally in charge of livestock. The questionnaire was administered in Kiswahili or translated into in the local language where a respondent has limited knowledge on Kiswahili. To maintain consistence, most of the questionnaires was designed in a closed format except for the introductory section. In cases where the set of expected responses was deemed not exhaustive, an option for "others: please specify" was provided. The questions were designed to identify and rank various livestock production constraints and the disease control strategies. Additional data was also sought on household information and demographics, grazing management, delivery of animal health services, occurrence of diseases in (cattle, sheep and goats) and mortality.

RESULTS

Farming enterprise and farmers characteristics

Njiru district is a peri-urban area of Nairobi metropolis thus land acreage is less than an acre (0.81) with only 0.18 designed for livestock production. The 120 farmers chosen for this study had a mean of 8 years of livestock farming experience. This implies that the majority of the farmers were very familiar with the common livestock diseases on their farms and livestock management practices. 63

percent of the respondents were male. The highest level of education was secondary education (mean of 10 years of schooling). The mean income of the respondent was 16,514 KES.

Tick infestation

Due to the amount of data that was collected from each farm both for this study and the broader study, it was not possible to undertake tick counts on each and every animal recruited into the study. Using a technique designed by Muraguri (1996), tick challenge was assessed by observing tick infestation on at least ten randomly selected cattle, sheep or goats in each sub-location. Tick challenge was categorized as follows:

High= Ticks found on most animals sampled (for ticks) at the time of the visit.

Medium= Ticks found on some animals at the time of the visit.

Low= Ticks of any species rarely found.None= No ticks of any species seen. The result of this question was that ticks of any species rarely found or low (53%), followed by medium (39%), high (7%) and none (2%).

Tick control methods and tick- borne disease management

Using a questionnaire, farmers on all the recruited farms were asked to provide information on occurrence of tick- borne diseases and mortality on their farms. The farmers were asked to describe the symptoms of suspected tick-borne diseases as a way of verifying the information provided. Additional data was sought on delivery of animal health services, tick control and grazing management.

The grazing management differed per location. In Kayole location, 81 percent of livestock farmers stall feed their livestock while in Ruai location only 76 percent stall feed. In Njiru, Drumville and Kamulu they mostly free graze their livestock with 67, 66 and 53 percent respectively. The most source of animal fodder is cut and carry from roadside with Kayole location 62 percent, Ruai 44 percent, Njiru 66 percent, stream valley 100 percent. This could increase the tick infestation on the farm as fodder may harbor these parasites especially fodder sourced along the road. However, Drumville and Kamulu mostly source their animal fodder from their own farm, 100 and 53 percent respectively as shown in table 1.

Table1. *Livestock production, feeding and source of fodder in Njiru district in percent*

	Livestock production systems			Livestock feeding method			Source of animal fodder		
Location	Stall fed/zero grazing	Free grazing	Tethered on unimproved pasture	Concentrates	Fodder-nappier grass,hay	Grazing	Own farm	Cut and carry on roadside	Buy
Kayole	81	4	15	96	4	0	15	62	23
Ruai	76	14	10	90	6	2	30	44	24
Njiru	33	67	0	38	48	14	28	66	5
Stream Valley	100	0	0	100	0	0	100	0	0
Drumville	0	66	34	0	33	67	0	100	0
Kamulu	41	53	6	71	6	23	53	23	23
Total	63	28	9	78	13	9	31	49	19

Tick control practices were categorized as follows.

Regular = acaricide (dip, spray or pour- on) applied according to manufacturers' instructions at 1-2 weeks interval.

Irregular = acaricide (dip, spray or pour- on) applied according to manufacturers' instructions at times of high tick challenge.

None= no tick control measures used.

The results shows that livestock farmers regularly use acaricide (89%), will only 11% admitting that they irregularly use acaricide in overall. Considering theNjiru district, the farmers regularly use acaricides with more than 80 percent except for Drumville location 33 percent as shown in table 2. This implies that livestock farmers have knowledge on tick control measure. Their level of satisfaction on tick control measure the use in their farm was high (52%), with medium 26 percent.

Table2.*Summary of tick control practices on farms per Location in percentage*

Location	Regular	Irregular
Kayole	92	8
Ruai	94	6
Njiru	81	19
Stream Valley	100	0
Drumville	33	67
Kamulu	88	12

Livestock production constraints

Scoring Method was used to evaluate the level of importance of different animal production constraints. Farmers were requested to give level of importance from 1 to 3, 1 representing not important and 3 most important. The mean was calculated and assigned integers a rank order to understand which constraint is most important to livestock farmers.

Table2.*Ranking of livestock production constraints*

Production constraints	Mean score	Standard deviation	Ranking
Direct contact with buyers	2.025	0.874	7
Extension advice from government staff	2.451	0.755	6
Training received on production of livestock	2.475	0.823	5
Need to increase household income	1.825	0.866	9
Maintaining household food self sufficiency	1.975	0.864	8
Access to inputs from the buyer(s) e.g. drugs and vet services	2.531	0.672	4
Livestock attack by parasites such as ticks	2.708	0.540	2
Tick borne diseases	2.714	0.523	1
Other livestock diseases	2.601	0.601	3
Access to market information	1.815	0.853	10

From the table 3 above, the results shows that livestock farmers are more concerned on the health of their animals than market access or even contact of buyers of animal products. This is shown clearly by ranking the highest the constraints of tick borne diseases, second livestock attack by the parasites especially ticks. This also supports the study on the concern on the impact of ticks and tick borne diseases. Farmers are also concerned on the access to inputs and veterinary services which also support the importance of animal health to farmers. The farmers ranked at the least the importance of access to market information need to increase house income and food self-sufficiency.

Occurrence of livestock diseases and mortality

Farmers were asked the key diseases that limit livestock production in Njiru district. Only the first choice listed was considered for analysis. The most preference diseases listed by farmers was East coast fever (ECF) with 40% in overall as shown in table 4. This disease was considered as the most disease constrain to livestock production by majority of farmers in all locations. This supports the problem of the ticks and tick borne diseases in the district. Farmers also relate this disease with high mortality late (56%) and very much importance in livestock production (77%). Foot and mouth disease, Anaplasmosis, Foot rot, mastitis, Pneumonia,and Bloat were also ranked by farmers as the most important disease constraints to the rearing of cattle in the district with respective percentage of 15, 10,10, 9, 4 and 4 respectively. Skin disease was perceived by most of the farmers as the least constraint disease in livestock production with only 1 percent of the farmers mentioning it.

Table4. *Occurrence of livestock diseases in percentage*

Location	Bloat	Anaplasmosis	Foot rot	ECF	FMD	Mastitis	Helminthiasis	Milk fever	Skin diseases	Pneumonia
Kayole	8	23	15	23	23	8	0	0	0	0
Ruai	4	12	6	41	14	8	4	4	0	6
Njiru	5	0	10	48	10	10	5	5	5	5
Stream valley	0	0	0	50	0	50	0	0	0	0
Drumville	0	0	0	100	0	0	0	0	0	0
Kamulu	0	0	19	44	19	13	0	0	0	6
Total	**4**	**10**	**10**	**40**	**15**	**9**	**3**	**3**	**1**	**4**

Livelihood impacts as result of tick infestation

The results show that livestock farmers are negatively affected as result of tick infestation on their livestock. This was a binary answer to capture where the farmer in negatively affected or not. Livestock farmers admitted negative effect of tick in their livelihood (77 percent yes and 23 percent No) as shown in table 5. Tick infestation has impacted in reduction of income of farmers (72.5%) and resulted to food insecurity (30%) with 1% seeking non-farm employment.

Table5.*Livelihood impact as result of tick infestation*

Location	No (%)	Yes (%)
Kayole	26.9	73
Ruai	29	71
Njiru	9.5	90.5
Stream valley	0	100
Drumville	0	100
Kamulu	23.5	76.5
Total	**23**	**77**

Delivery of animal health services

In all locations very few farmers had access to government veterinary (5%) and they mostly relied on private veterinary (65 percent). In stream valley and Drumville, however, farmers lied on animal health assistants wholly to treat sick animals and pay the professional charges as shown in table 6. Moreover farmer's level of satisfaction of animal health services provision is high (60%).

Table6.*Delivery of animal health services*

	Type of personnel that undertakes treatments when animals are sick (%)				
	Family member	Animal health assistant	Private vet	Government vet	Livestock officer
Kayole	0	46	39	8	8
Ruai	2	5.9	88	4	0
Njiru	5	24	57	0	14
Stream valley	0	100	0	0	0
Drumville	0	100	0	0	0
Kamulu	12	6	65	12	6
Total	3	22	65	5	5

DISCUSSION

The use of qualitative means to identify disease constraints to livestock production was useful in providing an insight into the most important diseases in the district from the farmers' perceptive. The farmers were able to accurately identify the main diseases prevalent in the district. The high tick challenge can largely be attributed to a break down in tick control services formerly supported by the government not only in the district, but in the rest of the country. The history of tick control in Kenya has been reviewed by Keating (1983). Despite the enactment of the Cattle Cleansing Act (GOK 1976) which led to the initiation of a national tick control programme, adequate control of ticks and TBDs is still far from being achieved. The escalating costs of acaricides, relevant infrastructure and monitoring services for the intensive tick control strategies advocated by the Cattle Cleansing Act led to the inability of the government services to sustain the programme (Wesonga et al 2010). Just like in other parts of the country, poor management of dips by local committees in the district virtually led to the collapse of the tick control facilities. As result virtually all the farmers depend on hand sprays to apply acaricides on the animals. Improper application of acarides especially use of under strength acaricides could result in ticks wide spread of infestation (Wesonga et al 2010).

CONCLUSIONS

The study concludes that tick infestation affects livestock production especially in the prevalence of tick borne diseases (53 percent) followed by tick infestation worry (45 percent), toxicosis (39 percent), and the cost of tick control especially acaricides costs 37.5 percent and mortality rate of the livestock 20.8 percent. The study also concluded that tick infestation negatively affect farmers livelihood. Tick infestation has impacted in reduction of income of farmers (72.5%) and resulted to food insecurity (30%) with 1% seeking non-farm employment

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AUTHORS' BIOGRAPHY

Dominic Mureithi. I come from Kenya, East Africa. I have a bachelor degree in Veterinary Medicine and Masters in Pharmacology and Toxicology. I'm currently working as an assistant lecturer in the department of Animal health and production at Mount Kenya University.

Eunice Wambura Mukiria. I come from Kenya, East Africa. I hold Diploma in Animal health, Bsc in Agriculture and Msc in Agriculture and Rural Development. I'm currently working in ministry of agriculture livestock and fisheries.