Current Livestock Production Challenges and Opportunities in Transmara Sub-County: Diagnostic Survey Report

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Abstract

The purose of this study was to assess feed resources available for Sahiwal and its Crossbred weaner calves in Trans Mara sub County of Narok County. A survey was carried out in three randomly selected Wards; Lolgorian, Keiyan and Kilgoris Central of Transmara sub-County in Narok County. A formal cross sectional survey was conducted using structured questionnaire to obtain information on challenges and opportunities related to weaner calf rearing. A single household keeping cattle was used as a sampling unit in this study. A list of households keeping Sahiwal and Sahiwal/Zebu crosses was purposively obtained from each ward and these were used to construct a sampling frame. Sample size was calculated as a proportion (0.1%) of the sampling frame. The objectives were to identify factors affecting growth of weaner Sahiwal and Sahiwal/Zebu crossbred calves and the opportunities to improve their performance under the prevailing rangeland conditions. The data collected was analysed using the Statistical Package for the Social Sciences (SPSS). Majority (over 90%) of the respondent farmers were males, thus suggesting domination of livestock activities by men. Cattle formed biggest part (about 80%) of the livestock in each farm followed by sheep and goats in that order. Free range production system was the dominant practice since people were not aware of other systems and the forages in the farm were mostly low quality natural pastures. In some areas where land was paddocked, rotational grazing was practiced. The crop by-products used to feed livestock by some farmers was mostly maize stovers and bean husks which were fed directly in the field. The major challenges encountered while raising weaner calves include diseases (>40%), drought (approx 20%), and inadequate feeds due to overstocking (<20%). To mitigate the stated challenges > between 16 and 22% of the farmers proposed proper parasites and disease control through Vaccination, dipping, deworming while between 3 and 22% suggested improvement of pastures including new introductions. Other proposals included introduction and use of A.I. services between 4 and 5%, availing affordable and quality breeding bulls especially for Sahiwal between 32 and 41%, improved livestock management and reliable access to affordable and quality animal feeds between 1 and 5%, amongst others.

Key words: Feed resources, Livestock production, Rangelands, Sahiwal breed, Weaner calves

INTRODUCTION

Livestock production plays a significant role in the livelihood of farmers in the arid and semi-arid communal rangelands of Kenya under a predominantly extensive system. Virtually all cattle and small ruminants rely on the natural rangelands and to a lesser extent on crop residues for feed. In the savannas of Kenya, grasses make up a significant proportion of the diet of domestic ruminants in both the wet and dry seasons. The productivity of ruminants on communal grazing lands largely depends on the quality and the quantity of the available forage. Pasture quality is related to the amount of nutrient in the pasture that can be available for grazing (Walton, 1983; Ball *et al*., 2001). Optimum nutrition is dependent upon a delicate balance of four basic factors i.e. the animal's nutrient requirements, nutrient content of the feedstuffs consumed, digestibility of the feed stuffs consumed, and the amount consumed (Vallentine, 1990). These factors are in turn affected by botanical and chemical composition of the range forage, both of which vary with season. Annual and perennial grass species grow rapidly during the growing rainy season and decline in growth rate, production, and nutritive value as they mature towards the end of the growing season (Tefera *et al*., 2009).

The Sahiwal cattle breed was introduced in Kenya by the British colonial government from India and Pakistan for crossing with local Zebu breeds to improve milk and growth performance (Mahadevan 1965; Kimenye 1983). The Kenyan Sahiwal is thus a product of several generations of crossing local East African Zebu (EAZ) cows with Sahiwal bulls. A major constraint to livestock production in developing countries is the scarcity and fluctuating quantity and quality of the year-round feed supply. Yield of ruminants is largely limited by forage quality which is mainly reflected in low voluntary intake and digestibility (Pashaei *et al*., 2010). The importance of these parameters in animal nutrition has been recognized.

The overall objective was to assess feed resources available for Sahiwal and its Crossbred weaner calves in Trans Mara sub County of Narok County. Therefore, the specific objectives of this study were to assess the prevailing calf management situations practiced by the farmers, to assess feed resources available for weaner calves and their quality, to understand causes of mortalities of weaner calves, to document the challenges of rearing weaner calves and to study the grazing systems practiced in three wards of Trans Mara.

MATERIALS AND METHODS

Study sites

The survey took place in 2014 October in three (3) Wards of Trans Mara sub County of Narok County in Kenya. The site of this study is situated in the western side of Narok County bordering the Republic of Tanzania to the South, Migori County to the West, Kisii County to the North and Bomet County to the east. Administratively, Trans Mara sub County has six County Assembly Wards; namely, Kilgoris Central, Keiyan, Ang'ata Barrikoi, Shankoe, Kimintet and Lolgorian. This study was carried out in three wards viz.Lolgorian, Keyian and Kilgoris Central. The study area lie at approximately between north 1° 32' 51" S; North 0° 59' 56" S; West 34° 37' 57" E; East 35° 8' 0" E; with a minimum elevation of 1156 m and a maximum elevation of 2278 m.

Data Collection

A survey was carried out in Lolgorian, Keiyan and Kilgoris Central Wards of Trans Mara sub County, Narok County to determine the prevailing calf management situations practiced by the farmers. Questionnaires were administered to livestock farmers purposively, whereby farmers with Sahiwal and their crossbred cattle were sampled. This study used a cross-sectional study design which involved farm visits, administering of questionnaires, and Participatory Rural Appraisal (PRA) methods with assistance of enumerators. The farmers with Sahiwal and their crossbred cattle were sampled. The questionnaires administered to the farmers rearing both Sahiwal and sahiwal/zebu cross bred cattle captured the following information: (i) Land tenure systems (ii) farm size (acres), (iii) Grazing land (acres), (iv) Number of Livestock/farmer, (v) Cattle herd structure in (%), (vi) Mortality of the weaner calves, (vii) Cause of mortality of the weaner calves, (viii) The grazing system (%) practiced, (ix) Supplementary feeding (concentrates and minerals), (x)Type of forages (%) fed to livestock and (xi) Challenges of rearing weaners. Also the available grass species were randomly sampled from the grazing fields in Trans Mara Sub County, and taken to KALRO Naivasha Laboratory for nutrient content analysis. The analysis for dry matter (DM %), crude protein (CP %) and ash contents was done using the official analytical methods (AOC, 1990) while the neutral detergent fibre (NDF %), acid detergent fibres (ADF %), and acid detergent lignin (ADL %) contents were analysed according to the methods of Van Soest *et al.* (1991).

The data collected was analysed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics (mainly the means) were generated to represent respondents' opinions on various aspects of livestock production.

RESULTS

General Household and Farmer Characteristics

Table 1 Characteristics of interviewed respondents

Variables	Wards			Mean
	Keyian	Kilgoris Central	Lolgorian	
n	14	9	28	
Gender (%)				
Male	92.86	100.00	96.43	96.08
Female	7.14	0.00	3.57	3.92
Age group (years)				
<30	28.57	11.11	14.29	17.65
30-40	50.00	33.33	21.43	31.37
40-50	21.43	44.44	46.43	39.22
>50	0.00	39.22	17.86	11.76
Education level (%)				
None	28.57	11.11	39.29	31.37
Primary	50.00	22.22	42.86	41.18
Secondary	7.14	55.56	10.71	17.65
Tertiary	14.29	11.11	7.14	9.80

The survey covered three Wards of Trans Mara sub County of Narok County. Table 1 summarizes the respondent characteristics in the three study sites. Most of those interviewed were male (92.7 %, 100.0 % and 96.4 % in Keyian, Kilgoris Central and Lolgorian, respectively. There was dismal number of female respondents in Keyian and Lolgorian Wards with no female respondent in Kilgoris Central (Table 1). More respondents were recorded in Lolgorian while the lowest number was interviewed in Kilgoris Central wards. Although the figure for Kilgoris Central Ward may not be a true reflection of the position since the ward has the largest population while the number interviewed was small. Majority of the respondents were males with Kilgoris Central Ward registering only male respondents. Most of the activities, especially on livestock issues, are dominated by men and that is why the percentage of women interviewed was very low. In most cases women are only considered if they are either widows or when their husbands (or those acting on behalf of the husbands) are unreachable.

In terms of age of respondents, majority were above 40 years of age (55.5 % and 64.3 % in Kilgoris Central and Lolgorian wards, respectively), while in Keyian Ward most of the respondents were below 40 years (78.6 %) with majority (50.0 %) falling under the age bracket of 30 to 40 years of age. However, the respondents who were above 50 years of age constituted 11.1% and 17.7% for Kilgoris Central and Lolgorian, respectively, while there was none for Keyian Ward. In the first two wards young men had gone herding, others gone to work and it also depended on the day and the time the team reached their homes. The visit to Keiyan coincided with a market day so many young men were interviewed.

As far as the highest educational level of respondents were concerned, the data indicated that majority of respondents, 78.57 % in Keyian and 82.15 % in Lolgorian Wards had primary level or no formal education at all, while only 14.3 % and 7.14% in Keyian and Lolgorian Wards completed tertiary education, respectively. Majority (66.67 %) of the respondents in Kilgoris Central Ward had at least secondary education and only 11.11 % had tertiary education. Most of the respondents who reached primary level of education in both Lolgorian and Keiyan never proceeded to secondary since they dropped out of school to join moranism and take care of livestock.

Table 2: Land tenure systems and uses

Variables	Ward			Mean
	Keyian	Kilgoris Central	Lolgorian	
n	14	9	10	
Land tenure system (%)				
Freehold[1*]	100.00	100.00	32.14	62.75
Leasehold[2]	0.00	0.00	3.57	1.96
Communal[3]	0.00	0.00	64.29	35.29
Farm size (acres)				
Freehold	63.43	50.89	185.00	91.16
Leasehold	-	-	48.00	48.00
Grazing land (acres)				
Freehold	48.79	40.00	130.67	69.34
Leasehold	-	-	45.00	45.00

**Definitions.*

Freehold Tenure: absolute right of ownership or possession of land for an indefinite period of time, or in perpetuity
Leasehold Tenure: is an interest in land that may be granted by a freeholder for a specific time period subject to the payment of a fee or rent, or certain conditions relating to development and use.

Communal Tenure: unwritten land ownership practices in certain communities in which land is owned or controlled by a family, clan or a designated community leader

Table 2 shows land tenure systems, land sizes and land under pastures. The land tenure system in both Keyian and Kilgoris Central are exclusively (100 %) freehold while in Lolgorian about two thirds (64.3 %) fall under communal and a third (32.1 %) fall under Freehold. The mean farm sizes owned by farmers in the three wards of Trans Mara Sub County, differed according to land tenure system. The farms in Keiyan and Kilgoris Central wards are relatively small with mean acreage ranging from 50 to 65 acres and are exclusively under Freehold tenure system. The two land tenure system viz: freehold and leasehold exist in Lolgorian Ward with the mean land acreage per farmer under Freehold being 185 acres while under Leasehold only 48 acres per farmer. The allocation of the farms to grazing activities is similar in all wards, with more than three quarters of the farm reserved for grazing.

Farming Enterprises

Table 3: Farm enterprises and population of livestock

Variables	Ward			Mean
	Keyian	Kilgoris Central	Lolgorian	
n	14	9	28	
Farm enterprises (%)				
Livestock	100.00	100.00	100.00	100.00
Crops	100.00	100.00	96.43	98.81
Livestock population (mean±SE)				
Cattle	73.5±9.33	68.9±8.33	86.6±10.91	79.9±6.68
Sheep	24.8±3.78	25.0±5.95	28.4±3.47	26.8±2.38
Goats	14.9±4.30	12.4±3.42	19.5±3.28	17.0±2.24
Cattle herd structure (%)				
Calves	19.90	18.80	21.30	20.60
Weaners	16.00	17.10	14.40	14.40
Weaners (12-24 months)	13.70	13.00	12.70	13.00
Mature stock	50.40	51.00	51.70	51.30

The main livelihood enterprises, livestock types and cattle herd structures are shown in Table 3. Almost all households had both livestock and crop enterprises on their farms. The livestock kept by farmers in the three wards of Trans Mara sub County were mainly cattle, sheep and goats. Cattle form the biggest part of the livestock in each farm followed by sheep and goats in that order. Farmers in Lolgorian ward had the biggest herd of cattle, sheep and goats as compared to their counterparts in the other two wards.

The herd structure was composed of calves, weaner and mature cattle. The weaners were further subdivided into those below one year and those between one and two years. Overall the percentages of the calves (20.6%) were more than for the weaner calves aged between 12-24 months (13%) meaning almost a third of the weaners did not transition to mature stock. The overall weaner mortality was high, over 20% with Lolgorian leading followed by Keyian and Kilgoris Central in that or

Quality of Natural Forages

Table 4: Chemical composition of common natural pastures

	Chemical composition (%)					
Forages (growth stage)	CP	DM	NDF	ADF	ADL	ASH
Pennisetum catabasis (MS)	4.54	96.40	71.80	44.63	5.67	10.23
Pennisetum catabasis (BS)	5.98	95.14	74.50	44.69	5.32	9.67
Themeda triandra (MS)	5.78	95.78	70.20	44.12	6.00	9.84
Hyperrhenia filipendula (MS)	5.76	96.21	70.72	45.29	7.05	8.53
Lontedia kagerensis (MS)	5.84	95.71	71.81	44.70	6.12	9.35

Key: MS= Mature stage; BS= Blooming stage

The chemical compositions of common natural grasses found in Transmara sub-county are shown in Table 4. The grasses had similar crude protein, dry matter, neutral detergent fibre, acid detergent fibre and ash. However, these forages had low levels of nitrogen and high levels of acid detergent fibres. For these reasons, feeding the grasses alone without supplementation would not provide sufficient nutrients for optimal growth of weaner calves.

Livestock Feeding Systems

Table 5: Livestock feeding systems

Variables	Ward			Mean
	Keyian	Kilgoris Central	Lolgorian	
n	14	9	28	
Feeding system (%)				
Zero grazing	0.00	0.00	0.00	0.00
Semi-zero grazing	0.00	3.60	0.00	1.20
Extensive grazing	100.00	96.40	100.00	98.80
Farmers practicing rotational grazing and forages fed to cattle (%)				
Rotational grazing	57.14	44.44	7.41	28.00
Natural forages only	85.70	77.70	96.40	90.20
Cultivated forages only	0.00	0.00	0.00	0.00
Natural and cultivated forages	14.30	22.20	3.50	9.80
Farmers supplementing cattle (%)				
Concentrates	0.00	0.00	7.10	3.90
Minerals	100.00	100.00	100.00	100.00

The information on livestock feeding systems is shown in Table 5. Extensive grazing was practiced exclusively in the two wards of Keyian and Lolgorian while in Kilgoris Central a negligible percentage (3.60 %) practiced both semi-zero and extensive grazing beside the extensive grazing. Under this extensive grazing, farmers in these wards practiced rotational grazing. More farmers in Keyian (57.1 %) practiced this type of grazing followed by Kilgoris Central (44.4%) and Lolgorian (7.4%), respectively. All farmers practiced supplementary feeding especially in providing mineral supplements. Very few farmers, particularly in Lolgorian Ward (7.1%) fed concentrates to the animals especially the ones under semi zero grazing. This happened only during dry seasons.

Table 6: Overall picture of ranking of crop by-products used by livestock

Crop by-products (%)	Ward			Mean
	Keyian	Kilgoris Central	Lolgorian	
n	27	10	42	
Maize stovers	44.44	70.00	50.00	51.90
Bean husks	11.11	0.00	11.90	10.40
Sugar cane tops	22.22	0.00	4.76	10.40
Maize	3.70	20.00	11.90	10.40
Beans	3.70	10.00	11.90	9.10
Banana leaves	11.11	0.00	4.76	6.50
Other Maize products	3.70	0.00	0.00	1.30

Natural pastures formed the major part of the forages fed to livestock in all the three wards of Trans Mara sub County (Keiyian, Kilgoris Central and Lolgorian). Apart from Natural pasture and to a limited extent both natural and cultivated pastures, crop by-products were used to supplement the pastures. Maize stovers formed the bulk of the by-products fed to livestock in the study area (Table 6). Each ward used the by-products available as feeds to the animals. The bulk of the crop by-products were used in all the wards (Keyian– 44.4%, Kilgoris Central –70.0% and Lolgorian – 50%). Depending on the ward, different crop by-products existed, led by sugarcane cane tops in Keyian, maize in Kilgoris Central and maize and bean husks in Lolgorian Wards.

Challenges of Reaing Weaner Calves

Table 7: Challenges of rearing weaner calves and their mortalities

Variables	Ward			Mean
	Keyian	Kilgoris Central	Lolgorian	
n	37	19	85	
Challenges (%)				
Parasites and diseases	48.60	47.40	37.60	41.80
Poor nutrition and management	32.40	42.10	32.90	36.20
Predators	2.70	0.00	11.8	7.80
Raids	8.10	0.00	8.20	7.10
High cost of inputs	5.40	0.00	3.50	3.50
Poor housing	0.00	5.3	2.30	2.50
Lack of clean water	0.00	5.30	2.30	2.10
Lack of markets	0.00	0.00	1.2	0.70
Lack of skills	2.70	0.00	0.00	0.70
Mortalities (%)				
Weaners	20.00	16.00	27.70	23.70

Several challenges were encountered by farmers when rearing calves in the three wards of Trans Mara (Table 7). The major challenges was parasites and diseases (42 %) followed by poor nutrition and management). In this part of the county, predators and raids posed a challenge to calf rearing. Diseases posed a major challenge to calf rearing in each of the three wards (35.1 %, 47.4 %, and 32.9 % in Keyian, Kilgoris Central and Lolgorian,

respectively). The constraints enumerated by respondents include pests and diseases, poor nutrition and management, predators, raids, high cost of inputs, lack of clean water, lack of market and, lack of skills. The overall weaner calf mortality was 24 % (Table 7) and the highest mortality was reported in Lolgorian Ward while Kilgoris Central had the lowest mortality.

How to Improving Livestock Production: Farmers' Viewpoint

Table 8: Ranking of farmer ways to improve livestock production

Variables	Ward			Mean
	Keyian	Kilgoris Central	Lolgorian	
n	27	19	76	
Ranking (%)				
Affordable and quality breeding bulls	40.74	31.58	27.63	31.15
Pest and disease control	22.22	15.79	15.79	17.21
Improved livestock management	14.81	5.26	15.79	13.93
Introduction of improved forages	3.70	21.05	5.26	7.38
Construction of dams for water storage	3.70	5.26	7.89	6.56
Avail adequate clean water	3.70	5.26	6.58	5.74
Training and advisory services	3.70	5.26	6.58	5.74
Introduction and use of A.I. services	3.70	5.26	5.26	4.92
Security, markets and crop cultivation	3.70	0.00	0.00	2.46
Reduced cost of production	0.00	0.00	2.63	1.64
Keep pure Sahiwal breed	0.00	0.00	2.63	1.64
Access to affordable animal feeds	0.00	5.26	1.32	1.64

Almost a third (31.2%) of the respondents talked of quality bulls, particularly Sahiwal bulls for breeding purposes as a way of improving the livestock in the area (Table 8). Parasites and disease control (Vaccination, dipping), and improvement of livestock management by proper feeding, land subdivision (paddocking to facilitate rotational grazing and pasture management. Other methods to improve livestock production suggested include proper feeding of the animals, proper pasture management by sub diving/paddocking the land to allow rotational grazing, observing pasture carrying capacity, improvement of pastures through introductions of improved species, availing clean water, introduction and use of A.I. services instead of use of bulls among others. Respondents in each ward prioritized differently the ways to improve production in their areas. The respondents in Keyian Ward (40.8%) prioritized the availing of affordable and quality breeding bulls (especially for Sahiwal breeds) followed by management of diseases through vaccination dipping and deworming (22.2%) as well as through proper feeding, and pasture paddocking, rotational grazing, pasture carrying capacity (14.8%). Other suggestions from the respondents in this ward carried the same weight of 3.7% (Table 8).

Similar trend was recorded for respondents in Kilgoris Central Ward where they prioritized the availing of affordable and quality breeding bulls (especially for Sahiwal breeds) (31.6%) followed by improvement of livestock management through proper feeding, and pasture paddocking, rotational grazing, pasture carrying capacity (21.1%) and, management of diseases through vaccination dipping and deworming (15.8%) all other suggestions carried the same weight (5.3%) while in Lolgorian Ward the respondents prioritized the availing of affordable and quality breeding bulls (especially for Sahiwal breeds) (27.6%), management

of diseases through vaccination dipping and deworming, and improvement of livestock management through proper feeding, and pasture paddocking, rotational grazing, pasture carrying capacity carried equal weight (15.8%). The respondents gave varied weights to the other suggestions they proposed to improve production, ranging from 1.32% to affordability of feeds and 7.94% for construction of dams.

DISCUSSION

The number of female respondents was very low in all wards of the sub County, a fact that could be attributed to the male dominance in livestock farming activities among the Maasai pastoral communities. This observation is consistent with what was reported in earlier studies (Mwacharo and Drucker, 2005; Ouma *et al*., 2007; Kosgey *et al*., 2008). Women's roles are mainly restricted to duties such as milking and taking care of the young stock, though, the region was predominantly a pastoral area, over the years there have been changes in the production systems due to various factors including impact of increased climatic variability (Simotwo *et al*., 2018) and increases in the general human population. Most productive assets (apart from partly chicken) were owned by men though most household members can access them (Alusi, 2014). Most decisions on use or control of resources at the household level were directed by men or in other cases the household heads (explaining the number of respondents in all cases Table1). Though men controlled most of the land use decisions, women were mostly involved in crop production as households increasingly turn to agro-pastoralism. There is therefore need to maximize the land given under crop production for the benefit of the women enterprises. This is key in contributing to household food security.

Grazing system used was extensive because land was mostly communal though sub division had started in some areas (Nyariki *et al*., 2009). At the same time people are not aware of other systems (i.e. zero grazing) and the pasture in the farm was mostly natural. In some areas where land was paddocked, rotational grazing was practiced. The crop by product used by some famers was mostly maize stovers and also some bean husks which are fed directly in the field. Source of water was mostly river because it was available and they take it in adlib in some cases dam water.

CONCLUSION

Results from the survey revealed that livestock in the three wards studied depended on poor quality natural pastures as the main feed resource while maize stover and bean husks were the main crop by-products fed to animals. From the farmers' point of view, the most important issues of animal husbandry were related to animal diseases and feed resources, particularly in the dry season. To mitigate the identified challenges, farmers proposed the adoption of proper parasite and disease control, appropriate pasture management and improved livestock management.

RECOMMENDATIONS

This study recommends a similar study be undertaken in the same study area widening the sample size and involving different gender; also it should be done for other pastoral areas to compare with findings obtained in this study. It would be beneficial to undertake study on management of available pastures and also introducing and evaluating improved pastures and other forages.

ACKNOWLEDGEMENTS

We acknowledge the collaboration and openness in sharing views and experiences by all survey respondents. We sincerely appreciate the logistic support and funding provided by Kenya Agricultural and Livestock Research Organization (KALRO) Naivasha and Lolgorian Centres. For the technical support, the authors appreciate the tireless guidance of Mr. Ngae who assisted in the design and analysis of the study.

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