

Both the conventional and non-conventional feed sources were used in the study Counties. The common feed resources used by dairy producers included natural pastures of *Pennisetum clandestinum* (Kikuyu grass) and the planted pastures of *Pennisetum purpureum* (Napier grass), *Chloris gayana* (Rhodes grass), banana stems of local varieties and maize stovers. Grazing on Kikuyu grass pastures was widely used by the farmers in smallholder farms (92 % of response, 1.85±0.26 acres of land), while the least was the feeding with the maize stalks collected after harvests (18 % of response, 0.0 acres of land) (Table 3a and 3b). This result was in line with previous researchers who reported grazing as the main feed source commonly practised under free grazing systems [16], [17]. Significant difference (p<0.05) was observed in land allocated for Kikuyu grass in the surveyed area.

Inadequate feed and poor feeding practices are constraints in smallholder dairy farmer as evidenced in Table 3(a). Grazing was the main form of cattle feeding while crop residues were the least used feed resources for cattle. It was also observed that 25.5 % of the respondents had cultivated grasses for additional feeding. The growing of pastures and other forages was due to the scarcity of land and lack of awareness of their importance. Judicious use of crop residues, as alternative feeds, and proper storage of seasonally available feeds can alleviate the problem of feed shortages. However, the utilization of fodder and other crop residues may be associated with inherent constraints of low digestibility, protein, energy and mineral contents that often result in poor intake and palatability. Feeding crop residues with the supplements of protein, energy and minerals as well as chemical treatment can overcome these constraints and thus improve intake and usage as ruminant feeds. The study showed that supplementation of livestock with common salt was practised by 13.4 % of the respondents.

Table 3 a: percentage preference of type of feed in 2012

District	Type of feed				
	Napier	Kikuyu grass	Boma Rhodes	Banana stems	Maize stalks
	% response preference of feed type				
Bomet	88	88	36	0	32
Chepalungu	77	100	42.3	3.8	15
Sotik	79	95.8	25	0	0
Konoin	80	80	28	8	8
Bureti	84	92	16	0	8
Kericho W.	96	96	24	40	8
Grand Mean	84	92	28.7	40	18

Table 3b: Mean ±SE of acreage of different pasture development in 2012

	Napier	Kikuyu grass	Boma Rhodes	Banana stems	Maize stalks
Bomet	0.225±0.04	1.0±0.43b	0.18±0.09	-	-
Chepalungu	0.38±0.08	1.48±0.41b	0.29±0.11	-	-
Sotik	0.20±0.04	4.22±1.21a	0.12±0.05	-	-
Konoin	0.45±0.13	1.13±0.48b	0.18±0.08	-	-
Bureti	0.51±0.13	1.79±0.35b	0.05±0.04	-	-
Kericho W.	0.52±0.14	1.8±0.37b	0.10±0.04	-	-
Grand Mean	0.37±0.04	1.85±0.26	0.16±0.03	-	-
LSD	-	1.7	-	-	-

Means with the same letter within the column are not significantly different. SE - Standard Error. n - Number of respondents

Source: Survey data, 2012

3.4. Adequacy of feeds

The majority of the respondents (74 %) experienced shortage of cattle feeds (Table 4) in their farms. Twenty five percent of farmers had hay, while 12.5 % of the respondents had silage under conservation. Production of grass for hay and fodder for silage conservation required skills and labour, which were noted as limiting factors in the study area.

Table 4: Percent response on the adequacy and use of various feed and feed supplements in 2012

	District						% Mean
	Bomet	Chepalungu	Sotik	Konoin	Bureti	Kericho W.	
Adequacy of available feed							
No	68	92	50	92	72	68	74
Yes	32	7.7	50	8	28	32	26
Percentage (%) of farmers with fodder under conservation							
Hay	40	15	30	20	12	36	26
Silage	16	3.8	23	16	8	8	12
Percentage of farmers using different feed supplements							
Vitamins	16	7.7	4.3	28	4	20	13
Concentrates	44	54	17	48	60	40	44
Mineral salts	64	81	22	76	88	100	73

3.5. Dairy cattle breeds

The mean number of dairy herd and composition is shown in Table 5. There is a high preference for improved dairy breeds of cattle than for autochthonous breeds. Based on the survey data, the Friesian (2.16±0.22) cattle predominated the breeds of dairy livestock kept by smallholder farmers, followed by Ayrshire (0.70±0.085), autochthonous breeds (0.60±0.16), Guernsey (0.04±0.02), and lastly Jersey breeds (0.03±0.02); though there were wide variations (p<0.05) across the districts. Evidently, the Jersey and Guernsey breeds were not distributed in all the districts surveyed. The data obtained supports assertions by [18] that smallholders in developing countries have often not followed recommended breeding practices and preferred to keep the larger dairy breeds (Friesian and Ayrshire), as opposed small-sized breeds. The high grades cattle have higher nutritional demands, poor adaptability, and low production efficiency under smallholder conditions [18].

Table 5: Mean±SE composition and number of milking cows, in Kericho and Bomet counties, 2012

	Friesian	Jersey	Guernsey	Ayrshire	Local Breeds
Bomet	1.32±0.28 ^b	0.00± 0.00 ^b	0.00± 0.00	0.76± 0.19	0.24± 0.20 ^c
Chepalungu	1.35±0.43 ^b	0.00± 0.00 ^b	0.00± 0.00	0.58± 0.17	2.04± 0.61 ^a
Sotik	4.17±0.94 ^a	0.76± 0.04 ^a	0.00± 0.00	0.43± 0.25	1.52± 0.66 ^{ab}
Konoin	2.40±0.50 ^b	0.00± 0.00 ^b	0.00± 0.00	0.80± 0.23	0.00± 0.00 ^c
Bureti	2.40±0.36 ^b	0.00± 0.00 ^b	0.08± 0.08	0.56± 0.14	0.04± 0.04 ^c
Kericho	1.50±0.39 ^b	0.16± 0.09 ^b	0.16± 0.08	1.08± 0.24	0.40± 0.19 ^{bc}
Grand Mean	2.16	0.03	0.04	0.7	0.6
LSD 0.05	1.47	0.58	-	-	1.16

a, b, c Means with the same letter within the columns are not significantly different (p<0.05), SE=Standard Error

3.6. Breeding practices

Access to quality breeding services is essential for the development of the dairy industry. In the studied area, 49.7 % of the households used natural mating through bulls to breed their cattle (Table 6). Some 5.3 % households use either the natural or the artificial insemination breeding systems, depending on their availability. These practices lead to use of bulls with unknown breeding values and hence low productivity in most smallholder dairy farms.

A high prevalence of bull service in an area, especially where records-keeping is poor, may pose risks of inbreeding and spread of breeding diseases. Increased inbreeding and use of genetically unproven bulls, coupled with breeding

diseases, can have unfavorable long-term effects on productivity through the degradation of the herd genotype [18].

Most of the foundation stocks in the sampled area were introduced through purchases (91.4 %), which suggests that the farmers were either not keen on/or did not have access to on-farm selection for quality dairy cattle. The availability of high grade dairy cattle was low (90.1 %) in the study area.

Table 6: Comparison (in percentage) of different breeding and reproductive techniques used by farmers in Kericho and Bomet counties in 2012

		Bomet n=25	Chepalungu n=26	Sotik n=25	Konoin n=25	Bureti n=25	Kericho W. n=25	% Total
Breeding system used	Bull	68	57.7	28	60	48	36	50
	AI	32	38.5	72	36	40	52	45
	Both	0	3.8	0	4	12	12	5
Breeding service availability	Available	44	88.5	100	40	76	80	72
	Occasionally	44	11.5	0	0	20	16	25
	Not available	12	0	0	0	4	4	3.3
Source of cattle	Gift	16	3.8	0	4	0	4	4.6
	Farmers group	0	0	0	20	4	0	4
	Purchase	84	96.2	100	76	96	96	91
Availability of cattle	Easy	24	19.2	0	0	0	16	9.9
	Not easy	76	80.8	100	100	100	84	90
Calving interval	Yearly	64	8.7	12	54	50	52	40
	Two years or more	36	91.3	88	46	50	48	60
AI services per conception	Once	40	16.7	89	15	42	76.5	51
	More than once	60	83.3	11	85	58	23.5	49
Knowledge of breeding cycle	Know	62.5	92	88	50	84	84	77
	Does not know	29.2	8	13	29	8	16	17
	Done by worker	8.3	0	0	21	8	0	6.1

n – Number of respondents

Source – Survey data, 2012

3.7. Calving interval

The average calving interval in majority of the farms was two years or more (Table 6), contrary to recommended rates of one year [19]. This indicated a decline in dairy cow fertility as evidenced by prolonged the calving interval, and may be attributed to among other factors, poor breeding management, small pool of quality bulls as most farmers use bulls for breeding or poor animal nutrition [20]. Number of services per conception was higher than two and should be rated as poor [21]. There is need to evaluate the reproductive performance of the dairy cattle and improve the quality of the breeds for better productivity in dairy cattle business [22].

3.8. Dairy cattle health problems

According to the respondents, common dairy cattle health problems identified in order of importance were East Coast Fever (E.C.F), mastitis, foot and mouth, lumpy skin disease, sensitivity to light of some animal breed especially Friesian breeds, milk fever, black water and red water (Table 7). This

study confirms findings of [23-24], that ECF is the most important tick-borne disease of cattle. Other tick borne diseases identified in the study as causing production constraints include Red water and Black quarter (Table 7). The diseases identified are as result of uncontrolled movement of livestock into and out of the area. However, the study was very limited in scope and the data collected was largely qualitative based on a questionnaire. Further studies will be needed to determine disease prevalence through serological evidence and other relevant methods.

Table 7: Multiple response analysis (%) of important disease constraints in 2012

Disease	District						Mean
	Bomet	Chepalungu	Sotik	Konoin	Bureti	Kericho W.	
Mastitis	9.4	61.5	23	11	2	20	17
Foot and Mouth	31	0	15	14	31	7	17
E.C.F	56	38.5	38	67	47	28	43
Milk Fever	3.1	0	1.6	2.8	0	4.2	2.3
Lumpy Skin Disease	0	0	9.8	2.8	10	14	8.4
Red Water	0	0	1.6	0	2	4.2	1.9
Black Quarter	0	0	1.6	0	2	5.6	2.3
Skin sensitivity to light	0	0	9.8	2.8	6	16	8.4

Source: Survey data, 2012

4. Conclusion

Livestock play an important role in the economy of different communities by supporting the livelihoods of farmers, consumers, and traders through provision of food, employment and resources for industrialization. Increasing the productivity and competitiveness of the dairy cattle through reduction of identified constraints will spur the dairy production chain.

Based on the results of the study, the following recommendations should be considered for improving the dairy industry in the counties of Kericho and Bomet:

1. The shortage of feed could be addressed through improvement of feed production and nutritional quality, with conservation for sustained feeding.
2. Upgrading the foundation stocks through quality breeding for milk production should be encouraged through extension services to improve genotypes and productivity of the cattle.
3. Improvement of farmers' knowledge base and skills on dairy cattle management should be done through training and extension services for improved productivity.
4. Disease and pest control services should be utilized optimally to create conducive conditions for dairy cattle productivity.

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