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# Farmer's Perceived Prevalence and Type of Lameness Between Smallholder Zero and Pasture Grazed Dairy Cows in Kenya

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**Abstract:** Lameness in dairy cattle is a welfare problems and a production limiting disease with high risks in cows kept in house (zero-grazing housing units) for intensive production. The objective of this study were to compare farmer estimated, observed prevalence and prevalence of types of lameness from cow-lameness in farms practicing zero-grazing and pasture grazing. The study sampled zero-grazed and pasture-grazed cows in an observational study design in Nakuru County. A total 172 smallholder farms were randomly selected in which 485 cows were examined for lameness and each animal record and history were obtained together with risk factors. Hypotheses were tested using Chi square and spearman rank correlation. The observed prevalence of cow- lameness was 22.1% and was comparable to farmer-estimated prevalence (22.7%). Farmer-estimated and observed prevalence had a strong positive correlation (r=0.959, p=0.0001). The percent of lame cow was not different between zero-grazed (23.0%) and pasture grazed (20.2%) cows. Laminitis was the most prevalent type of cow-lameness in zero- grazed (43.8%) and in pasture grazed (41.7%) cows compared to digital dermatitis (30.1% *Vs* 36.1%), sole ulcer (11.0% *Vs* 8.3%) or white line disease (15.1% *Vs* 13.9%). This study showed that cases of cow-lameness were high in zero grazed than in pasture grazed. There is need to increase farmers awareness in zero grazed compare to pasture about lameness perception and prevalence.

**Key words:** Dairy Cows · Farms · Grazing Management · Risk Factors · Welfare

## INTRODUCTION

Cow-lameness manifesting as an abnormal gait or animal limping when walking or claw disorders is a cause of worry to dairy producers because it could be clinical condition accompanied with painful lesions which can result into severe animal welfare problem and production-limiting in the herd. Solano *et al*. [1] reported large variations of lameness prevalence between countries: 16% in the Netherlands, 37% in Britain, 48% in Germany and up to 63% in the USA. A common characteristic of these dairy systems is intensive dairying in which cows are confined in housing units, the equivalents of which is zero-grazing units utilized by smallholder dairy farmers and there are about half (44%) of such farms in the Kenya highlands [2]. This would suggest that management of cows in smallholder dairy zero-grazing units could also be experiencing high prevalence of cow-lameness and presenting problems of animal welfare and production-limiting. The farmer's perception of lameness problem was compared with the prevalence detected by observation of the milking herd and ninety percent of farmers did not perceive lameness to be a major problem on their farm [3]. Lameness perception is less of a problem for cows managed at pasture compared to zero-grazing herds [4].

Studies of cow-lameness are few in Kenya, but they suggest increased incidences of cow-lameness with the shift from pasture to zero grazing and over the years, which could mean that cow-lameness present problem in smallholder farms. Gitau *et al.* [5] reported cow-lameness prevalence of 0.76% per month in cattle kept in pasture 24 hours a day and 2.14% in cows housed 24 hours a day in Kiambu farms. Mbuthia [6] performed a radiographic examination of 318 abattoir obtained claw samples and found 35% subclinical and 21% chronic laminitis cases with 44% of the claws experiencing extreme deformities. The two cited Kenyan studies present empirical evidence limited only to prevalence, therefore weak in informing the design of effective management interventions. Though a large population of the national dairy herd is kept in smallholder zero grazing units where risks for cow-lameness is high, only limited empirical

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studies exists on this welfare and production limitation challenge in Kenyan smallholder dairy farms. This study proposes to fill this knowledge gap with an empirical study of the farmers estimated prevalence, lameness condition and type of lameness of cow-lameness in smallholder farms which could inform management interventions for improved animal welfare and herd productivity.

## MATERIALS AND METHODS

**Study Site:** The study was in smallholder dairy farms in Bahati, Njoro and Lare regions of Nakuru County within the Kenya Highlands. Zero grazed dairy herds dominate in Bahati and Njoro regions, while pasture grazed dairy herds dominate in Lare region.

**Sampling Procedure:** A simple random sampling procedure was used for the study, where Bahati and Njoro areas represented the zero-grazing and Lare the pasture grazing. Farms within each area were randomly selected based on a list provided by the staff of animal production directorate in Bahati, Lare and Njoro Sub Counties. Smallholder dairy farms with 1 to 5 adult cows were selected for the study for a total of 70 farms in Bahati, 45 in Njoro and 57 in Lare. The sample farms were recruited into the study on the consent of the owner to participate in the study and allow for the examination of the cows for lameness.

**Data Collection:** Data was obtained through observation and administering questionnaires either to farmers or stockmen (As respondent interviewees) before examination of cows. Farms were visited in the morning and farmers were asked whether lameness was a problem for the past two years, proportion of lame cows, lameness condition and risk factors. The study was conducted on 485 cows belonging to 172 farms kept under different management systems within Nakuru County.

**Lameness Diagnosis:** Cows were observed for lameness condition when they were in motion for detection of any kind of abnormality in locomotion and cows that move with clear abduction or adduction, shows clear impaired movement was diagnosed as lame. This was followed by each cow being restrained in a crush for physical clinical examinations which were conducted to identify the site and type of lameness after hooves were washed and cleaned.

**Statistical Analysis:** Data collected from the survey were processed and analyzed using appropriate computer packages, including the SPSS and SAS statistical software. The perceived cow-lameness prevalence was computed from the farmers own estimated cow-lameness in their herds and computed as percentage of lame cows in a farm. Both farmer's estimates and observed cow prevalence were subjected to Spearman rank correlation analysis.

Chi-square test statistic was used to determine associations between prevalence, grazing management and type of lameness. An association was considered significant at the level of $P<0.05$. The prevalence of lameness was calculated as the number of cows affected by lameness divided by the total number of cows examined multiplied by 100. Prevalence (%) = Positive/total*100.

## RESULTS

**Description of the Sample Farms and Cows:** Table 1 is a summary description for the 172 sample farms that were visited. More of the farms practiced zero-grazing (63.4%) than free grazing (36.6%) system, but average herd size of 2.8 cows was not different between the two production systems. The study examined 485 cows for lameness of which 22.1% were found lame.

**Farmer Estimated and Observed Prevalence of Cow-Lameness:** Results showed that cow-lameness in smallholder farms is about 22-23%, whether estimated by farmers or observed in the zero-grazed or in pastured grazed dairy cows (Table 2). Cow-lameness prevalence estimated by farmers was not different from the observed prevalence (22.7 *vs* 22.1%) in the sample farms and the two estimates had a strong positive correlation ($r=0.959$; $P = 0.001$). Both farmers estimated and observed prevalence of cow-lameness was not different ($p>0.05$) between zero and pastured grazed cows (farmer estimate: 23.7 *vs* 20.8; observed: 23.0 *vs* 20.2 %).

**Prevalence of Types of Cow Lameness:** Four types of cow-lameness were identified in both zero- and pastured grazed cows, of which the most prevalent were laminitis (43.1%) and digital dermatitis (32.1%) compared to sole ulcers (10.1%) or white line disease (14.7%). However, the prevalence of the four types of cow-lameness did not significantly differ between the grazing systems (Table 3).

Table 1: Description of the sampled farms

| Farm grazing system | Farms (n) | Cows (n) | Lame cows (n) | Mean±SD (minimum-maximum) |
|---|---|---|---|---|
| Zero-grazing | 109 | 317 | 73 | 2.9±1.2 (1.00 - 5.00) |
| Pasture grazing | 63 | 168 | 34 | 2.7±1.2 (1.00 - 5.00) |
| Sample total | 172 | 485 | 107 | 2.8±1.8 (1.00 - 5.00) |

Table 2: Farmer estimated and observed prevalence of cow lameness

| | Farmer estimated prevalence | | Observed prevalence | | Correlation coefficient | |
|---|---|---|---|---|---|---|
| Cow grazing system | Farms (*n*) | Prevalence (%) | Cows (*n*) | Prevalence (%) | R value | *P* value |
| Zero-grazing | 109 | 23.7 | 317 | 23.0 | 0.991 | 0.001*** |
| Pasture | 63 | 20.8 | 168 | 20.2 | 0.953 | 0.001*** |
| Total | 172 | 22.7 | 485 | 22.1 | 0.959 | 0.001*** |

Table 3: Prevalence of types of cow-lameness

| | Types of lameness (%) | | | | | |
|---|---|---|---|---|---|---|
| Cow grazing | Digital dermatitis | Laminitis | Sole ulcer | White line disease | Overall prevalence | Chi square statistics |
| Zero | 30.1 | 43.8 | 11.0 | 15.1 | 23.0 | Value 0.4818 |
| Pasture | 36.1 | 41.7 | 8.3 | 13.9 | 20.2 | DF= 3 |
| | | | | | | P= 0.9229 |
| Total | 32.1 | 43.1 | 10.1 | 14.7 | 22.1 | |

## DISCUSSION

Results showed that smallholder dairy farmers can accurately estimate the prevalence of lameness in their herds and their estimate correlated positively (r=0.959) with the observed prevalence which was in agreement with Leach *et al*. [3]. This demonstrated that there require increasing the awareness of the lameness problem and therefore more likely to adopt interventions. A similar observation was made by Bauman *et al.* [7] in a Canadian study of cow lameness that farmers were aware of the magnitude of the lameness in their herds. This observational study was based on sample farmers in zero and pasture grazed with their individual records and herd histories. A total of 485 cows were examined from 172 farms and herd size range from 1-5 cows. Farmer's estimated and observed prevalence in zero and pasture grazed where not significantly different between the two grazing systems, however, high prevalence was documented in zero grazed compare to pasture grazed, This observation corroborates those of Leach *et al*. [3] indicated that lameness perception is less of a problem for cows managed at pasture compared to zero-grazing farms. Lameness was perceived as the second most important health problem to control after mastitis and tied with fertility problems, a ranking similar to that of European producers [3]. In the Canadian study, lameness was ranked even higher, as the number one disease problem on the farms [7].

The prevalence of cow-lameness in smallholder farms of 22.1% observed in this study is comparable with those observed in the USA, 25% in Wisconsin and Minnesota [8], 22% in England [9] and 21% in Finland [10]. However, the lameness prevalence in present study was lower than the finding in other intensive dairy systems found in USA and Germany (34 to 63%) reported by Sarjokari *et al*. [1] and von Keyserlingk *et al*. [11] and prevalence in Canadian herds reported was around 24% [12]. While in other animal, Cart mule was reported in Ethiopia 26.8% [13]. But prevalence was much higher than 3.5% estimated in Ethiopian smallholder dairy farms Mishamo and Abebe [14], 3.8% in Abergelle fattening farm in Ethiopia [15 ] and in Nasarawa state, Nigeria 4.3% Hambali *et al*. [16]. Difference in variation in prevalence may depend on different management systems, climate, herd size and breed. The low prevalence observed during the current study may be due to pasture fields, loosing housing and small herd size. There was larger variation of cow-lameness prevalence found in zero grazed dairy farms. Observed lameness prevalence of cow-lameness was higher in zero grazed (23.0%) compare to pasture (20.2%).

In the present study, four types of cow-lameness were identified of which the most prevalent were laminitis (43.1%) and digital dermatitis (32.1%) relative to sole ulcers (10.1%) and white line disease (14.7%). However, prevalence of these four types of cow-lameness was not significantly different between zero-grazed and pastured-grazed cows. High prevalence of laminitis was recorded in zero grazed compare to pasture grazed cows and this is

possibly due to the fact that cows stand on bare earth floor, concrete for long time and also feeding concentrates. However, Tranter and Morris [17], Tranter *et al*. [18], Vermunt [19], Macky [20] and Westwood and Lean [21] suggested an association between feeding high-quality pastures and laminitis. The association between 3rd or higher parities with laminitis agrees with previous findings by Sagstad *et al*. [22] that most lameness is generally associated with third or higher parities. The laminitis processes are further aggravated by the stress of heavy milk production during the first 90 to 120 days post-calving [23] could have contributed to the difference in the prevalence rates of laminitis between zero-grazed and pasture grazed farms. In a study by Nguhiu *et al*. [24] found that housing cows on earthen (Bare soil) floors was an important risk factor for development of chronic laminitis which is in line with the findings of the current study.

The greater prevalence of digital dermatitis was in pasture compare to zero (36.1 vs. 30.1%), this reflects the increased exposure these cows would have to manure and moisture. This was consistent with a number of authors have who have found links between the cleanliness of the environment and digital dermatitis prevalence [25, 26, 27, 28, 29]. The greater prevalence reported for pasture was in agreement with these findings [22, 29]. It is in agreement with Relun *et al.* [25] found direct relationship between leg cleanliness in dairy cows and housing provided for the dairy cows were also link to digital dermatitis prevalence. This in line with Holzhauer *et al*. [26] who found that access to pasture was associated with an increased risk of digital dermatitis. In fact, Relun *et al*. [27] found a direct relationship between levels. However the sole ulcer reported in this study was 11.0% in zero grazed compared to pasture grazed 8.3% which was less than the finding of Manske *et al.* [29] and Hedges *et al.* [30] who reported 26% of sole ulcer. White line disease 15.1% was high in zero grazing than in pasture grazing 13.9%.

## CONCLUSIONS

This observational study found that zero and pasture grazed was positively correlated. Producers are aware of the general risk factors for lameness and that lameness is expensive and painful for the cow, although producers are knowledgeable on the main risk factors for lameness, they may not realize that the risk factors are present on their individual farm. Additionally, recording of lameness cases is still lacking. Four types of cow-lameness were found to be associated with cow-lameness in both zero- and pastured grazed cows, of which the most prevalent were laminitis, digital dermatitis, sole ulcers and white line disease. Cow-lameness prevalence of smallholder dairy cows was 22.1% which was comparable to farmers estimate prevalence of 22.7%. There is need to increase farmers awareness in zero grazed compare to pasture about lameness perception and can support in determining strategies to establish good dairy cow foot health. Therefore very important that extension activities focus on improving the knowledge of dairy farmers

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