A Note on Risk Factors for Calf Mortality in Large-Scale Dairy Farms in the Tropics : A Case Study on Rift Valley Area of Kenya

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ABSTRACT : The aim of this study was to assess the associations of some potential risk factors and occurrence of calf mortality in large-scale dairy farms. Njoro area of the Rift valley, Kenya was selected due to its potential of large-scale dairy farms, since the time of the Europeans settlers. The study was retrospective and focused on the calves dying from January 1996 through October 1998. Sample of studied population consisted of 105 calves extracted from the farm records. Data was collected using a questionnaire and were grouped into farm-level and animal-level factors. Calf mortality was 15.6% and important risk factors for calf mortality were sex of calf, season of birth, pneumonia disease, age of dam when calf was born and house type for calves. Female calve born during colder wet seasons and born to dams of 2-4.5 years of age were equally at higher risk. Calves raised in movable pens compared to those raised in permanent pens were at higher risk of mortality from pneumonia. Animal level factors were major causes of calf mortality in commercial farms used in this study and therefore details study is needed in these factors in controlling the calf mortality rates. (*Asian-Aust. J. Anim. Sci. 2001. Vol. 14, No. 6 : 855-857*)

Key Words : Calf Mortality, Large-Scale Dairy Farms, Tropics

INTRODUCTION

In Kenya, herds in smallholder farms dominate the dairy industry, constituting over 75% of the national dairy cattle population (Reynolds et al., 1996; MoA, 1998). These herds, however, are unable to raise high quality heifers due to pervasive feed constraint, high disease incidences and insufficient number of heifers reaching milking herd. Thus application of heifer selection is limited. Large-scale dairy farms are the major source of high quality replacement heifers and breeding bulls in the genetic improvement of the national dairy herd. However, this important role of supplying young dairy stock for breeding tends to be ignored with the present consensus that dairy development efforts are best targeted to smallholder dairy production (Walshe et al., 1991).

Recent research has indicated that the reproductive rates, herd structures and calf mortality rates of smallholder dairy herds are such that over 50% of the herds are unable to produce the replacements required to sustain themselves (Bebe, 1998; Staal et al., 1998). Therefore, optimised calf health and production in large-scale dairy farms is essential for the continued supply of young breeding dairy stock to smallholder dairy farms.

The Kenya National Dairy Development Policy document (MoA, 1998) recently recognised that inadequate supply of young dairy stock for breeding was a major constraint to dairy development in the country. High calf mortality rate is one of the important factors contributing to the insufficient supply of young dairy stock for breeding (Bebe, 1998; De Jong, 1996; Gitau et al., 1994; Lanyasunya et al., 1998; Kariuki, 1980). These authors reported calf mortality rates ranging from 10 to 33% annually and mainly from smallholder dairy farms. Risks factors associated with the mortality of the calves were inadequate labour, inadequate housing, inadequate feeding of colostrum, feeding of concentrates, season of birth and some specific disease conditions especially diarrhoea and pneumonia. Given the major differences in resources and managerial strategies between large and small-scale dairy farmers, risk factors and disease pattern of calf mortality may differ. Identification of such risk factors will be helpful in designing possible control strategies as a pragmatic approach to lower the calf mortality risk and suggest further research objectives in support of the dairy industry in Kenya. Therefore, the aim of this study was to assess the associations of some potential risk factors and occurrence of calf mortality in large-scale dairy farms of Kenya.

MATERIALS AND METHODS

Sample population

Five large-scale dairy farms within Njoro area in the Rift Valley of Kenya were selected for this study. The farms were all located around Egerton University and kept Friesian dairy cattle breed and their crosses. The area has been, and still is among major dairy calf producer in Kenya. The study focused on the calves dead within 1996-1998 period. The studied population

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consisted of death records of 105 calves obtained from the farms. Njoro area and Rift valley in general has a long history, as home of European settlers, and still one of the major dairy areas in Kenya.

Data collection

Data collection was retrospective, based on the farm records of calves dying within January 1996 to October 1998 period. A questionnaire was used to extract the relevant information from the farm records. Data collected were grouped into farm-level and animal-level factors. Farm-level factors included the individual farm, type of calf housing, type of floor for calves and feeding method (bucket or suckling). Animal-level factors included sex of the calf, season of birth, season of death, age of calf at death, age of dam at calfs birth, source of semen (imported or local bull), and cause of death diagnosed or suspected.

Data analysis

Calf mortality was the outcome variable. The explanatory variables were farm-level and animal-level factors, which were the risk factors, thought to be related to calf mortality. Mortality rates were calculated for the specific risk factor by dividing the number dead due to the relevant risk factor by the total number dead as the denominator. The associations between risk factors and calf mortality were evaluated through multiple logistic regression models (PROC LOGIST: SAS Institute Inc, 1989). Explanatory variables were fitted to the multiple logistic regression models by backward elimination to retain only the significant factors. Interactions between the explanatory variables were not evaluated due to small sample size involved.

The relative risk (Odds ratio) of different factors and the 95% confidence interval (CI) were calculated. Odds ratio expresses the strength of the association between the investigated (explanatory variables) and the occurrence of death for the calf. Odds ratio is one (1) if no association can be observed. The more odds ratio differs from one, the larger the association. The association is positive if odds ratio is greater than one and negative if odds ratio is less than one. When one is outside the 95% CI, the association between the risk factor and the occurrence of death is significant. Results are only shown for the factors found significant in the final logistic model.

RESULTS

Table 1 displays the factors that were found significant for calf mortality in the large-scale dairy farms sampled. Calf mortality was associated with sex of calf ($p<0.01$), season of birth ($p<0.01$), disease condition ($p<0.05$), age of dam when calf was born ($p<0.05$) and house type for calves ($p<0.05$). The model fitting the five factors accounted for 68.8% of the calf mortality. Out of the five significant factors, four were classified as animal-level factors.

Mortality was the highest for calves born females, calves born during July-September season, calves born to dams between 2-4.5 years of age. Calves raised in movable pens compared to those permanent structures were at higher risk of mortality. Pneumonia was the most important cause of calf mortality. Results did not exhibit strong collinearity among the explanatory variables evidenced by the absence of extraordinarily large estimated Odds ratio and standard error.

DISCUSSION

The estimated average calf mortality rate of 15.6% falls between the reported ranges of 10-33% for the Kenyan dairy herds (Kariuki, 1980; Lanyasunya et al., 1998; Bebe, 1998). However, this rate of loss is high enough to limit the annual surplus of heifers and young bulls to potential market presented by large

Table 1. Risk factors significant (final model) for calf mortality in large-scale dairy farms within Njoro area of Kenya evaluated with use of logistic regression model

Risk factor	Number of animals	Percent died	Odds ratio	95% CI
Sex				
Females	61	58.4	1.00	
Males	44	41.6	0.52	0.34-0.78
Season of birth of calf				
January-March	23	21.7	1.00	
April-June	25	23.6	1.03	1.01-1.05
July-September	37	35.4	1.93	1.32-2.82
October-December	20	19.3	0.79	0.50-1.22
Disease				
Pneumonia	47	44.7	1.00	
Scouring	18	17.5	0.65	0.46-0.93
Salmonellosis	15	14.5	0.54	0.09-3.34
Unknown	24	23.3	0.77	0.56-1.05
Age of dam when calf born (y)				
2-4.5	59	56.6	1.00	
>4.5-6.5	25	24.2	0.70	0.52-0.96
>6.5-8.5	12	11.1	0.57	0.34-0.92
>8.5	9	8.1	0.35	0.14-0.63
House type				
Permanent Pens	14	13.1	1.00	
Movable pens	91	86.9	13.16	2.45-70.75
Aggregate*	673	15.6		

* Total number of calves born within January 1996 to October 1998 period.

smallholder population in need of breeding stock.

Studies of smallholder dairy herds (Gitau et al., 1994; Lanyasunya et al., 1998) reported mortality rates for male calves that were twice higher for female calves. The observations were attributed to poor attention given to male calves because they are attached to low commercial value by farmers. The opposite of this pattern was exhibited in large-scale dairy herds in this study, and probable explanation is discussed in the following sections.

Calves born during July-September season were at higher risk of death than any other season. The period coincides with colder wet season in Njoro area and explains the high mortality due to pneumonia disease observed in the dairy herds studied. Use of movable pens exposed calves to cold weather and risk of death from pneumonia. Results suggest the importance of adequate housing for calves in colder seasons. The higher calf mortality of calves born to younger dams of 2-4.5 years of age could be due to delayed suckling of colostrum milk, resulting in reduced absorption of immunoglobulins to impart the antibodies. These results suggest that heifer behaviour at calving need to be monitored to ensure that the calf gets adequate colostrum, especially where calf are left with the dam during the week of birth. Results show that animal related to risk factors were the most important for calf mortality. The results therefore indicate the needs to direct more research to animal related factors for controlling calf mortality in large-scale farms.

CONCLUSIONS

Calf mortality was relatively high in the large-scale dairy farms studied. Important risk factors for calf mortality were sex of calf, season of birth for calves, pneumonia disease, and age of dam when calf was born and house type of calves. Calves were at higher risk of mortality when born female, born during colder wet seasons and born to dams of 2-4.5 years of age. Calves raised in movable pens were at higher risk of mortality from pneumonia. A long-term study is required to elucidate the findings of this study.

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