RATES AND CAUSES OF CALF LOSSES IN DAIRY CATTLE OF SOUTHERN HIGHLANDS OF TANZANIA

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SUMMARY

This study was undertaken in five large scale dairy farms located in the southern highlands of Tanzania. The intention was to establish rates of abortions, stillbirths and postnatal calf losses and to examine causes of deaths. All data was transcribed from farm books and reports. Influence of various factors (farm, sex and years) were tested by chi-square statistic.
Overall abortion rates for individual farms ranged from 1.8 to 9.5% and the difference between farms in incidence rate was significant ($P < 0.001$). Rates of stillbirths were 3.4, 9.8, 9.6, 3.8 and 5.0% for Ihimbu, Iwambi, Kitulo, Mbarali and Uyole farm, respectively. Farm differences and yearly variations were large. Pre-weaning calf losses ranged between 9.3 and 25.5%. Effect of sex on death rates was not important ($P > 0.05$). From weaning to 18 months of age, death rates ranged from 13.2 to 29.2% and from 18 months of age to first calving heifer mortality ranged from 7.1 to 29.6%. Overall loss of heifers from birth to calving was estimated to be between 32.1 and 68.8%. Thirty two to 52% of all calf deaths were caused by pneumonia, scours/diarrhoea and nutritional deficiencies. Other important causes of deaths were tick-borne diseases, bloat, poisoning, accidents and abscessations. It was concluded that the results did not deviate at all from other reported findings from the tropics.

INTRODUCTION

One of the reasons for poor herd growth in many dairy herds in the tropics, Tanzania not being an exception, is hypothesized to be due to the low survival rate among calves. Losses could be due to abortions, stillbirths or postnatal deaths. Besides economis losses resulting from costs already incurred on calf rearing, deaths also result in a) loss of animals of high genetic value, b) fewer herd replacements and c) reduced selection differential (Vaccaro and Vaccaro, 1981). Asker and Il-Itriby (1957) have further pointed out that calf mortality rate in an introduced breed of animals is closely associated with its adaptability to the new environment and resistence to endemic diseases.

The magnitude of death rate in a farm is not only a reflection of level of management but could also be indicative of herd health problems (Simensen, 1986) and may imply reduced annual income and increased veterinary expenses (Hollon and Braton, 1975). This study was carried out with the following objectives; to establish rates of abortions, stillbirths and postnatal calf mortality in large scale dairy farms and to examine causes of deaths with a view of identifying major killer diseases and conditions.

MATERIALS AND METHODS

Five large scale dairy farms were involved in this study. These were Ihimbu and Kitulo in Iringa region and Iwambi,

Mbarali and Uyole in Mbeya region. Incidences of abortions and stillbirths were compiled either from calf registers (for Mbarali and Uyole) or from monthly farm reports (in case of Ihimbu, Iwambi and Kitulo). Summaries were made for each farm to obtain total number of pregnancies (confirmed by a calving), live births, abortions and stillbirths. Rate of abortion was computed as number of abortions as percent of all pregnancies while stillbirth rate was calculated as number of such incidences as a fraction of all calves born and expressed in percent. Calculations were done within years and for the whole study period. Study periods varied between farms. Chi-square analysis (Snedecor and Cochran, 1989; Putt *et al.*,1987) was performed to compare year (within farm) and farm differences in incidence rates.

All information on calves that were born and died during each month in the study period was transcribed from calf registers and monthly reports. In addition, monthly herd strengths were available. Summaries on births, deaths, total and average numbers of various classes of animals were calculated by sex, year and age. Death rates were computed as number of calves that died as fraction of calves born (for pre-weaning mortality) or as proportion of calves weaned or at risk (for post-weaning mortality). This was done within sex, year and age sub-classes. Annual mortality rate for heifers of above 18 months of age was calculated as number of heifers that died as percent of average number of heifers. Again, chi-square tests were done to find out if differences in observations between subclasses were significant.

Ihimbu, Iwambi, Kitulo and Uyole farms, as a matter of routine, write death certificates for each animal that dies on the farm. Besides indicating the most probable cause of death, clinical symptoms and post mortem findings, if any, are also shown. In case of Mbarali causes of deaths were reported in a book and in the dairy unit monthly report. All available causes of death for each dead animal were transcribed and later summarized. Proportional mortality rates were calculated as the total number of deaths occuring from a specific disease or condition in the farm during the whole study period divided by the total number of deaths occuring during the study period (Putt *et al.*,1987).

RESULTS

Abortions and stillbirths

Overall farm means in abortions were 1.8 to 9.5% while yearly abortion rates ranged from zero to 20%. Difference in abortion rates between farms was large ($Chi^2 = 118.8$; $P < 0.001$). The highest rate of abortions was recorded at Mbarali farm (9.5%). The rest of the farms had rates not exceeding 3% (Table 1). Differences between years in abortion rates were significant in all farms except Ihimbu.

In most farms rates of stillbirths were higher than abortion rates. Overall rates ranged from 3.4 at Ihimbu to 9.8% at Iwambi. Again, between farm differences were quite considerable (Chi-square = 78.9; $P < 0.001$).In three of the farms (Iwambi, Kitulo and Uyole), yearly variations in rates of stillbirth were remarkably large ($P < 0.001$).

Calf mortality rates

Table 2 presents mortality rates of calves up to 18 months of age. Mortality rates of unweaned calves ranged from 9.3 at Iwambi to 25.5% at Kitulo. Between farm difference in death rates was significant

(Chi^2 = 330.4; P < 0.001). As expected, differences between years were also significant (P < 0.01 to 0.001) but no obvious trends were discerned.

Sex differences in death rates of unweaned calves were non-significant (P > 0.05) in all farms except Iwambi where there was heavier (by 6.7%) heifer calf mortality. After weaning, death rates were 13.2% at Mbarali to 29.2% at Iwambi. Mean death rates at Kitulo, Ihimbu and Uyole were 21.3, 16.9 and 17.2%, respectively. Between farms (Chi^2 =93.7; P < 0.001) and between years (P < 0.001) differences in death rates were quite substantial. Real sex differences in mortality rate among weaners was detected at Ihimbu (P< 0.05), Iwambi (P<0.001) and at Kitulo (P<0.001). Calculated total calf loss from birth to approximately 18 months of age was 25.2% at Ihimbu, 36.2% at Iwambi, 41.4% at Kitulo, 26.4% at Mbarali and 27.4% at Uyole.

Mortality rates

Mortality rates among heifers of above 18 months of age were equally high, ranging from 7.1 at Ihimbu to 29.2% at Iwambi (Table 3). Farm differences in death rates for this class of cattle were large (Chi-square=135.0; P <0.001). Overall loss of heifers from birth to first calving ranged between 32.1 and 68.8% indicating that one third to two thirds of heifer calves born never reached the milking herd. Causes of calf deaths approximately 32 to 52% of all calf deaths in the studied farms were caused by three disorders; pneumonia, scours and nutritional deficiencies (Tables 4, 5). There were a few other farm specific major causes of death that need to be mentioned. At Ihimbu, tick-borne diseases (Anaplasmosis and East Coast fever) caused 10.5% of calf deaths. Bloat (tympanites) caused 9.6% of calf mortality at Ihimbu farm and was mainly associated with over-eating of lucerne. Poisoning was highat Iwambi in 1984 when 157 weaners and heifers died of copper sulphate put in concentrates to remedy copper deficiency. Others were due to snake venom, dip wash and molasses toxicity.

Apparently poisoning also claimed lives of some calves at Mbarali (18.7% of deaths) and at Kitulo (4.0% of deaths). At Kitulo suspected poisons were copper sulphate, urea, acaricide and plant weeds.

Attack by stray dogs was responsible for 44 deaths (5.7%) at Iwambi and 18 deaths (5.9%) at Uyole. General abscessation and abscesses of lungs and liver (Table 5) was the fourth major cause of calf death at Kitulo dairy farm. Also high on the list were incidences of lung worms (*Dictyocaulus viviparus*) and bloat. At Kitulo and Uyole there were a substantial number of un-detected/found dead cases in which even post mortem could not be performed. In the latter farm such cases were lumped into the "others" sub-class.

DISCUSSION

Abortions and stillbirths

The average rates of abortion in four of the five farms studied (1.8 to 3.0%) do not differ from those reported in the literature for various exotic dairy breeds managed in the tropics; for example Vaccaro (1974) of 2.8% among Friesians in Columbia, Kabuga (1990) of 6.7% in Ghana and Madsen and Vinther (1975) of 3.8 to 5.3% among various crossbred dairy cattle in Thailand. The abortion rate for Mbarali was, however, on the higher side. All farms, as a matter of routine, had vaccinated yearling heifers against brucellosis using a live attenuated vaccine S_{19}.

Table 1: Rates of abortions and stillbirths in Ihimbu, Iwambi, Kitulo, Mbarari and Uyole farms.

Trait/aspect	Ihimbu	Iwambi	Kitulo	Mbarali	Uyole
Year	1981-89	1980-89	1979-90	1984-89	1980-89
Abortions					
Mean (%)	2.8	1.8	2.2	9.5	3.0
Range [1]	0.9-7.2	0.0-6.9	0.0-4.3	3.8-20.0	0-7.0
Chi[2]	10.8 ns	36.5***	53.0***	17.7**	26.2**
Stillbirths					
Mean (%)	3.4	9.8	9.6	3.8	5.0
Range[1]	0.0-7.4	5.7-17.8	2.0-14.6	2.2-7.1	1.4-14.0
Chi[2]	10.5 ns	30.7***	76.5***	4.7ns	36.2***

1 Range of annual rates
[2]Chi-square test for differences between years

Moreover, occasionally farms have screened cows against brucellosis as evidenced by slaughters of positive reactors. Nevertheless, this does not exclude brucellosis as a possible cause of abortions. There could be other, non-infectious causes of abortion such as hormonal imbalances, physical stress, poisons as well as nutritional deficiencies. The significant differences between years in all farms (except Ihimbu) can be explained by the fact that incidence rates depend on specific causes of abortion. In that case rates are expected to fluctuate from year to year. Vaccaro and Vaccaro (1981) observed an increase in incidence rate as years went by but no resason was given to explain the finding. Differences between farms could partly be ascribed to breed variations and partly to environmental differences. In the present case the two were confounded.

With exception of Mbarali farm, all farms had higher incidences of stillbirths than of abortions. In all farms natural mating was practiced, and length of gestation period was not known at the occurance of abortion or stillbirth. Further, a veterinarian was not always around to assess the foetuses and a bias in registering could have happened. Otherwise the rates were consistent to those reported in Zambia (Igboeli 1973), Ghana (Kabuga,1990) and elsewhere in the tropics. On the other hand, these results are higher than incidence rates reported in the temperate countries (e.g. Auran, 1972 of 2.6% and Roy, 1970 of 3.3%). Stillbirth rates of nearly 10% at Iwambi and Kitulo were higher than those reported in the other farms. Significant differences between farms and years could have the same reasons as those discussed above.

There is need to further investigate influencing factors such as season and age of dam at parturition. For example, Igboeli (1973b) found highest rates of stillbirths to occur after the hot dry period and Auran (1972) after the June-July pasture period.

Table 2: Mortality rates among heifers of over 18 months of age including from birth to calving (BTC)

Farm	Age class	No. of calves		Death rate	Between years		Between sexes		
		Born/at risk	Died		Range	Chi-square	M	F	Chi-square
Ihimbu	Un-weaned	734	73	9.9	0.0 - 43.5	112.3^{***}	11.1	8.9	0.8^{NS}
	Weaned	661	112	16.9	4.8 - 56.4	56.4^{***}	13.7	19.8	3.9^{*}
	Birth-18 mon.	734	185	25.2	-	-	-	-	-
Iwambi	Un-weaned	1550	145	9.3	2.0 - 49.6	269.4^{***}	6.1	12.8	20.1^{**}
	Weaned	1405	416	29.6	5.7 -100.0	565.8^{***}	11.6	49.6	242.6^{***}
	Birth-18 mon.	1550	561	36.2	-	-	-	-	-
Kitulo	Un-weaned	6096	1555	25.5	9.1 - 40.0	199.8^{***}	25.1	25.9	0.5^{NS}
	Weaned	4541	969	21.3	7.3 - 38.2	235.8^{***}	15.9	27.4	90.0^{***}
	Birth-18 mon.	6096	2524	41.4	-	-	-	-	-
Mbarali	Un-weaned	525	80	15.2	3.4 - 35.9	45.9^{***}	16.2	14.2	0.3^{NS}
	Weaned	445	59	13.2	0.0 - 25.0	42.1^{***}	10.4	16.1	3.1^{NS}
	Birth-18 mon.	525	139	26.4	-	-	-	-	-
Uyole	Un-weaned	1311	162	12.3	4.1 - 18.6	22.1^{**}	12.0	12.7	0.2^{NS}
	Weaned	1149	198	17.2	5.2 - 33.3	80.3^{***}	17.6	16.8	0.1^{NS}
	Birth-18 mon.	1311	360	27.4	-	-	-	-	-

Table 3: Mortality rates in heifers of > 18 months of age including from birth to calving (BTC)

Farm	Age	Death rate (%)	Range	Chi^2
Ihimbu	>18	20/283 (7.1)	0.0-28.9	40.9***
	BTC	32.1		
Iwambi	>18	218/746 (29.2)	4.4-100.0	375.2***
	BTC	68.8		
Kitulo	>18	257/2064 (12.4)	2.5-26.5	98.2***
	BTC	52.9		
Uyole	>18	63/310 (20.3)	0.0-69.7	68.2***
	BTC	42.1		

Both are stressful periods to the cows. Moreover, it has been documented (Auran, 1972) that frequency of stillbirth is higher among heifers than among older cows.

Postnatal mortality rate

From the literature, calf mortality rates from the tropics have varied very much from as low as 4% to as high as 71% with most death rates below 30%. Calf death rates from the farms studied here are of similar magnitude. Direct comparison of results appears not quite valid because age limits are either not specified or are different. It may also mean comparing different breeds and/or management systems. Mwakatundu and Masanje (1984) indicated that in Tanzanian dairy farms, pre- and post-weaning mortality rates of 10% were considered tolerable rates. Based on this criterion, Ihimbu and Iwambi farms had acceptable pre-weaning mortality rates but all others should be considered to be high. In this study pre- and post-weaning periods were of quite different durations (4 versus 14 months), it appears that in three of the farms the proportion of weaned calves that was lost was higher than proportion lost during pre-weaning period. This reflects the sub-standard management (especially feeding) given to calves after weaning as previously reported by Mchau *et al.* (1983) and Msanga and Nduyé (1990) for similar farms in Tanzania.

Significant sex differences were obtained in three of the farms (Ihimbu, Iwambi and Kitulo) and in all cases mortality rate was higher in heifer than in bull calves. These farms belong to Tanzania Dairy Farming Company (DAFCO) and are commercial enterprises. Farm managers were given mandate to sell bull calves after they had received colostrum. Such occasional sales were difficult to be accounted for in calculating mortality rates hence a somewhat downward bias on males. The large variation in death rates between years was expected as annual death rates are a function of herd health, changes in management (e.g. personnel) and occurance of disasters such as the 1984 copper poisoning at Iwambi. The overall death rates up to 18 months of age (exluding stillbirths) ranged from about 25 to 40%. These rates resemble those reviewed by Vaccaro (1974) which ranged between 30 and 45%. They are, however, much higher compared to those experienced in the temperate countries (Peters, 1986; Simensen, 1986).

Table 4: Causes of deaths among young stock at Ihimbu, Iwambi, Mbarali and Uyole dairy farms (%)

	Ihimbu	Iwambi	Mbarali	Uyole
Total no. of deaths	209	776	139	305
Pneumonia	7.2	14.8	125.9	9.5
Diarrhoea/scours	18.7	11.1	9.4	9.8
Bloat	9.6	2.5	3.6	-
Nutritional deficiency	5.7	12.1	16.5	20.3
Born weak	2.4	2.9	-	3.6
Poisoning	4.3	25.8	18.7	3.9
Accident or drown	5.3	3.6	2.9	3.6
Attacked by stray dogs	2.4	5.7	-	5.9
Fascioliasis	4.3	0.5	1.4	-
Lung worms	3.3	0.9	-	3.3
Tick-borne diseases	10.5	2.6	-	0.7
Other digestive system disorders	4.3	2.0		
Liver failure (cirrhosis or abscessation)	-	2.5	-	4.3
Destroyed; general malaise	10.0	0.5	-	6.5
Scours and pneumonia	-	2.0	-	-
Lung abscesses	-	0.5	2.2	-
Foot and mouth disease	-	0.4	5.0	-
Lumpy skin disease	-	0.3	5.0	-
Lung tuberculosis	-	-	2.9	-
Navel infection	-	-	-	2.6
Other causes	12.0	9.3	6.5	25.9
Total	100.0	100.0	100.0	100.0

Table 5: Causes of death among young stock at Kitulo dairy farm

Cause of death	Number of deaths	Percent
Pneumonia	522	19.0
Diarrhoea/scours	314	11.4
Enteritis/gastroenteritis	308	11.2
Abscesses (general,lungs,liver)	166	6.1
Lung worms	159	5.8
Un-detected/un-known cases	157	5.7
Tympanites (bloat)	146	5.3
Drowning in water/mud	136	5.0
Nutritional deficiency/debility	117	4.3
Poisoning	110	4.0
Reproductive problems in heifers including hydramnios/hydrallantois	89	3.2
Multiple of causes	70	2.6
Liver failure/cirrhosis	61	2.2
High altitude (brisket) disease	53	1.9
Accidents/trauma	46	1.7
Helminthiasis (mainly tape worms)	42	1.5
Attack by stray dogs	30	1.1
Navel ill/joint ill	28	1.0
In-digestion	25	0.9
Born weak	22	0.8
Intestinal obstruction/strangulation	19	0.7
Cold stress	18	0.7
Fascioliasis	16	0.6
Tuberculosis	14	0.5
Destroyed due to ill health	8	0.3
Others	67	2 . 4
Total	2743	100.0

Heifers are the herd replacements. Death rates among heifers (birth to calving) found in this study are higher than that of 25% among Friesian heifers reported by Vaccaro and Vaccaro (1981). On average one half of all heifers born did not reach the milking herd. This implies that almost no culling could be done among cows if herd size was to be maintained. It would have been interesting to derive replacement rates in the farms (as number of first calvers as proportion of total number of calvings in a year) but the nature of the records (failure to trace first calvers in each year) could have given very un-realistic results. With such a high rate of heifer mortality, herds can only

sustain herd numbers if calving rates are above 90%. Nevertheless, culling intensity for production is tantamount to be zero.

Causes of calf deaths

The major causes of death among calves, that is pneumonia and scours/diarrhoea have been widely reported (Roy, 1980; Simensen, 1986; Shoo *et al.*,1992; Amble and Jain, 1967). However, nutritional deficiency which was responsible for many deaths in all farms studied has rarely been reported elsewhere (e.g. Mchau *et al.*,1983). All three causes are management problems which can be controlled if seriously attended to. At Kitulo, digestive system disorders were rampant indicative of gross feeding and/or hygiene problems in the farm. Other conditions which can be curtailed through improved management include cases of drowning in water/mud, poisoning, cold stress and undetected cases.

Dipping to control ticks was done in all farms, yet Ihimbu and Iwambi farms registered quite a number of deaths from tick-borne diseases. This can be explained by failure to counter-check or wrong reports on acaricide strength of dip washes or by allowing non-farm cattle to trespass their farms. Another speculation could be resistence of ticks to acaricides in use. High altitude disease was a farm-specific cause of death among calves at Kitulo (altitude 2630-2820 m). It is a disease which affects cattle under one year of age and has also been reported in the Ethiopian highlands (Njau and Kasali, 1989). Although dewormings had been done in the five farms against various kinds of internal parasites, it appears fascioliasis, lungworms and other unidentified intestinal worms have claimed lives of many calves. This has probably been a result of irregular availability of drugs and increases in prices which led to sub-optimal deworming frequencies.

Finally, it is worth to mention (as also noted by Putt *et al.* 1987) that veterinarians vary in their diagnostic abilities, experience, dedication to work and in the use of the correct term for a disease or condition. This by itself may contribute, to some extent, to the variation of frequencies reported.

Conclusions

Abortion rates were similar to those reported elsewhere in the tropics but rates of stillbirths showed to vary widely among farms and were slightly higher than those reported in temperate countries. Postnatal death rates were, in general, very high. Such high death rates among heifers result in low replacement rate and culling rate among cows. Pneumonia, diarrhoea/scours and nutritional deficiencies were the main calf killers in the farms. Quite a number of diseases and conditions could be controlled through improved feeding and general husbandry practices.

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