

# LEVELS, CAUSES AND FACTORS AFFECTING MORTALITY IN A HERD OF SMALL EAST AFRICAN GOATS ON A SEMI-ARID THORNBUSH SAVANNAH

By

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## Introduction

Kenya comprises vast arid and semi-arid areas and at the present level of technology and economic infrastructure in the country, the only feasible way to produce food for human consumption from these areas is through domestic ruminants.

Small stock production has played a major role in the economy of range areas in the past 10 years. Sheep and goats have contributed significantly more than cattle in terms of livestock products in these areas (Semenye, 1977).

The goat population has recently been estimated at 7.7 million with 40% of these being kept by pastoralists (Stotz, 1983).

An increasing proportion of goats is observed in the pastoralists flocks with increasing aridity of the environment, leading to the assumption that goats are better adapted to the conditions of the arid rangeland of Northern Kenya.

High mortality rates, especially preweaning, has been cited as a major constraint on improving productivity. Wilson et al. (1985) reported a preweaning mortality of 28.6% for goats in a Maasai ranch. Carles et al. (1982), working in a pastoral area in Northern Kenya, reported mortalities of 6-12% for breeding females, rising as high as 66% during the first year of life.

An opportunity arose to study in more detail, the causes, levels and factors affecting mortality in a typical pastoral system with the establishment, by the Department of Animal Production in cooperation with the Ministry of Livestock Development, the European Economic Community, the German Research Foundation and the German Agency for Technical cooperation, of a research station in a pastoral area near Isiolo.

## Materials and Methods

### Environment:

The studies were carried out at a small research station situated on a holding ground of the Livestock Marketing Division near Isiolo, 300 km. north of Nairobi.

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The altitude is 1100 m and the mean annual rainfall is 510 mm. in two rainy seasons (March to May and October to November). The soils are volcanic in origin with some alluvial floodplains along seasonal watercourses. The main vegetation type is a thornbush savannah dominated by various Acacia species with a sparse ground cover of annual grasses, herbs and dwarf shrubs. Along the seasonal watercourses, Acacia woodland and dense bush dominated by Grewia species occur and perennial grassland is found on the floodplains.

#### Experimental animals:

These comprised a herd of small East African goats. The original stock of 60 mature and immature females was provided by the research division of the Ministry of Livestock Development. By culling and further local purchases, 90 mature and 50 immature females were present at the start of the recording. Except for 56 of the mature does, which were tooth aged, the rest of the animals had age and previous birth records.

#### Herd management:

There are no fenced paddocks and animals were herded throughout the year. A normal grazing day started at 0700hr, was interrupted for watering from a deep borehole which was part of the station, with a midday rest between 1300hr and 1500hr and ended at 1800hr, when the animals returned to the night enclosure.

The animals were drenched twice a year before the rains using Ranide\* and were vaccinated once a year against contagious caprine pleuropneumonia (CCPP). Injuries were treated as they occurred and Pye grease\* was applied to animals affected by ticks. Rock salt (which is easily available in the local markets) was supplied in the night enclosure.

#### Data collection:

All events such as abortions, births and deaths were recorded continuously, liveweights and milk yields were measured regularly every two weeks.

Whenever possible dead animals were subjected to a post mortem examination to attempt to establish the cause of death. Due to the distance from the Department and the unavailability of a veterinarian at all times to perform the post-mortem when a carcass was fresh, standard post mortem sheets were designed to enable trained field assistants to carry out a systematic examination and description of the carcass.

Pasture condition was judged every two weeks using a simple classification with four categories incorporating forage availability and quality.

The following factors were then analysed to determine whether they affected kid survival:-

1. Type of birth
2. Sex

3. Forage condition
4. Birth weight
5. Dam weight at kidding
6. Dam age at kidding
7. Milk consumption
8. weight gain

Data analysis was done using the least squares methods for multiple classifications of non-orthogonal data, as described by Harvey (1966) and applied by Seebeck (1975) in his computer programme SYSNOVA (Version 7.1).

Due to the binomial nature of the kid data, the problem of unequal error variance arose and was overcome by using weighted least squares analysis (Neter and Wasserman, 1974).

### Results and Discussion

Levels:

Mortality levels for different age groups are shown in Table 1.

Table 1: Age specific mortality rates

Class	Age (days)	Mortality rate
Young kids	1-13	16%
Older kids	14-160	18%
Weaners	161-365	4%
Adults	>365	12%

Mortality rates are higher for kids than adults and weaners. This was expected and has been reported by Carles et al. (1982) working in a similar area in Northern Kenya. This higher mortality in kids could be attributed to the young being less resistant to environmental factors and infectious diseases. The weaners had the least mortality. Almost all adult deaths occurred in animals which were lactating or pregnant during a dry season and this could explain the lower mortality of the weaners. The difference between the two kid groups was very small and could be attributed to chance.

Causes:

The causes of death for adults and immatures are given in Table 2. The original classification of causes of death which included; unexplained loss, predation, doubtful diagnosis, miscellaneous causes, pneumonia, emaciation, cestodes and strongyles had to be modified for analysis due to the small numbers observed in some classes.

Table 2: Causes of death for 40 adults and immatures

Causes	Proportion (%)
Unexplained loss	17.5
Emaciation	30
Miscellaneous	20
Predator	15
Pneumonia	17.5

The major cause of death was emaciation and this was attributed to a prolonged drought in 1984 when most deaths in this class occurred. Miscellaneous causes included animals which were sick, a postmortem was done, but the causes of death were too diverse to be classified separately. Unexplained loss were those animals which died and for some reason a post-mortem examination was not done. Animals dying from pneumonia had lesions typical of CCPP. Most of the predation occurred during the drought when some animals were very weak and were separated from the herd during grazing.

For kids the causes of death were not analysed as the gross pathological findings of the carcass were inadequate for specific diagnosis to be made.

Factors affecting mortality in kids:

Young kids (1-13 days)

Of the factors analysed only sex ( $P < 0.05$ ), birth weight ( $P > 0.001$ ) and milk intake ( $P < 0.001$ ) were significant. Forage condition, type of birth (single or multiple), dam weight at kidding and age of dam at kidding were non-significant ( $P > 0.05$ ).

The female kids had a 3.7% higher probability of survival than the male. Although this is a little surprising it is consistent with the findings of Wahome (1986) (from the same data) that does with male kids produced less milk than those with female kids.

For every extra 100g in birthweight the probability of survival increased by 2.6%. There was a 34% difference in probability of survival between kids born with the lowest birth weight and those with highest over the expected range covering 90% of the observations (Figure 1). The high rates of survival for heavier kids could be attributed to the fact that these are more mature at birth, their physiological systems are more developed therefore more resistant to environmental stress.

Milk intake is critical for the survival of kids. The results indicate that for every extra 100 ml/day of milk taken, the probability of survival increased by 0.03%. There was a 21% difference in probability of survival between kids with lowest milk intake and those with highest intake during the first two weeks of life over the 90% expected range of observations (Figure 2).

Figure 3 shows that dams whose kids died before weaning were generally lower yielders.

Older kids (14-160 days):

Only average daily weight gain upto 42 days was significant ( $P < 0.001$ ). Birth weight, dam weight at kidding, dam age at kidding and sex were not significant ( $P > 0.05$ ).

The weight gain was highly significant. For every 1 g advantage daily weight gain, the probability of survival increased by 1.05% over the expected 90% range of observations (Figure 4). Weight gain is a reflection of the general fitness and level of nutrition. Fast growing kids are relatively more mature and thus more resistant to environmental stress.

The major nutritional component at this age is milk. Milk intake was analysed separately and its effect was highly significant.

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Fig. 1. Partial relationship between survival and birth weight.

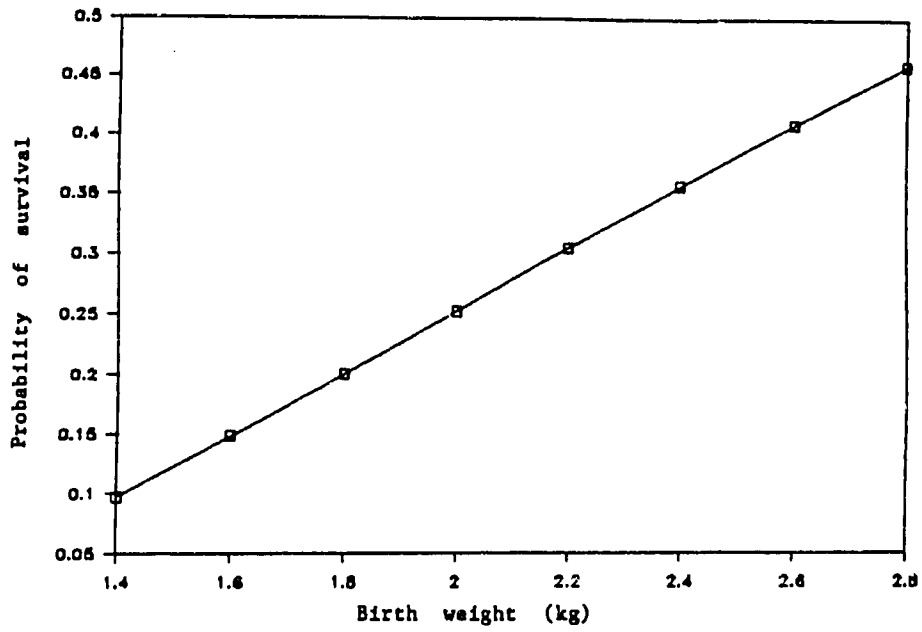


Fig. 2. Partial relationship between survival and milk intake

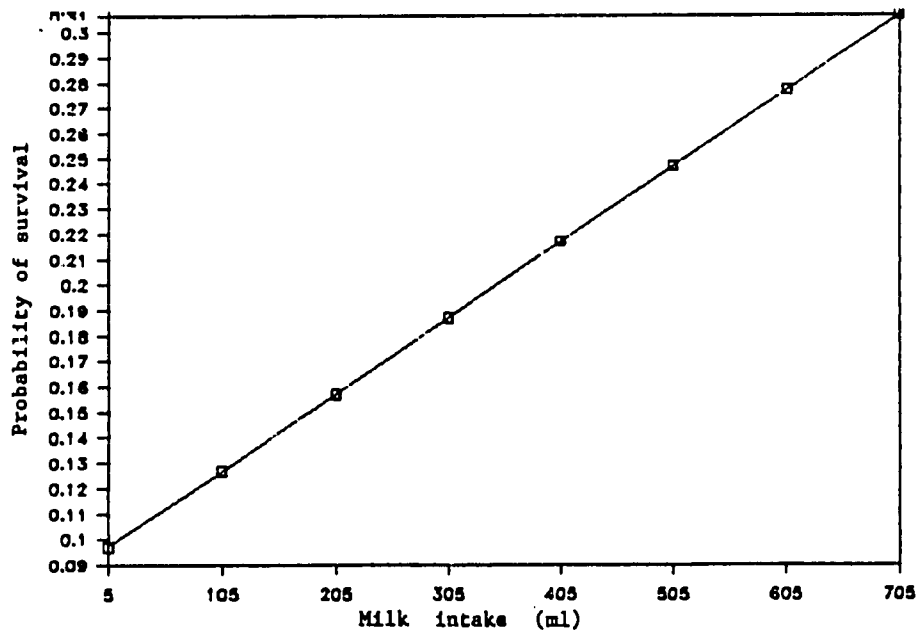


Fig. 3. Effect of milk yield on kid survival

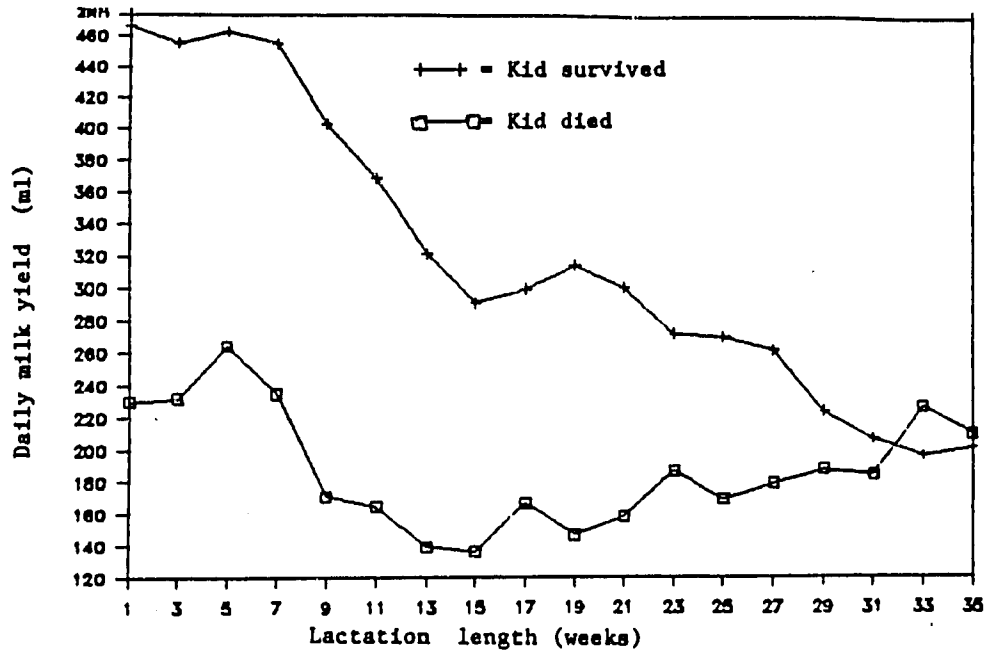


Fig. 4. Partial relationship between survival and daily weight gain.

