

*Full Length Research Paper*

# Herd mortality and cattle off-take rates among small-holder producers in the North West Province of South Africa

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**This study was done to determine the influence of herd mortality on off-take rates through face to face interviews of 308 smallholder cattle producers from Dr RSM District Municipality, North West. Most deaths were caused by diseases (50%) and drought (34%). Producer's gender had no influence on herd performance and off-take even though extension ward with higher proportion of women had higher mortality and lower off-take rates. The sale of steers decreased significantly ( $P<0.05$ ) as the death of adult animals as well as that of the overall herd increased. Herd off-take also declined as mortality of suckling calves as well as that for overall herd, increased. Herd mortality logically reduces stock and therefore suppresses sales. It is recommended that herd mortality should be monitored through animal recording to improve the competitiveness of small-holder production systems.**

**Key words:** Adult mortality rates, causes of death, cattle producers.

## INTRODUCTION

Recent population census revealed that cattle production especially small herds comprising 1 to 10 head of cattle, plays an important role in rural livelihoods (Statistics South Africa, 2013). Small-holder cattle producers in South Africa own 40% of the national herd (RMRDT, 2008), but are less productive than commercial producers. Even though the low competitiveness of this sector has been partially attributed to low off-take rates (Tapson, 1990; Scholtz and Bester, 2010), risk factors contributing to this poor performance have not been identified. According to Swai et al. (2010), tick-borne

diseases were the main cause of deaths in small-holder dairy cattle in Tanzania. It is well known that high mortality of young stock is an indicator of low productivity among small-holder producers in Africa (ILCA, 1982). Diseases causing deaths among young calves are often attributable to poor management (Mansour et al., 2014; Wudu et al., 2008). Scholtz and Bester, (2010) also estimate high herd mortality amongst South Africa's small-holder cattle producers, which Meissner et al. (2013) cite as liable for poor productivity and low off-take rates. The calculation of herd mortality requires elaborate

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**Table 1.** Distribution of farmers according to extension ward and gender.

Extension ward	Number farmers	Age head	Years of experience	Herd size	% Herd mortality	% Herd sales
	M/F	M/F	M/F	M/F	M/F	M/F
Taung North	41/36	63.7/53.9	19.7/15.2	16.1/15.6	16.6/9.6	25.6/20.1
Mean	77	59.2 <sup>a</sup>	17.7 <sup>a</sup>	15.9 <sup>a</sup>	13.4 <sup>a</sup>	23.1 <sup>a</sup>
Ganyesa	105/30	55.1/60.7	23.0/21.1	45.1/31.2	7.6/ 9.0	13.7/14.6
Mean	135	56.3 <sup>b</sup>	22.6 <sup>b</sup>	42.7 <sup>b</sup>	7.9 <sup>b</sup>	13.9 <sup>b</sup>
Morokweng	86/10	48.6/63.1	20.9/24.9	50.0/26.5	8.6/10.2	10.9/4.4
Mean	96	50.8 <sup>b</sup>	21.2 <sup>ab</sup>	46.5 <sup>b</sup>	8.9 <sup>b</sup>	9.9 <sup>b</sup>
Total	232/76	54.3/58.4	20.9/20.9	42.6 <sup>a</sup> /24.1 <sup>b</sup>	9.4/9.5	14.6/15.0
	308	56.8	20.9	35.3	10.0	15.0
SE	-	0.97	1.02	1.99	1.18	0.96

Values with different superscripts differ significantly ( $P < 0.05$ ).

data (Woodbury et al., 2005; Swai et al., 2010). However, crude death, which is the total number of animals found dead in a specified population during a specified period divided by the average number of animals in that population in that specified period, are the most commonly used form of measuring mortality (Putt et al., 1988). The North West Province is prone to drought, which tends to be severe in the western areas. Previous studies found no significant shifts in cattle sales during droughts in West Africa (Fafchamps et al., 1998) and Kenya (McPeak, 2004). It was hypothesized that cattle producers would dispose other categories of animals in favour of females. The purpose of this study was to determine the relationship between crude herd mortality and off-take rates.

## MATERIALS AND METHODS

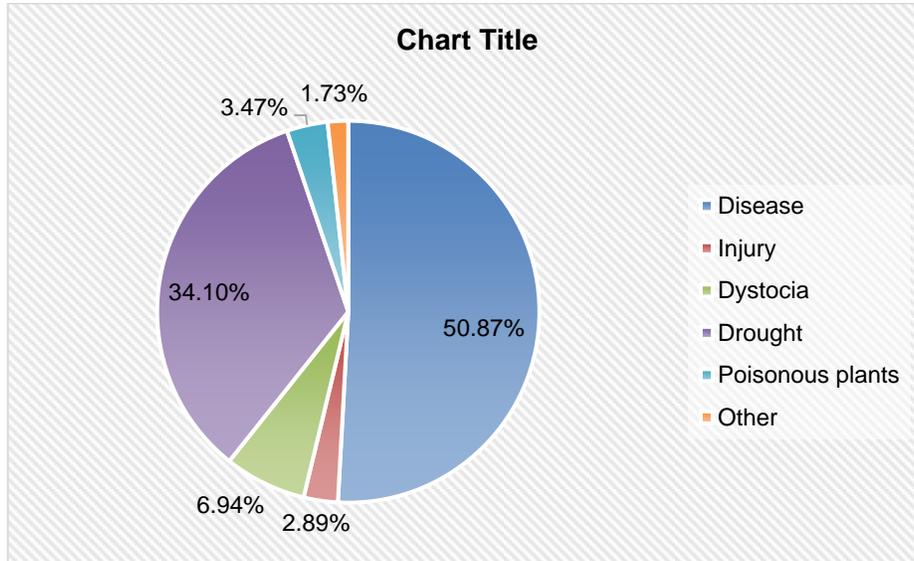
This study was conducted in the Dr Ruth Segomotsi Mompati (RSM) District Municipality of the North West Province. A random sample of 308 was selected from a list of 1700 cattle farmers from the District Department of Agriculture and Rural Development. Three wards of Taung North (25%), Morokweng (31%), and Ganyesa (44%) were used as strata to draw proportionate samples. A questionnaire aimed at capturing cross-sectional data on factors affecting cattle off-take for 2011 breeding season was developed and administered through face to face interviews with respondents. The instrument containing 73 questions ranging from demographic data to production data including mortality and sales was administered between May and July, 2012. The interviews lasted for 45 min with each respondent. Crude herd mortality was calculated using the following equation: number of deaths during 2011/average of opening and closing herd sizes in 2011  $\times$  100. Calculations for mortality were first made according to animal categories within the herd to distinguish suckling calves (pre-wean) from weaners and adult animals. Off-take rate was calculated as number of sales during 2011/average of opening and closing herd sizes during 2011  $\times$  100. For this purpose, animals were categorized as bull, ox, cow, heifer, bullock, and steer.

Data were analyzed using IBM SPSS statistics 22 (2013). Descriptive statistics were computed using frequencies and means to determine patterns between variables. Herd sizes were classified according to categories suggested by Tapson (1990) where herds of less than 10 were regarded as small. The GLM multivariate analysis was performed to test effect of farming area and farm level variables on herd mortality and off-take rates. Means were separated using least significant differences (LSD) tests. Correlation analysis was performed to measure associations between herd mortality and herd off-take.

## RESULTS AND DISCUSSION

The majority (76%) of respondents were males, 82% of whom lived at home. The age of household heads ranged from 24 to 86 with an average of 57 years. The majority (46%) of respondents belonged to middle age of between 45 and 65 although seniors (>65) constituted a significant proportion of the population (34%). These households owned herds ranging from one to 169 with an average of 35 head of cattle. The average calving rate was 55% ranging from 5.6 to 100% whilst herd mortality ranged from 0.5 to 94.8% with an average of 10%. Herd off-take rates ranged from 2.7 to 66.7% with an average of 15%. The herd dynamics in the study area were atypical of the lower levels reported in other studies of South African small-holder cattle (Tapson, 1990; RMDT, 2008; Scholtz and Bester, 2010).

Table 1 shows that female farmers owned significantly smaller herds than men ( $P < 0.05$ ). However, except tendencies for women experiencing lower calving rates ( $P < 0.09$ ), no significant differences were observed between men and women regarding herd performance. However, farmers from the Taung North extension ward had the highest proportion of female farmers who owned smaller herds than other farmers ( $P < 0.05$ ). Previous studies have shown that there is a strong correlation



**Figure 1.** Distribution of herds according to causes of deaths among small-holder herds in Dr Ruth Segomotsi Mompati District Municipality (N=173).

**Table 2.** Average crude herd mortality rates by herd size.

Herd category	Pre wean (N=101)	Weaner (N=94)	Adult (N=176)	Herd (N=214)
1-10(N=40)	2.51	3.14 <sup>a</sup>	12.23 <sup>a</sup>	18.16 <sup>a</sup>
11-30(N=117)	1.99	1.99 <sup>ab</sup>	4.84 <sup>b</sup>	8.63 <sup>b</sup>
31-70(N=99)	2.16	1.72 <sup>b</sup>	4.75 <sup>b</sup>	8.12 <sup>b</sup>
>70(N=52)	2.02	1.01 <sup>b</sup>	3.08 <sup>b</sup>	6.12 <sup>b</sup>
SE	0.30	0.30	0.77	1.06

Values with different superscripts differ significantly (P<0.05).

between women’s economic opportunities and access to affordable, safe food (EIU, 2012; MuGeDe, 2014). The predominance of female farmers in Taung North suggests that cattle production plays an important role in meeting household needs. Although not significantly different from the Morokweng ward, farmers from Taung North were less experienced than those from Ganyesa (P<0.05). Furthermore, these farmers experienced higher herd mortality but sold the highest proportion of stock than other farmers (P<0.05). This apparent low herd performance in the Taung North extension ward is a matter of concern, because it affects female headed households with relatively limited resources.

Most (41%) of the respondents utilized exotic cattle breeds and non-descript types (33%) in their herds, while only 26% utilized indigenous breeds. Approximately 70% of the herds experienced 10% average mortality during 2011 ranging from 0.5 to 94.8%. Figure 1 shows that most deaths were caused by diseases (50%) followed by drought (34%). The study area has experienced severe drought since 2008, which may explain the high

incidence of drought related deaths among adult animals as well as high mortality among small herds. The incidences of dystocia related death could also be attributed to the high adoption rate of exotic breeds, which produce large framed calves.

Previous studies showed that most deaths occur among young animals (Swai et al., 2010) and tends to decline for yearlings and rise afterwards (Fiore et al., 2010). This trend is confirmed in our study showing higher mortality rates for pre-wean calves, a decline for weaners and a rise for adults (Table 2). Small herds had significantly higher crude herd mortality rates (18.16%) than other herd size categories and mortality rates improved significantly with larger herd size categories(P<0.05). Weaner mortality rates of small herds differed significantly (P<0.05) with those for all herd size categories except medium size (11-30). Small herds (1-10) had significantly higher mortality rates for both old animals and total herd than other herd size categories (P<0.05).

The effect of drought and other sources of income and

**Table 3.** Relationship between crude mortality rates and off-take rates.

Parameter	Pre weanmortality	Adultmortality	Herdmortality	Steeroff-take
Adult mortality	0.242**	-	-	-
Herd mortality	0.595**	0.881**	-	-
Steer sale	-0.036	-0.123*	-0.131*	-
Herd off-take	-0.150**	-0.103	-0.147*	0.265**

\*\*Correlation is significant at the 0.01 level (2-tailed). \*Correlation is significant at the 0.05 level (2-tailed).

asset shocks has been widely reported (Kinsey et al., 1998; Fafchamps et al., 1998; McPeak, 2004). Some of these studies found no significant shifts in cattle sales during droughts in West Africa (Fafchamps et al., 1998) and Kenya (McPeak, 2004). Contrary to expectation, our study did not find a significant correlation between herd mortality and the sale of cows. However, the sale of steers decreased significantly ( $P < 0.05$ ) as the death of adult animals as well as that of the overall herd increased (Table 3). Furthermore, herd off-take also declined as mortality of suckling calves as well as that for overall herd, increased. These results imply the loss of calves reduces the number of available steers for the markets. Similarly, the death of old animals especially cows reduces the number of calves to be raised for the market and thus affecting the overall herd off-take, such that fewer animals become available for sale when herds experience high mortality. Some studies reported high off-take rates associated with the adoption of animal health practices (Muma et al., 2009; Hüttner et al., 2001) where stock is culled to acquire remedies. In our study, 90% of respondents reported that they always vaccinate their animals for notifiable diseases and dose animals for parasites. It can therefore be inferred that the adoption of animal health practices is in place, which suggests that cattle producers in the study area use disease incidences as a herd management tool. These results imply that herds with high mortality rates have limited stock to sell.

## Conclusions

This study has provided a descriptive analysis of crude herd mortality rates in the study area. Even though the Taung North extension ward has a high proportion of female farmers and smaller herds, gender did not show significant influence on both herd mortality and off-take. The results confirm previous findings showing curvilinear pattern where mortality rates plummet for weaner calves. Diseases are the main causes of deaths in the study area followed by drought. It was also concluded that the considerable mortality incidences resulting from dystocia is a sign of a high adoption of exotic breeds, which are liable for large-framed calves.

Larger herds of more than 10 head of cattle had significantly lower mortality rates than smaller ones. It

was therefore concluded that larger herds are more efficient than small herds in terms of mortality rates across all animal age categories. Finally, it is evident that herd mortality influences herd off-take rates. The inclusion of herd mortality data in animal recording systems may enhance the monitoring of small-holder production systems and thus improve competitiveness. The high mortality rates for old animals should receive focused extension efforts to improve disease management and implement a drought management strategy.

## Conflict of interests

The authors have not declared any conflict of interests.

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