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Calving Period Affects Cow And Calf Performance In Semi-Arid Areas In Zimbabwe.

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Abstract; *One hundred and twenty cow records of communal reared beef cattle were used to evaluate cow and calf performance. The animals were group according to calving period and there were three calving periods namely January to April, M ay to August and the September to December period. The result showed that there was significant difference (P<0.05) on performance for calving down on different months. High postpartum weight loses were observed on dry season calvers and mid rain season calvers as well. The time taken to recover and recommencement of oestrus was significantly different as shown by the conception rate values. High calf and cow mortality was observed in May to August calving and January to April calving. Results demonstrate that poor resource farmers in region that experience April to November dry season should embrace the September to December calving period in order to succeed. If all other seasons are to be used more investment in feed supplement and drugs is needed.*

Key Words*; Calving season, pre-partum weight, postpartum weight, conception rate*

I. Introduction

Livestock have multiple roles in the smallholder and communal farming system in the semi and arid regions in Zimbabwe (Rukuni et al., 2006). Semi arid areas experience long dry period from April to November in Zimbabwe. Rangeland degradation has been reported to be very high in these areas which are accompanied by perennial feed deficit both in quality and quantity (Abuser and Ahmed, 2010; Fynn, 2010) between April and November because of seasonality of rainfall. Animals in these areas rely on areas such as arable lands, wetland, drainage area and crop residues but the quality of the forage will at least meet maintenance requirements (Ngongoni et al 2006; 2007, 2009). Rangeland forage quality in these areas is dynamic and exhibits a narrow period of high quality (Ngongoni et al 2009; Fynn, 2012) between December and April, when temperature and precipitation conditions are optimal for growth of native tropical forages. As quantity of precipitation decreases and temperature decreases in winter, forage quality declines rapidly and generally stays low through the dry season, creating a long period when nutritional quality may limit maximal beef production. Moreover, the communal farmers practice all year round breeding where bulls move in with cows throughout the year (Ngongoni et al 2006; Marius et al., 2010) and that increase the amount of stress exerted on lactating cows.

Understanding the relative performance of cattle born during different seasons of the year is important to meet specific goals and optimize economic returns (Reisenauer et al., 2001). The main objective of a cow–calf production system is to yield a high calf crop each year, which is the primary factor impacting profitability. A high calf crop is dependent upon optimal reproduction, which is one of the most important factors affecting the financial viability of a cow–calf enterprise (Hess et al., 2005). In this situation, a cow has to calve once a year; hence, the recommencement of oestrus within a relatively short time-frame following parturition is recognized as a major milestone to achieving optimal reproductive performance (Hess et al., 2005). This is often limited by a prolonged postpartum anoestrous interval (Ciccioli et al., 2003), which is most evident in primiparous cows compared with mature cows.

Generally, if a cow is severely underfed throughout her last trimester of gestation, that may negatively, affect its reproductive performance (Washburn et al 2002). Supplies for gestation characterise nutrients essential to sustain both growth and maintenance of foetus, placenta, uterus and mammary gland. Bovine foetal growth is not linear by gestational age, but exponential (Stalker et al 2006; Raduz et al 2010) with more than 60% of total foetal weight being accrued during the final two months of gestation. This foetal growth pattern places the maximum nutritional load on the late pregnant cow. Consequently, the final two months of gestation requires particular care in terms of higher condition of vital nutrients. The calving percentage is higher in commercial farming areas than in communal farming areas i.e. 70% to 40 % respectively (Ngongoni et al., 2006).

The effects of season of calving on calving interval, conception rate, calf growth and cow performance were evaluated in this study using data from animals that where managed using the communal system method in a semi arid region. The aim of the study was to evaluate cow efficiency in relation to calving season and to establish the effects of each calving season on livestock performance.

II. Materials And Methods

2.1 Study site

The data was collected at Makoholi Research Station, 32 km North of Masvingo town in Zimbabwe. The average rainfall for the period was 565mm (range from 133 - 1155mm). The Station lies in agro-ecological region IV with the altitude of 1204m. Its soils are granite derived with typical arable topsoil, which consists of sand 96%, silt 2% and clay 2%. Soils are inherently infertile and plant growth is severely limited by the unavailability of nitrogen and phosphorus. Randomly selected 120 Mashona cows whose records were extracted from Makoholi Research Station herd were used in this study. Each cow's monthly weights were collected over a 13 month period (from a month before calving down to the twelfth month after calving down). The cows were grouped into three calving seasons namely, the rain season calving (January-April), the dry season calving (May –August) and the conventional one (September-December). Each group had forty cows whose weight changes and reproductive performances were monitored until its twelfth month from the day of calving.

1. January – April calving (cow and calves)
2. May – August calving (cow and calves)
3. September – December calving (cow and calves)

2.2 Statistical analysis

Analysis of variance was carried out using the general linear model (GLM) procedure of SAS (SAS, 2000). The monthly weights data were analysed using GLM for repeated measures. Difference among treatment means were compared using the Duncan's multiple range tests.

III. Results

The results from the study are shown in Table 1 and Table 2 below. From the study the animals that calved down in May to August period lost weight significantly ($P<0.05$). The May to August group lost 35±14kg compared to 18±9kg and 16±11kg for January to April and September to December calving season respectively (mean± SD). Those cows, which calved in January to April calving period, continued to lose weight up to the ninth month after calving. This also happened for those that calved in the May to August calving period, they continued to lose weight until the sixth month and they then started to gain weight. The cows that calved down in September to December period lost weight during calving but managed to recover one month after calving and the weight lost was lowest. Their condition was significantly different ($P < 0.05$) for the entire period.

Table 1: Pre and post partum weight changes of cows calving down in three different periods of the year.

Item	Jan-April calving	May-Aug calving	Sep-Dec calving
Pre-partum weight	308^{a}	299^{a}	264^{b}
Post partum weight1	290^{a}	264^{b}	248^{c}
Post partum weight2	281^{a}	247^{b}	263^{b}
Post partum weight3	269^{a}	247^{b}	274^{a}
Post partum weight4	254^{b}	247^{b}	280^{a}
Post partum weight5	253^{b}	247^{b}	288^{a}
Post partum weight6	242^{c}	257^{b}	289^{a}
Post partum weight7	242^{c}	271^{b}	280^{a}
Post partum weight8	228^{b}	279^{a}	271^{a}
Post partum weight9	215^{c}	302^{a}	273^{b}
Post partum weight10	218^{c}	307^{a}	261^{b}
Post partum weight11	239^{b}	299^{a}	254^{b}
Post partum weight12	260^{b}	295^{a}	246^{b}

Different ^{abc} superscript in the same row means significant different at ($P< 0.05$)

Table 2: Performance of cows calving in different seasons of the year

Parameter	Sep – Dec Calving	May- Aug Calving	Jan- April Calving
Cow Mortality (%)	2	34	21
Conception Rate (%)	83	33	41
Retained Placenta (%)	10	3	6
Dystocia (%)	0.3	0.1	2
Calf mortality (%)	7.5	50	28

IV. Discussion

It was observed that the highest postpartum weight loss was on cows that calved down in May –August period followed by January to April season and finally those that calved down in September to December period. This could be related to nutrition and water stress challenges. During winter communal livestock travel long distances to water sources' and nutrition quality is at its lowest. According to Abuser and Ahmed (2010) during long dry season there is low crude protein content, high crude fibre and low concentration of vitamin A leading undernourished livestock. Crude protein was observed to start declining in February hence animals that calved down in January to April period experience close to eleven months of undernourishment. The animals that calved down in May to August also experience close to six month of low quality forages. It was observed that animal that calved down in January up to August continue to lose weight until the onset of good rains in November. Therefore, the period taken to recover after calving is long hence low conception rate were also observed in this study. Some of the cows failed to recover as shown by the number of animal that died after calving down. Cows that calved down in dry season continue to lose weight and may die before the onset of rainfall. This could be due to nutritional stress and lactating stress experienced by lactating cows.

Calf growth from birth to weaning depends on dam's milk supply. The amount of milk produced depends on nutrition and other environmental factors. Dam milk supply is affected by the nutritional conditions and the demand of the calf. If the cow calves during the winter May – August period the nutritional condition will fail to support the high milk demands of the calves. Most of the nitrogen in the 2% CP is highly Acid Detergent Insoluble Nitrogen (ADIN) which is not available to the animal. According to Funston (2006), when the crude protein content of forages drops below 7%, forage intake declines. However, intake of other forages may decline when forage crude protein drops below 10%. Part of the variation can be attributed to differences in nutrient requirements of the cattle, with the remainder of the variation attributed to inherent differences among forages that present different proportions of nutrients to rumen microbes. Intake response to a single nutrient such as crude protein should not be expected to be similar among all forages (Mathis, 2000). Milk yield was observed to decline by more than 50% in smallholder dairy during the dry season. The quality of the milk is affected by the quality of the diet, subsequently; the calf will fail to get adequate milk supply and also fail to meet the growth requirements. This lead to stunted growth in calve the consequences could be more pronounced in the event of death of the dam. Stalker et al., (2006) reported increased weight of calves born to cows with greater nutrient plane pre- and postpartum, hence differences in diet quality during gestation is a possible explanation for decreased percentage of calves weaned in the cows. When the dam died the calf normally fails to survive too. The calves which were born in Jan – April period had higher calf birth mass compared to the Sep –Dec and May –August period. Maternal nutrition directly influences milk quantity and quality available to offspring (Swanson et al., 2008). In cows, low dietary protein in the first third of gestation followed by increased protein in the second third of gestation enhanced placental development (Perry et al., 1999; Vonnahme et al., 2007). However, there were 10% dystocia cases observed. Twenty four percent of the calves born during this period died. The causes of death were recorded as scouring. If the cows calve after the rains have started, the flush of grass brings the increase of milk and increase in parasites lick ticks as well as other pathogens. The calf will get more than its requirements and may end up scouring and this may expose it to more opportunistic diseases because of flies, resulting in high mortality rate. During the second month when the milk demand from the calves increased the cows failed to increase the milk yield thus leading inadequate supply to the calves. When the calves were older and able to consume more, the cows failed to produce it because the native pasture was already deteriorating. During the Jan –April period there are more ticks than the other drier months. The Sep – Dec calving period had lower calf and cow mortality rate compared to other calving periods. Calves that were born in Sep-Oct months were better than those calved in Nov-Dec when rains had already started. According to Martin et al., (2006) improved energy status of cows during early lactation increase progeny weaning weight, hence, the calves will also be big enough to use the grass directly and this causes calves which are born early in Sep –October to be heavier at weaning than those calved in Nov- Dec. These calves have a high chance of survival through the summer despite high rate of disease prevalence. Although there are many studies that have demonstrated a positive impact of maternal nutrition on the birth weight of calves (Kale, 1984; Prasad and Tomer, 1995; Khan et al., 2004), its effects in influencing the early growth performance of the calves is often without agreement.

The nutritional condition of the period of calving determines the time that will be taken by the cow to recover from the calving shock and weight loss. Higher weight losses are experienced during the winter calving. A cow should be able to rear a good calf and be able to conceive again within three months of calving down. Cows normally take two months to recommence oestrus cycle after calving down, but it can be long if the cow is in poor condition. If the cow is to conceive she must be in good condition and therefore should have had some time on good quality grazing before the bulling season starts. Lactation is the biggest drain on the cow's body reserve and cows in lactation require double the amount protein compared to dry cows and very often, an energy supply is needed as well.

Hough (1990) stated that in breeds that are prone to calving difficulties the good nutritional conditions during pregnancy means that these calving problems are aggravated in cow calving after a summer pregnancy. Several studies have reported that inadequate prepartum nutrition decreases weight and condition of the dam and birth weight of the calf, but it does not alter calving difficulty (Bellows and Short, 1978; Hough, 1990 Ngongoni et al., 2006). Cows that calve down late in summer fail to conceive. This could be due to decline nutritive quality of native grass especially in sour veld (Gambiza and Nyama 2000). These cows later conceive in next breeding season after going through a year without a calf. During winter the conditions will be poor for the cows to conceive especially those which calve down in March and April. These could be due to the fact that the cows were having good nutrition conditions during the last stage of gestation. These cows will be suppose to conceive in June and July but in most case there will be no sufficient water and quality feed to support reproduction and cow maintenance requirements. The demand of calf will also aggravate the stress leading to death of the dam in some case. In this study cow mortality was 16 % and this happen in July and October period. These cows' calves were not weaned because they failed to attain weaning weight. In that case the cows succumbed to lactation and nutrition stress leading to its death in October when feed shortage is more critical

Low quality forage available could have triggered the trend as maternal energy source could affect nutrient supply of glucose and amino acids to the gravid uterus and these are important substrates for fetal growth (Raduz et al., 2010). The cows' body reserves are heavily depleted and this situation affects the performance of the cows in the coming seasons. Dominant forage during this season may not meet cow nutrient requirements; thus, supplementation is commonly recommended to ensure acceptable pregnancy rates (DelCurto et al., 2000). The rangeland nutrition is at its worst in quality condition during dry season tropical and subtropical ecosystem (Gambiza and Nyama 2000; Sibanda and Khombe 2006; Ngongoni et al., 2006, 2007). The calves' demands are not met by the dams. This situation leads to death of the calf and sometimes both the dam and the calf failed to cope. Calves also may be affected by having less vigour and reduced passive immunity when pre-calving nutrient availability is low (Ngongoni et al., 2006). Maternal nutritional restriction also can affect the ability of the calf to absorb immunoglobulins (Raduz et al., 2010). If the dam survives it took long to commence its oestrus cycle or it experiences silent oestrus. It was also observed that some lost condition to such an extent that they only conceive in the second summer season. Limiting nutrients during gestation decrease body condition score, and inadequate body condition at calving can severely affect production traits such as rebreeding and calf growth (Hough 1990). The relationship between maternal nutrient intake during pregnancy and growth of the foetus is imperative for determining pregnancy success, neonatal morbidity and mortality, as well as life-long health and productivity of offspring (Stalker et al., 2006; Vonnahme, et al., 2007).

V. Conclusion

Calving in dry season and mid rain season increase the amount of money lost in purchasing feed supplement and drugs respectively. Without supplement, both cows and calves may die in number thus increase the money loses. The cows also experience long period of silent oestrus thus failing to give a calf every year. No calf no profit for a beef farmer and that affects the living standards of the rural and communal beef farmers. Farmers should embrace the September to December calving period if there are to realise profit of beef farming in tropical condition with April to November dry season.

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