final report

Reducing calf loss from exposure

Project code:B.GBP.0031

Prepared by: Kieren McCosker
Centre for Animal Science, Queensland Alliance for Agriculture, and Food Innovation, The University of Queensland on behalf of Northern Territory Department of Industry, Tourism and Trade.

Date published:November 2023

PUBLISHED BY
Meat & Livestock Australia Limited
PO Box 1961
NORTH SYDNEY NSW 2059

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

Abstract

Foetal and calf losses between confirmed pregnancy and weaning (calf wastage) have been identified by beef producers in northern Australia as a major problem. In a study of the reproductive performance of 142 commercially managed breeding herds in northern Australia, McCosker et al. (2020) reported 25% of herds located in the northern downs having foetal and calf losses exceeding 15%. Beef CRC studies of 9,678 pregnancies showed that pre-natal loss in the absence of infectious disease averages only ~3%, and most loss, approximately 2/3 of all postnatal losses, occurred during the first week of life (Bunter *et al.* 2013).

Heat load has been identified as a candidate factor contributing to calf loss. In the northern downs, a 7% higher occurrence of calf loss was observed for heifers in the region when the temperature humidity index exceeded 79 for at least two weeks during the month of expected calving (Fordyce *et al.* 2022). Modification of the environment could reduce the heat gain and elevate the heat dissipation to protect calves and heifers from heat load.

The Northern Territory Department of Industry, Tourism and Trade staff worked with researchers from the University of Queensland and University of Southern Queensland to conduct a pilot study to evaluate the effectiveness of providing paddock-shade shelters on reducing the occurrence of calf wastage. While there are potential animal welfare benefits gained by the provision of artificial shade to open grazing lands, the installation of shade shelters near watering points did not reduce the occurrence of foetal and calf loss, nor did it result in any other production gains.

Executive summary

Background

Calf loss is a major economic loss in beef cattle herds of northern Australia (Niethe and Holmes 2008). In a study of the reproductive performance of 142 commercially managed breeding mobs in northern Australian (McCosker *et al.* 2020), losses were greatest in the dry tropics (Northern Forest) and tree-less downs (Northern Downs) with 25% of heifer mobs and cow mobs in these regions experiencing losses of greater than 19% and 15%, respectively. Beef CRC studies of 9,678 pregnancies showed that pre-natal loss in the absence of infectious disease averages only ~3%, and most loss, approximately 2/3 of all postnatal losses, occurred during the first week of life (Bunter *et al.* 2013).

Large numbers of breeding females graze treeless rangelands. Heat load has direct and indirect effects on fertility of cattle in northern Australia. Emerging evidence indicates that heat load profoundly alters the immune response of calves and cows, from the prenatal stage through lactation. The intrauterine environment experienced by the developing foetus can shape physiological responses in preparation for postnatal life. The provision of shade in treeless rangelands is considered to be a potential management intervention to combat the 4-7% percentage point increased occurrence of calf loss estimated for heifers that were predicted to calve in months that had unfavourable temperature-humidity index conditions (Fordyce *et al.* 2022).

Objectives

The objectives of this study were to, by 30th of November 2023, evaluate the effectiveness of providing paddock-shade shelters on reducing the occurrence of calf wastage in a populations of commercial beef heifers as a pilot study.

Methodology

Over four years, 2019-2022, three year-cohorts of purebred wagyu heifers (n=737) predicted to calve between October and January were randomly allocated to either a paddock that either had a single feedlot-grade shade structure installed within 200-500m of a permanent water point or not. The participation of the year-cohort in the study concluded when the resulting calf crop were weaned in the following year, with the next year-cohort of pregnant heifers allocated to the experimental paddocks approximately two months afterwards.

Heifers inducted into the study were typically observed for approximately 12 months, from pregnancy diagnosis (Aug-Sep) until the resulting progeny were weaned in the following year (Jun-Jul). Each year, heifers (predicted to calve between Oct to Jan) were selected at the annual pregnancy test muster of a large maiden heifer mob, with individuals randomly allocated to either the paddock with (S) or without (NS) installed shade shelters. Data capture was supported using crush-side individual animal performance recording software and with each animal individually identifiable by both a NLIS compliant RFID ear tag and a visual management ear tag displaying a unique number. At induction, predicted month of calving, body condition score (BCS) and lactation status was recorded. At the weaning muster, heifers were assessed visually for BCS and lactation status, pregnancy tested and foetal age estimated if pregnant. Liveweight, sex and treatment group were recorded for all calves. Heifers observed as not lactating at the weaning muster were considered to have lost their calf.

Differences between treatment groups means for foetal and calf loss (FCL), percent pregnant while lactating (WP) and liveweight of calves at weaning (WW) were compared after employing a generalised linear mixed model with treatment fitted as a main effect and year as a random effect using R and RStudio, version 1.4.113.

Both paddocks were relatively treeless with cracking clay soils supporting productive Mitchell and Flinders grasslands and were assessed as being similar in production potential. The paddocks were almost square in shape and similar in area, approximately 56km2 each. Paddocks were equally well-watered with 7 water points strategically located throughout each paddock with watering points approximately 5km apart. The largest distance from water in either paddock was 4km.

Features derived from GPS and weather station parameters were used to define the likely heat load of study at the time of calving and explore their associations with reproductive performance. To measure environmental conditions, two Environdata Australia Pty Ltd's Weather Master 3000s were installed at each trial site with one weather station installed underneath and external to a shade structure to quantify the influence of a shade structure on environmental conditions. The movements of over 400 pregnant heifers cattle were recorded over at a frequency of 10-15 minutes. These data were used to create features describing shade seeking, distance walked and distance from water.

Results/key findings

The results of this research highlight the devastating impact calf loss is having on the productivity of northern beef businesses. The provision of artificial shade near watering points in this study was not an effective method at consistently reducing its occurrence of foetal and calf loss and did not result in any other production gains. Whiet there are potential animal welfare benefits gained by the provision of artificial shade to open grazing lands, due to the high costs associated with their installation and ongoing maintenance, it is unlikely to be profitable.

Benefits to industry

These results highlight that the causes of calf loss are multidisciplinary and the need for management decisions to be based on evidence. This study demonstrates an appropriate methodology to assess the effectiveness of a management intervention in a commercial operation. Outcomes from this project will guide future infrastructure development.

Future research and recommendations

Further research is warranted to investigate the impact of heat load on grazing beef cattle. It is recommended that future research be directed at measuring the actual body temperature of grazing beef cattle under high stress load events – potentially with the use of smaxtech rumen boli technology. It is also recommended that further work is needed to further develop our understanding of the impact of daily environmental conditions on calf survival which relies on the accurate identification of a calving event with the use of remote technology.