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FAECAL NIRS: A USEFUL TOOL TO IMPROVE CATTLE MANAGEMENT AND PERFORMANCE IN THE RANGELANDS

P.C. Smith[1,3] *and M.J. Jeffery*[2]

[1]Department of Agriculture and Food Western Australia, PO Box 1618, Karratha, WA, 6714
[2]Department of Agriculture and Food Western Australia, PO Box 278, Derby, WA, 6728
[3]Corresponding author. Email: pcsmith@agric.wa.gov.au

ABSTRACT

The use of faecal Near Infra-red Reflectance Spectroscopy (NIRS) to predict the diet quality selected by grazing cattle and future body condition of cattle has been evaluated for several common pasture types in the Pilbara and Kimberley of Western Australia. During a three year project, changes in cattle body condition scores (BCS) were recorded at seventeen locations in the Pilbara and Kimberley at regular intervals. Diet quality selected by these grazing animals was predicted from faecal samples collected at each observation using NIRS.

NIRS predictions of digestibility, diet crude protein (Diet CP) and faecal nitrogen (FN) predictions were shown to be correlated with breeder body condition six and nine weeks into the future.

INTRODUCTION

To develop more productive and environmentally responsible cattle production systems for the northern rangelands of WA, it is necessary to develop an understanding of current animal productivity and the relationships between body condition changes, diet quality, pasture type and pasture yield. While some information has been documented on animal survival and reproductive performance in the Kimberley, little has been recorded in the Pilbara and no information has been recorded on the diet quality actually selected by grazing cattle.

Developing an understanding of the diet quality selected by grazing cattle on different pasture systems and subsequent changes in BCS has implications for improving the timing of management activities including weaning musters, sales and implementing supplementation strategies.

A three year project, supported by Meat and Livestock Australia (MLA) and Department of Agriculture and Food WA (DAFWA), was conducted to determine the reliability of NIRS to predict BCS changes of breeders grazing different pasture types in the Pilbara and Kimberley. This project was initiated in the Pilbara and later extended to the Kimberley.

The objectives of this project included:

1. Establish initial animal performance 'benchmarks' of grazing cattle in the Pilbara region of WA.
2. Establish the reliability of faecal NIRS to predict animal performance and as a management tool in the Pilbara.

METHODS

Sites

Cattle data collection sites were established at a total of twenty-two stock watering points on nine of the more productive land systems/pasture types on properties in the Pilbara and Kimberley. Details of the collection sites and the land systems and pasture types included in a 3 km grazing radius from the stock watering point are presented in Table 1.

A 3 km grazing radius from water was selected for the purpose of establishing the main land systems/pasture types available for grazing at each site. It was assumed that cattle spend the majority of their grazing time within that area. These land systems and pasture types are described by Van Vreeswyk et al (2004).

Each site was selected in co-operation with pastoralists as being representative of that land system/pasture type on their property and likely to carry cattle throughout the year.

Table 1: Pilbara sites with land systems and pasture types within a 3 km grazing radius

Sites	Land systems	Pasture types
Cliffs Mill, Horseshoe, No6	Hooley, Brockman, Paraburdoo, Pindering.	Roebourne plains grass, Buffel
Christmas Tank, Midway No3, Ram Quarry	Uaroo	Soft Spinifex, Aristida spp.
Crossroads, Tragedy	Cane, Horseflat, River	Tussock grasses inc. Ribbon, Roebourne plains and Buffel grasses.
Fredericks, Yorks Mill, Manawar	Brockman, Hooley	Mitchell and Roebourne plains
Minsons, River, Parsons	River, Mallina,	Buffel
Stirrup Iron, Shaws, Stewarts	Sylvania, River, Divide, Fortesque.	Buffel, Roebourne plains, soft Spinifex, ,Aristida spp.
Victory Mill	Yamerina.	Buffel and marine couch
Nimmingarra	Uaroo, River, Boolaloo.	Soft and hard Spinifex (limited collections only)

Table 2: Kimberley sites with land systems and pasture types within a 3 km grazing radius

Sites	Land systems	Pasture types
Bulka	Pindan	Soft Spinifex, Buffel grass
Jubilee No1	Pindan	Soft Spinifex, ribbon grass, wattles
Myroodah	Pindan	Soft Spinifex, ribbon grass, wattles
Nerrima	Pindan	Soft Spinifex, ribbon grass, wattles
Jubilee Greenhide	River floodplains	Mitchell grass, blue grass, mimosa
Liveringa	River floodplains	Mitchell grass, bluegrass, native sorghums
Moola Bulla	Loamy creek lines/rocky outcrops	Soft Spinifex, black spear grass, bluegrass

Pasture monitoring photo sites were established 1.5 and 3 km from stock waters adjacent to roadways in areas representative of the target pasture type. These sites provided a photographic record of season and grazing effects on pasture quality and quantity during the project.

Cattle measurements

Cattle measurements were made every 4-6 weeks (weather permitting) and included:

- Body condition (1 – 9 scale) of representative lactating, dry and growing animals present at each site. A minimum of 15 head of each status to a maximum of 30% of the cattle present was recorded. Photo standards of body condition were developed and used to ensure consistency of body condition assessment.
- An estimation of females lactating as a percentage of mature-age females present.
- An assessment of the current liveweight (condition) change of dry animals. This assessment was usually a combination of the perceptions of the pastoralist and project officer and recorded as "Gaining", "Holding" or "Losing".
- Cattle management activities/events (e.g. mustering, weaning, sales) that might affect grazing behaviour, stocking rate and body condition of the representative group were recorded during each collection.
- Rainfall, fires etc that may have effected pasture quality or quantity.
- An assessment of quality of pasture on offer using pasture growth phases (as used in the EDGE*network* Nutrition workshop), leaf: stem ratio, % green leaf and an estimate of yield.
- A bulked faecal sample consisting of a 100 ml scoop of fresh (warm) faeces collected from at least 15 dung pats. This bulk sample was thoroughly mixed and a 300 ml sub sample selected and immediately refrigerated. Samples were refrigerated for up to four days before freezing if it was not convenient to oven dry (Pilbara samples) or air dry (Kimberley samples) samples immediately.

NIRS determinations

Each dried faecal sample was divided, with one sample forwarded by mail to CSIRO, Townsville, for NIRS determinations by David Coates and a duplicate sample forwarded to the WA Chemistry Centre for determination of 'wet chemistry' N and P.

RESULTS

NIRS predictions of digestibility was the independent variable most highly correlated with the BCS of wet and dry cows recorded nine weeks later. Many of the independent variables were highly correlated with one another. Values of the same measurement three weeks apart had correlations ranging from 0.81 to 0.95. Values of the same measurement six weeks apart had correlations ranging from 0.57 to 0.79. NIRS predictions of DCP and FN six and nine weeks before sampling were also highly correlated with BCS.

Pasture yield, an estimate of feed likely to be consumed by grazing cattle, also had a significant effect on BCS of breeders. Relative to cows on paddocks with pasture yields <500kg, cows on pastures yielding 500 – 1,000 kg/ha had condition scores 0.859 ± 0.144 ($P<0.001$) higher, cows on pastures yielding 1,001 – 2,000 kg/ha had condition scores 1.066 ± 0.156 ($P<0.001$) higher, and cows on pastures yielding 2,001 – 3,000 kg/ha had condition scores 1.430 ± 0.273 ($P<0.001$) higher. There was no difference in the BCS of cows on the top three yield categories.

BCS of dry breeders seldom fell below score five (1-9 scale) in years following useful summer rain in the Pilbara pasture types. Following the complete failure of the 2004/05 growing season experienced at many sites breeders declined rapidly in condition until useful July rains were recorded. Following these rains BCS did not improve immediately, presumably due to inadequate dry matter yield at some sites.

CONCLUSIONS

Faecal NIRS provides another tool for pastoralists to predict with some confidence future changes in body condition of breeders. The six to nine week 'window' suggested by the results of this project provides a useful time frame for planning management activities like mustering and sales in extensive cattle herds. It is interesting that this time frame is similar to the 'rule of thumb' that visual observations of cattle performance are often 6 weeks late i.e. they have been losing condition for up to six weeks before a change is observed.

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