Novel livestock supplementation: reducing shy feeders

D.J. Cottle[1] and R. Wyld[2]

[1]School of Environmental and Rural Science, University of New England, Armidale NSW 2351 Australia
[2] Sapien Technology, 22 Harker Street, Burwood, Vic 3125 Australia
Presenting author: David Cottle david.cottle@une.edu.au

Summary

Mobile feed bin trailers that enable control and monitoring of the maximum daily supplement intake by individual grazing cattle have been developed. Data from four trailers can be integrated via wireless to manage larger mobs within a paddock. Compared to using conventional feed bins and multiple recorded live weights, shy feeders can be removed to different management regimes quickly after supplement introduction. Animals cannot gorge on supplement, so deaths are less likely. Management groups can be fed differently without the need for drafting. Animals' live weights can be used to remotely adjust individual maximum daily intakes to achieve targeted growth paths and faster finishing. Twice as many grazing heifers at 'Te Mania', with access to 2 Sapien trailers and 2 Greenfeed bins, ate supplement from the trailers. Of those heifers accessing both bin types, the proportion of their maximum daily allowance consumed was 3 times higher via the trailers.

Introduction

Prior research into smart feed bunks has produced the following list of key design criteria: animal throughput to suit mob size, feed holding capacity to optimise feed loading schedule, animal training and behaviour patterns to make the equipment as animal friendly as possible, transportation and logistics to ensure practical application, setup and commissioning fit for purpose in the paddock, reliability, low cost by clever choice and use of components to meet expected price points and a feed ration system to provide accuracy and flexibility.

Challenges to achieving this are: different animals feed at different rates, drafting shy feeders based on their short term liveweight (LW) change can be inaccurate, animal personalities result in different approaches to the feed bunk resulting in animals gaining weight at different rates with a wider LW spread at market time.

Using individual animal measurement at the feed bin and metering feed to each animal can control the amount any animal receives in any given time. We propose that one can profile animal personalities to allow mob creation based on similar feeding traits. We also propose that metering feed to individual animals provides much greater control over reducing feed waste by preventing overeating by an aggressive animal and giving all animals a chance to eat the prescribed amount for their current weight. Coupling the smart feed bunk to a Walk-Over-Weigh system would provide even greater accuracy for feeding to manage weight gain of the individual animal and to drive the weight gain of the individual animal, and therefore the entire mob, to a target market LW with greater accuracy.

Previous work, e.g. Bowman and Sowell (1997), Cockwill et al. (2000), Dixon et al. (2003), Eggington et al. (1990) and Kahn (1994), has shown that the supplement intake of individual animals varies widely within a herd or flock. This leads to a wider range of LWs at the end of the finishing period. It is well accepted that higher prices are received for more even mobs of cattle with some major domestic buyers, such as Coles and Woolworths, having well defined, tight ranges for the LW and condition of cattle that they purchase.

A study of reducing methane production by selecting on pasture intake generated data that allowed comparison of the distributions of stock access to supplement fed from Greenfeed (GEM) feed stations versus multi-feed station trailers (Sapien Technology).

Materials and Methods

At Te Mania Angus stud, Mortlake, Victoria, 122 heifers grazed a silver grass (40%), perennial ryegrass (30%), bent grass (25%) pasture with Yorkshire fog (5%) and were given access to two Sapien mobile trailers (Figure 1) that fed controlled amounts of maize supplement (1.5kg/hd/d maximum), each with four of six feed stations (2/3 per side) operating, starting on 14 September 2015.

Figure 1. Two mobile feed trailers at Te Mania

Regular daily maize intakes, from November 23rd to December 3rd, required for pasture feed intake estimates from pasture and faecal samples (Cottle 2016) were achieved in 57 of the 120 heifers. The heifers also had access between November 12th and December 12th to two GEM bins (units 26 and 53) to measure methane production (Cottle et al. 2015) during the trial period. There were 360 minutes between each feeding session (4 sessions/day); each feeding session comprised 5 feed drops spaced 40 seconds apart. Therefore the maximum number of feed drops offered was 20 drops (~0.69kg)/day across the 2 GEMs. The heifers were pre-trained onto the GEMs by

gradually pulling in the side panel wings to form the race leading into the GEM. The GEMs' main purpose is methane measurement, not the supplementation of animals.

The same (attractant) maize supplement was used in the Sapien mobile trailers and the GEM bins. The total daily intake of maize supplement by individual animals was therefore calculated by adding the amount each heifer ate from both the Sapien and GEM bins.

The crushed maize supplement contained 92.99% lightly rolled maize, 3% bentonite, 3% lime, 1% molasses (Molafos Gold) and 0.01% Agolin.

The distributions of individual heifer daily maize supplement intakes from the Sapien trailers and Greenfeed bins were studied by calculating the relative daily intakes of each heifer as a proportion of the set daily maximum (Sapien: 1.50kg, GEM: 0.69kg). A linear model (JMP, 2016) with feed bin type as a fixed effect and a random animal effect (multiple days of data) was run using all non-zero, relative intake data and a subset of data from heifers that fed from both types of bin. Only 1 heifer can eat at a time at a GEM, whereas 2 heifers could feed side by side on each side of a Sapien trailer.

Results

The average LW of the 122 heifers on the 8 September was 363 ± 21.7 kg. The maize supplement was 89% dry matter (DM) and 82% digestible organic matter (as %DM).

The distributions of heifer numbers versus their average daily maize intakes for 16 days from November 17 to December 2 are shown in Figure 2. Half of the heifer mob did not visit either of the 2 GEMs, while only 13% (16/122) of heifers did not visit either of the 2 Sapien trailers. All heifers that ate at the GEMs also ate at the Sapien trailers, but not all heifers that ate from the Sapien trailers ate at the GEMs.

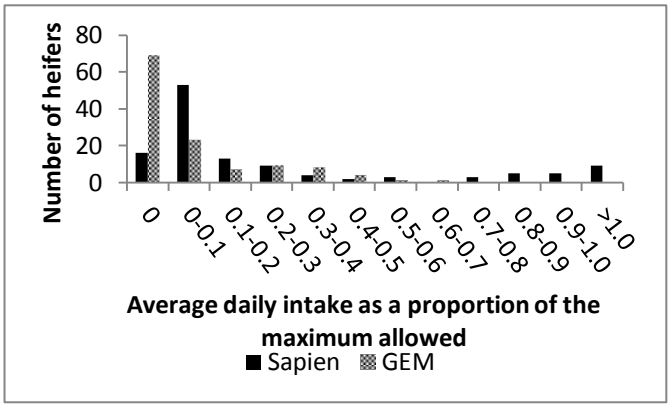

Figure 2. Histogram of average supplement intake from the two bin types as a proportion of the set maximum daily limit.

The least squares means (LSM) of non-zero, relative daily intakes of each heifer as a proportion of the set maximum were 0.57 ±0.03 and 0.14 ±0.04 for the Sapien and GEM bins respectively (r^2=0.37, RMSE= 0.44, n = 1154). The LSM for the subset of data from heifers that ate at both bins were 0.70 ±0.04 and 0.25 ±0.04 for the Sapien and GEM bins respectively (r^2=0.38, RMSE= 0.42, n = 922). Similar significant differences (P<0.0001) between bin type were obtained for relative daily intakes when tag was instead fit as a fixed effect. This adjusts the treatment effect for the heifers that didn't visit the GEMs in the full dataset.

Discussion

Significantly more heifers accessed the feed stations on the 2 Sapien trailers than the 2 GEMs during the 16 trial days and those heifers eating at the trailers had higher proportional maize intakes. Waghorn et al. (2016) suggested a single GEM may handle up to 100 dairy cows as each cow averaged less than 2 visits per day, but they noted that the reasons for low and intermittent GEM visits were unknown. Cottle et al. (2015) also found an average of only 2 visits per day to GEMs which are designed for methane measurement.

The maximum daily intakes settings for the bins were influenced by the need to have not much pasture substitution caused by the supplement intake, as pasture intake estimation was the main aim of the project. Ideally the maximum set would have been the same for both types of bins but rescaling the average daily supplement intakes to the proportion of maximum allowed daily intake would reduce any unknown bias.

It can be postulated that having animals able to feed side by side makes them feel more comfortable and secure and enables 'bullies' and/or animals that gorge on the supplement to be more easily avoided or dislodged by other animals. A new controlled supplement device (SmartFeed Pro) that has a single bin design appears to have been modified from the GEMs (C-Lock 2016). Mobile Sapien trailers hold 2.5 tonne of supplement so only need topping up weekly. A large SmartFeed bin volume is 0.78m^3 (~ 0.59 tonne maize), so five SmartFeed bins would be needed to feed as much supplement as one Sapien trailer.

A trial to compare the abilities of mobile Sapien trailers and SmartFeed bins (where there was a similar investment cost in the number of units deployed) to service the controlled supplementation of a typical herd size would be worthwhile.

Acknowledgement

This research was funded by the Department of Agriculture and Water Resources, through the Action on the Ground program. We thank Tom Gubbins, Rob Herry and Mark Troeth of Te Mania, Russell Cranston, Sapien and Graeme Bremner, UNE for their assistance with the heifers and trial.

References

Bowman and Sowell (1997) *J. Anim. Sci.* 75, 543-550.

C-Lock (2016) www.c-lockinc.com/shop/feed-intake-measurements/smartfeed/ Accessed March 2016.

Cockwill CL, McAllister TA, Olson, ME, et al. (2000) *Can. J. Anim. Sci.* 80, 681-690.

Cottle DJ (2016) *Livestock Sci.* 184, 13-20.

Cottle, D.J., Velazco, J.I., Hegarty, R.S. and Mayer, D. (2015). *Animal* 9, 1949-1957.

Dixon RM, White A, Fry P. et al. (2003) *Aust. J. Agric. Res.* 54, 529-540.

Eggington AR, McCosker TH, Graham CA (1990) *Aust. Rangeland J.* 12, 7-13.

Kahn LP (1994) *Aust. J. Agric. Res.* 45, 1731-1739.

JMP (2016) www.jmp.com/support/help/Fitting_Linear_Models.shtml. Accessed March 2016.

Waghorn GC, Jonker A and Macdonald KA (2016) *Anim. Prod. Sci.* 56, 252-257.