BREEDER PERSPECTIVES ON FAT AND FEMALE MANAGEMENT

S. J. Lee, I. K. Nuberg, W. S. Pitchford

Cooperative Research Centre for Beef Genetic Technologies
School of Agriculture, Food and Wine, The University of Adelaide, Roseworthy SA 5371

SUMMARY

Seedstock breeder's perspectives on topics associated with maternal productivity were investigated through the use of qualitative in-depth semi-structured interviews. Qualitative content analysis of interview data yielded a considerable divergence in attitudes to female management with regards grazing management, body condition score (BCS) fluctuation and the utilisation of body fat reserves. Variation in these attitudes were associated with divergence in perspectives on the importance of selecting for positive (> 0) rib and rump fat estimated breeding values (EBVs) for female fertility, or selecting for neutral or negative (≤ 0) fat EBVs to assist yield, particularly with regards commercial steer progeny. These results demonstrate that amongst seedstock breeders targeting similar end markets, substantial variation in animal selection and management exists that requires further characterisation to ensure breeding programs and animal management are optimal.

INTRODUCTION

Today's modern production animals have been selected on output traits and subsequently fitness traits and adaptability have generally declined, potentially leading to reduced overall productivity (Hohenboken *et al.* 2005). In response, the requirement of cattle breeders has shifted from simply selecting for increased output towards selecting for optimum conversion of available food resources to marketable product across the production system (Jenkins and Ferrell 2007). In forage based systems the quality and quantity of dry matter available varies greatly and periods of low feed availability may inhibit individual animal's ability to express their genetic potential for production traits. Jenkins and Ferrell (1994) effectively demonstrated the need for genetic potential to be aligned with production environment. If there is a high genetic potential but poor production environment (low or variable nutrition), it is likely biological production efficiency will be severely reduced due to factors such as reduced body condition and extended calving interval (Richards *et al.* 1986).

Body fatness at calving is recognised as a major factor determining duration of postpartum anoestrus and subsequent conception rates. BCS is a subjective measurement of the level of fat and muscle reserves that an animal displays and has been reported to be highly correlated to different measures of body fat. Wagner *et al.* (1988) estimated that BCS accounted for 80% of the phenotypic variation of carcass fat in 400kg beef cows. For dairy cattle BCS is heritable (0.17) and genetically correlated to fertility traits and thus it is possible to indirectly select for fertility traits which are lowly heritable by selecting for BCS (De Haas *et al.* 2007). In beef cattle, Johnston *et al.* (2003) estimated heritabilities of 0.16 for BCS and 0.38 for P8 fat depth, potentially indicating response to selection for body fatness may be better achieved through P8 rather than BCS selection.

Beef producers recognise the importance of BCS at calving for subsequent reproduction. However, there is considerable divergence in opinion about how to achieve optimal BCS at calving for subsequent rebreeding whilst producing beef in the most biologically efficient and economically profitable way. This paper aims to illustrate the divergence in breeder perspectives on the management of females and also on the perceived importance of fat EBVs in relation to female fertility, BCS and carcass yield.

MATERIALS AND METHODS

A qualitative research approach comprising 24 in-depth semi-structured interviews with Angus and Hereford seedstock breeders was conducted. The interviews focused on factors breeders perceived as important in contributing to maternal productivity in beef cattle. Sampling was purposeful with all breeders interviewed conducting the full range of Breedplan performance recording on both sexes. The interview schedule combined a structured approach to allow for systematic comparison of interviewees responses to a particular topic with unstructured spontaneous questioning to facilitate further understanding on topics of interest. The interview schedule was formed from existing research knowledge in beef production, before being internally examined by peers and formally assessed in a pilot study with 3 breeders.

Audio from the interviews was digitally recorded and transcribed in full. The transcripts were analysed using a content analysis approach as described by Miles and Huberman (1994) with the assistance of NVivo™ 8 software providing a database for the arrangement, retrieval and verification of data. The actual coding and arranging of data was conducted by the researcher. Content analysis is multi-staged and involves transcript familiarisation, data coding, and within and across interview analysis. Multiple readings of each transcript were undertaken prior to coding to understand fragments of text in context. Coding of data involved both data reduction; by arranging large texts into small analytic units (codes) which acted as labels for assigning meaning to descriptive information compiled from interviews; and analytical categorisation of the data (Neuman 2003). An initial coding structure was formed from prior research knowledge and complemented with concepts emerging from initial readings of the transcripts. Further codes were added to the coding structure when new information or relationships in data became apparent.

First level coding of each transcript in its entirety was conducted and involved placing segments of text to the appropriate code. Secondary coding was performed to cluster codes together and examine the relationships and interactions between initial codes and to form an initial conceptual order to indicate the nature of relationships between categories. Secondary coding was used to demonstrate interactions between codes, to show how concepts cluster together and how codes relate to each other under different circumstances.

Data within code for each interview was compared to ensure consistency of message on a particular topic, and identify underlying factors if content was not consistent. Data within code and between interviewees were then compared to determine if common themes or messages, or contrasting information was emerging for a particular code. Cross case analysis involved comparing comments on the theme, 'fat EBVs and fertility' across interviews and provided an insight into how applicable the findings of the project would be across multiple sites or similar circumstances (Miles and Huberman 1994).

RESULTS AND DISCUSSION

The outcomes of analysis of interview data demonstrated substantial variation in breeder attitudes towards expectations of the female that appeared independent of breed, calving season, average genetic potential and production environment (location). The vast majority of breeders interviewed had firm requirements about the need for females to calve at 24 months and subsequently calve on an annual cycle. However, considerable divergence existed in their attitude to female management with regards grazing management, provision of supplementary feed, BCS fluctuation and the utilisation of body reserves. Variation in these attitudes was associated with differing opinions on the importance of selecting for positive fat EBVs for female fertility, or selecting for neutral or negative fat EBVs to assist yield, particularly with regards commercial steer progeny. Figure 1 depicts the variation in attitudes held by many interviewees towards female management, associated attitude to fat EBVs, fertility and yield and subsequent perceived outcomes for the breeding female, commercial progeny, production efficiency and profitability.
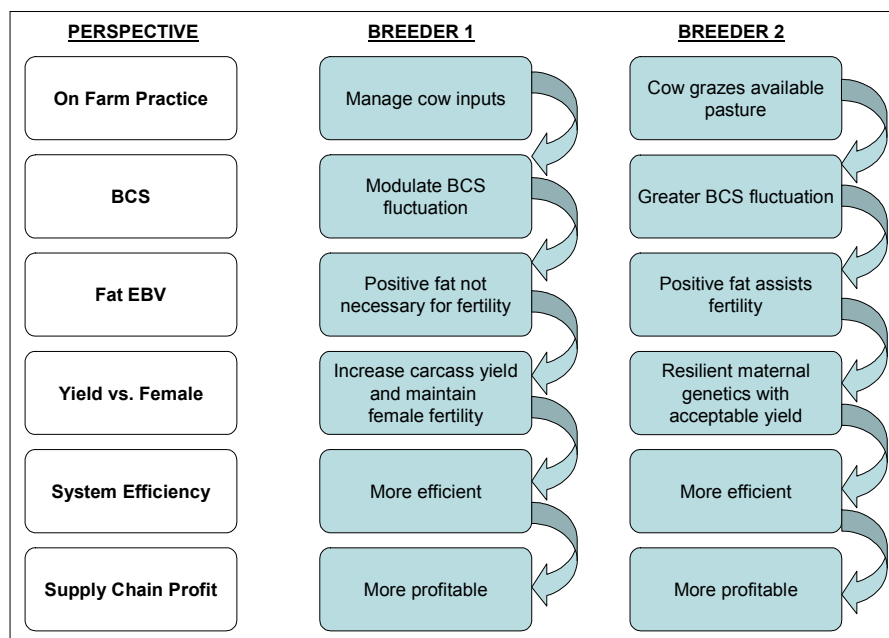
Figure 1. Contrasting breeder perspectives on animal management, selection and profit.

Breeder quotes outlining their perspective on animal management, attitude to fat and system efficiency demonstrate a considerable contrast. Quotes below are from breeders who believe that positive fat is not necessary for fertility (quote 1) and that large fluctuations in body condition are poor utilisation of available energy (quote 2) and that genetic gain and phenotypic production for fertility were better achieved through advancement in the days to calving (DTC) EBV (quote 3).

'If you couldn't do it any other way and we were dropping 10% conception rate, then you have to have that fat there. If you can have yield and have efficient cows, then to me the wrong thing for a seedstock business to do is to push positive fat.'

'I have a real problem with fat and I touched on this before in regard to cow condition…When you feed it (fat) *on and it costs you somewhere in the vicinity of 40% of every mega-joule you end up using in the process of putting it on and then re-metabolising it again, that's just crazy'*

'People that pick fat cows for fertility, they should concentrate on fertility, don't measure a correlated trait, measure the trait you want…we use our DTC EBV to make sure they are still fertile and staying in calf.'

The following quotes are from breeders who believe that positive fat is important for fertility and selection on the DTC EBV for fertility is not sufficient. Breeders were aware of the importance of carcass yield but believe that they cannot afford to select for negative fat due to the impact on female fertility (quote 1). Breeders believed managing cows to gain body condition during times of high feed availability and mobilise body condition when feed is limited is desirable and that positive fat cattle had greater ability to successfully fluctuate in BCS (quotes 2 and 3).

'I use the carcass traits more for maternal productivity than for carcass. It is huge, rib and rump, whenever I use an AI sire I have a really good look at his fat EBVs. When I use a negative fat bull the drop out rate in our maternal side is too high…I know the feedlot buyer wants high yielding steers but I can't afford that in the cow herd.'

'The ones that have stayed in the system have this ability where they can put weight on quickly in spring when there is compensatory growth and they can draw down on those reserves when things are tougher like now (March-April) *and then gain weight quickly when the feed is available. We see a real advantage in that.' 'They are positive fat cattle and pretty fertile cattle.'*

The quotes demonstrate a clear divergence on breeders perspectives on the optimal female, breeding and animal management strategy to maximise production efficiency and supply chain profitability. This result was somewhat surprising given that all breeders interviewed were aiming for high quality beef markets. The finding demonstrates that even though the breeders had similar end market goals, there were substantial differences in selection criteria and the way they interpreted and utilised fat EBVs. Had one group of breeders focused on a terminal end market and the other on a self replacing herd the divergence would have been less surprising.

Fluctuations in body weight and condition associated with synthesis and catabolism of protein and fat consumes substantial amounts of energy and is generally an inefficient use of metabolisable energy (ME). Ferrell *et al.* (1976) estimated the maternal energy gain in non pregnant heifers was 39% whilst Freetly *et al.* (2008) estimated the overall efficiency of maternal energy gain was 41%. However, Freetly *et al.* (2008) found when feeding pregnant females on a rising plane of nutrition following a period of low nutrition the efficiency of converting ME to retained energy ranged from 84-98%. The results of Freetly *et al.* (2008) demonstrate that the energy expenditure associated with changing body composition is negligible relative to total feed intake. This led the authors to suggest that, contrary to prior assumptions that allowing cows to lose and gain energy was an inefficient use of energy, it may indeed provide an efficient use of energy. By implementing feeding strategies focused on optimising body weight fluctuation to best use available feed resources it may be possible to increase the efficiency with which body tissue is synthesised and mobilised. This strategy would allow cattle breeders to determine how and when feed resources are utilised, namely females gaining body condition during times of high feed availability and mobilising stored energy during times of low feed availability. Further research on cow body condition is required to understand the effect fat genotype has on the efficiency of energy gain, storage and mobilisation, the nature of efficiency of body condition gain and the efficiency of accumulating and mobilising tissue reserves without impacting performance.

ACKNOWLEDGEMENTS

REFERENCES

De Haas, Y., Janss, L. L. G. and Kadarmideen, H.N. (2007) *J. Anim. Br. And Gen.* **124**:277.
Ferrell, C. L., Garrett, W. N., Hinman, N. and Grichting, G. (1976) *J. Anim. Sci.* **42**:937.
Freetly, H.C., Nienaber, J.A. and Brown-Brandl, T. (2008) *J. Anim. Sci.* **86**:370.
Hohenboken, W., Jenkins, T., Pollak, J., Bullock, D. and Radakovich, S. (2005) *Proc. Beef Impr. Fed. 37th Annual Research Synposium* **37**:115.
Jenkins, T. G. and Ferrell C. L. (1994) *J. Anim Sci.* **72**:2787.
Jenkins, T. G. and Ferrell C. L. (2007) *J. Anim Sci.* **85**:1787.
Johnston, D. J., Reverter, A., Burrow, H.M., Oddy, V.H., and Robinson, D. L. (2003) *Aust. J. Agric. Res*. **54**:107.
Miles, M.B. & Huberman, A.M. (1994) "Qualitative Data Analysis" 2nd ed. Sage Publications, US.
Neuman, W.L. (2003) "Social Research Methods" 5th ed. Pearson Education, US.
Richards, M. W., Spitzer, J.C. and M. B. Warner (1986) *J. Anim Sci.* **62**:300.
Wagner, J.J., Lusby, K. S., Oltjen, J. W., Rakestraw, J., Wettemann, R. P. and Walters, L. E. (1988) *J. Anim. Sci.* **66**:603.