Presentation to Booroomooka Cattle Breeders Information Day, 31st July, 2008

Improving the efficiency of your breeding herd
~ A summary of some key research findings

Peter Parnell

NSW Department of Primary Industries,

Beef Industry Centre of Excellence, Armidale NSW

Email: peter.parnell@dpi.nsw.gov.au

1. Beef production is an energetically inefficient process ! Only about 6 percent of the feed inputs in beef production is used for end-product protein deposition (compared to about 15 percent in pork and about 20 percent in poultry).
2. Feed energy is used in a cow herd for body maintenance (70-75%), gestation (5-10%), lactation (10-15%) and growth of calves & cows (10-15%). Feed energy is also used for maintenance and growth of replacement heifers.
3. The maintenance energy requirements of individual cows are largely determined by their body weight, fat content and milk production potential.
4. On average, larger cows, and cows with higher milk production potential tend to have greater maintenance energy requirements.
5. Cows with a greater proportion of their body weight comprised of lean tissue tend to have higher maintenance energy requirements than fatter cows of the same weight.
6. Despite these general trends, research has also shown that considerable variation exists among cows in their feed requirements, independent of their size and milk production.
7. Research conducted by NSW DPI at Trangie in the1980s showed that some cows consumed almost twice the amount of feed per kg of calf weaned than other cows (e.g. 50kg calf weaned per 1,000 kg feed *versus* 80kg calf weaned per 1,000 kg feed) .
8. Subsequent studies at Trangie during the 1990s showed that variation in feed requirements, net of differences in growth rate and size, was heritable and responded to genetic selection. More recent studies on these cattle have shown that animals selected for improved feed efficiency also tend to have lower green house gas (methane) emissions per kg body weight.
9. Research has also shown that differences in the way cows store and retrieve energy in their body (i.e. fat tissue *versus* protein tissue) has a significant influence on their maintenance requirements. Cows having a tendency to store/retrieve energy dense fat tissue tend to be more efficient than cows that manipulate lean (muscle) tissue.
10. A kilogram of stored fat tissue contains 5 times more energy than a kilogram of muscle tissue. But, it only takes about 25 percent more feed energy to store a kilogram of fat compared to a kilogram of muscle. Once fat tissue is deposited, it takes less than half as much energy to maintain compared to the same weight of muscle. This is because muscle tissue is much more “metabolically active” than fat tissue.

11. The energy requirements for fat deposition of mature cows is lower than for growing animals, due to a shift in nutrient partitioning toward fat deposition that occurs when cattle reach maturity.
12. Under grazing conditions with widely fluctuating seasonal feed supplies, the ability of a cow to deposit fat reserves when feed is abundant, and mobilise this energy when needed, is an important factor determining overall herd efficiency
13. Manipulating cow condition can be an efficient means to transfer feed energy across the year. A beef cow can typically store/retrieve up to 3500MJ of stored energy over an annual production cycle, equating to about 300kg barley, or 2 bales silage !
14. There is currently very limited ability to accurately select for cows with improved efficiency of feed use for maintenance.
15. Estimated Breeding Values (EBVs) for Mature Cow Weight, 200-Day Milk, Days to Calving can be used to select bulls to produce replacement heifers with improved productivity. But, new/better tools are necessary to enable improvement in maintenance efficiency.
16. Visual selection of replacement sires for later "maturity type" may result in increased herd maintenance requirements (via increased mature cow size and reduced proportion of body composition as fat).
17. Selection for replacement sires with lower carcase Fat EBVs, and increased Carcase RBY% EBVs, may result in increased herd maintenance requirements. Conversely, selection for increased carcase Fat EBVs, and increased IMF% EBVs may result in reduced herd maintenance requirements. However, insufficient knowledge currently exists to confidently predict the magnitude of these changes.
18. Research led by NSW DPI is currently in progress by the Beef Cooperative Research Centre to develop new knowledge to enable beef producers to select for improved cow efficiency, and to determine the optimum balance between end-product (carcase) traits and components of maternal productivity in their breeding programs.
19. Early results of this research, involving repeated ultrasound measurement of body composition on 6,000+ heifers in co-operator herds throughout south-eastern Australia, has confirmed that large differences do occur in the fatness of heifers within a herd across their first and second parities. Further studies on these heifers will hopefully reveal the relationships of these body composition profiles with various components of lifetime maternal productivity.
20. The need for this knowledge will become more important as future cow-calf operations will be forced into more marginal and variable environments. Under this scenario the beef industry requires resilient maternal genotypes that can efficiently utilise variable feed resources (e.g. via efficient energy storage and mobilisation of body tissue reserves) whilst also having the ability to produce progeny that meet high quality market targets.

~~~
~~~