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COW ADAPTABILITY AND CARCASS ACCEPTABILITY - ARE THEY COMPATIBLE?

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Introduction

Obviously cows have to be bred to fit their environment/resource base and their progeny have to produce desirable consumer beef. However, genetic antagonisms between traits and other management factors result in mismatches that occur between optimum cow fitness and optimum carcass fitness. Fortunately the knowledge base that can be used to manage some of these mismatches has grown in recent years. Given time, effort, and commitment, a rancher can develop an action plan to produce not a perfect fit, but a profitable compromise between "cow goals" and "carcass goals".

Table 1. Matching Genetic Potential for Different Traits in Varying Production Environments[1]

	Production environment						
Feed Availability	Environmental stress[2]	Milk production	Mature size	Ability to store energy[3]	Adaptability to stress[4]	Calving ease	Lean yield
High	Low	M to H	M to H	L to M	M	M to H	H
	High	M	L to H	L to H	H	H	M to H
Medium	Low	M+	M	M to H	M	M to H	M to H
	High	M-	M	M	H	H	M
Low	Low	L to M	L to M	H	M	M to H	M
	High	L	L	H	H	H	L to M
Breed role in terminal crossbreeding systems							
Maternal		L to H	L to M	M to H	M to H	H	L to M
Paternal		L to M	H	L	M to H	M	H

[1]L = Low; M = Medium; H = High.
[2]Heat, cold, parasites, disease, mud, altitude.
[3]Ability to store fat and regulate energy requirements with changing (seasonal) availability of feed.
[4]Physiological tolerance to heat, cold, parasites, disease, mud, and other stresses.

The optimum trait levels shown in Table 1 are appropriate for General Purpose type cattle, cattle that are usually used in rotational crossbreeding programs. The lower part of the table lists optimum trait levels for both the maternal and paternal sides of a terminal crossbreeding program.

Cows without the ability to store energy, when feed availability is low, often do not have enough body condition to rebreed quickly. Cows that do well in low feed environments may be fat cows in high feed-low stress environments. Since lean yield and ability to store fat are antagonistic, the optimum level of leanness varies with feed availability. A lean cow may be acceptable when feed is good but with limited feed, cows need to fatten easily.

Recommendations for optimum trait levels for sires and dams in terminal crossbreeding systems vary somewhat from General Purpose types. Maternal type cattle generally need more adaptability, more ability to store fat and less lean yield than General Purpose types. Milk production should be about the same but size should be less to take advantage of the complimentary effects of using growthier terminal sires. Traits emphasized in terminal types are growth rate and lean yield.

Goal Setting

Selection goals must be value and profit driven. Long term profits will only rise if there is a balance between the needs of the cow segment (reproduction and growth), the needs of the feeding segment (growth and feed conversion) and the needs of consumers (safety, quality, value).

Historically, several obstacles have slowed progress in balancing production and carcass traits: 1) lack of a comprehensive identification and data collection system for carcass traits; 2) the marketing system did not differentiate nor reward carcass product value; 3) adequate databases did not exist that identified genetic differences in carcass product value.

On the cow herd side of the profit equation, such criteria as cow maintenance feed cost, net reproductive rate, cow turnover rate, calf death loss and calf production per cow will continue to have major impact in the future.

On the carcass side of the profit equation, the likely critical factors for the future are carcass weight, retail product yield, marbling and tenderness, all of which are under some degree of genetic control.

Carcass Antagonisms

The scarcity and expense of collecting tenderness data probably contributes to the current emphasis on marbling as the tangible component of "quality" that the beef industry seems to be pursuing. Marbling appears to be quite variable across breed biotypes with British types (Angus, Hereford, Shorthorn, Devon) having greater genetic potential for

marbling than Continental types (Charolais, Simmental, Gelbvieh, Limousin) and with Brahman types having the least potential for marbling. Not surprisingly, research has indicated an unfavorable correlation between fat deposition and percent retail product and a positive relationship between marbling and overall fat deposition. Thus, there appears to be an antagonism between marbling and cutability across and within some breeds. Ideally, we would like to improve marbling and percent retail product. Angus data indicates a low genetic correlation between marbling and percent retail product which would indicate that some progress in both traits could be made if selection were applied to both traits.

Marbling and Reproduction / Production

With more focus on marbling in many programs it is important to understand the impact of traits like marbling on reproduction and production. Nebraska researchers found no difference in age of puberty among daughters of High and Low Marbling EPD sires. Other studies would indicate biological type or breed would have more impact on reproduction than marbling potential. Heterosis would have major impact on reproduction independent of ability to deposit marbling.

Between breed differences indicate a positive relationship between milk production potential and marbling. Higher milk producing breeds tend to be have higher marbling scores and low milk tends to be associated with breeds with lower marbling scores. Within the Angus breed, this tendency does not appear to be very high, indicating selection for marbling would not necessarily increase milk production.

Muscling and Reproduction / Production

Several studies indicate a potential "red flag" from excessive selection pressure for "muscle" traits like ribeye area or retail product due to the potential negative impact on reproductive traits such as conception rate and age at puberty. As expected, there is a sizeable positive relationship between various measures of growth and carcass retail product yield(lbs) or other measures of muscling. The negative impact of extreme muscle mass on reproduction in "double muscled" females is well documented.

Balancing Cows and Carcasses

In order to optimize the important reproduction and production traits while balancing them against carcass traits, it appears several tools will be required, 1) an extensive database for all economic traits, 2) the correlations and economic weightings to construct selection indices for differing carcass goals, and 3) discipline to use breed differences and heterosis in order to avoid previously discussed antagonisms. Reasonable compromises between the major trait areas of reproduction, production and product will be struck. Breed blends of existing well documented genetics will be the key to striking this balance.

Acknowledgment

Fortunately an excellent paper on this same subject has recently been written by Dr. Ronnie Green and his co-workers at Colorado State University. I have asked that this paper be printed in these proceedings following my brief remarks. I'm sure you will also find it to be helpful and thought provoking.