

Shorthorns – Maternal or Terminal?

Ron Bolze
Executive Secretary
American Shorthorn Association
8288 Hascall Street
Omaha, NE 68124
402 393 7200 / 402 393 7203 (fax)

Hopefully, this title has caught your attention. I think this is an issue that really needs further thought and discussion by those Shorthorn breeders that are truly interested in future potential commercial application for Shorthorn genetics. The thought process is timely in that many Shorthorn breeders will be making breeding decisions at about this time. Remember, the sire selection decisions that we make in 2006 will not create progeny that attain breeding age until 2008 in your herd and will not leave lasting impact on commercial herds until 2010 and beyond. Delaying just one year in making the right genetic decisions, delays the availability of your product to the commercial industry for another year. The point is that timely genetic decisions are critical to not only your own program, but even more so to the commercial users of your genetics. The commercial producer is the ultimate judge of whether or not your genetics and that of the Shorthorn breed have long term application to commercial production. In short, Shorthorn genetic inputs to commercial application absolutely must “work” the first time. There will be no second chances.

The stimulus to write this column came from my recent travels to the Range Beef Cow Symposium (RBCS) which is held the first or second week of December every other year as a cooperative effort between the Cooperative Extension Services and Animal Science Departments of South Dakota State University, Colorado State University, University of Wyoming and University of Nebraska. This year's event was held in Rapid City and typically also rotates through Cheyenne, Fort Collins and Scotts Bluff. Weather permitting, the RBCS attracts 600 – 1200 cow calf producers which represent millions of seedstock and commercial cows. Shorthorn seedstock producers that took time from their busy schedules to prioritize attendance at this year's event include Dale Rocker, Rocker Brother's Shorthorns, Seward, NE; Jeff Schmidt, JR Ranch, Othello, WA; and Rick Leon, Peak View Shorthorns, Fowler, CO, all of which were exposed to commercial producers considering the merits of using Shorthorn genetics in systematic crossbreeding programs.

This brings me to one of the most interesting topics discussed at the RBCS that could not be any more timely. **“Crossbreeding: The Forgotten Tool”**, presented by soon-to-retire Dr. Jim Gosey, University of Nebraska Beef Extension Specialist, that has emerged as the “voice of common sense” in today's beef production era characterized by commercial straight-bred Angus production. Jim has devoted his professional career to helping beef cattle producers make money largely through a clearer understanding of genetic

application principles. You can access his entire presentation at <http://www.rangebeefcow.com/speakers/Gosey.html>.

Quotes from his presentation follow:

"Many commercial cowherds have drifted towards straight bred Angus in an attempt to achieve management simplicity, greater uniformity and to pursue a premium, non-commodity product."

"The result is the loss of most of the heterosis that once existed in many of our commercial cowherds."

"Heterosis and breed complementarity are powerful forces that combine to produce the total advantage of beef cattle crossbreeding systems."

"Heterosis, or hybrid vigor, is measured as the performance advantage of crossbreds over the average of their straight bred parents. Maximum heterosis is realized in the first cross of distinctly different parents."

"Most ranchers know crossbreeding can increase output, but perhaps don't appreciate the potential advantage in lifetime productivity of crossbred cows."

"This crossbred advantage can amount to as much as 25% greater lifetime productivity (pounds of calf weaned per cow exposed) for crossbred cows as compared to straight bred cows."

"Lost maternal heterosis shows up in the same lowly heritable traits that would be associated with the inbreeding depression, namely reproductive, fitness and longevity traits."

"Thus, the price paid for loss of heterosis occurs as a number of very small losses that when added up can amount to a substantial sacrifice in lifetime productivity."

"Ranchers would be wise to crossbreed even if heterosis were zero, due to the complementary effects of matching strengths of one breed to offset the weaknesses of another breed."

"Heterosis can impact many traits, but is especially useful in improving performance in lowly heritable traits, such as reproduction, early growth and fitness or lifetime productivity as shown in Table 1. On the other hand, highly heritable traits (above 40% heritability) like carcass traits respond to direct selection within breed."

Table 1 Average Heterosis in Beef cattle Traits

Trait	% Heterosis
Calf Crop Weaned	8
Weaning Weight	13
Yearling Weight	4
Carcass Traits	3
Lifetime Productivity	25

"This huge increase in lifetime productivity of the crossbred cow is driven by the reproductive performance through earlier puberty, higher conception rate, faster breed back, greater longevity and the maternal impact on calf performance."

Take home message: The secret lies in the crossbred cow

Where do Shorthorns logically fit in systematic cross breeding programs?

Most breeders of all breeds of beef cattle honestly believe that their breed can do all things for all segments of commercial beef production. For example, most Shorthorn breeders would like to believe that Shorthorn genetics can do all things equally well if indeed not better than any other breed when it comes to any measure of beef production efficiency. In other words, Shorthorns are believed to be more fertile, calve easier, grow faster, have cows that excel in maternal function and longevity and hang carcasses unsurpassed for quality and yield grade and tenderness superior to any other beef breed. That is true for a few of these traits, however, a review of the Meat Animal Research Center (MARC) historical data would tell us otherwise for all traits. In fact, no single beef breed excels in all economically important beef cattle production trait. Hence, the additional need for systemic crossbreeding for commercial beef production.

Trait Selection Antagonisms

A further review of the MARC Germ Plasm Evaluation (GPE) and Utilization (GPU) research efforts through the years reveals that many beef cattle production traits are antagonistic. In other words, selection for one trait may result in an indirect selection for another trait, often times in the wrong direction.

The classic examples are:

- 1) BW and Calving Ease versus WW and YW
 - BW, WW, YW and most other measures of growth in beef cattle are genetically, positively correlated. For example, single trait or primary selection for yearling growth without regard for BW would likely result in greatly increased BW and resulting calving difficulty over time. In contrast, single trait or primary selection for lighter BW without regard for YW would likely result in performance depression over time. Herein lays the reason for focusing on calving ease instead of just BW.
- 2) Carcass quality and yield grade
 - Carcass quality grade (largely marbling) is antagonistic to the components of yield grade. In other words, single trait or primary selection for carcass marbling score without regard for the components of yield grade would likely result in increased incidence of yield grade 4s. As a result of intense selection for marbling over the last 15 years, the Angus breed is now experiencing a historical high % of yield grade 4s.

Systematic crossbreeding involving terminal sires on crossbred maternal females allows commercial producers to defy these genetic antagonisms for greater efficiency and “profitability” of commercial beef production.

The Profit Equation

Many cattle producers refer to “profitability” of commercial beef production, however, few fully understand the entire concept. This brings us to the profitability equation:

Commercial cow/calf profitability = Value of outputs-costs of inputs

In recent years, the US beef cattle industry has focused on the “value of outputs” side of this equation. Increased “value of outputs” has been achieved through intense selection for increased growth rate (weaning weight, yearling weight, feedlot gain, etc.) and carcass merit (carcass weight, marbling, yield grade, etc.). However, our industry has focused very little attention on reducing “cost of inputs”. **Profitability** for a commercial producer is driven by net income after “costs of inputs” are accounted for, not gross income driven by maximum selection for the traits that contribute to “increased value of outputs”.

In general, beef cattle production traits that would increase “value of outputs” are antagonistic to traits that would reduce “costs of inputs” for a commercial cow herd. In other words, intense selection for growth rate and carcass merit could be counter productive to selection for maternal function. Recognizing that different breeds excel in different traits, this is why commercial production using only a single breed does not result in the greatest “profitability”.

What is Maternal Function?

Maternal function includes all the convenience traits that we take for granted in a beef cow. Things that we do not tend to think about until they become a problem. Things like fertility, conception rates, (with reproductive pressure of 60 days or less), pregnancy maintenance, calving ease, maternal instinct at calving, adequate milk production, udder quality, fleshing ability (with minimal supplementation), sound feet and legs, disposition, etc. which collectively contribute to cow longevity. Cow longevity is important to profitability because it reduces female replacement rate. Maternal function is the key to reducing “costs of inputs”.

The Beef Cattle Production Trait Continuum

If we were to list all the beef cattle traits chronologically in the order if which they appear from conception to carcass and draw a line at weaning, it could look something like this:

Preweaning Traits

- Early puberty
- Fertility
- Yearling heifer pregnancy
- Pregnancy maintenance
- Direct calving ease
- Birth weight

- Maternal instinct
- Milk (optimal level for a given environment)
- Udder quality
- Fleshing ability
- Mature cow energy maintenance
- Feet and leg soundness
- Stayability
- Maternal calving ease

Postweaning Traits

- Postweaning growth
- Average daily gain
- Feed efficiency
- Carcass Yield Grade (carcass weight, REA / 100 # of carcass weight and external fat thickness)
- Carcass Palatability (marbling and tenderness)
- Days to .4 inch external fat cover
- Days to USDA Low Choice quality grade

Collectively, all the “**preweaning**” traits would fit what I would loosely characterize as “**maternal function**” traits that have great merit in driving down the “**cost of inputs**” in the profitability equation. Collectively, all the “**postweaning**” traits would fit what I would loosely characterize as “**end product production efficiency**” traits that have great merit in increasing the “**value of outputs**” in the profitability equation. This raises another question:

Should all breeds be selected for the same traits to achieve maximum production efficiency and the greatest profitability?

I would contend that the English breeds (Shorthorn, Angus, Hereford, etc.) tend to excel in preweaning traits plus marbling (except for Hereford) and hence should be crossed to generate the crossbred commercial cow that excels in maternal functionality traits and maternal heterosis to yield an increased 25% lifetime productivity. This type of cow would keep the annual cow cost lower and have a reduced replacement rate due to enhanced fertility. These are the breeds that have and would respond to intense selection for the maternal functionality traits and, if properly selected would reduce the “cost of inputs”.

In contrast, the exotic growth-type breeds (Charolais, Simmental, Gelbvieh, Limousin, etc.) tend to excel in postweaning traits (except marbling) and are most ideally used as “terminal” sires. These are the breeds that have and would respond to intense selection for highly heritable traits like growth, feed efficiency and carcass leanness. These are the breeds that, if properly selected would increase the “value of outputs”.

To maximize profitably, a commercial cow calf producer must increase the “value of outputs” while simultaneous decreasing the “costs of inputs”. Recognizing trait antagonisms, this can not all be done in the same breed. It requires systematic cross breeding with different breeds selected for different traits.

So, what does this mean for Shorthorns?

As stated many times over the last 2-3 years, the Shorthorn breed is in a unique position to become the non-Angus English breed to recreate maternal heterosis in commercial beef production. In other words, if commercially oriented Shorthorn seedstock producers are willing to select for economically important beef production traits, Shorthorn bulls should be in great demand to mate to “Angusized” commercial cows to create the resulting crossbred cow that can produce 25 % more pounds of calf per cow exposed throughout her lifetime than the straight bred Angus cow.

Does it mean that Shorthorn breeders should put no selection emphasis on postweaning traits like growth and carcass merit? Absolutely not. What it does mean is that Shorthorn breeders should select for postweaning traits as long as it does not interfere with maternal function.

So, how do Shorthorn breeders select for maternal function?

Unfortunately, current selection emphasis for many breeders from many breeds (not just Shorthorn breeders) focuses on the need to use the latest, high use genetics for merchandising purposes. The point is that genetics get used long before we know anything about maternal function of certain sire lines. The only way to select for maternal function is to use sires whose daughters excel in maternal function. Unfortunately, these sires are old and oftentimes deceased long before we recognize the value of their daughters. Artificial insemination is the answer. How about for those that do not AI. Seek out old cows from herds that are run under practical commercial like conditions – reproductive pressure (60 day breeding seasons with the opens culled), minimal supplementation to allow the environment to “sort” the cattle, intense culling for functionality traits (fleshing ability, udder quality, disposition, feet and legs, etc). There are reasons why these old cows are still in production after so many years that we will likely never be able to quantify with an EPD. Use sons out of these old, functional cows that are sired by bulls that have left daughters that excel in maternal function.

Summary

Systematic crossbreeding will likely be used again by those astute commercial producers that understand the “profitability” equation. Shorthorn seed stock producers targeting genetics to these commercial producers need to have a clear understanding of where Shorthorns fit and breed the cattle accordingly. Again, the Shorthorn breed is in a unique position to become the non-Angus English breed to recreate maternal heterosis in commercial beef production. The opportunity is staring at us in the face. Will we seize the opportunity?

Thought for the Month

A mind that is stretched will never return to its original dimension.

Author Unknown