ECONOMIC IMPACT OF REPRODUCTIVE RATE

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INTRODUCTION

To begin, everyone reading this paper realizes a dead calf is worth a lot less than a live calf. In fact, about the only thing worth less than a dead calf is no calf at all. Therefore, the only "safe" thing I am sure to say in this paper is that "we need to get as many cows pregnant as possible." I could end this discussion right there, but I won't. Instead, I will attempt the following:

- ***to convince you that reproductive efficiency is by far the most important factor affecting profit of a cow-calf operation;***
- ***to put a dollar figure on the cost of an open cow or a cow that is bred late; and***
- ***to give you my biased view on how to MAXIMIZE reproductive efficiency in a commercial cow-calf herd***

Effect of Reproductive Efficiency on Profit

Perhaps the most recent and most "fashionable" approach to estimating the economic impact of variables that affect a cow-calf operation is the use of computer modeling. Computer models are based on input data collected from research studies and "real world" situations. The advantage of using modeling is the ability to change several variables simultaneously and in a controlled fashion to assess the impact of those changes. The model of most recent note is a "bioeconomic" model described by Melton (1995) to consider the profit effects of changing individual variables related to beef genetics.

The bioeconomic model addresses the relative value of changing each of 16 different variables one standard deviation or one unit. It estimates the effect of those changes on the profit of a cow-calf operation. Of the 16 variables imposed, only seven had a significant impact on the profitability of raising calves to weaning. Those variables were grouped into areas characterized as "Reproduction", "Production/Growth" and "Product/Consumption". Then, the relative impact of changes in those three general areas on profit at the cow-calf level were compared.

Changes in reproductive variables had the greatest impact on cow-calf profit (Table 1). In fact, of the variables combined to form the "Reproduction" category, a change in only two (weaning rate and lactation) had a significant impact on profitability. In contrast, the "Production/Growth" variables had less effect on a cow-calf producers profit and the variables related to the quality of the retail product had the least impact on success at the cow-calf level.

Table 1. Standard (per std. dev.) Economic Weights by General Production Area[a]

Area	Ratio
Reproduction	3.24
Production / Growth	2.87
Product / Consumption	1

[a] Melton (1995)

A study done by Agriculture Canada and cited by Ritchie (1995) was even more specific in identifying how reproductive, production and price variables influenced profit. In that study they estimated the change in net farm income that would be caused by a 1% change in each of eight traits (Table 2). Improving conception rate was predicted to have the greatest affect on income. Note that improving conception rate by 1% was more influential than increasing the price of calves.

Table 2. Contribution of Production Variables to Net Cow-Calf Income[a]

Production variables	Effect on net farm income $ / cow
Conception rate, 1% increase	+ 6.34
Winter feed, 1% increase	- 1.28
Calving rate, 1% increase	+ 3.59
Birth weight, 1% increase	+ 0.46
Difficult calvings, 1% increase	- 1.80
Postnatal calf death loss, 1% increase	- 3.59
Weaning weight, 1% increase	+ 3.30
Price of steer calves, 1% increase	+ 3.30

[a]Adapted by Ritchie (1995) from Agriculture Canada data.

These two studies demonstrate the remarkable potential for improving profitability of a cow-calf operation by improving fertility, calf survival and lactation. Equally important is how little the quality of the retail meat product affects the income of a cow-calf producer This emphasizes the concept articulated by Melton (1995):

"The current beef market, at least at the weaned calf level, is dominated by average price purchasing in which genetic superiority (or inferiority) for post-weaning performance or product quality is not adequately reflected by price premiums (or discounts)"

Hence, the signal to cow-calf producers is very clear. Even though you control the genetic decisions that ultimately determine post-weaning performance and carcass quality, at the present time you are more likely to be rewarded for selection decisions that improve reproduction and lactation in your cow herd than for a genetic change that improves feedlot gain or carcass quality.

Cost of Open Cows or Cows Bred Late

A cow is a factory. The factory produces weaned calves. Any factory that fails to produce a product is unprofitable. The question is: just how much does an open cow cost you ?

Table 3. Effect of Open Cows on Cow-calf Cash Flow

Open Cow Salvage		Buy Bred Cow	
1100# @ .26	+$286	1 head @ $500	-$500
Marketing	-11	Less salvage	+275
	+$275		-$225

Replacement cost	-$225
Interest (225 x 10%)	-23
Annual cow cost	-215
	-$463
Value of weaned calf	+$284
Cost to replace open cow	-$179

The question of what an open cow costs can be answered hypothetically using the figures in Table 3. The estimated value of an open/cull cow in fall "95 is only $286. Less sale expenses, that's a salvage value of only $275. If that salvage value is applied back towards the purchase of a bred cow and the bred cow costs $500 (which a good quality bred cow that we know much about will cost), then it costs you $225 to exchange a bred cow this fall for an open cow. The purchased bred cow will have a calf next spring, however. Therefore, if we consider the cost of keeping her until her calf can be weaned ($215) and what you expect to receive from her calf, then the total cost of replacing an open cow with a bred cow today will be $179. You can argue about these figures, but it is clear when you just consider the value of an open/cull versus a bred cow on today's market - having a cow go open is costing you money.

A problem that goes unnoticed more often than the open cow is the cost of cows that are bred late. I calculated the average weights for calves born in 1993-95 during the first, second and third 20-day periods of the calving season in Virginia Tech's commercial cow herd at Catawba, Virginia (Table 4). Cows bred early that calved in the first 20 days of the calving season had calves that were the heaviest at weaning. Even though those calves brought less per pound because of being in a higher weight bracket, they consistently returned more total dollars.

Table 4. Value of Cows Born During 1st, 2nd, or 3rd 20-day Periods of Calving

	1993			1994			1995		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Calf weight	472	411	386	617	562	509	616	565	532
Price / cwt	$87	$89	$91	$70	$71	$73	$60	$61	$63
Calf value	$411	$366	$351	$432	$399	$372	$370	$345	$335
Value lost/day		$1.50			$1.35			$0.88	
Average cost for each day bred late					$1.24				

To estimate the cost of each day a cow was bred later in the breeding season I simply averaged the difference in calf value between calves born in the 1st and 2nd, 2nd and 3rd and 1st and 3rd 20-day periods of the calving season. As you can see in Table 4, the cost of a "day open" was greater in "93 and '94 when calf prices were higher. Nonetheless, when you average over the 3 years, the cost of being bred a day later and calving a day later was $1.24. This means that if you have a 90-day breeding season you should expect next spring's calves born on the last week of the calving season to return more than $70 less than calves born in the first week of the calving season.

This cost of cows being open or bred late should make you reconsider the importance of incorporating (or continuing) some of the following management practices which increase the likelihood of cows breeding early in the breeding season:

- ***Scheduling a controlled 60- to 120-day calving season***
- ***Begin breeding of yearling heifers 21 days before breeding cows***
- ***Adequate nutrition beginning 60 days prior to calving***
- ***Feeding enough energy and protein to support lactation***
- ***Checking bulls for breeding soundness 30 to 60 days prior to breeding***
- ***Considering the use of estrus synchronization***
- ***Pregnancy checking all cows 60+ days after the breeding season***
- ***Culling open cows***

Creating a "*MAXIMUM REPRODUCTION*" Program

This section is a "mind game". The goal of the game, "*MAX - REPRO"*, is to devise a cow-calf management system that has the maximum chance for achieving the highest possible reproductive efficiency. In other words, "gets the most cows bred and most live calves weaned". The rules of this game are that you can choose different breeding programs, replacement programs and when during the year to calve. What follows is the way I would "play" to win this "game".

Breeding Program: My choice would be to breed crossbred cows with a bull of a third breed that had moderate growth and mature size. It would be easiest to pick Angus x Hereford crossbred cows. The reason for picking crossbred cows is simple - Hybrid Vigor. Reproductive traits have low heritablities (~10%) which means that direct selection (picking daughters of cows that consistently breed early) is not likely to yield rapid genetic progress. Crossbreeding, however, improves reproductive performance and calf viability immediately through hybrid vigor (Table 5). Adding a third breed with a terminal-cross bull, for example a low-birth weight Gelbvieh, would make the calves three-way crosses and improve their chances of living and enhance their growth rate.

Table 5. Computation of Heterosis for Percent Calf Crop and Weaning Weights[a]

	Calf Crop (%)	Weaning Weight (lb)	Lb Calf Weaned per Cow Exposed
Breed A	82	460	377
Breed B	78	540	421
Average of the two breeds (without heterosis)	80	500	399
Average of crossbreds (with heterosis)	84	520	447
Superiority of crossbreds	4	20	
Percent heterosis	5%(4÷80)	4%(20÷500)	

[a]Adapted from Taylor (1995)

Replacement Program: This is a "no brainer". I would not breed or calve any heifers. Heifers breed okay the first time as yearling (as long as they are adequately fed), but if this game requires maximizing the number of live calves, I don't want the calving difficulties that come with first-calf heifers (Table 6). Even more important is the fact that first-calf heifers are the most difficult to get bred back and they are the most likely to reduce a herd's pregnancy rate.

Instead of raising replacements, I would find a source of bred crossbred cows. This may be the most unrealistic choice in my "game plan". Most producers don't want to sell young, productive commercial cows. Remember, however, this game doesn't have any rule that says everything has to be easy!

Table 6. Age of Dam Effects on Reproductive Traits

Trait[a]	Mature	2-year-old
Calf weight (lbs)		
At birth	77	71
At weaning	416	347
Pelvic area (cm^2)	333	255
Postpartum interval to first estrus (days)	45	63
Pregnancy rate (%)	86	78

When to Breed / Calve: The correct choice here is to breed in December and January with calving in September and October. Fall calving cows have a much shorter interval from calving until they begin cycling after calving (postpartum interval) than do spring calving cows. We recently switched a University herd from spring to fall calving and their average postpartum interval decreased from 63 days to 42 days. As a result, fall-calving cows are more likely to be ready to breed at the beginning of the breeding season.

Despite my desire to set up a fall calving system, I will admit that fall calving requires a more complex winter feeding program. Furthermore, since I was not necessarily "practical" with the replacement plan chosen above, I will agree to spring calving since most Virginians do it that way. BUT, if I have to calve in the spring, I will choose to calve in March and April with breeding coming during late May to late July. The reason for breeding so late is to "capture" as much of the spring forage as possible. The longer a cow has access to good pasture after calving in the spring the more likely she is to be in better body condition and be cycling before the breeding season.

I WIN !!!!!!!! A crossbred cow (no heifers), bred to a moderate bull of a third breed that is bred in late May and calves in March is the combination that gives the highest reproductive efficiency. Crossbred replacements may be hard to find and this timing of calving doesn't allow as much time for the calf to grow from birth to weaning as calving earlier in the year. Remember, however, the goal of this "game" is to get pregnant cows and live calves - not necessarily the heaviest calves at weaning.

CONCLUSION

For me this paper has re-emphasized the economic importance of reproductive efficiency and maternal ability for Virginia's cow-calf producer. From here on out, every time I pick up a national beef cattle magazine or newspaper and see feedlot steers or a rib steak on the cover I'm going to remind myself to stay "focused" on what makes a dollar for the Virginia cow-calf producer: pregnant cows that raise live calves.

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