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Comparison of Cows of Different Size and Milk Production Using Simumate With Two Different Energy Partitions

B. A. Buckley

Dept. of Animal Science Report

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Summary

A computer simulation was performed using nine biological types of cattle of different mature size and milk production. The simulation was done to compare differences between two energy partitions designed to calculate the TDN requirements of beef cows for South Dakota. The results show larger cattle were more economically productive at weaning and on an industrywide basis. When milk production alone was considered, high milking cattle were most economical at weaning. However, on an industrywide basis, there was little difference between types.

Introduction

Total energy intake can be divided or partitioned into several components. However, the producer is primarily interested in the energy required for maintenance, growth and milk production. Recent research by Vernon Anderson, South Dakota State University, using individual feed records has led to the partitioning of the total energy intake of cows into energy required for maintenance, growth and milk production. This resulted in development of a prediction equation to be used to calculate yearly Total Digestible Nutrients (TDN) usage. This partition was used to revise a previously existing energy partition within Simumate. The new energy partition is more accurate than the previous partition for two reasons. First, the old partition was developed in a southern climate and did not account for energy needed to maintain cows during the winter months. Second, the procedure by which the old partition was developed resulted in a biased recommendation which underfed smaller cows and overfed larger animals.

Simumate is a computer program designed to simulate production costs and economic returns of differing breeds and breeding systems. Simumate considers many of the factors involved in the various phases of beef production and combines these to give the producer a more accurate picture of how the breeds or breeding systems compare. The producer can further utilize Simumate as a management tool by using cost and performance records of his herd.

The purpose of this paper is to demonstrate through the use of Simumate differences between the previous energy partition and the new partition by using nine biological types of cattle varying in mature size and milk production.

Procedures

The increased availability and usage of exotic breeds has given the producer a choice of a considerable range of mature sizes and milk production levels. For this simulation, nine biological types of cattle were simulated using three different mature sizes and three levels of milk production (table 1). Cow size and milk production are two variables which directly influence TDN requirements. TDN consumption in turn affects the number of animals a given amount of feed or land base can sustain or carry at adequate production levels. Relative carrying capacities of different breeds can be obtained by comparing TDN consumption.

Male and female fertility levels are shown in table 2. Male fertility was assumed to be equal for all biological types because this study was primarily concerned with cow differences. Female fertility levels were dependent on mature size and milk production plus such factors as calving difficulty and postpartum interval. Calf livability levels were affected by milk production of the dam, which has a large effect on the health and welfare of the calf. Other intangible factors, mothering ability for instance, may differ between biological types. However, these factors are extremely difficult to quantify.

A primary function of Simumate is economic comparison of breeds or breed crosses. Therefore, other factors considered were weaning costs, feed costs and livestock selling prices Weaning costs totalled $27,500 for a 100-cow herd or cost per year would equal $275. Feed cost per pound of feed for backgrounding, growing and finishing were 3.5, 3.8 and 4.0 cents, respectively. Selling prices for 400-pound weanlings, 700-pound backgrounded calves and feedlot calves were 68, 63 and 57 cents a pound, respectively, and price per pound of choice carcass was $1.03. All of the prices were for the week of June 2-6, 1980, from the Sioux Falls Stockyards. All values used were identical for both energy partitions and are estimates. A rancher should use his own values to obtain results more applicable to his operation.

Results

Results of the old and new energy partitions are shown in table 3. The carrying capacity base or pounds of TDN required for one cow for a year is one of the primary differences. The old base was 4250 pounds of TDN, while the new partition resulted in a base of 4942 pounds. The difference of 692 pounds of TDN between the new energy partition and the old is the additional energy required to maintain an animal in the colder climate of South Dakota. Examination of the carrying capacities indicate that more small, low milking cows can be carried. As expected, this number decreases with larger and heavier milking cows. However, this does not mean that small cows will always be the most economical to the producer. In this simulation, all net returns per unit demonstrate larger cows are most economical.

Net return at weaning is of major interest to the cow-calf producer. The old energy partition resulted in all biological types losing money at weaning due to the economic values used. However, there was little difference between types. The new partition resulted in a definite ranking of the types. Larger, higher milking cows lost less money than smaller, lower milking cows. While all types still lost money at weaning, the new formula demonstrates economic differences between the various types and should more accurately describe the adaptation of these types to South Dakota conditions.

Industry net return per individual estimates the total return per individual produced for all phases of the beef industry. Industry net return per individual is the value of interest for most cow-calf producers as this enables the producer to estimate the performance of his animals through slaughter and their value to industry. Using the old energy partition, smaller biological types returned the most to the industry. In addition, within a given size, lower milking animals were more profitable. The new partition indicated larger sized biological types were more profitable. However, there is little difference between the milk production types when considered alone.

Industry net return per individual does not always give the producer an accurate estimate of the net worth of a breed or biological type because differences in reproduction and carrying capacity are not included in this calculation. For these reasons, another measure of total industry net return is included calculated on a herd basis rather than individual. This value is of interest to the producer who feeds his own cattle and must consider the reproduction and carrying capacity of his herd in evaluating postweaning economics. Results using the old energy partition estimated the small, low milking type would be most beneficial to the industry. The medium and larger sized, as well as the higher milking cattle, did not return as much to the industry as the smaller cattle. The new energy partition estimated that large cattle would return most to industry with medium sized cattle the next best type. Again, there was little difference between types when based on milk production. In general, on an industrywide basis with the new energy partition, large biological types were the most economical followed by medium and small. In this case, several factors have a trade-off effect with the larger type cattle being lower in carrying capacity but more than adequately overcoming this disadvantage through larger size and better growth rate.

All biological types had similar weaning percentages because adequate nutrition is provided for through calculation of carrying capacity. Differences in cow fertility and calf livability still exist for different types. However, these effects tend to cancel each other out as can be seen by calf crop weaned (table 2). It should be noted that the differences between the partitions are great. However, most of these differences are due primarily to the bias of the old partition and biological type differences are not extremely different.

There were no differences between the old and new energy partitions for backgrounding, feedlot and packer net return. Table 4 is included to give the producer unfamiliar with Simumate an example of some additional features of the program. For further information on Simumate, contact your County Extension Agent. It should be emphasized that these results are meant to serve only as a demonstration and the producer should use his own cost and production figures to obtain results applicable to his farm or ranch.

TABLE 1. BIOLOGICAL TYPE, MATURE SIZES AND ANNUAL MILK PRODUCTION

Biological type	Mature size (lb)	Milk production (lb)
Small-Low (SML)	950	2000
Small-Medium (SMM)	950	3125
Small-High (SMH)	950	4250
Medium-Low (MEL)	1125	2000
Medium-Medium (MEM)	1125	3125
Medium-High (MEH)	1125	4250
Large-Low (LAL)	1300	2000
Large-Medium (LAM)	1300	3125
Large-High (LAH)	1300	4250

TABLE 2. FERTILITY LEVELS OF DIFFERENT BIOLOGICAL TYPES

Biological type	Bull fertility	Cow fertility	Calf livability	Percent weaned per cow exposed
SML	.95	.95	.89	80
SMM	.95	.93	.90	80
SMH	.95	.90	.91	78
MEL	.95	.95	.89	80
MEM	.95	.93	.90	80
MEH	.95	.91	.91	79
LAL	.95	.95	.88	79
LAM	.95	.93	.89	79
LAH	.95	.92	.90	79

TABLE 3. RESULTS OF OLD AND NEW ENERGY PARTITIONS

Biological type	Carrying capacity		Net return weaning		Industry net return per individual		Industry net return per herd[a]	
			- - - - - - - - -	- - dollars - -	- - - - - - - - -			
	Old	New	Old	New	Old	New	Old	New
SML	100.0	100.0	-46	-46	85	85	5929	5929
SMM	92.6	97.9	-44	-38	81	87	4773	5968
SMH	86.1	95.8	-46	-33	74	86	3423	5609
MEL	86.4	96.3	-46	-33	81	94	4210	6541
MEM	80.8	94.3	-45	-26	76	95	3268	6512
MEH	75.8	92.4	-44	-19	71	96	2416	6454
LAL	76.0	92.9	-49	-24	73	98	2471	6579
LAM	71.6	91.1	-48	-17	67	98	1699	6505
LAH	67.7	89.3	-45	- 9	63	100	1262	6763

[a] Number of cows per herd equals carrying capacity.

TABLE 4. ADDITIONAL RESULTS FROM SIMUMATE

Biological type	Net return backgrounding		Net return feedlot		Net return packer	
	- - - - - - - - -	- - - - - -	dollars - -	- - - - - -	- - - - - - -	
	Old	New	Old	New	Old	New
SML	30	30	30	30	70	70
SMM	25	25	30	30	70	70
SMH	19	19	30	30	70	70
MEL	28	28	43	43	56	56
MEM	22	22	43	43	56	56
MEH	16	16	43	43	56	56
LAL	24	24	55	55	42	42
LAM	18	18	55	55	42	42
LAH	11	11	55	55	42	42