

# Simulation of Calf Gain from Birth to Weaning in Oklahoma

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## Story in Brief

A computer simulation model to predict calf growth from birth to weaning has been developed from OSU data. Variable inputs include type of pasture, cow age, level of milk production, month born, month weaned, sex of calf, birth weight and whether creep pasture is available. Simulated and actual milk production and calf forage intake were not significantly different ( $P > .1$ ). Simulated calf gain followed seasonal trends of data collected in OSU studies, and was not significantly different from actual calf gain ( $P > .5$ ). Important factors influencing calf weaning weight for a given date are: date of birth, availability of high quality forage and milking ability.

## Introduction

The most profitable management of land and animal resources depends on proper management and fertilization of pasture and range land, improved nutrition and management of farm animals, and utilization of superior genetics. Producers must decide what levels of these inputs are optimum for maximizing profits. With simulation models different management schemes can be evaluated and compared for biological and economical efficiency.

The purpose of this study is to contribute to a larger study, which, when complete, should be able to simulate a complete cow/calf system with varying management alternatives. This segment deals with calf production from birth to weaning simulated under varying animal and land management schemes.

## Model Development

Equations to predict calf milk and forage intake were developed from data collected in Oklahoma State University (OSU) studies. Milk yield predictions for each month are based on forage digestibility for that month and cow average milk production. Forage digestibility values (Brorsen, 1980) for bermudagrass, native tall grass, native short grass, weeping lovegrass and fescue, with wheat pasture and sudangrass as creep pastures, are available to simulate different management schemes. Calf forage intake is based on the ratios of calf milk consumption and body weight to forage digestibility. Calf growth is simulated by computing energy intake from the predicted milk and forage intake and using the California Net Energy System (CNES) equations, with modifications, to predict calf gain from energy intake. The modifications, developed from data collected in OSU studies, were needed so that the CNES equations, which

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were developed for older, fattening feedlot steers and heifers, would predict the gain of very young calves.

## Results and Discussion

Simulated milk yield and forage intake (Tables 1 and 2) were not significantly different from actual observations ( $P > .1$ ). Actual and predicted average daily gain are compared in Figure 1. Predicted and actual gain were not significantly different ( $P > .5$ ). Records of simulations of 686 calves (with varying months of birth and types of pasture) were averaged to see if differences between ages of dam and sexes seemed reasonable. At 210 days of age, steer calves were about five percent heavier than heifer calves. Simulated weaning weights for calves of 2-yr-old, 3-yr-old, 4-yr-old and 11-yr-old or older cows averaged 14 percent, eight percent, four percent and five percent, respectively, less than for calves of mature cows (five to 10-yr-olds). These figures are similar to industry-wide accepted differences of 15 percent, 10 percent, five percent, and five percent for two, three, four, and older than 10-year-old cows, respectively.

An example of the model output from a TRS-80 Model 16 micro computer (Tables 3 to 6) shows predicted weaning weights by sex, cow age and month of birth for a specified weaning date. The effect of a short calving season (two versus four months) is illustrated in these examples. The model can illustrate the effects of the type of pasture, availability of creep pasture, varying heifer replacement rates, cow milk yield, calf sex, season of birth and birth weight.

**Table 1. Simulation of milk yield**

Source	Actual	Predicted
Velasco, 1962	8.3	7.4
Pope et al., 1963	10.3	10.5
Deutscher, 1970	8.5	8.9
Kropp, 1972	12.1	12.6
Lusby et al., 1974	12.5	13.1
Omar, 1974	10.4	9.8
Omar, 1974	15.0	15.0
Wyatt et al., 1977	10.1	10.7
Average	10.9	11.0

**Table 2. Simulation of forage intake**

Source	Actual	Predicted
Kartchner, 1975	5.36	6.08
Lusby et al., 1976	2.88	5.08
Wyatt et al., 1977	7.02	6.30
Barnes et al., 1978	8.52	8.11
LeDu and Baker, 1979	3.31	3.52
Weighted average	6.56	6.52

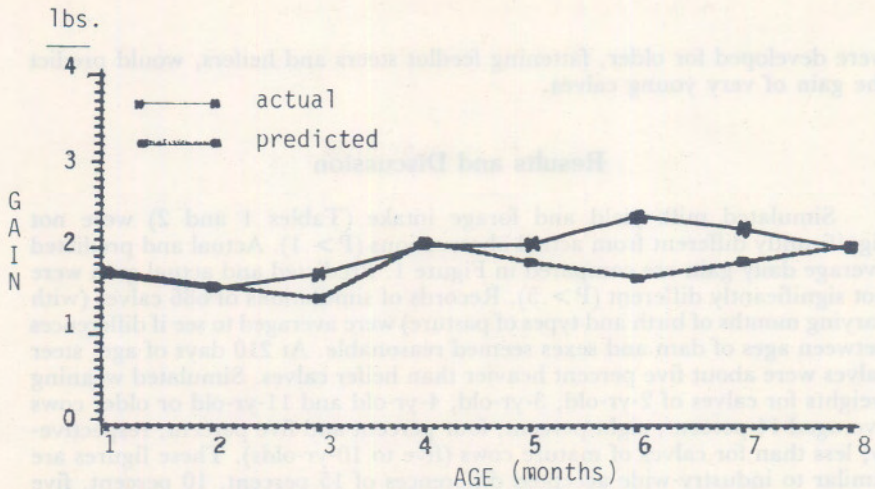


Figure 1. Actual and predicted calf average daily gain.

Table 3. Example of output from TRS-80 Model 16.

Simulation of Calf Gain From Birth to Weaning Adapted From  
Thesis of Margy Cannon, Oklahoma State University

Milk Prod	Birth Wt	Month of Weaning	Type of Cow Pasture	Type of Creep Pasture
11	75	November	Tall Native	None

Weaning Weight By Age of Dam and Month of Birth

Cow Age	Month of Birth	
	February	March
2 Years	442	424
3 Years	461	448
4 Years	504	462
5 to 10	517	473
Over 10	494	453
CALF AGE	275	244

Cow Age	Month of Birth	
	February	March
2 Years	428	402
3 Years	456	432
4 Years	470	455
5 to 10	499	466
Over 10	462	437
CALF AGE	275	244

**Table 4. Example of output from TRS-80 Model 16**

Milk Prod	Herd Averages Based On Herd Composition			
	Birth Wt	Month Of Weaning	Type of Cow Pasture	Type of Creep Pasture
11	75	November	Tall Native	None
Herd Composition				
Cow Age	Percent	Month of Birth	Percent	
Two Year Olds	15	February	65	
Three Year Olds	12	March	35	
Four Year Olds	10			
Five To Ten Year	60			
Over Ten	3			
Average Weaning Weights				
Cow Age	Steers	Heifers	Overall	
Two Year Olds	436	419	427	
Three Year Olds	457	447	452	
Four Year Olds	489	465	477	
Five To Ten Years	501	488	494	
Over Ten	480	453	466	
HERD AVERAGE	484	469	477	

**Table 5. Example of output from TRS-80 Model 16.**

Milk Prod	Simulation of Calf Gain From Birth to Weaning			
	Birth Wt	Month of Weaning	Type of Cow Pasture	Type of Creep Pasture
11	75	November	Tall Native	None
Weaning Weight by Age of Dam and Month of Birth				
STEERS				
Cow Age	Month of Birth			
	February	March	April	May
2 Years	442	424	402	385
3 Years	461	448	419	400
4 Years	504	462	431	433
5 to 10	517	473	440	441
Over 10	494	453	423	403
CALF AGE	275	244	214	183
HEIFERS				
Cow Age	Month of Birth			
	February	March	April	May
2 Years	428	402	382	371
3 Years	456	432	408	383
4 Years	470	455	419	392
5 to 10	499	466	428	400
Over 10	462	437	412	387
CALF AGE	275	244	214	183

**Table 6. Example of output from TRS-80 Model 16**

Milk Prod	Herd Averages Based on Herd Composition			Type of Creep Pasture
	Birth Wt	Month of Weaning	Type of Cow Pasture	
11	75	November	Tall Native	None
Herd Composition				
Cow Age	Percent	Month of Birth	Percent	
Two Year Olds	15	February	45	
Three Year Olds	12	March	25	
Four Year Olds	10	April	20	
Five to Ten Year	60	May	10	
Over Ten	3			
Average Weaning Weights				
Cow Age	Steers	Heifers	Overall	
Two Year Olds	424	407	415	
Three Year Olds	443	433	438	
Four Year Olds	472	449	460	
Five to Ten Years	483	467	475	
Over Ten	460	438	449	
HERD AVERAGE	467	451	459	

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