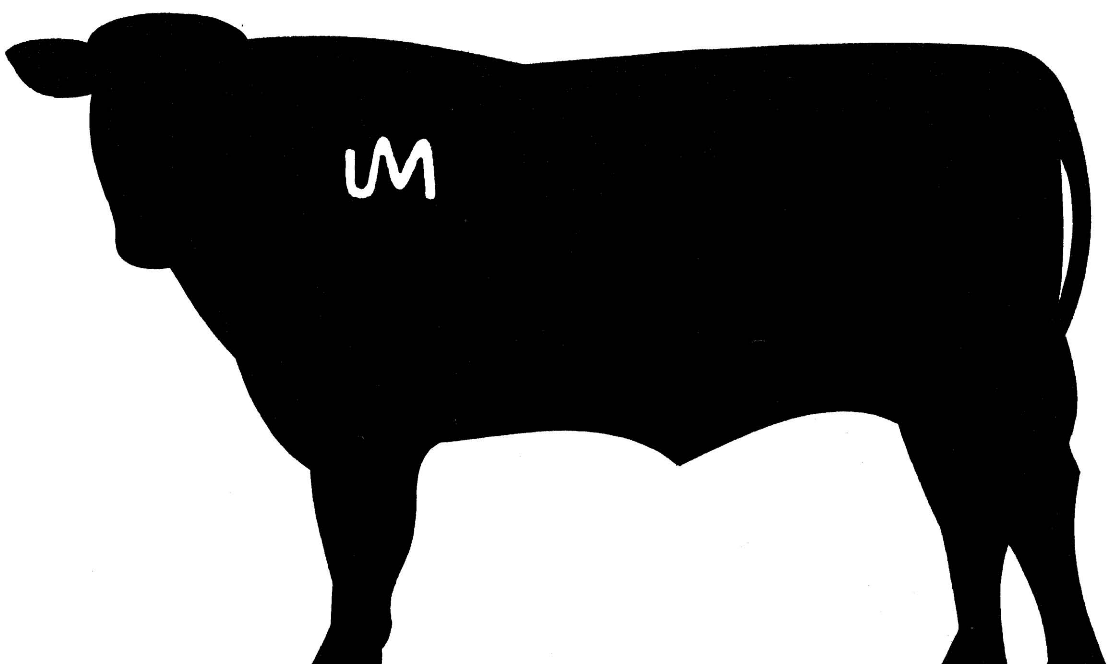
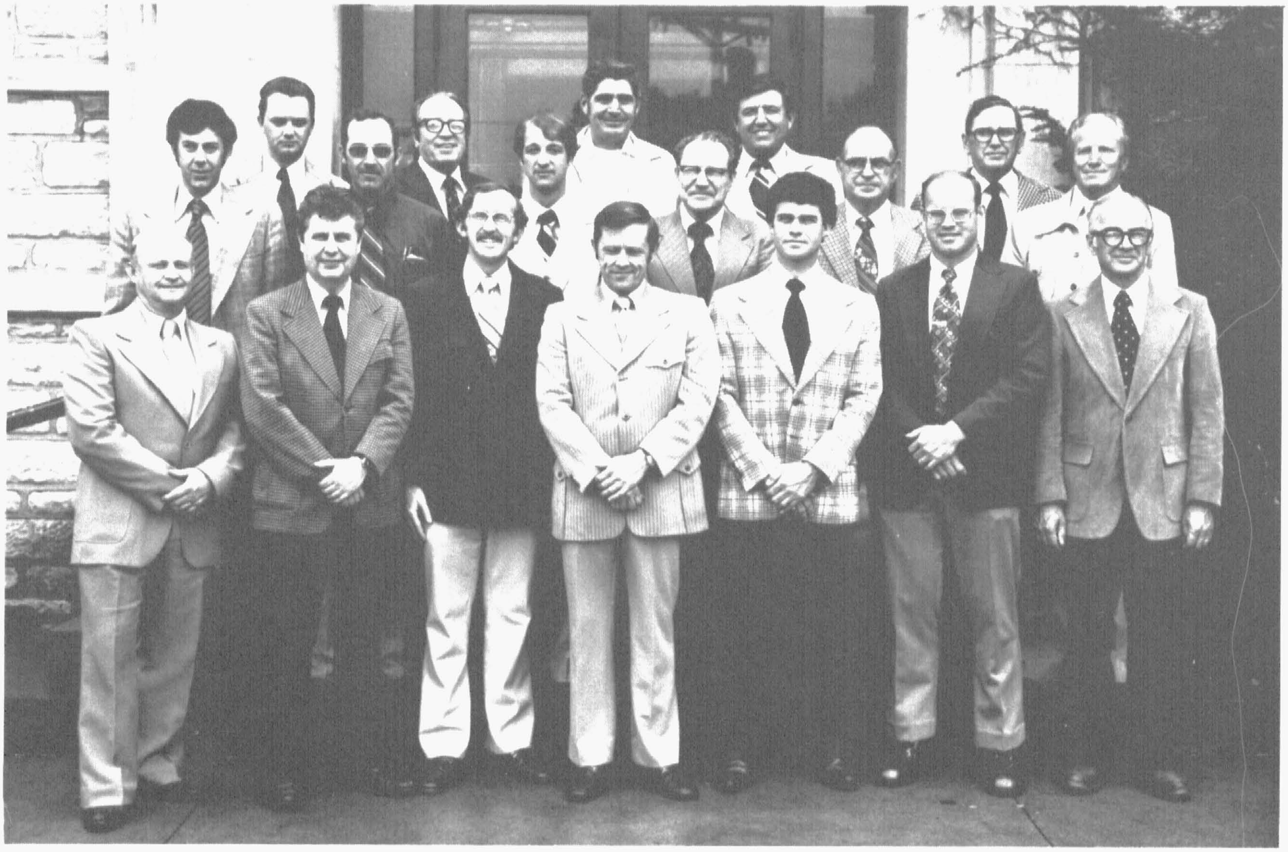
Beef Cattle Production & Management 1978 Progress Report

College of Agriculture
Agricultural Experiment Station
University of Missouri-Columbia



SR214
July 1978

ANIMAL HUSBANDRY STAFF



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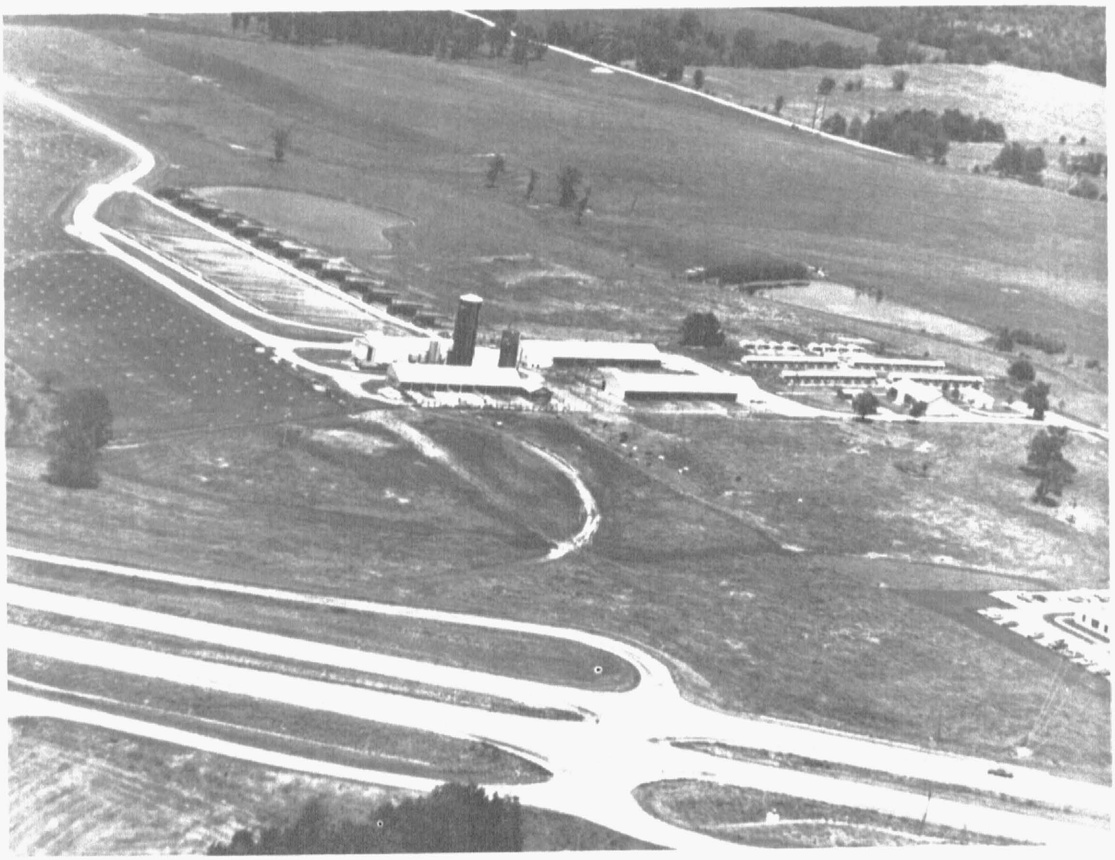

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FOREWARD

The material presented in this publication is written primarily for the beef cattle producer in Missouri. The majority of the information is presented as a progress report rather than a final research report. In some cases the analysis of the data is not complete, and in many instances, data are still being collected on the projects described. Hopefully, many of these progress reports will be written as a more technical research report upon completion of the project.

Our objective in this endeavor is to acquaint you with some of the work being done in the area of, either directly or indirectly related to, Beef Production and Management. We would like to stress the amount of interdisciplinary effort among departments in doing research with beef cattle and hope the cooperative effort continues.

I wish to thank Dr. G. B. Thompson, my predecessor, for his years of service to UMC and his effort in developing the research and teaching program in Cow-Calf Management. Appreciation should also be expressed to the following:

Dr. George Garner, Forage-Livestock Coordinator, for his interdisciplinary leadership.

Members of other departments who submitted material.

Graduate students and support staff who actually collected the data and did the "real" work on this publication.

Jacky Crocker and Cathy Thomas for the typing of this publication.

Don Esslinger and Joe Marks, Ag Editor's Office, for the editing and assembling of the material.

Ron Morrow, Cow-Calf Management
Teaching and Research

ACKNOWLEDGMENTS

The following have provided support for research conducted at the UMC Beef Cattle Farm. Without the support of industry and producer organizations, much of our work could not be conducted.

Agriculture Foods Inc., Troy, MO
Bell Egg Farm, RR #7, Box 197, Joplin, MO
Elanco Products Company, Greenfield, IN
Hess & Clark, Ashland, OH
IMC Chemical Group, Inc., Terre Haute, IN
Missouri Beef Cattle Improvement Assoc.
Syntex Agribusiness Inc., Des Moines, IA

UNIVERSITY OF MISSOURI-COLUMBIA
BEEF CATTLE HERD (SOUTH FARM)

Duane Sicht, Dave Bowman and Ron Morrow

The college beef herd is made up of about 75 Angus females, 50 Simmental females and 50 Charolais-cross females. The herd produces animals for teaching as well as for research in cow-calf management and cooperative use with other projects and departments.

Classes using the cattle are Beef Production and Management 321, Livestock and Meat Science 20, Livestock Judging 101 and 191, Physiology of Reproduction 303 and special problems for approved students. Cattle from the Beef Cattle Farm are also used in 4-H and FFA judging contests and by visiting judging teams from other universities.

The Angus cows are primarily all daughters of Emulation 31 with a few of the younger cows being daughters of Ankonian Dynamo. The 1977 replacement heifers are sired by Marshall Pride 256, Emulous N 2, and Tail N Emulous 541. The old line cows that were started as far back as 1919 were in need of extra frame. In 1969, Dr. Glenn Richardson purchased Emulation 31 for that purpose. He worked well and left behind daughters that were a full frame size larger than their mothers. So far, an effort to find the bull that will do that again has been quite difficult.

The average weight of the Angus cows is somewhere between 1075 and 1100 lbs in good flesh. They are structurally correct, feminine mothers that milk well.

In 1973 an Emulation 31 son from sire-daughter mating was born. He had an adjusted 365-day weight of 1290 lbs and was a 5-frame. One-half interest was sold to Curtiss Breeding Service in the spring of 1975 at the Performance-Tested Bull Sale for $3,000.

The Simmental cow herd stems from a Shorthorn and Hereford base. The typical up grading program has been used. The first half-blood calves were born in the fall of 1970. Those first calves were sired by Parisien. Bulls that followed him were Lacombe Adonnis, Snowball, Galant, Mucho Galant, Toni, Cyr, Signal and Achilles Return 244E. Many large-framed bulls with heavy yearling weights have been produced in this herd, and in the spring of 1977 the University of Missouri had the high-selling percentage bull in both the Performance-Tested Bull Sale and the Missouri State Simmental Sale. The average weight of the Simmental cows is between 1100 and 1125 lbs. The higher percentage of Simmental blood in the cows, the more breeding problems occur in our all forage program.

The Charolais crossbred cows originated from Dr. Lasley's heterosis project at Spickard, MO. In 1970, Dr. Lasley transferred some Charolais and Hereford cows to the South Farm. These cows were bred to Charolais and Hereford bulls to give F1 Charolais x Hereford females. They were developed on two different energy levels. The resulting herd are these F1 females or their offspring. They are now being used to produce heifers of the same combination of breeds but of different body types. Half the cows were selected randomly and mated to a 3000 lb dual-purpose Shorthorn bull and the others were mated to a 1500 lb Shorthorn bull. The cows are being mated again to these two bulls this year. The next year different bulls will be used to produce different body type heifers. An effort will be made to produce an all forage program for these different cow types and look at some of the cow size and nutrition interactions that exist. These Charolais cross cows weigh between 1075 and 1100 lbs.

The three herds of cattle are comingled and managed according to calving periods. The best management practices available are administered by dedicated, conscientious personnel.

The cow herd is vaccinated annually for 5 strains of lepto and for vibrio. They are wormed and poured for grubs annually. An annual test for brucellosis free and accredited TB-free herd recognized by the United States Department of Agriculture. The calves are vaccinated for blackleg, 5 strains of lepto, IBR, BVD, PI_3 and malignant edema. This is done about a month prior to weaning to ease the stress at weaning time. At weaning time the calves are wormed.

Artificial insemination is used in both the spring and fall calving herds. Three capable technicians are a part of the "farm crew" with conception rates being as high as 100% on one service in a small herd of 15 cows. The average AI conception rate would probably be 70-80% under normal conditions.

Some of the purebred cattle have been marketed through state and local sales. These cattle are not placed in these sales to compete with other breeders in the state, but more to cooperate with and support these sales. This also serves as a vehicle to show others an example of the breeding program at the University of Missouri.

The primary purpose for the existence of this herd of cattle is research and teaching. The cattle are used extensively for these purposes. Many tours are conducted through the farm every year by groups from this state as well as others. Visitors are always welcome to the University of Missouri Beef Cattle Farm and prearranged tours can be conducted at any time.

We would like to take this opportunity to thank the following people who have donated semen on the bulls listed below. We are extremely appreciative of their support of the program at the University of Missouri Beef Cattle Farm.

<u>Polled Hereford</u>

Frank Felton - Felton Hereford Ranch, Maryville, MO (FHR Genetic Giant, FHR Battle Mixer, FHR Oak Ridge Lamp 818).

<u>Charolais</u>

Steve Sevanson - Bayvue Farms, Bay, MO (Co Co John).

Charolais

Jerry Litton - Litton Charolais Ranch, Chillicothe, MO (LCR Royal Duke A161).

Joe Netherton - Box N Ranch, Richards, MO (Mister Commander, Lauright's Emperuer).

Angus

Earl Nau - Nau's Angus Farm, Republic, MO (Emulous N 2).

David Miller - Sun Up Farms, Smithville, MO (Sun Up S 2).

Bill Wilson - Premier Angus, Indianapolis, IN (Marshall Pride 256).

Forrest Byergo - Byergo's Angus Farm, Barnard, MO (Byergo's Black Revolution 36).

Dave Hawkins - Michigan State University, East Lansing, MI (MSU Freestate 343).

Simmental

Thomas N. Depew - Trail Tree Farm, Irondale, MO (Achilles Return 244E).

Charles Cooper - Cooper Bros. & Associates, Mountain View, MO (Polled Preference).

Bob Stevens - BOB Simmentals, Albany, MO (Sam of BOB).

Shorthorn

Mark Graham - Graham Land and Livestock, Waverly, MN (Clark X).

Robert Miller - Bar 4 Cattle Co., Fordville, ND (Hilltop Warrior X).

THE EFFECTS OF CREEP FEEDING FALL-BORN HEREFORD CALVES RAISED ON FESCUE-LADINO CLOVER PASTURES WITH THREE FERTILITY LEVELS

Ron Morrow, Jim Stricker, Jerry Matches, Fred Martz, Vic Jacobs and G. B. Thompson

SUMMARY

Performance of fall-born Hereford calves nursing cows grazing fescue-ladino clover pastures fertilized with 0, 100 and 200 lbs of nitrogen were used to evaluate the effects of creep feeding. Highly significant differences ($P<.01$) in ADG between creep-fed and no creep calves were observed during the winter, spring and backgrounding phases. There was a highly significant interaction ($P<.01$) between sex and creep feed for ADG during the winter and backgrounding phases. Creep fed bull calves outweighed noncreep bull calves 165, 128, 88 lbs at the end of the winter, spring and backgrounding phases, respectively. The difference between the heifer calves was 101, 73 and 51 lbs at the end of the respective phases.

INTRODUCTION

The cow-calf phase of the beef industry in Missouri is very dependent on forage utilization. The primary forage available in the state is fescue. During the last few years legumes have been becoming increasingly important to reduce cost of fertilization and also to improve pasture quality. Another economic concern of feeder calf producers that have a fall calving season is whether or not to creep feed. Creep feeding profitability can depend on several factors, one of which is the quality of feed available to the cow during lactation. Another is the milk production potential of the cow. The objective of this trial was to evaluate the effect of creep feeding of fall calves nursing cows grazing fescue-ladino clover pastures that had been fertilized with three levels of nitrogen.

PROCEDURE

Fall-calving Hereford cows at the Forage Systems Research Center were used to study the effects of creep versus no creep on fescue-ladino clover pastures that had been fertilized with 0, 100 or 200 lbs of nitrogen per acre. The results reported here are from two years of research, 1975-76 and 1976-77 (156 cow-calf pairs). The performance of the calves was evaluated by phases:

1. Fall phase: September-November 15. Calves were born during this period. This phase was not significant in relation to other phases and will not be discussed in this paper.

2. Winter phase: November 15-April 15. During this phase, the animals were on winter pasture with access to small round bales and half of the calves had access to creep feed (Table 1).

3. Spring phase: April 15-June 30. None of the calves had access to creep feed at this time. Calves weaned the last of June, bull calves castrated and percent fat-free body estimated by ^{40}K Counter.

4. Backgrounding phase: July-October 31. All calves were grouped on one pasture and backgrounded for approximately 112 days. The cattle were rotated monthly on alfalfa-orchardgrass pasture and fescue-ladino pasture. The summer of 1976 was very dry and the calves lost weight the first two weigh periods after weaning.

RESULTS

The mean squares of average daily gain (ADG) for the last 3 phases showing the significance of the main effects and significant interactions are presented in Table 2. The simple means are presented in Table 3. During the winter phase there was a significant effect of sex and creep with a significant sex by creep feed interaction. There was also a significant difference in ADG between creep-fed and no creep calves during the spring phase and backgrounding. Effects of nitrogen fertilization level on calf performance were not significant. A significant sex by creep interaction was observed during the backgrounding phase. During the creep feeding (winter) phase, the creep fed calves outgained the no creep calves 1.80 to .97 lbs per day. The creep-fed bull calves gained 2.0 lbs while the heifers that were creep fed gained 1.61. Both bulls and heifers in the no creep group gained .97 lbs per day. The no creep calves had an apparently certain amount of compensatory gain when going on spring pasture and outgained the creep-fed calves 1.69 to 1.28 lbs per day. That trend continued through the backgrounding phase with the creep-fed bulls having the lowest ADG (.62) and the no creep bulls the highest (.95).

The means of adjusted 205-day weight are shown in Table 4. The adjusted 205-day weight of the creep-fed calves was 407 versus 339 for the no creep calves. Of particular interest was the added advantage of creep feeding bulls (432 vs 342), which is an important statistic for purebred producers. There was considerable difference in composition of creep-fed versus no creep calves at weaning. The creep-fed calves averaged 13.51% body fat and no creep calves 10.01%. This estimate was 2½ months after calves were taken off creep.

The actual weights of the calves at the end of each phase by sex and creep groups are shown in Table 5. There was as much as 165 lbs difference between creep and no creep calves (bulls) at the end of the winter phase. This decreased to 88 lbs at the end of the backgrounding phase. The magnitude of the difference indicates that management of calves, April through the summer, should be considered in making the decision to creep feed or not.

Table 1. Creep feed composition

Ingredient	Amount in Pounds
Whole oats	1100
Corn chop	600
32% protein supplement	200
Dry molasses	100

Table 2. Mean squares for average daily gain (ADG) during the three phases

		Mean Squares		
Source	df	ADG Winter	ADG Spring	ADG Backgrounding
Sex	1	.208*	.007	.011
Nitrogen tmt	2	.040	.020	.006
Creep	1	4.977**	1.016**	.371**
Sex x CF	1	.272**	.038	.048**
Error	22	.027	.024	.007

*P<.05
**P<.01

Table 3. Means[1] of main effects and interaction significantly influencing average daily gain (pounds)

Winter Phase	
Sex	
heifers	1.32[a]
bulls	1.45[b]
Creep Feed	
no creep	.97[e]
creep	1.80[b]
Sex x Creep	
heifers, no creep	.97[a]
heifers, creep	1.61[b]
bulls, no creep	.97[b]
bulls, creep	2.00[b]
Spring Phase	
Creep Feed	
no creep	1.69[b]
creep	1.28[a]
Backgrounding Phase	
Creep Feed	
no creep	.92[b]
creep	.70[a]
Sex x Creep	
heifers, no creep	.90[b]
heifers, creep	.77[bc]
bulls, no creep	.95[bc]
bulls, creep	.62[ac]

[1]Means within each class with the same letter are not significantly different P<.05.

Table 4. Means[1] for adjusted 205-day weight

Sex	
heifers	361[a]
bulls	385[b]
Creep Feed	
no creep	339[a]
creep	407[b]
Sex x Creep	
heifers, no creep	336[a]
heifers, creep	384[ac]
bulls, no creep	342[a]
bulls, creep	432[bc]

[1]Means within each class with the same letter are not significantly different P<.05.

Table 5. Mean weights (pounds of calves at end of each phase

	April		July		November	
Heifers, no creep	304		440		519	
(difference)		(101)		(73)		(51)
Heifers, creep	405		513		570	
Bulls, no creep	312		451		535	
(difference)		(165)		(128)		(88)
Bulls, creep	477		579		623	

GROWTH AND CARCASS PERFORMANCE OF STEERS FED HIGH AND LOW ENERGY PREWEANING AND POSTWEANING

Joe Price, Jerry Lipsey, Jasper Grant, Jim Stricker and Wayne Shannon

SUMMARY

Data presented are from the first year of a two year trial to compare and characterize the growth and carcass performance of creep fed (C) and noncreep (NC) steers finished on two levels of ration energy. Forty-two Hereford steers born mostly in September and October, fed various levels of dietary energy at various points in their growth curve, were slaughtered at a predetermined body composition endpoint of 26% fat as estimated by ^{40}K Whole Body Counter. After creep feeding one-half of the steers, they were grazed together from July through November. They went to the feedlot in December and were finished on either a high energy (HE) or low energy (LE) ration. At slaughter (26% body fat), their average daily gains (ADG) and days on feed were: CHE, 2.6 ADG, 176 days; NCHE, 2.5 ADG, 187 days; CLE, 1.9 ADG, 227 days; and NCLE, 1.8 ADG, 295 days. Their carcass data was: CHE, 3.2 YG, Good plus; NCHE, 3.2 YG, Good plus; CLE, 2.6 YG, Good minus; and NCLE, 2.5 YG, Good minus.

INTRODUCTION

In an effort to expand on the information we can provide from Forage Systems Research Center, Cornett Farm, Linneus, MO, we arranged to finish some steers to characterize their growth and carcass performance. Since creep feeding has been used as an experimental variable in cow-calf research, we wanted to measure its subsequent effects on feedlot steers. In addition, we wanted to compare the effects of creep feeding calves when as feedlot steers they are fed two levels of dietary energy. Since physiological maturity (body composition) can have a large effect on average daily gain and feed efficiency, we decided to feed each steer to 26% predicted body fat as estimated by the Whole Body Counter. Each steer was slaughtered when he reached 26% body fat regardless of his weight or days on feed.

METHODS

Twenty creep fed and twenty-two steers not creep fed from the 1975 fall calf crop at the Forage Systems Research Center were randomly assigned to a high or low energy feedlot ration (Table 1). All steers were implanted with Ralgro and received Rumensin at 300 mg/head/day. We routinely analyzed the steers with the Whole Body Counter to determine body composition. The steers were slaughtered at 26% estimated body fat regardless of their weight or days on feed. Quality and yield grade data were collected from the carcasses.

RESULTS AND DISCUSSION

The growth performance data for the four treatment groups are shown in Table 2. The NC group went into the lot about 80 pounds lighter than the C group; however, ADG on both rations was slightly higher for the C steers. The NCHE group showed superior ADG to the CHE group early in the test, but these advantages of compensatory gain did not remain over the entire feeding period. On the low energy ration, the NC steers did not exhibit compensatory gain advantages over the C group.

Carcass data is shown in Table 3. Note that the NCLE steers were slaughtered at about 24% body fat rather than 26% as outlined in the project design. This was because we were forced to terminate about one-half of the steers in the NCLE group at about 20% fat. Late in the feeding period, their gains were poor and inefficient, and both their feed and nonfeed costs were becoming unrealistically high. Carcass fat thickness, yield grade and quality grade were similar for both groups on the high energy ration; however, the C steers were 80 pounds heavier at slaughter and their carcasses were correspondingly heavier.

It appears from the first year data that creep feeding affects carcass fat thickness less than energy concentration of the finishing ration. It also appears that either ^{40}K analyses of body composition is sensitive to the ration being fed, or cattle on lower levels of dietary energy deposit a higher percent of their fat in the noncarcass portion of the body.

Table 1. Feedlot rations for fall 1975 steers

Energy density	Dry rolled milo	Ground fescue hay	Prot-min supp
High	78%	16%	6%
Low	47%	47%	6%

Protein-Mineral Supplement Composition

Ingredient	%
Ground shelled corn	67.8
Soybean meal	12.5
Urea	9.4
Limestone	4.0
Dical PO_4	1.5
Trace mineral salt	2.8
Vitamin A-D premix	1.5 (about 25,000 units A/day and 4700 units D/day)
Rumensin	---

Table 2. Feedlot performance of fall 1975 steers

Treatment[a]	Wt_o[b]	Wt_f[c]	ADG[d]	DOF[e]	Total wt gain
C	588	1021	2.26	202	433
NC	498	982	2.13	241	484
HE	547	997	2.53	182	450
LE	533	1003	1.86	263	470
CHE	606	1050	2.58	176	444
NCHE	513	971	2.48	187	458
CLE	576	1024	1.93	227	448
NCLE	485	1000	1.78	295	515

[a]Where C = creep, NC = no creep, HE = high energy ration and LE = low energy ration.

[b]Weight into feedlot, pounds.

[c]Slaughter weight, pounds.

[d]Average daily gain.

[e]Days on feed.

Table 3. Carcass data of fall 1975 steers

Treatment	%fat[a]	Carc wt[b]	%dress[c]	Fat thickness[d]	KPH[e]	REA[f]	YG[g]	QG[h]
C	26.4	591	59.0	.43	2.0	10.5	2.9	7.9
NC	25.0	575	57.4	.40	2.3	10.0	2.8	7.1
HE	26.5	603	59.7	.50	2.4	10.0	3.2	7.7
LE	24.9	562	56.6	.30	1.85	10.3	2.5	7.3
CHE	27.3	613	60.4	.50	2.3	10.5	3.2	8.0
NCHE	26.3	594	59.0	.50	2.5	9.8	3.2	7.8
CLE	26.1	569	57.6	.36	1.7	10.6	2.5	7.5
NCLE	23.9	556	55.7	.30	2.0	10.2	2.5	7.0

[a]Final % body fat as predicted by ^{40}K.

[b]Carcass weight, pounds.

[c]Dressing % = cold carcass wt/live wt

[d]Carcass fat thickness at 12th rib.

[e]% kidney, pelvic and heart fat.

[f]Ribeye area at 12th rib.

[g]Yield grade.

[h]Quality grade, USDA, 1973, where 7 - low good, 8 = average good, 9 = high good, 10 = low choice, etc.

EVALUATION OF TOTAL MANAGEMENT SYSTEMS WITH STEERS FED HIGH AND LOW ENERGY RATIONS, PREWEANING AND POSTWEANING

Jim Stricker, Jerry Lipsey, Vic Jacobs, Ron Morrow, Fred Martz, Gerry Matches, Joe Price and Jasper Grant

SUMMARY

Yearling Hereford steers, born in September and October 1975, from preweaning creep-feed or no creep-feed treatments were finished on either a high energy or low-energy finishing ration. The steers were slaughtered at a predetermined end point of 26% body fat as determined by the ^{40}K Whole Body Counter. Per head carcass values for each group were estimated and average creep feed, feed for finishing and yardage was charged against the steers in each group. Non-creep-fed-high-energy steers had the highest return over cost followed by creep-fed-high-energy steers. The low energy finishing ration did not appear to be practical, although feed price per pound was lower, total finishing feed costs were higher than the high energy ration. Creep feeding steer calves born in the fall does not appear to be economically feasible if the steers are to be grazed for an extended period after weaning.

INTRODUCTION

Creep feeding suckling calves is known to increase liveweight gain and amount of body fat carried by the calves. Also important is the effect of creep feeding on calf gain after weaning. How much of the advantage of creep feed is carried over to the finishing phase after the steers are grazed without grain supplement for an extended period of time after weaning? One might expect a reduction in the time on feed and the amount of feed required to reach finish. A group of 42 steers from the Forage Systems Research Center (see "Growth and Carcass Performance of Steers Fed High and Low Energy, Preweaning and Postweaning") were followed from birth through slaughter. Physical results were evaluated with prices current during the time the steers were slaughtered to see the value of added production from creep feeding would be sufficient to pay the added cost.

METHODS

Residual effect of creep feeding suckling steer (bull) calves was evaluated by estimating a weighted average carcass value by slaughter grade and yield grade for each group of steers. Prices were estimated from weekly average prices at mid-month or the first week for which a full range of prices were available from midwest markets from April through October 1977[1]. Average per head feed fed to each group was priced at 3.5¢ per pound for creep feed for the high energy ration and 3¢ per pound for the low energy ration. Yardage of 15¢ per head per day was charged to cover all non-feed finishing

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[1]Prices were obtained from U.S. Meat and Wool Market News, Weekly Statistics, Livestock Division Agric. Marketing Science U.S.D.A.

costs. Feed cost and yardage per head was subtracted from the per head gross carcass value. The result is a residual to pay the cost of raising the calf and backgrounding.

Hereford calves were born mostly in September and October 1975. Creep feeding extended from mid-November until mid-April. Calves grazed with their dams until weaned in early July. Bull calves were castrated in May. After weaning, the calves were grazed in one group, on a common pasture, until placed in the feedlot in early November. All steers were fed alfalfa-orchardgrass hay for 28 days before being started on full feed.

RESULTS AND DISCUSSION

Creep fed steers consumed an average of 1058 lbs of creep feed and weighed 176 lbs more than non-creep fed steers in mid-April when creep feeding was stopped. When weaned in early July, creep-fed steers weighed 132 lbs more than non-creep-fed steers and only 84 lbs more at the end of the background phase in early November. At slaughter the creep-fed-high-energy steers were still 79 lbs heavier than non-creep-fed steers (see Table 2 in companion article).

In this study the non-creep-fed-high-energy steers had the highest income over cost for finishing with $137.72 left to cover costs of calf raising and backgrounding (Table 1). The creep-fed-high-energy steers had the highest carcass value and required an average of six days less feed, but total feed costs including creep feed was $39.76 higher than for the high energy non-creep fed steers. Both creep-fed and non-creep-fed low energy groups had a lower per head feeding return than did the high energy treatments. Results from this study confirm that creep feeding fall born calves destined to go into a deferred grazing program after weaning is not likely to be economically feasible because of the ability of a calf to compensate for slow growth in one period of his life cycle by more rapid growth in the next period.

Table 1. Evaluation of creep fed versus non-creep fed steers finished on low and high energy rations after an extended grazing period

	Creep Feed	Feed Finish	Days Fed	Yardage[2]	Per head Carcass Value	Balance[3]
	Feed Costs[1]					
Creep- Hi E.	$36.96	$163.80	181	$27.15	$355.50	$127.59
Creep- Lo E.	36.96	173.10	226	33.90	337.31	93.35
Non-Creep Hi E.	---	161.00	187	28.05	326.77	137.72
Non-Creep Lo E.	---	200.10	295	44.25	318.95	74.60

[1]High energy ration and creep feed @ 7.7¢/kg, low energy 6.6¢/kg.

[2]Yardage @ 15¢ per head per day.

[3]Balance to pay for raising calf and backgrounding.

EFFECTS OF CREEP FEEDING AND NITROGEN FERTILIZATION OF FESCUE - LADINO CLOVER PASTURES ON PERFORMANCE OF SPRING-BORN HEREFORD CALVES

Jim Stricker, Ron Morrow, Jerry Matches, Fred Martz,
Vic Jacobs and G. B. Thompson

SUMMARY

Spring born (February and March) Hereford calves raised on fescue - ladino clover pastures fertilized with 0, 100, or 200 lbs of nitrogen were used to evaluate the effects of nitrogen fertilization and creep feeding. Bull calves gained more rapidly, had slightly larger frame size and higher body fat content at weaning than heifer calves. Creep feeding increased gain, frame size and body fat content of both bull and heifer calves. Nitrogen fertilization of fescue - ladino clover pastures reduced calf gain, frame size and body fat content.

INTRODUCTION

Forages are the backbone of the cow-calf industry in Missouri. The primary forage, particularly in the southern part of the state, is fescue. High prices for nitrogen fertilizer has created an interest in use of legumes as a source of nitrogen in pastures to reduce costs and improve forage quality. To creep feed or not to creep feed spring calves is a question that must be answered by many cattlemen. The objective of this trial was to evaluate the effect of creep feeding and of applying nitrogen fertilizer to fescue - ladino clover pasture on growth rate and body fat of spring born calves.

PROCEDURE

Spring calving (February and March) Hereford cows at the Forage Systems Research Center were used to study the effects of fertilizing fescue - ladino clover pastures with 0, 100, and 200 lbs of nitrogen per acre and creep feeding versus no creep feeding. Results reported here are for three years: 1972, 1974 and 1975 (207 cow-calf pairs). Calves consumed little or no creep feed in 1973 and that data was omitted. Data from the summer phase, mid-April until late-October, are reported.

RESULTS

Means for average daily gain (ADG), adjusted 205-day weights and frame score are reported in Table 1. Actual average daily gain of bull calves was .21 lb greater than heifer calves and adjusted 205 day weight of bull calves was 48 lbs heavier than heifer calves. Frame score for bull calves was 2.72 versus 2.52 for heifers.

Creep feeding increased average daily gain and adjusted 205 day weight, as expected (for the composition of the creep ration see Table 1 in "The Effects of Creep Feeding Fall Born Calves Raised on Fescue - Ladino Clover Pastures with Three Fertility Levels" in this publication). In addition, creep fed calves had a higher frame score than noncreep-fed calves; 3.06 versus 2.22. Body fat content was 10.02% and 12.68% for noncreep and creep fed heifer calves, respectively, while bull calves had 11.03% and 12.84% body fat for noncreep and creep-fed respectively. Creep feeding benefitted bull calves a little more than heifer calves. Creep-fed bull calves gained 24.1 lbs more than creep-fed heifer calves.

Nitrogen fertilization of fescue - ladino clover pastures influenced weight gains of spring born calves but did not significantly affect the gains of fall-born calves. Spring-born calves gained 1.88, 1.73 and 1.68 lbs per day on the no nitrogen (N_1), 100# nitrogen (N_2), and 200# nitrogen (N_3) treatments, respectively. Frame score of calves was also affected. Calves from the N_1 treatment had average frame scores of 3.02 while the N_2 and N_3 calves averaged 2.59 and 2.28, respectively. N_1 calves also had higher body fat with 12.15% and the N_2 and N_3 calves had 11.30% and 11.28%, respectively.

Table 1. Means for performance of spring-born calves

	ADG	Adj 205 day wt	Frame Score[1]
Sex			
heifers	1.67	404	2.52
bulls	1.88	452	2.72
Creep feed			
no creep	1.53	398	2.22
creep	1.99	457	3.06
Nitrogen treatment			
No nitrogen	1.88	448	3.02
100# nitrogen	1.73	419	2.59
200# nitrogen	1.68	408	2.28
Sex x creep			
heifers, no creep	1.46	378	2.31
heifers, creep	1.87	430	2.77
bulls, no creep	1.62	412	2.09
bulls, creep	2.13	488	3.35
Sex x nitrogen treatment			
heifers, no nitrogen	1.72	415	2.96
heifers, 100# nitrogen	1.65	402	2.55
heifers, 200# nitrogen	1.63	395	2.18
bulls, no nitrogen	2.04	481	3.07
bulls, 100# nitrogen	1.81	438	2.63
bulls, 200# nitrogen	1.76	428	2.42

[1] Means are from only two years of data.

ECONOMIC EVALUATION OF NITROGEN FERTILIZATION OF FESCUE - LADINO CLOVER PASTURES AND CREEP FEEDING FOR BOTH SPRING BORN-AND FALL-BORN CALVES

Jim Stricker

SUMMARY

Applying nitrogen fertilizer to fescue - ladino clover pastures increased carrying capacity of the pastures, decreased animal performance in the spring herd and also increased costs. Total production with observed calving rates actually declined when nitrogen fertilizer was applied to pastures in the spring herd but increased in the fall herd. Since production declined in the spring herd, there was no break-even calf price which would pay for the added costs. In the fall herd the break-even calf price was 74¢ and 95¢ per lb for the 100 lb nitrogen (N_2) and 200 lb nitrogen (N_3) systems. With an assumed 90% calving rate, break-even calf price in the spring herd was $1.17 and $1.28 for the N_2 and N_3 systems and in the fall herd $.73 and $1.00. Creep feed plus nitrogen in the spring herd, with observed calving rates, resulted in break even calf prices of $.66, $1.20 and $1.60 per lb for N_1, N_2 and N_3 systems respectively; with an assumed 90% calving rate, $.50, $.87 and $.87 for the N_1 and N_2 and N_3 systems respectively. Creep feeding with no nitrogen in the fall herd produced the lowest break-even calf price of 33¢ per lb with observed calving rate while the N_2 and N_3 creep feed systems produced break-even prices of $.61 and $.75, respectively. The assumed 90% calving rate in the fall herd produced break-even prices of $.52, $.65 and $.72 per lb for creep feed N_1, N_2 and N_3 systems. Break-even prices were calculated with $.20 per lb nitrogen, $.05 per lb creep feed, $40.00 per head annual cow ownership costs, and $.30 per bale hay baling cost.

INTRODUCTION

The primary motivation for applying nitrogen fertilizer to pastures for cows and calves is to grow more grass. By growing more grass one can expect to carry more animals or add more weight to existing animals. When the animals are sold, the revenue from additional animals or animal weight is expected to pay for the fertilizer with some profit left over. Calves are creep fed, also, with the idea that creep fed calves will gain more weight and when the calves are sold the return from the added weight will pay for the creep feed with profit left over. Unfortunately, extra grass produced from applying nitrogen

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NOTE: The information in this paper is taken from "Forage Systems Research with Cows and Calves" In 1977 Field Day Research Reports, Forage Systems Research Center, University of Missouri, College of Agriculture SR207. Data presented in this paper is from four years of research with both spring calving and fall calving herds and may differ slightly from the selected data presented in other papers on spring and fall calving in this publication.

fertilizer does not grow at a uniform rate all year long to satisfy the year long demand of a cow breeding herd but usually grows during a short period of the year and must be stockpiled "on the stump" for utilization later, most likely at reduced quality, or harvested and stored at considerable cost for later feeding. The added weight from creep feeding may affect the per lb value of the whole animal. If a fleshier creep-fed calf sells for less than a thinner noncreep-fed calf the value of the added weight from creep feeding will be worth less than the selling price of the calf. (See "Creep Feeding Suckling Beef Calves - A Guide to Decision Making" AH-BC-7807)

METHODS

Total calf weight produced per acre from each nitrogen fertilization - creep feed system for both spring and fall born calves was calculated (Table 1) from the formula:

(Cow-calf units carried per acre)
x(number of calves produced per 100 cows bred) = cow weight produced per/A
x(actual weaning (or selling) weight)

Both observed and an assumed 90% calving rate was used (See "Effect of Supplemental Winter Feeding on Conception Rate of Spring Calving Cows" AH-BC-7810). Carrying capacity of pastures was measured in metabolic animal unit months (AUM) of animal demand satisfied. (One animal unit month is roughly equivalent to the amount of forage needed to maintain a 1000 lb cow for 30 days). The individual animal demand of cow-calf units was calculated from average weights of cows and calves and the time they were on the individual pastures.

Fall cow-calf animal demand was .5 AUM greater than individual spring cow-calf animal demand; reflecting a 48 day longer preweaning period for fall calves.

A base system with no nitrogen fertilization and no creep feeding was used with the other five higher input systems compared to it. A break-even price, or a price for which the calves produced on a given system, must sell to pay the added costs above the costs of the base system.

$$\frac{\text{added costs per acre}}{\text{added production per acre}} = \text{Break-even price (marginal cost)}$$

Added costs were figured by:

Added costs = (additional cows carried/acre) x (ownership cost/cow) + (lbs nitrogen applied/acre) x (price/lb) + (additional hay harvested) x (harvest cost)

Added production above that produced from the no-nitrogen - no-creep-feed system was figured by:

Added production = total production (system x) - total production base system

RESULTS

Results for the spring herd are presented in Table 2a and for the fall herd in Table 2b. Total production actually declined when nitrogen fertilizer was applied to fescue - ladino clover pastures and no creep feed was fed for spring calving systems, because of lower calving rates and lower calf weights. With an assumed 90% calving rate, the added carrying capacity overcame the decreased weaning weight and produced an increase in production. However, with nitrogen at $.20 per lb calves would have to sell for $1.17 and $1.28 per lb to cover the costs of the 100 and 200 lb nitrogen rates.

For the fall calving herd the results were more favorable because weaning weights and calving rates were not strongly affected by nitrogen fertilization. The break-even price for calves on the 200 lb nitrogen system was higher for the assumed 90% calving rate than the observed calving rate. This was because conception rate actually increased from 79.2 to 83.3% from the base system to the 200 lb nitrogen system; of course, no increase occurred where a constant 90% calving rate was used.

In the spring herd, creep feeding with nitrogen fertilization increased production but calves would have to sell for $.66, $1.20 and $1.60 per lb to cover the costs of creep feed with creep at $.05 per lb and nitrogen at $.20 per lb on the N_1, N_2, and N_3 creep feed systems. With an assumed 90% calving rate the break-even prices were $.50, $.87 and $.87 respectively for the three creep feed-nitrogen systems.

The lowest cost increase in production was in the fall herd creep-feed - no-nitrogen system where the break-even calf price was $.33 per lb, the N_2 and N_3 creep-feed break-even prices were $.61 and $.75. For the 90% calving rate, break-even prices were $.52, $.65, and $.72 per lb with creep-feed in the N_1, N_2, and N_3 systems.

Table 1. Pounds of calf produced per acre.

Nitrogen treatment	Cow-Calf units per acre	x	Conception rate	x	Actual weaning weight (lb)	=	Lb calf per acre	Assumed 90% calving rate lb/A
			Spring Herd[1/]					
	No Creep Feed							
0# N/A	.43		80.0		443.9		152.7	171.8
100# N/A	.52		56.6		422.1		124.2	197.5
200# N/A	.60		27.8		399.9		66.7	215.9
	Creep Feed							
0# N/A	.43		77.7		499.4		166.8	193.3
100# N/A	.52		74.9		469.0		182.7	219.5
200# N/A	.60		69.4		468.4		195.0	252.9
All spring calves	.52		64.4		450.4		148.0	210.8
			Fall Calves[2/]					
	No Creep Feed							
0# N/A	.41		79.2		425.9		138.3	157.2
100# N/A	.51		81.2		430.0		178.1	197.4
200# N/A	.58		83.3		408.4		197.3	213.2
	Creep Feed							
0# N/A	.41		87.5		497.9		178.6	183.7
100# N/A	.51		83.3		492.2		209.0	225.9
200# N/A	.58		81.2		497.3		234.2	259.6
All fall calves	.50		82.6		485.6		200.6	218.5

1/ Spring cow-calf unit per year = 14.5 AUM.

2/ Fall cow-calf unit per year = 15.0 AUM.

Table 2a. Spring calving herd per acre cost of increasing calf production and calf prices needed to pay costs with both observed and assumed 90% calving rates.

	No Creep Feed			Creep Feed		
	0 lb N/A	100 lb N/A	200 lb N/A	0 lb N/A	100 lb N/A	200 lb N/A
	(Base system)					
1. Cow-calf units/A[a]	.43	.52	.60	.43	.52	.60
2. Add'l cow-calf units carried/A[b]	--	.09	.17	--	.09	.17
3a. Add'l lb/A of calf produced-observed calving rate[a]	--	-28.50	-86.00	14.10	30.00	42.30
3b. 90% calving rate[a]	--	25.70	44.10	21.50	47.70	81.10
4. N cost per A w/N @ 20¢/lb	--	$20.00	$40.00	--	$20.00	$40.00
5a. Creep cost/A with feed @ 5¢/lb - observed calving rate[c]	--	--	--	$9.30	$9.60	$11.28
5b. 90% calving rate[c]	--	--	--	10.78	11.54	14.63
6. Cost of owning add'l cows[d]	--	$3.60	$6.80	--	$3.60	$6.80
7. Cost of harvesting add'l hay produced @ 30¢/bale[e]	--	$6.50	$9.50	--	$6.50	$9.50
8a. Total added costs/A observed calving rate[f]	--	$30.10	$56.30	$9.30	$36.10	$67.58
8b. 90% calving rate	--	30.10	56.30	10.78	41.64	70.93
9a. Calf prices/lb needed to pay added costs[h]	--	j	j	$.66	$1.20	$1.60
9b. 90% calving rate[i]	--	1.17	1.28	.50	.87	.87

Table 2b. Fall calving herd per acre cost of increasing calf production and calf prices needed to pay costs with both observed and assumed 90% calving rates.

	No Creep Feed			Creep Feed		
	0 lb N/A	100 lb N/A	200 lb N/A	0 lb N/A	100 lb N/A	200 lb N/A
	(Base system)					
1. Cow-calf units/A[a]	.41	.51	.58	.41	.51	.58
2. Add'l cow-calf units carried/A[b]	--	.10	.17	--	.10	.17
3a. Add'l lb/A of calf produced-observed calving rate[a]	--	39.80	59.00	40.30	70.70	95.90
3b. 90% calving rate[a]	--	40.20	56.00	26.50	68.70	102.40
4. N cost per A w/N @ 20¢/lb	--	$20.00	$40.00	--	$20.00	$40.00
5a. Creep cost/A with feed @ 5¢/lb-observed calving rate[c]	--	--	--	13.33	13.87	16.41
5b. 90% calving rate[c]	--	--	--	13.71	14.99	18.19
6. Cost of owning add'l cows[d]	--	$4.00	$6.80	--	$4.00	$6.80
7. Cost of harvesting add'l hay produced @ 30¢/bale[e]	--	$5.53	$9.11	--	$5.53	$9.11
8a. Total added costs/A observed calving rate[f]	--	$29.53	$55.91	$13.33	$43.40	$72.32
9a. Calf prices/lb needed to pay added costs[h]	--	$.74	$.95	$.33	$.61	$.75
9b. 90% calving rate[i]	--	.73	1.00	.52	.65	.72

Footnote from Tables 2a and 2b

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[a]From Table 1

[b]Cow-calf units carried per acre over the number carried in the base system

[c]Cow-calf units per acre (Table 1) x calves per cow x lb of feed consumed per calf x price of feed per lb.

[d]Additional cow-calf units above base system (line 2) are needed to utilize added forage. Annual ownership costs assumed total $40.00 and include: interest on borrowed money on forage and on equity, salt and mineral, personal property tax, veterinary expenses, marketing expenses for calf.

[e]Hay baled per acre for each of the nitrogen treatments averaged 32, 50, and 62 for the 0 lb/A, 100 lb/A, and 200 lb/A, respectively, from the fall herd pastures, and 39, 52, and 58 in the spring herd.

[f]Sum of lines 4, 5a, 6, and 7

[g]Sum of lines 4, 5b, 6, and 7

[h]Line 8a divided by line 3a

[i]Line 8b divided by line 3b

[j]Since, as nitrogen rate was increased, total calf weight produced per acre decreased, there is no price at which the value of added calf weight will pay the cost of the nitrogen (there is NO ADDED calf weight).

CREEP FEEDING SUCKLING BEEF CALVES - A GUIDE TO DECISION MAKING

Jim Stricker, Vic Jacobs and Ron Morrow

Much research has been done on feeding supplemental grain to suckling beef calves (creep feeding) with sometimes confusing results. What, on the surface, may seem to be a simple method of increasing the weaning weight of calves while they are young, growing rapidly and efficiently; turns out, on closer examination, to be a more complex problem. Creep feed calves consume grain containing around 75% TDN at the expense of milk and perhaps 60% TDN pasture with a consequent partial feed conversion ratio of from 6:1 to as high as 20:1 (1, 2).

To make matters worse, the additional weight gained will also affect the price of the whole calf at weaning - not just the value of the added weight gained. For example: a 400 lbs noncreep fed calf may sell for 40¢ per pound at weaning, resulting in a gross value of $160.00. A similar creep fed calf might weigh 450 lbs and sell for 38¢ per pound and have a gross value of $171.00. The value of the additional 50 lbs is not 38¢ but $\frac{\$171 - \$160}{50 \text{ lb}} = \frac{\$11}{50 \text{ lb}}$ or only 22¢ per pound. It is also possible, but unusual, for a creep fed calf to sell for a higher price per pound than a thinner noncreep fed calf. This was the case a few years ago when, during a period of high grain prices, fat calves sold at a premium. In this situation, the 450 lb calf might sell for 42¢ per pound and have a gross value of $189.00. The value of the 50 lbs added by creep feeding would be $\frac{\$189 - \$160}{50 \text{ lb}} = \frac{\$29}{50 \text{ lb}}$ or 58¢ per pound (3, 4, 5).

If the goal of the cattle producer is to maximize income, he will want to creep feed his calves only if he anticipates the cost of producing the extra weight will not exceed the value of the extra weight produced. The following formula will be helpful in estimating the cost of producing added calf weight from creep feeding: (lbs of feed needed to produce a lb of added gain) x (lbs of added gain) x (price of feed per lb) + (cost of feeding equipment and added labor) = (cost of producing the extra weight).

No one knows exactly how many pounds of feed will be needed to produce an extra pound of gain or how many pounds of gain will be produced on a given farm or in a given herd. Research has shown that one can normally expect a partial creep feed conversion of from 7:1 to 15:1 lbs of feed per pound of added gain and from 30 to 80 lbs of additional gain. Higher quality forage and better milking cows are associated with lower additional gains and result in higher feed conversion ratios.

The following points should be kept in mind when trying to decide whether or not to creep feed calves:

1. How calves are to be managed after weaning is very important. The weight advantage of creep fed calves will diminish with time after

the end of the creep feeding period, particularly if calves are maintained on largely all forage diets (6).

2. Only the weight advantage from creep feeding remaining at sale time is convertible into income (7). For example, if fall born calves are grazed through the summer after weaning, half of the weight advantage of creep fed versus noncreep fed calves may be lost after 3-4 months.

3. Steer (or bull) calves will make more effective use of creep feed than heifer calves (6). It would be beneficial to separate cows with steer (or bull) calves from cows with heifer calves and creep feed only steer (or bull) calves.

4. There is some evidence that creep fed heifer calves kept for breeding animals will not milk as well as they would have, had they not been creep fed. (This is apparently related to fat deposits in the heifers body and is also true for heifers raised on high milk producing cows). Large frame heifers with potential for rapid growth without putting on excessive fat will be able to utilize creep feed more efficiently than small frame slow growing heifers. If heifers are to be calved at 2 years of age, some supplemental feeding may be needed to get them to the desired weight at breeding. British breeds should weigh 600-650 lbs when bred and European breeds 700-750 lbs.

5. Calves on high quality forage and/or good milking cows do not benefit as much from creep feed as calves on poor quality forage and/or poor milking cows (8, 9, 10).

6. The grain in creep feed is a high cost item while the pasture and milk may have little or no alternative value. However, results from the Forage Systems Research Center show carrying capacity of pastures increased .36 AUM per acre where creep feed was fed.

7. Fall born calves appear to make efficient use of creep feed than spring born calves (12). This can be attributed to lower quality forage available during the winter which would also cause a reduction in cow milk production. Feed requirements for animals on a maintenance ration are higher during the winter; increasing about 1% for each 1.8°F decline in effective temperature (wind chill effect - but not the same as wind chill index for humans) below a base of 60-75°Fβ. Creep fed calves because of higher production would produce more heat as a by-product of production and consequently require less energy for maintenance.

8. Creep feeding calves during prolonged periods when the quantity and/or quality of forages is low may be a good policy (14). If the period is expected to be short, the calves would gain more rapidly (compensatory gain) when conditions improved so benefits from creep feeding would be reduced.

9. Creep feeding suckling late-winter-early-spring-born calves during the breeding period while grazing fescue-ladino clover pastures, fertilized with nitrogen, has been associated with improved conception rates (12). It is not clear, at this time, that this is a true cause-effect relationship, but the relationship has been observed.

10. Purebred cattle producers have considerations other than mentioned here and will normally find creep feeding, particularly of bull calves, profitable more often than a commercial cattle producer.

A blanket statement about the profitability of creep feeding calves is inappropriate. Each farm is unique and the decision must be made by the individual farm manager based on his likes and dislikes, how he intends to manage his calves after weaning, his knowledge and judgement of quality of forage available and the milking ability of his cows. In addition, he must make judgements on what he thinks the price relationships between fleshy and thin cattle will be at the time and in the market he intends to sell his calves.

No two years are alike, so careful records should be kept each year of decisions made, pasture conditions through the summer, apparent milking ability of the cows, and weight and condition of the calves when sold. Attention should be given to price relationships of fleshy and thin cattle of about the same frame size on different markets. These records, although backward looking, may help evaluate the effectiveness of past decisions. Attention to market forecasts will also be an important aid in deciding if one should creep feed or not.

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PERFORMANCE OF CULL COWS ON FULL-FEED OF CORN SILAGE

Ron Morrow, Jim Berger, Duane Sicht and Mark Smith

SUMMARY

Fifty-four cull Hereford cows were divided into 3 groups. One group was slaughtered before feeding, and two groups were full-fed corn silage for 28 and 42 days. The cows were also divided into thin and average condition subgroups. The thin cows fed 28 days gained 2.98 lbs per day and required 20 lbs of silage per pound of gain. The average condition cows fed 28 days gained 3.12 lbs per day and required 18 lbs per pound of gain. In the 42-day group, the thin cows gained 2.31 with a feed conversion of 25 versus 1.46 for the average condition cows, which had a feed conversion of 44. These results indicate feeding cull cows for a short period of time at present market prices could be economical. A more detailed discussion of economics is presented in another article.

INTRODUCTION

During the last several months the possibility of feeding cull cows for economic gain has been considered by several producers. Cows that are in thin condition could put on a large amount of weight in a short period of time. With the current market price the gain in weight should more than offset the cost of feed. The objective of this trial was to evaluate the performance of cull mature cows on full-feed of silage for two different lengths of feeding.

PROCEDURE

Fifty-four Hereford cows, ranging in age from 6 to 11 years, that had been culled from the Forage Systems Research Center, were randomly allotted into three groups of 18 animals each. The cows were then graded by personnel from the Missouri Department of Agriculture. Group 1 was slaughtered immediately to get an estimate of carcass characteristics. The weight to wither height ratio of animals in Groups 2 and 3 was used as an estimate of condition. The cows were then divided by condition into four pens of 9 animals each and started on feed January 18, 1978. Group 2 was fed 28 days and Group 3 was fed 42 days. Cows were then slaughtered and graded. The silage fed averaged 47% dry matter.

RESULTS

The performance data of the cows are presented in Tables 1 and 2. Table 1 shows the comparison of thin and average condition cows fed 28 and 42 days. A comparison of all cows fed 28 and 42 days is shown in Table 2.

The majority of the cows had excellent gains during the trial. With the exception of the average condition cows fed 42 days, every pen had individuals that gained over 4 lbs per day. Both groups of cows fed 28 days averaged approximately 3 lbs per day (2.98 and 3.12 for thin and heavy cows, respectively).

There was a significant difference between groups (P<.01). ADG for the 28 day group was 3.05 and for the 42-day group 1.89. Pounds of silage (as-fed) required per pound of gain was 19 for the short term group and 35 for the other. These results indicate that cows should not be fed as long as 42 days unless they are extremely thin or unless the gain in carcass traits would be beneficial economically.

Although estimated consumption per day for cows in all pens was approximately the same (59 to 64 lbs of silage, as-fed), there was a considerable difference in feed required per pound of gain (Figure 1). Cows in Group 2 required approximately 20 lbs of silage. Cows in Group 3 required 25 and 44 lbs per pound of gain for thin and average condition cows, respectively. The weather during this trial was bad (cold and snow) for a long period of time. Feed conversion and gain could have been affected by temperature.

Table 1. Comparison of cows by pen

	Group 2A Thin 28 Days	Group 2B Average 28 Days	Group 3A Thin 42 Days	Group 3B Average 42 Days
Initial weight	937	1072	913	1034
(Range)	(795-1045)	(970-1220)	(846-990)	(960-1130)
Final weight	1021	1159	1010	1095
(Range)	(865-1150)	(1045-1340)	(930-1105)	(985-1220)
Carcass weight	487	570	506	558
Dressing %	47.6	49.1	50.2	51.1
ADG	2.98	3.12	2.31	1.46
(Range)	(.9-5.5)	(1.4-4.25)	(1.5-4.2)	(.24-2.98)
Condition	20.4	23.2	19.8	22.2
Silage/day/cow	59	56	60	64
Silage/lb of gain	20	18	26	44
DM/lb of gain	9.4	8.5	12.2	20.7

Table 2: A comparison of cows fed 28 days versus 42 days

	28 Days	42 Days
Initial weight	1005	973
Final weight	1090	1053
Carcass weight	529	533
Dressing %	48.3	50.6
ADG	3.05	1.89
Condition	21.9	21.0
Feed/day/cow	57.5	62
Feed/lb of gain	19	33
DM/lb of gain	8.9	15.5

THE PROFITABILITY OF A SHORT FEED OF CULL COWS ON CORN SILAGE

Jim Stricker, Vic Jacobs and Ron Morrow

SUMMARY

Hereford cows were full-fed corn silage for 28 days (Group 2) and 42 days (Group 3). Profitability of feeding cows will depend on the cost of gain and the value of gain. While the cost of gain is a straight forward feeding cost ÷ gain, value of gain is more complex because "whole animals" are sold, not just the gain and feeding can affect the price of the whole animal. Two pricing situations were used: Case I assumed normal price relationships with the price of higher carcass grades (more fat) lower per cwt, Case II was the unusual situation where higher carcass grades were worth more per cwt. Silage prices of \$16.00 per ton (\$2.00/bu corn) and \$22.40 per ton (\$2.80/bu corn) were applied in Case I and Case II respectively. Cost of gain was \$4.10 for Group 2 and \$4.63 for Group 3 greater per head than gain in value for Case I with carcass prices of \$60.00, \$57.02, and \$53.68 per cwt for canner and cutter, boning utility and breaking utility respectively. In the Case II pricing situation an \$11.43 and \$7.64 profit per head for Groups 2 and 3, respectively, resulted with carcass prices of \$55.11, \$57.10, and \$58.45 per cwt for cutter and canner, utility boning, and utility breaking grades respectively. An increase of only 38¢ and 44¢ per cwt in market price during the feeding period would have wiped out losses in Case I. A decline of only \$1.05 and \$0.73 would have eliminated the profit in Case II. With short feeds of cows seasonal or cyclical prior movements can overwhelm all other economic costs or returns.

INTRODUCTION

The performances of the Hereford cow on short feeds of corn silage (28 and 42 days) are reported elsewhere in this publication (see Morrow and others, "Performance of Cull Cows on Full Feed of Corn Silage"). As can be observed in that report, the cows performed comparatively well on a high roughage corn silage ration--gaining 3.05 and 1.89 lb per day on 28 and 42 day feeds.

PROCEDURE

The economic desirability of feeding cows prior to sale for slaughter does, however, depend on several factors in addition to the physical performance of the cows. In particular, the profitability depends on the cost of the gain (performance and feed prices) and the value of the gain.

While the first part (cost of gain) is a straight forward computation (feeding cost ÷ gain), the second part (value of gain) is more complex. While it can be simply calculated "after-the-fact" (Increase in value per cow ÷ pounds of gain)--forecasting the value of the gain prior to feeding is more complicated. The reason is that we sell "whole animals"--not just the gain, and a crucial effect of feeding is what it does to the price of the whole animal.

Thus, while the price level of slaughter cows is important, its effect may be overwhelmed by slight changes in the price of the whole animal. Three causes of price change on the whole animal are:

1. Increase dressing percent (from feeding) tends to increase live grade and price.

2. Increased carcass grade (i.e. from canner-cutter to utility boner or breaker) may decrease values per cwt. Or, in unusual periods such a change may add to value per cwt.

3. Changes in market prices during the feeding period may increase or decrease price per cwt. While never 100% predictable, strong seasonal tendencies in cow prices do provide different odds for different seasons of the year.

A simple example will demonstrate the importance of these effects. Feeding a 30¢, 900 lb cow into a 33¢, 1000 lb cow returns 60¢ for each lb of gain /($330-$270) ÷ 100 lb)/. In contrast, feeding a 33¢, 900 lb cow into a 30¢, 1000 lb cow returns only 3¢ per lb of gain. Thus "change" in price may be much more important than "level" of price.

RESULTS

The initial and final, live and carcass weights of 48 Hereford cows fed 0, 28, or 42 days on corn silage are reported elsewhere in this publication ("Performance of Cull Cows on Full Feed . . ."). Final live and carcass weights were respectively 976 and 471 lb; 1090 and 531 lb; and 1052 and 532 lb (for 0, 28, and 42 day feeds). Dressing percents were 48.2, 48.7, and 50.6%. These cows were slaughtered and sold in Columbia on carcass weight and grade. Thus, values were obtained from actual carcass data rather than live grades.

Value of gain. Three carcass grades were indentified, cutter and canner, boning utility, and breaking utility--representing lower to higher degrees of fleshing. As can be seen in Table 1, feeding tended to move carcass grades from canner and cutter upward into boning and then into breaking utility grade.

Rather than use prices temporarily in existence on the three different sale dates, two pricing situations have been assumed and applied to the carcass data to hopefully represent conditions more similar to those expected in the future.

Table 1. Effects of feeding on carcass grades and dressing percents

	COW GROUP		
	I	II	III
Number of cows	18	18	18
Days fed	0 days	28 days	42 days
Final live wt. (lb)	976.4	1090.0	1052.5
Final carcass wt. (lb)	471.0	531.4	532.7
Dressing percent	48.24	48.75	50.61
No. in each carcass grade:			
Canner cutter	16	2	7
Boning utility	1	14	3
Breaking utility	1	2	8

In Case I, a $60 base price for a canner and cutter grade carcass has been employed. Using carcass price differentials of 1973; 1976, and 1977, comparable prices for the other two grades are $57.02 and $53.68 respectively for boning and breaking utility grades. These relationships are considered more "normal" -- as the value of a cow carcass commonly depends on how much waste fat and tallow can be added to it from the trim off fed cattle carcasses.

Occasionally, when grain is very high priced relative to beef, and markets are suddenly overwhelmed with thinner non-fed animals and choice carcasses are scarce, these relationships may be reversed--as fat and fleshing assume a much higher value. Such relationships existed in the other two years of the past five--1974 and 1975. Adjusting those years' actual prices upward to produce the same average price for the three grades, produces $55.11, $57.10, and $58.45 per cwt respectively for the canner-cutter, boning utility, and breaking utility grades. This set of prices was applied in Case II and is believed to be "unusual"--but possible whenever sudden increases in grain prices force large increases in non-fed slaughter and sudden declines in higher grade fed slaughter.

Case I and II carcass price relationships are graphically represented in Figure 1.

Feeding Costs. (Especially nonfeed costs) will differ from farm to farm, and feed prices can vary widely from year to year. For evaluation of these results the silage was priced at two levels, $16 and $22.40 per ton to represent corn prices of approximately $2.00 and $2.80 per bushel. Other costs were estimated at 15¢ per day. Prices and costs more appropriate to individual situations and years could be substituted for those in Table 2.

Table 2 evaluates the approximate economic results that would have been experienced with the Case I and II carcass price schedules and with the $16.00 and $22.40 per ton corn silage values. Initial cow values for Groups II and III (28 and 42 day fed cows) are, of course, only estimates based on actual initial live weights of the groups taken times the dressing percents and carcass prices of the control group (Group I). Thus, the analysis assumes that Groups II and III initially had the same dressing percent and carcass grades as Group I. Further, the lower silage price is used with the Case I carcass price schedule while the higher silage price is employed in the Case II analysis.

As can be seen in Table 2, the cost of gain was larger than the gain was larger than the gain in value with Case I carcass prices and $16 silage. Interestingly the reverse is true despite the substantially higher silage price ($22.40) with Case II carcass prices. In Case I, the carcass price differentials offset the gain in dressing percent giving a value gain of only $29.70 and $35.66 per cwt gain in carcass and justifying no increase in live price per cwt. Case II carcass prices would have justified $1 and $2/cwt increases in live price for cows fed 28 and 42 day feeds--thus showing a profit despite the substantially higher feed price assumed.

Case I is, however, considered more normal.

Changes in Price Level and Time of Year. Even in Case I, the $4.10 and $4.63 losses per head (Groups 2 and 3) could have been turned into profits by only a 38¢ and 44¢ per cwt increase in live cow prices during the feeding period. Similarly, decreases in price during the feeding period of only $1.05 and $0.73 would have eliminated the $11.43 and $7.64 per head profits of Groups II and III with Case II price structures.

Seasonal price changes are a fact of market life as cow marketings peak in late fall and early winter and bottom out under pressure to stock pastures in the spring. Figure 2 shows the seasonal price change from January 1 for the past five years. Monthly increases or decreases of $1 to $3 per cwt are common--and should be considered carefully in any decision to feed cows. The difference in seasonal patterns between Case I and Case II are evident. In Case II, a violent nonseasonal downtrend was evident ('74-'75) with smaller early season increases and larger late season declines the rule.

It should be evident that with short-feeds of cows, seasonal or cyclical price movements can overwhelm all other economic costs or returns. A one-month $3 per cwt change in general cow price level produces a "windfall" ($30 on 1000 lb) that is larger than either the cost of a month's feed--or the value of the gain in weight during the month. Thus, such a price level change can easily make or break in any cow feeding activity.

Table 2. An economic analysis and summary of the FSRC cull cow feeding experiment

Groups	CASE I PRICES 1	2	3	CASE II PRICES 1	2	3
1. Value of whole carcass/cwt	$ 59.43	$ 56.81	$ 56.62	$ 55.43	$ 57.12	$ 56.96
2. Final carcass value/head	279.94	301.88	301.60	261.07	303.56	303.40
3. Initial carcass value/head	279.94	287.98	279.10	261.07	268.61	260.30
4. Gain in carcass value/head	-	13.90	22.50	-	34.95	43.10
5. Gain in carcass wt (lbs)/head	-	46.8#	63.1#	-	46.8#	63.1#
6. Gain or loss in value/cwt gain in carcass	-	$29.70	$35.66	-	$74.68	$68.30
Cost of Feeding						
7. Lbs of silage fed/head	-	1725#	2604#	-	1725#	2604#
8. Cost of silage @ $16/ton	-	$13.80	$20.83	-	-	-
9. Cost of silage @ $22.40/ton	-	-	-	-	$19.32	$29.16
10. Yardage of 15¢/hd/day	-	$ 4.20	$ 6.30	-	$ 4.20	$ 6.30
11. TOTAL COST	-	$18.00	$27.13	-	$23.52	$35.46
12. Cost/cwt added carcass wt	-	$36.46	$43.00	-	$50.26	$56.20
Profits						
13. Profit (or loss) per hd. (Ln. 4 minus Ln. 11)	-	(-$4.10)	(-$4.63)	-	+$11.43	+$ 7.64
14. Profit (or loss) per cwt carcass gain (Ln. 6 minus Ln. 12)	-	(-$8.76)	(-$7.34)	-	+$24.42	+$12.10

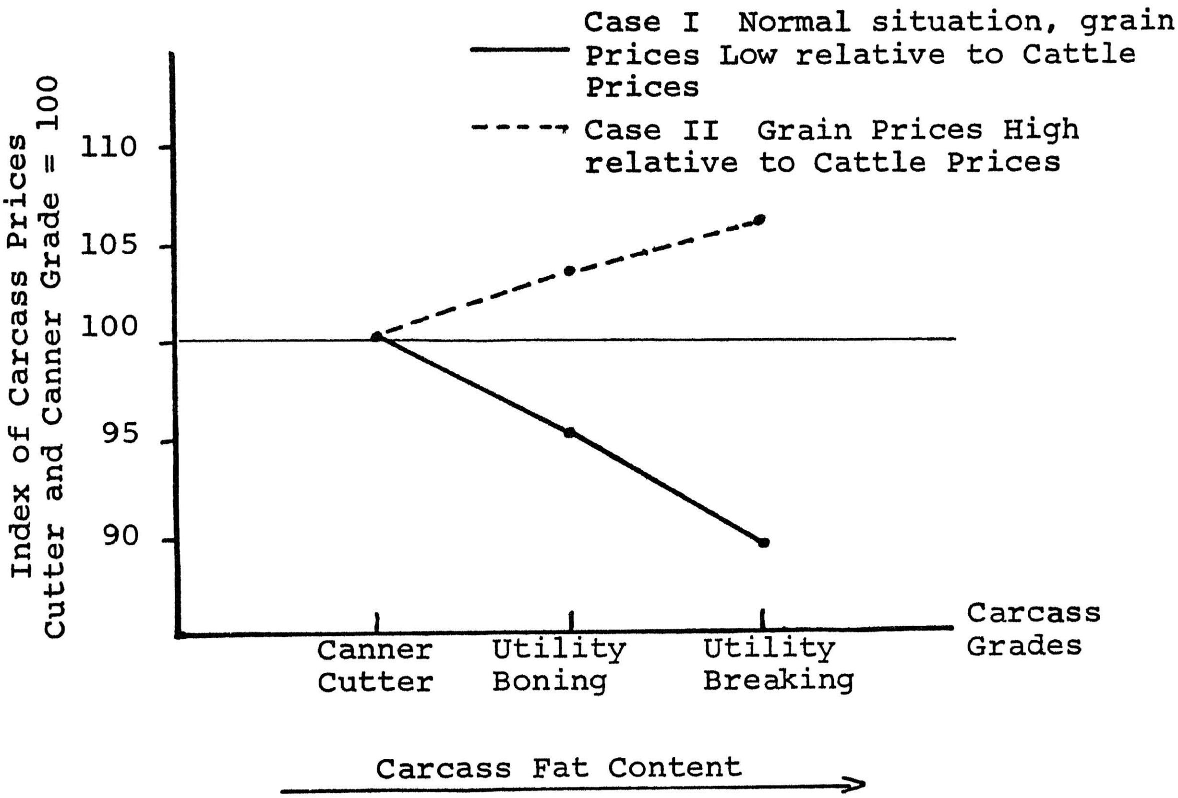

Fig. 1. Index of Cow Carcass Grade Price Relationships. Case I based on 1973, 1976, and 1977 Prices. Case II based on 1974 and 1975 Prices.

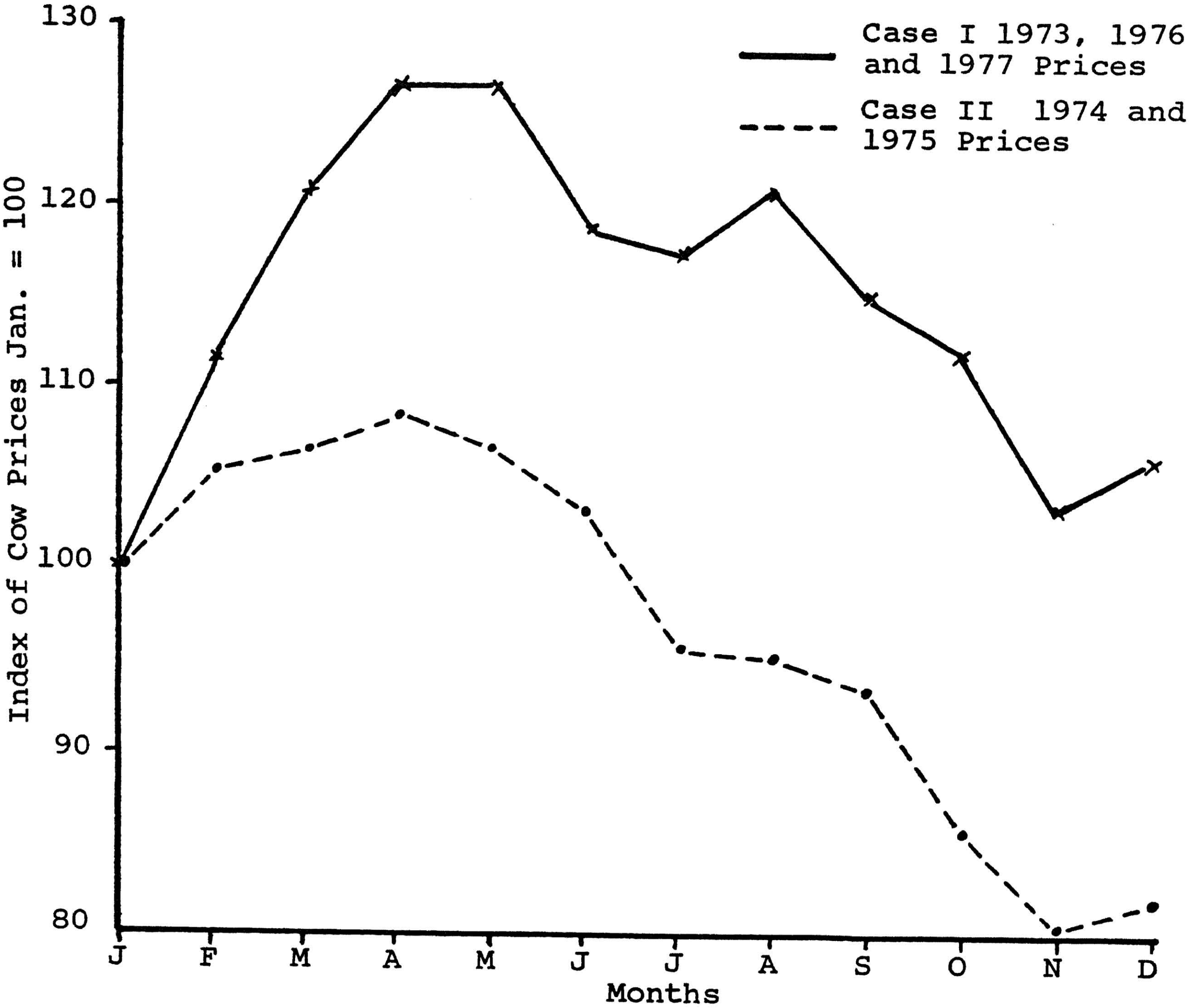

Fig. 2. Index of Average Monthly Prices for Utility Cows at Omaha

WINTER FEEDING OF FALL-CALVING BEEF COWS

Dave Bowman, Jim Berger, Duane Sicht, Alfred Decker and Ron Morrow

SUMMARY

Two separate winter feeding trials of short duration were performed at the UMC Beef Cattle Farm in 1976-77 and 1977-78. Primarily fall-calving cows nursing calves were used in these trials. The first trial consisted of three systems: 1) red clover hay fed free choice in hay racks, 2) corn silage and 3) fescue hay baled in small round bales and left in the field. In the second trial the systems evaluated were: 1) red clover hay, limit fed, 2) fescue hay and 3) mixed grass-legume hay. The latter two were small round bales left in the field. Cows on systems utilizing small round bales had access to a liquid supplement. During the first trial, lactating cows on clover hay significantly ($P < .01$) outgained the other two groups (2.4 lbs per day versus .1 and -.3 for silage and fescue, respectively). The calves gained 2.6, 2.3 and 2.1 lbs per day for silage, clover and fescue, respectively. The second year the clover hay was limit fed. The cows on clover hay and mixed hay were of the same weight and condition at the end of the trial as the beginning while the cows on the fescue lost weight and condition. The ADG for the calves was 2.35, 2.04 and 1.96 lbs per day for clover, mixed and fescue hay, respectively.

INTRODUCTION

One of the largest expenses of a cow-calf operation in Missouri is winter feeding. A variety of wintering systems are available to producers, such as silage, stockpiled forage, small round bales, conventional bales and large hay packages, all revolving around forages of various quality. Different energy and protein supplementation methods are also available to supplement the forage program.

Winter feeding systems become increasingly important for producers that calve their cows in the fall. Not only is the forage quantity and quality important, but creep feeding the calves becomes an important consideration. The purpose of these trials was to study the performance of fall-calving cows on various winter feeding regimes.

EXPERIMENTAL PROCEDURE

Separate feeding trials were performed during the winters of 1976-1977 and 1977-1978 at the UMC Beef Cattle Farm. Spring-calving Charolais crossbred cows as well as fall-calving Angus and Simmental cows ranging in age from two to six years were used in the first trial. The Charolais crossbred cows were not used in the second trial. The first trial was 51 days in length, December 27, 1976 to February 16, 1977, and involved 80 cow-calf pairs and 47 dry cows. The second trial was 78 days in length, December 21, 1977 to March 9, 1978, and involved 64 cow-calf pairs. In each trial, cows were wormed, weighed and randomly sorted into three groups according to breed, age, sex of calf, age of calf and weight. A height at withers measurement was also recorded for each cow and this in conjunction with the cow's weight was used to determine condition at the beginning and end of both trials. Creep feed was available *ad libitum* for all calves. All cattle also had access to fresh water and a free choice loose mineral mix composed of trace mineralized salt, dicalcium phosphate and magnesium oxide.

The three systems evaluated in the first trial were red clover hay, *ad libitum*; corn silage, *ad libitum*, plus one pound of supplement per head per day (Table 3); and fescue hay (small round bales left in the field). The three systems evaluated in the second trial were red clover hay, limit-fed (approximately 30 lbs per head daily); fescue hay and mixed grass-legume hay. The fescue and mixed hay was baled in May and left in the field as small round bales. The consumption of the small round bales was controlled by an electric fence. After the hay in each portion was cleaned up, the fence was moved to give the cows access to a new section.

The mixed grass-legume hay was approximately 40% fescue, 40% orchardgrass and 20% clover. The animals in each round bale hay group each year had access to a liquid supplement designed to supply extra energy (59% dry matter). The consumption was very high in the second trial and therefore the trial was split into two phases - with and without supplement. The performance difference between the two phases should not be used to compare with and without liquid supplement. Feed analysis and creep feed composition for both trials are given in Tables 1, 2 and 3.

RESULTS

1976-1977 Winter Trial

Estimated dry matter available for consumption was 28, 31 and 45 lbs of feed per cow daily for Groups A (silage), B (fescue) and C (clover), respectively. Cows on all treatments had access to sufficient dry matter to meet recommended daily requirements. Average daily crude protein fed was 2.2, 3.0 and 5.1 lbs per head for treatments A, B and C, respectively. According to NRC, the daily requirement is 1.99 lbs of crude protein per head for cows nursing calves three to four months of age. It is unlikely that any cows lacked sufficient protein. Estimated consumption of net energy per day was 20.8, 20.9 and 26.2 Mcal per cow for treatments A, B and C, respectively. The daily requirement is 11.1 Mcal for 1100 lb cows nursing calves and 8.1 Mcal for dry, pregnant cows.

Means for weights of all cows and calves are given in Table 4 as well as the creep feed consumption of calves. Weight gain, weight-height ratio, and average daily gain were significantly ($P < .01$) higher for the cows in the clover group. The lactating cows in the clover group gained 2.4 lbs per day, whereas the cows in the fescue group lost 3.0 lbs per day. Lactating cows in the silage group had a slight gain of 0.1 lb per day.

1977-1978 Winter Trial

Weight changes, liquid supplement consumption and creep feed consumption are summarized in Table 5. Due to the high consumption of liquid supplement (approximately 11 lbs per head daily as compared to 7 lbs in the previous trial) this trial was divided into two phases. The cows on fescue and mixed round bales had access to liquid supplement for the first 47 days of the 78 day trial and then finished the remaining 31 days without supplementation. The cows on mixed round bales and liquid supplement had the highest average daily gain for the first phase of the trial with a gain of 1.36 lbs per cow. Cows on limit-fed clover hay gained 1.0 lb per head daily and the cows on fescue round bales and liquid supplement lost 0.06 lbs per head daily.

The weather was extremely adverse during the second phase of the trial. Temperatures were extremely low and snow covered the ground from January 9, 1978 until the end of the trial. Cows on all three treatments lost weight. Limit-fed clover and fescue round bale treatments each resulted in a loss of 1.5 lbs per cow daily for the last 31 days. Cows on the mixed round bales lost 2.0 lbs per head daily. It is difficult to estimate intakes for the cows on the two round bale treatments due to differences in regrowth after baling. However, it was obvious that the cows on the fescue round bales were not consuming as much as the mixed round bale group. (.6 bale per cow-calf pair versus .9 bale estimated available for consumption). The difference in performance of these two groups during the second phase may be due to the fact that the mixed hay group was having to depend more on regrowth than the fescue group as the supply of round bales was nearly gone. These data suggest considerable palatability and quality differences in the fescue and mixed hay, indicating a need for a higher energy supplement for lactating cows on fescue regrowth and hay.

Overall weight changes for the entire trial were -50, 0 and 2 lbs per cow for the fescue round bales, limit-fed clover and mixed round bales, respectively. The latter two groups were of the same weight and condition at the end of the trial as the beginning.

Calves nursing cows on the limit-fed clover group performed better than the calves nursing cows on the fescue and mixed round bales groups. Calves in the clover group had an average daily gain of 2.35 lbs as compared to 2.04 lbs for the mixed hay group and 1.96 lbs for the fescue group. This may be partially due to the increased creep feed consumption of the clover group calves. Also, the calves consumed some of the clover hay.

Table 1. Feed analysis for 1976-1977 trial

	Silage	Fescue	Clover	Liquid Supplement
% K	1.29	1.69	1.96	1.53
% P	0.22	0.17	0.17	1.45
% Ca	0.38	0.57	0.99	0.75
% Mg	0.18	0.21	0.20	0.28
% Crude fat	2.3	2.1	1.6	0.4
% Crude fiber	20.5	28.7	23.6	0.2
% Ash	5.0	8.8	6.8	7.6
% N	1.09	1.21	1.77	1.34
% Protein	6.8	7.6	11.1	8.4

Table 2. Feed analysis for 1977-1978 trial

	Fescue Hay	Mixed Hay	Clover Hay	Liquid Supplement
% K	1.84	2.19	1.55	1.53
% P	0.20	0.28	0.21	1.45
% Ca	0.27	0.30	1.30	0.75
% Mg	0.16	0.14	0.26	0.28
% Dry matter	85.0	83.9	85.0	59.1
% Crude fat	1.7	1.3	1.7	0.4
% Crude fiber	31.3	31.1	24.8	0.2
% Ash	7.8	8.2	8.0	7.6
% N	1.02	1.55	1.9	1.34
% Protein	6.4	9.7	11.6	8.4
% ADF	39.4	38.9	33.9	
% NDF	65.1	66.1	48.3	

Table 3. Composition of creep feed and supplement

Creep Feed Composition
37% cracked shelled corn
15% soybean meal (44% protein)
10% bran (wheat)
27% crimped oats
5% cottonseed hulls
5% molasses
0.5% trace mineral salt
0.5% dicalcium phosphate
Supplement Fed Cows on Silage
81.6% ground corn
8.2% urea
2.7% trace mineral salt
5.4% dicalcium phosphate
2.1% vitamin A & D premix

Table 4. 1976-1977 winter trial weights and gains

	Silage	Fescue	Clover
		Lactating Cows	
Number	29	27	24
Initial weight	1077	1059	1076
Final weight	1080	1038	1200
Gain	3	-16	124
ADG	.1	-.3	2.4
		Calves	
Initial weight	282	286	285
Final weight	416	392	403
Gain	134	106	118
ADG	2.6	2.1	2.3
Creep feed/head/day	5.5	5.6	4.0
		Dry Cows	
Number	13	17	17
Initial weight	1038	1011	1070
Final weight	1161	1069	1263
Gain	123	57	193
ADG	2.4	1.1	3.8

Table 5. 1977-78 winter trial performance

	Clover	Fescue	Mixed
	Lactating Cows		
Number	21	21	22
Initial weight	1021	1031	1049
Initial condition	21.2	21.7	21.8
Intermediate weight	1068	1028	1113
Gain (phase 1)	47	-3	64
ADG (phase 1)	1.0	-.06	1.36
Intermediate condition	22.1	21.6	23.2
Final weight	1021	981	1051
Gain (phase 2)	-47	-47	-62
ADG (phase 2)	-1.5	-1.5	-2.0
Final condition	21.0	20.5	21.8
Overall gain	0	-.64	-.03
Supplement consumption	----	10.9	11.1
	Calves		
Initial weight	285	287	292
Intermediate weight	411	391	410
Gain (phase 1)	126	104	118
ADG (phase 1)	2.68	2.21	2.51
Final weight	468	440	451
Gain (phase 2)	57	49	41
ADG (phase 2)	1.84	1.58	1.32
Overall gain	183	153	159
ADG	2.35	1.96	2.04
Creep feed consumption (per head/day)	6.0	5.2	4.6
Phase 1	5.0	4.6	4.5
Phase 2	7.5	6.1	4.9

EFFECT OF SUPPLEMENTAL WINTER FEEDING ON CONCEPTION OF SPRING-CALVING COWS

Ron Morrow and Jim Stricker

SUMMARY

Nutrition during the breeding season has always been considered to be an important component of cow reproduction. Some data have indicated that nutrition just prior to and directly after calving may be more important because of the increase in nutrient requirements of the cow nursing a calf. This is probably more critical for spring calving cows than fall calving cows.

Research at Cornett has indicated a decreased conception rate on fescue pastures fertilized with a high level of nitrogen versus pastures containing a legume. Work at Illinois and Indiana indicates a tendency for higher conception rate on fescue with a legume. Preliminary data at Cornett (Spring, 1977) indicate that supplementing spring calving cows directly after calving with either grain or a high quality legume tends to increase conception rate.

INTRODUCTION

The key component in gross income of a cow-calf operation is pounds of calf weaned per cow in the herd. Many management factors enter into this, including both genetic and environmental factors such as milk production of cow, creep feeding, forage quality, growth rate potential of the calf and reproduction. The most important component is reproduction (% calf crop). A highly significant effect of crossbreeding has been shown on pounds of calf weaned per cow in the herd when crossbred cows were compared to straight bred cows. First, there was an increased growth rate and secondly, an increased conception rate. Heterosis is greatest for traits that have a low heritability, such as reproductive traits. While the advantages of crossbreeding have been discussed considerably we have not done an adequate job of looking at the influence of nutrition of the cow, prior to and directly after calving, on reproduction as a major influence on pounds of calf weaned per cow in the herd. Many animal breeders have referenced the superiority of the crossbred cow but have we adequately pursued increasing percent calf crop through proper nutrition and management? The objective of this paper is to discuss conception rate differences of Hereford cows on an all-forage (fescue), year-round grazing program at the Forage Systems Research Center at Linneus (FSRC).

PROCEDURE

The overall experimental procedure at FSRC (Cornett Farm) is outlined in the 1976 and 1977 Field Day Reports. The original project consisted of evaluating cow and calf performance with both fall and spring calving cows on fescue-ladino pastures with a creep feeding component also in the research. The results of the four years of research have indicated possible conception rate problems with spring calving cows on fescue pastures where the cows were not supplemented during gestation or lactation. The summary of conception rates is shown in Table 1. In 1977 a new project was initiated with the spring-calving herd to look at the effect of supplementing cows from calving to when spring grass was available (approximately April 20) on conception rate. Two quality levels of pasture were utilized - fescue with 100 lbs of nitrogen and fescue-red clover. Cows were divided into three supplement groups across pasture treatment: 1) no supplement after calving, 2) 2 lbs of grain (87.5% ground corn, 12.5% SBOM) and 3) 3 lbs of red clover hay per head per day.

RESULTS

According to the recommendations expressed in Nutrient Requirements of Beef Cattle, a 1000 lb cow in the last third of pregnancy needs approximately 1.1 lbs of protein and 9.1 Mcal of net energy per day. This requirement increases to 1.9 or 2.7 lbs of protein and 10.5 or 13.6 Mcal of net energy for average or superior milk producing cows after calving. This requirement can also be increased dramatically by extreme weather conditions. A cow calving in February may not be able to meet the nutrient requirements described above if on an all-forage diet, particularly if the forage is of average to low quality and weather conditions severe.

We have normally talked about supplementing cows with extra energy and/or protein during the breeding season. The availability of high-quality forage is usually plentiful when spring calving cows are being bred and is usually listed as an advantage of spring calving. Some limited work with nutrition of gestating and lactating beef cows indicates that the interval from calving to first estrus may be related to nutritional status of the cow prior to and directly after calving. Possibly we need to be concerned more with the nutrition of the cow at that time than during the breeding season since it may be too late for the cow to recover from poor nutrition during the winter and cycle during a 60-day breeding season, even with lush spring pastures.

Advocates of fall-calving have indicated the primary advantage of that season is that fescue pastures are of good quality in September and October, at a time when the fall-calving cows need a boost in nutritional status. Data at Cornett have supported this as has work at Ohio and other states. Fall calving cows at Cornett had a conception rate of 82.6% over four years while the spring calving cows had a 64.4% conception rate. This is not an argument for fall-calving but a point that spring-calving cows need a different management program at calving than fall calving cows.

Preliminary results of the supplemental feeding of the spring-calving cows in 1977 are shown in Table 2. The conception rate of cows supplemented with grain was 94.4% versus 90.0% for the red clover hay and 69.7% for the group without supplement. These data indicate that a small amount of grain added to the ration of a spring-calving cow after calving can increase the conception rate percentage. The data presented in Table 2 will be followed up with two more years of data.

Table 1. Conception rates of cows at FSRC

	Spring	Fall
	% Tester cows settled	% Tester cows settled
1972-73	75.2	
1973-74	68.0	68.1
1974-75	50.0	84.7
1975-76		87.4
1976-77		90.3
	No creep feed for calves	
0# N/A	80.0	79.2
100# N/A	56.6	81.2
200# N/A	27.8	83.3
	Creep feed for calves	
0# N/A	77.7	87.5
100# N/A	74.9	83.3
200# N/A	69.4	81.2
All cows	64.4	82.6

Table 2. Conception rates of cows supplemented from calving to grass (Spring, 1977)

	Number	% settled
No nitrogen	50	77.9
100# nitrogen	46	91.3
No supplement	33	69.7
2# grain	33	94.4
3# clover hay	30	90.0
All cows	96	84.6

LIVESTOCK TRANSPORT STRESS EFFECTS ON SHRINKAGE

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Harold Hedrick, Donald Naumann, Homer Sewell and Harold Johnson

SUMMARY

This pilot study showed that stress is costly in terms of shrinkage whether animals are shipped a long distance (882 miles) or a short one (52 miles). Even when animals were kept in holding pens for two days and given all the feed and water they would consume, shrinkage percentages were still 5 percent for those in the long haul group and 3.7 percent for those in the short haul group. This preliminary study shows us that cattlemen need better methods to reduce stress from handling and shipping and/or methods that will help the animals make a better recovery from this stress.

PROCEDURES

The cattle used in this study were purchased from a farmer-feeder located approximately 15 miles northwest of Mexico, Missouri. The farmer-feeder had originally purchased the animals as feeder cattle in November, 1976, at the Kansas City Stockyard. They were over-wintered on silage and 3 to 4 lbs of milo per head per day, then implanted with 2-15 mg pellets of Stilbestrol and given a ration of green chop wheatlage _ad libitum_ and 7 lbs of wet milo per head per day starting in mid-April, 1977, when they weighed from 650 to 750 lbs. The wet milo was increased until they were receiving about 10 lbs per day on July 1, 1977. After July 1, the animals were moved into a semi-confinement building with about 20 square feet per animal and given a ration of ½ high moisture corn and ½ high moisture milo, with the silage ration the same.

After being selected for our study on September 23 from 100 market-weight animals available, the 24 animals were moved to a smaller pen at one end of the building. This pen was designed to hold 40 head at 20 square feet per head. They were held in this pen from 10 a.m. Friday to 6 a.m. Monday, September 26.

Transportation of the 24 animals from the feedlot to the University of Missouri Beef Farm was contracted to a commercial livestock trucking firm often used by the farmer-feeder. The 24 head were divided into two lots of 12 head each, which were further subdivided into treatments as shown in Table 1. This was a random gate cut at the time of loading. The animals were loaded on two trucks by the truck drivers and the farmer-feeder. Trucks used were long wheelbase, cab-over-engine and were equipped with 8 foot by 18 foot or 20 foot livestock beds.

The 52 mile transport route for both trucks from the feedlot to the University Beef Farm was over two-lane state and county hardsurfaced highways. The 12 animals in the short haul test were on the truck about 2 hours from loading at the feedlot to unloading at the University farm. The 12 head in the long haul test were on the truck 24 hours and covered a total distance of 882 miles, with 15% over two-lane state and county highways and the remainder over divided interstate highways before returning to the University Beef Farm.

The cattle were transported in 6 head groups in a low-bed fifth-wheel trailer from the University Beef Farm to the abattoir, holding pens and Climatic Laboratory. The animals walked on and off without the use of a loading chute.

Three animals from both the short and long haul groups were taken directly to slaughter after jugular blood samples were taken and the cattle weighed, with no access to feed and water. Three head from both the short and long haul groups were held for 2 days in holding pens adjoining the abattoir. During the two-day holding period the cattle had access to feed and water _ad libitum_.

Six animals from both the short and long haul groups were held in the Missouri Climatic Laboratory for 7 days. Three head from each group were held at thermoneutral conditions of 20 °C, 75% RH with three head held under heat stress conditions of 30 °C, 50% RH. During this 7-day holding period each animal had access to feed and water _ad libitum_.

The cattle were individually weighed as they left the holding pen in the confinement, at the Beef Farm after transport, and at the abattoir. A set of calibrated weights were used to check and calibrate each scale prior to and after weighing cattle, so that accurate and reliable weights of each animal could be obtained.

RESULTS

The initial average weights of the fat cattle in each group are listed in Table 1. Shrinkages from the feedlot to the Beef Farm, from the feedlot to the abattoir, and from exposure to the treatments with feed and water supplied are also given.

The observed effects on shrinkage of finished cattle transported and handled different ways in this pilot study were:

Short-haul group, transported 52 miles:

1. Shrink during initial loading and transport (abattoir group) was 1.8%.

2. Off-loading, handling, reloading and transporting 6 miles in a low fifth-wheel trailer after transportating 52 miles resulted in an additional 0.5% shrink on cattle going direct to slaughter.

3. Placing the animals in a holding pen after one loading, transporting and unloading sequence for 2 days with feed and water available _ad libitum_ did not restore shrink weight loss; in fact, there was an additional 2.1% shrink.

4. Animals held under a controlled environment of 20 °C, 75% RH

(thermoneutral conditions) with *ad libitum* feed and water had the highest shrink of any short-haul group (7.2%); those held at 30 °C, 50% RH (heat stress) had a lesser shrink (5.6%), but this was still an increase over the holding pen animals (3.7%).

Long-haul group, transported 882 miles:

1. Shrink during initial loading and transport (abattoir group) was 6.5%.

2. Additional handling and transporting 6 miles in a low fifth-wheel trailer after transporting 882 miles resulted in an additional 0.1% shrink on fat cattle going directly to slaughter.

3. Placing the animals in a holding pen for 2 days with *ad libitum* feed and water restored some of the shrink loss, but total shrink (5.0%) was still more than for the short-haul group in the same treatment (3.7%).

4. Animals held under a controlled environment of 30 °C, 50% RH (heat stress conditions) with *ad libitum* feed and water had a higher total shrink (6.2%) than those held at 20 °C, 75% RH (thermoneutral conditions), which had a 5.6% total shrink.

There may be one or more reasons why the cattle held for two days did not regain the weight lost in transit. The ration used during this period was considerably different from what they had been receiving. Management of the cattle during this period and the facilities used may have also influenced the feed and water intake during this period.

The cattle held in the Climatic Laboratory for seven days exhibited some of the same characteristics in the regain of weight lost during transit as those held for two days. The effects of the ration, management and facilities could account for part of this difference.

Weights of the fat cattle at the abattoir and the carcass data are given in Table 2. The carcass data are the hot carcass weights and the weights after 24 hours in the cooler. The cooler shrinkage data, over a 24-hour period seems to indicate that the treatments affect the amount of shrinkage. This might be an indication of a trend but due to the low number of animals, no definite statement can be made.

Table 1. Initial weights and shrinkage of fat cattle transported different distances and treatments before slaughter

	Initial Weights	Shrinkage			
		Feedlot/Beef Farm		Feedlot/Abattoir	
SHORT HAUL	lbs	lbs	%	lbs	%
Direct to slaughter	1070.3	20.0	1.8	24.0	2.3
Held 2 days open pen	1012.0	16.7	1.6	38.3	3.7
Environ. hold 7 days TN	1040.7	19.7	1.9	74.9	7.2
Environ. hold 7 days heat	1044.0	18.3	1.7	57.3	5.6
	1041.8	18.7	1.8		
LONG HAUL					
Direct to slaughter	1077.3	70.3	6.5	71.3	6.6
Held 2 days open pen	1023.3	75.0	7.3	51.7	5.0
Environ. hold 7 days TN	1041.0	83.0	8.3	58.3	5.6
Environ. hold 7 days heat	1064.0	74.3	7.0	66.0	6.2
	1051.4	75.7	7.2		

Table 2. Abattoir weights and carcass weights for fat cattle transported different distances and treatments before slaughter

		Carcass Data			
	Abattoir Weights	Hot Weights	Yield	24 Hour Weights	Cooler Shrinkage
SHORT HAUL	lbs	lbs	%	lbs	lbs
Direct to slaughter	1046.3	686.0	65.6	675.7	10.3
Held 2 days open pen	973.7	643.0	66.0	635.0	8.0
Environ. hold 7 days TN	966.0	646.3	67.0	642.0	4.3
Environ. hold 7 days heat	986.7	648.0	65.7	642.0	6.0
LONG HAUL					
Direct to slaughter	1006.0	659.0	65.4	652.7	6.7
Held 2 days open pen	971.7	639.3	65.8	633.7	5.7
Environ. hold 7 days TN	982.7	645.0	65.6	637.7	7.3
Environ. hold 7 days heat	998.0	657.3	65.9	650.0	7.3

ENSILED CAGE-LAYER WASTE AS A SOURCE OF NITROGEN FOR RUMINANTS

Victor Arvat, Joe Vandepopuliere and Jerry Lipsey

SUMMARY

Forty-eight lambs were used to compare the nutritional value of two types of ensiled fresh poultry waste (PW) from caged layers. Silage A and B were prepared by using 22.7% PW from layers consuming a conventional corn-soybean meal diet and a grain by-product diet respectively. Each PW was mixed with ground corn, ground fescue hay, salt and water and ensiled anaerobically in plastic lined cardboard drums. Corn silage, supplemented with soybean meal, TM salt, minerals and vitamins A and D, was used as the control diet to compare to the PW diets. Vitamins A and D were added to the PW silages at the time of feeding. Each diet was fed ad libitum to two pens of eight lambs each during the 54 day trial.

Feed consumption for the poultry waste silages was lower than for the control; however, no significant differences were observed in feed conversion. Daily weight gain for the control diet (.35 lb) was significantly greater compared to silage A (.22 lb) and silage B (.26 lb).

INTRODUCTION

The demand for protein for animal feeding is rapidly increasing throughout the world and it is predicted that demand will soon exceed the supply from conventional sources such as oil meals, animal and fish by-products.

Recycling animal waste, poultry waste in particular, as a crude protein source for ruminants has been the topic of numerous experiments. Caged layer waste has gained much interest because of its high crude protein content and because antibiotic drugs are not used in the diet of the laying hen. The Departments of Agriculture of several states have set standards and approved the sale of dried caged layer waste as a feedstuff. However, data on feeding fermented poultry waste to ruminants are limited.

EXPERIMENTAL PROCEDURE

Fresh poultry waste (PW) from caged layers consuming a corn-soybean meal diet (PWA) and a grain by-product diet (PWB) was collected and ensiled with ground fescue hay and ground corn three times a week for seven weeks. The hay used in silage production was ground in a hammer-mill with a 1 5/16 inch screen. Diets containing fresh manure were packed in cardboard drums lined with plastic bags (2 mills).

The drums, containing approximately 200 lbs were sealed and stored at room temperature for two to three months prior to feeding. An average pH of

4.0 for silage A and 4.3 for silage B demonstrated that fermentation was satisfactory. The average pH of the corn silage from a trench silo used in the control diet was 3.7. Compositions of the experimental diets are shown in Table 1.

Forty-eight Western feeder lambs, averaging 66 lbs were stratified by weight into six pens. All animals were wormed with 21 ml of tramisol (Levemisole HCl), vaccinated for Contagious Ecthyma and for Enterotoximia Type D upon arrival and implanted with 12 mg of Ralgro the first day of the experiment. Each diet was fed ad libitum to two pens twice daily for 54 days. Salt was available free choice, the soybean meal supplement was added to the corn silage and vitamins A and D were added to the PW silages at feeding time.

RESULTS AND DISCUSSION

Dry matter (%) and crude protein (% on dry matter basis) for silage A were 32.2 and 13.7; for silage B 33.6 and 15.2; for the control diet 44.7 and 14.2.

The animals consumed the PW silages readily; however, daily feed consumption per lamb (dry matter basis) for silage A (2.20 lbs) and silage B (2.40 lbs) was lower than for the control (2.80 lbs). It is possible that lower feed consumption for the PW silages may have been a result of the high moisture content of the two diets.

Growth with corn silage produced a significantly greater daily gain (.35 lb) compared to silage A (.22 lb) and silage B (.26 lb). The carcass grade for the lambs fed corn silage was 44.5% choice, 55.5% prime; silage A 72.5% choice, 37.5% prime; silage B 87.5% prime and 12.5% choice.

The results of this experiment indicated that different results can be expected from manure of different sources. The poultry waste of the birds consuming the by-products diet produced a silage with a higher crude protein level (1.5% on dry matter basis) than the waste of the birds fed a corn-soya diet. Weight gain and feed efficiency for the by-products waste silage were numerically superior to the corn-soybean waste silage.

Utilizing fresh caged layer waste through the ensilage process would eliminate the ever increasing cost of drying the waste. Only fresh cage waste should be used to mix with chopped roughage to produce this type of silage. Fresh manure that has not gone through bacterial decomposition not only contains a higher amount of nitrogen (crude protein) but does not have the strong odor usually associated with this by-product.

Table 1. Compositions of the diets used to evaluate cage-layer waste as a feedstuff for ruminants

Ingredient	Control	Silage A	Silage B
Corn silage	91.77		
Soybean meal (44%)	7.95		
Manure-corn soybean diet		22.70	
by-products diet			22.70
Corn, ground		15.90	15.90
Hay, ground		15.90	15.90
Water		45.38	45.38
Dicalcium phosphate	0.04		
Ground limestone	0.18		
Trace mineral salt	0.04		
Salt (NaCl)		0.10	0.10
Vitamin A-D mix	0.02	0.02	0.02
Diet observations			
Crude protein, % dry matter	14.2	13.7	15.2
Dry matter, %	44.7	32.2	33.6
pH	3.7	4.0	4.3
Performance			
Weight gain, lb/day	0.35	0.22	0.26
Consumption, DM lb/day	2.80	2.20	2.40
Feed efficiency, gain/feed	0.12	0.10	0.11

ENSILED LAYER MANURE AND CHOPPED CORN PLANT FOR GROWING STEERS

Wayne Shannon, Jerry Lipsey and Joe Vandepopuliere

SUMMARY

Fresh layer manure was ensiled with chopped corn plant in a trench silo and fed to growing steers to evaluate its palatability and usefulness as a protein source. Sixty Hereford x Angus yearling steers were divided into four lots and received manure silage or corn silage ad libitum. Steers receiving corn silage were supplemented with a conventional protein-mineral premix. Chemical analyses indicated that the manure silage contained higher levels of nitrogen, calcium and phosphorus than the corn silage. Steers fed the manure silage mix showed greater dry matter consumption than the corn silage group; however, steers receiving corn silage plus supplement gained faster and more efficiently.

INTRODUCTION

Previous studies conducted at UMC have shown that the nitrogen in poultry waste is well utilized by rumen microorganisms and feeding dried poultry waste as a protein supplement to ruminants can be an economical step in both cattle feeding and recycling waste. Rising energy costs have increased the expense of drying poultry waste. Workers in Virginia have found that ensiling raw wastes kill pathogenic bacteria; therefore, we undertook this study to obtain information on methods of preparing the silage, storage, palatability and livestock response.

EXPERIMENTAL PROCEDURE

We obtained fresh layer manure from a large layer operation, and transported it back to the UMC South Farm by dump truck. We added the manure to corn silage so that the resulting mixture was about 25% manure (wet wt. basis). It was mixed and packed in a trench silo with a crawler and then covered with plastic.

Sixty 600 lb Hereford x Angus and reciprocal cross steers were randomly allotted into four pens. Two pens received manure silage and two received corn silage plus supplement. The trial started September 13 and lasted 52 days. Chemical analyses, feedlot performance, ration composition and feedlot performance are shown in Tables 1-3.

RESULTS AND DISCUSSION

The manure silage had a distinct, although not unpleasant, odor and pH of 5.26 compared to 4.16 for the corn silage. The steers readily consumed the manure silage (Table 2). Spoilage appeared to be normal for a trench silo.

Since poultry waste is a low energy feed component, we assume the manure silage provided less energy than the corn silage ration. The poorer gains of the manure silage fed cattle support this concept. To compensate for less available energy, the manure silage cattle consumed more dry matter per unit body weight than corn silage fed cattle (3.1% _vs_ 2.7%).

CONCLUSIONS

1. Fresh layer manure can be successfully ensiled and fed to steers without causing sickness.

2. Cattle will readily consume a manure silage.

3. Layer manure, when added to corn silage, will significantly increase the rations nitrogen, calcium and phosphorus content.

4. In this trial, performance of growing steers fed a manure silage mixed at approximately 25% manure (on a wet basis) was poorer than steers fed a supplemented corn silage ration.

Table 1. Chemical analyses of silages (dry basis)

Silage	% dry matter	% nitrogen	Calculated % protein	% calcium	% phosphorus
Manure silage mix	41.0	.72	10.98	1.88	0.59
Corn silage	38.0	.48	7.95	0.29	0.24

Table 2. Feedlot performance

	Manure silage steers	Corn silage steers
Weight on test	593	593.5
Weight off test	677	699
Average daily gain, lbs	1.62	2.03
Dry matter intake, lbs/gain, lbs	11.8	8.6
Dry matter intake, lbs	19.6	17.3

Table 3. Composition of rations

Ingredient	Manure silage ration % dry matter	Corn silage ration % dry matter
Manure silage mix	94.38	
Corn silage		87.95
Ground corn[1]	5.55	5.75
SBM (44%)		4.62
Urea		.83
Dicalcium phosphate		.48
Limestone		.30
Vitamin A	30,000 IU/hd/day	30,000 IU/hd/day
Rumensin[2]	300 mg/hd/day	300 mg/hd/day

[1]Ground corn was included in manure silage ration as a carrier for vitamin A and Rumensin.

[2]Rumensin courtesy of Elanco Products Company.

RUMENSIN FOR GRAZING CATTLE

Jerry Lipsey, David Bowman, Alfred Decker, Duane Sicht and Bud Reber

SUMMARY

Eighty crossbred steer calves were grazed 112 days at two University locations to test the effects of Rumensin on their performance and review the management considerations of using this feed additive in a salt limiting feeding program. At the UMC South Farm, we tested salt limit feeding Rumensin versus daily hand feeding, and we used salt limit fed corn as a reference. At the North Missouri Center, we tested salt limit fed corn versus corn and Rumensin but did not hand feed corn and Rumensin. Performance at both locations showed Rumensin increased ADG. Salt limit feeding requires management skill, especially when the desired grain intake is extremely low such as 1 lb/head/day. Rumensin has a "palatability factor" which tends to decrease ration intake, especially during damp weather. Careful management of salt concentration is required to keep intake at low levels and still obtain daily consumption. This may require a weekly change in salt concentration of the ration.

INTRODUCTION

Careful stocking rates, pasture fertilization, establishing legumes, implanting and feeding grain are common practices for Missouri producers who graze cattle. We are constantly searching for management techniques to improve the efficiency of cattle production. The feed additive Rumensin (sodium monensin) alters rumen metabolism and changes the action of rumen microorganisms so cattle can use feed more efficiently. Although Rumensin is used extensively in feedlots, the FDA has not yet cleared it for grazing cattle. On high forage feedlot rations, Rumensin has increased both feed efficiency and ADG by about 10%. Data indicates that this additive will increase gains of grazing cattle. We wanted to test its usefulness for grazing steers and look at the management considerations in using it in a salt limiting feeding program.

METHODS

We purchased 80 Hereford x Angus and reciprocal cross steer calves from local graded feeder calf sales. They were wormed, vaccinated and implanted. The lightest 32 steers were sent to the North Missouri Center (NMC) at Spickard and 48 remained at the UMC South Farm. These steers were randomly assigned to groups of 8 head. The trial started April 19 and continued 112 days. At UMC, 8 steers grazed 4 acre fescue pastures that had received 150 lbs of N per acre in March. At the NMC, each group of 8 grazed 10 acre pastures which had not received fertilizer. All cattle were limited to grain supplement at the rate of 1 lb/head/day by either hand feeding daily or adding salt to restrict intake. Treatment groups received Rumensin at 200 mg/head/day (Table 1). All groups were replicated in the trial.

RESULTS AND DISCUSSION

Performance data for the steers at the UMC and NMC are shown in Table 2. Overall, the NMC steers showed superior ADG to the UMC group. Since the NMC steers were lighter, they probably benefited from greater compensatory gains. In addition, the stocking rate at NMC was lower (8 steers/10 acres at NMC vs 8 steers/4 acres at UMC). Rumensin increased daily gains at both locations.

Since we were attempting to hold grain consumption to 1 lb/head/day, continual adjustment of added salt was required in the ration. Since we formulated the base ration at 3% trace mineral salt and 6% dical, little added salt was required early in the trial while the calves were adjusting to eating grain and the pasture was lush. We noted that the Rumensin supplemented steers exhibited typical ration rejection for about 7 days. This is apparently a combination of palatability and rumen metabolism changes. After about 20 days, we added 20 lbs of mixing salt to 100 lbs of the base ration to maintain intake at 1 lb. With only slight adjustments, the ration containing Rumensin stayed at this level throughout the trial; however, we continually increased the added salt to the ration without Rumensin. At 112 days we were adding nearly 30 lbs of mixing salt to the base ration to hold consumption at 1 lb.

We concluded from this study that producers who would like to use Rumensin for grazing cattle (if FDA clearance comes) should consider the costs of the carrier (corn in this case). Since daily consumption of Rumensin is recommended, extra labor input may be required. Salt limit feeding could reduce labor input; however, strict management is required to make such a program successful and profitable.

Table 1. Experimental rations for grazing cattle

Treatment	% Corn	% Dical	% TMS[a]	% Salt[b]	Rumensin
Corn and salt (ad lib)	79.1	5.2	2.6	13.0	------
Corn, salt and Rumensin (ad lib)	86.7	5.7	2.8	4.8	200 mg
Corn and Rumensin (hand fed)	91.0	6.0	3.0	----	200 mg

[a]Trace mineral salt.

[b]Salt used to limit feed consumption to 1 lb/head/day.

Table 2. Performance of grazing steers[a]

Treatment	On test	Off test	Total gain	ADG	Ration consumed daily/head	Corn consumed daily/head
Location: UMC						
Corn and salt[1]	495	580	85	.76	.95	.75
Corn, salt and Rumensin[1]	494	594	100	.89	.80	.69
Corn and Rumensin[2]	493	598	105	.94	1.00	.91
Location: NMC						
Corn and salt[1]	388	537	149	1.33	1.20	.99
Corn, salt and Rumensin[1]	382	573	191	1.70	1.25	.99

[a]Units in pounds.

[1]Fed *ad libitum*.

[2]Hand fed daily.

SUPPLEMENTAL SELENIUM FOR GROWING STEERS

Jerry Lipsey, Alfred Decker, Jim Berger and Duane Sicht

SUMMARY

Two groups of 8 Hereford x Angus steer calves grazed 4 acre fescue plots for 112 days the summer of 1977. Both groups received about one pound of corn per head per day; however, only one group received supplemental Selenium (Se). Steers supplemented with Se displayed increased average daily gain (ADG).

The same groups were moved into the feedlot at the end of the grazing trial and fed a high corn silage ration. The original group continued to receive supplemental Se. No differences in ADG were observed.

INTRODUCTION

It has been clearly established that Missouri soils are deficient in the trace mineral Selenium. Understandably, much of our forages and feed grains contain less than adequate amounts of Se. Other midwestern universities have demonstrated increased livestock performance through feeding supplemental Se. Presently, the FDA has not cleared Se as a trace mineral additive for ruminant rations. Most researchers feel that adequate ration levels of Se are about 0.10 ppm; however, since toxicity levels are only about 50 times the adequate levels, legal clearance has been slow. Recent information from the FDA indicates that they are strongly considering allowance of Se in ruminant supplements. We initiated this project to test the supplemental Se needs of steer calves grazing fescue pasture and fed a growing ration in the feedlot.

METHODS

We purchased 16 Hereford x Angus and reciprocal cross steer calves at local graded feeder calf sales. They were wormed, vaccinated, implanted and randomly assigned to two groups. The trial started April 19 and continued 112 days. Each group of 8 steers grazed 4 acre fescue pastures that had received 150 lbs of N per acre in March. We rotated the groups every 28 days in an attempt to decrease any pasture quality differences that may have existed. Both groups received grain supplement at the rate of 1 lb/head/day (Table 1); however, only one group received supplemental Se.

After the grazing trial, the same groups were moved into the feedlot and received a high corn silage ration (Table 2). The feedlot trial started September 12 and continued through January 9. The original group continued to receive supplemental Se.

RESULTS

Our data indicates that cattle grazing fescue pasture may show increased performance if they receive supplemental Se. Even though our cattle numbers were rather small to confidently conclude that increased performance should be expected, the percentage increase in ADG we observed in the grazing trial is extremely encouraging. Overall gains in the grazing trial were low, but the stocking rate was quite high.

Data from the feedlot phase of the trial indicates that supplemental Se was not effective in promoting increased growth. Apparently, the corn silage base ration, or the protein and mineral supplements we used contained adequate levels of Se. Also, the nonsupplemented steers may have been showing some compensatory gains.

Table 1. Rations for grazing steers[a]

Treatment	% corn	% dical	% TMS[b]	Selenium[c]
Control	91.0	6.0	3.0	----
Supplemented	91.0	6.0	3.0	.10 ppm

[a]Fed at 1 lb/hd/day.

[b]Trace Mineral Salt.

[c]Selenium in form of Na_2SeO_3 (Sodium Selenite) added to supply 0.10 ppm Se in estimated daily dry matter intake.

Table 2. Rations for feedlot steers[a]

Ingredient	Control	Supplemented
Corn silage %	87.95	87.95
Ground corn %	5.75	5.75
SBM (44%) %	4.62	4.62
Urea %	.83	.83
Dical %	.48	.48
Limestone %	.30	.30
Vitamin A	30,000 IU/hd/day	30,000 IU/hd/day
Selenium	-----	.10 ppm

[a]Dry matter basis, fed *ad libitum*.

Table 3. Performance of Selenium supplemented steers

Test period	Control	Supplemented
Grazing phase (112 days)		
Weight on test, lbs	492.0	494.0
Weight off test, lbs	571.3	591.9
Total gain, lbs	78.6	97.9
ADG, lbs	.70	.87
Feedlot phase (119 days)		
Weight on test, lbs	593.5	612.0
Weight off test, lbs	902.0	902.0
Total gain, lbs	308.5	290.0
ADG, lbs	2.59	2.44

THE PRODUCTION, CHARACTERISTICS AND UTILIZATION OF FORAGE-FED BEEF

Jerry Lipsey, Ron Morrow, Duane Sicht, Gerry Matches, Harold Hedrick, Bill Stringer, Bob Finley and Jim Rhodes

SUMMARY

For the next three years we will be reporting data from this project. This preliminary report deals primarily with the details of the experimental plan.

INTRODUCTION

In recent years there has been considerable discussion comparing forage fed beef and conventional grain fed beef. Increasing pressure upon use of grains for human consumption can be expected to require greater efficiency from the use of forages in future beef production. The large amounts of corn grain, corn silage, legumes and grasses produced in Missouri, makes it one of the ideal locations to study more efficient ways of producing and utilizing forages.

Not only increased biological (and consequent economic) demand for feed grains will exist, but the steady and often more apparent increase in energy costs of harvesting, storing and feeding grain make forage systems appear more competitive. From grazing to feedlots, all aspects of beef production are found in this state, and analyses of energy expenditures for these systems will be valuable to producers.

Finally, we must take a sincere interest in the final product. The beef produced in these systems must have eye appeal, as well as tenderness, juiciness and flavor to maintain the demand we need to make our cattle industry profitable. The following is a list of the objectives for this project:

1. Evaluate pastures containing grass or a combination of grass:legume in terms of cattle gains and composition and to define plant-animal relationships.

2. Measure the rate, composition and efficiency of cattle gains using production systems which vary in the amount of total body weight gain produced on pasture, corn silage or corn grain.

3. Evaluate energy input requirement of seven beef production systems differing widely in the substitutions of replenishable energy requirements (photosynthesis source) and non-replenishable energy requirements (fossil fuel, fertilizer) under differing price-cost relationships.

4. Determine if the beef produced under the above systems has the characteristics acceptable to the consumer and industry.

METHODS

Seven systems for growing and finishing beef cattle from weaning to slaughter weight were selected to provide variation in grain inputs and non-replenishable (fuels and fertilizer) energy inputs. Basic corn grain-corn silage systems commonly used in the corn belt are being compared to systems making optimal use of pasture and roughages utilizing legumes to reduce fertilizer requirements and harvesting with animals to decrease fossil fuel requirements. These systems we selected to study should provide a basis to determine the minimal amounts of grain needed to produce acceptable beef.

The cattle selected for this project are Hereford x Angus and reciprocal cross steers. They were chosen to represent a large supply of feeder cattle with the growth potential, slaughter size endpoint and meat quality which Missouri cattle feeders commonly produce. These steer calves are obtained from Missouri producers about mid October weighing 400-500 pounds. We attempt to select steers as uniform in weight, frame and condition as possible. They are wormed, vaccinated, poured for warbles and lice, implanted, tagged, branded and analyzed for body composition with the ^{40}K Whole Body Counter. The steers are assigned to treatments by blocking so that the on test treatment group means for weight, frame and percent body fat are nearly equal.

The systems are outlined in Table 1. Steers in systems 1-3 go directly to the feedlot and receive an all corn silage ration until they reach 800 lbs. System 1 cattle are then slaughtered and system 2 and 3 are changed to a high energy finishing ration (*ad lib* shelled corn + 10 lbs corn silage per head + prot supp). System 2 and 3 steers are slaughtered at 950 and 1050 lbs respectively. All the other systems are wintered together. About April 15, they go on to the grazing phase. The pasture variables are forage type (fescue, fescue-red clover and fescue-trefoil) and fertilization rates (fescue legume pastures receive no nitrogen).

After they have gained 100 lbs, steers pasturing at the UMC South Farm (fescue and fescue-red clover, systems 4A, 4B, 5A and 5B) are given access to ground corn (self feeder). Steers at the Bradford Agronomy Research Center (systems 6A, 6B, 6C, 7A, 7B and 7C) graze until September 15. System 6 cattle go to slaughter directly off pasture and system 7 cattle are moved to the UMC Feedlot. They are finished on the same high energy ration as systems 2 and 3.

All growth performance and carcass grade information is collected as well as feed intake data. Detailed pasture data is collected which includes stocking rates, and measurements of forage availability, quality and residue. Steaks and roasts are removed from carcasses produced in all systems and slaughter endpoints. Complete palatability studies are conducted with the steaks and roasts as well as evaluating storage and cooking characteristics.

Table 1. Production systems for forage-fed beef study[a]

System	Phase	Location	Treatment description	Starting wt	Expected gain wt	Slaughter wt
1	finishing	UMC Feedlot	corn silage + prot supp	400-500	300-400	800
2	finishing	UMC Feedlot	corn silage + prot supp	400-500	300-400	---
	finishing	UMC Feedlot	shelled corn + corn silage + prot supp	800	150	950
3	finishing	UMC Feedlot	corn silage + prot supp	400-500	300-400	---
	finishing	UMC Feedlot	shelled corn + corn silage + prot supp	800	250	1050
4A	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
	grazing	UMC South Farm	fescue pasture	550-650	100	---
	finishing	UMC South Farm	fescue pasture + ground corn	650-750	200-300	950
4B	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
	grazing	UMC South Farm	fescue pasture	550-650	100	---
	finishing	UMC South Farm	fescue pasture + ground corn	650-750	300-350	1050
5A	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
	grazing	UMC South Farm	fescue-red clover pasture	550-650	100	---
	finishing	UMC South Farm	fescue-red clover pasture + ground corn	650-750	200-300	950
5B	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
	grazing	UMC South Farm	fescue-red clover pasture	550-650	100	---
	finishing	UMC South Farm	fescue-red clover pasture + ground corn	650-750	300-350	1050

Table 1. (continued)

System	Phase	Location	Treatment description	Starting wt	Expected gain wt	Slaughter wt
6A	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
	grazing	Bradford	fescue pasture	550-650	150-250	800
6B	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
	grazing	Bradford	fescue-red clover pasture	550-650	150-250	800
6C	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
	grazing	Bradford	fescue-trefoil pasture	550-650	150-250	800
7A	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
	grazing	Bradford	fescue pasture	550-650	150-250	---
	finishing	UMC Feedlot	shelled corn + corn silage + prot supp	700-800	250-350	1050
7B	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
	grazing	Bradford	fescue-red clover pasture	550-650	150-250	---
	finishing	UMC Feedlot	shelled corn + corn silage + prot supp	700-800	250-350	1050
7C	wintering	Bradford	stockpiled pasture + hay + grain and prot supp (if needed)	400-500	100-150	---
	grazing	Bradford	fescue-trefoil pasture	550-650	150-250	---
	finishing	UMC Feedlot	shelled corn + corn silage + prot supp	700-800	250-350	1050

[a]Each system includes 9 head per year.

EFFECT OF DIFFERENT LEVELS OF ENERGY INTAKE ON BULL GROWTH AND REPRODUCTIVE TRAITS

Jack Breuer, John Lasley, Ron Morrow and Alfred Decker

SUMMARY

Thirty-three bulls were fed for 140 days on two different energy level rations. The bulls on the higher energy ration gained 1.6 lbs more per day, had more skeletal development with larger loin eye areas, larger scrotal circumference, more backfat and a higher percent total body fat composition than bulls on the low energy intake. The semen characteristics evaluated were not significantly different between treatments.

INTRODUCTION

The effect of high energy intake in bulls to measure their genetic potential to convert feedstuff to meat upon subsequent reproductive performance should be and is of extreme importance to the beef producer. The objective of this trial was to determine the effects of two energy intake levels on bull growth and reproductive traits.

PROCEDURE

Thirty-three UMC purebred bulls, 9 Simmental and 24 Angus, were stratified into 4 pens in each of two treatments. One treatment was the ration fed at the UMC Bull Test Station (refer to Beef Cattle Testing article) and the other animals were allowed to eat corn silage *ad libitum* with 1 lb of supplemental protein added per head per day. The animals were fed for 140 days and then evaluated for growth as well as reproductive potential.

RESULTS

The means for the traits measured are presented in Table 1. At least 30 bulls are represented in each mean. The off test weight and average daily gain reflect the 1.6 lb advantage the bulls on the concentrate ration exhibited. Although the means for wither height, hip height, fat free body, backfat, loin eye area and scrotal circumference do not appear to be that different, they were consistently exhibited in this fashion within the respective treatments and therefore were significantly different due to treatment. In contrast, live sperm cells, motility and total abnormal sperm cells would appear to be more different. However, these traits were not as consistent in expression within treatment and therefore were found to be not statistically different, even though the mean trend would favor the low energy intake group with respect to sperm cell characteristics.

Table 1. Means[1] of reproductive and growth traits

	Silage	Concentrate Ration
Off test weight (lbs)	933[a]	1157[b]
Average daily gain on test (lbs)	2.56[a]	4.16[b]
Wither height (inches)	46.1[a]	47.2[b]
Hip height (inches)	47.5[a]	48.5[b]
Fat free body (%)	73.2[a]	70.3[b]
Scanogram backfat (in)	.16[a]	.37[b]
Scanogram LEA (sq in)	11.10[a]	13.62[b]
Final scrotal circumference (cm)	32.1[a]	34.8[b]
Live sperm cells (%)	63.5[a] (26.18)	53.7[a] (25.78)
Motility scale (1-4)	3.08[a] (1.17)	2.62[a] (1.15)
Total abnormal sperm (%)	30.52[a] (32.19)	33.8[a] (30.46)

[1]Means for each trait with different superscripts are significant different. Standard deviations are shown within parenthesis.

BEEF CATTLE TESTING
UNIVERSITY-OPERATED STATIONS

John Massey, Alfred Decker and Bub Reber

INTRODUCTION

The Missouri beef cattle testing stations are operated on a self-supporting basis, nonprofit, and accessible to all breeders in the state. Assignment is made on an animal-breeder lottery basis at the Central Testing Station, Columbia, Missouri, and a pen-breeder basis at the North Missouri Center, Spickard, Missouri.

The rules and rations for test station entries are given in this report. Application forms are available from the local University Extension Center.

PROCEDURE

The Central Testing Station was made available to breeders for testing beef cattle through state appropriated funds. The present facilities were erected in 1961.

The Missouri Beef Cattle Improvement Association purchased two electronic devices (Pinpointers) for measuring individual feed efficiency of beef bulls. The first of these was purchased in the summer of 1976, and the second, the summer of 1977.

Two tests are conducted annually at the university-operated test stations. Requirements for consignment and testing follow:

1. Cattle must be eligible for registry in a beef breed association recognized by national records association. The registration certificate or recordation record must be executed if entry is questioned before cattle are off test.

2. If space is limited, herds enrolled in the Missouri Beef Cattle Improvement Program will have preference. Weighing must be supervised by a livestock specialist or someone he appoints. If entries exceed space available, assignment will be made by consignor and animal at Columbia, and by pen at Spickard.

3. Calf must have an adjusted 205-day weaning weight ratio of 90 percent or better. The weaning weight ratio is computed by taking the herd average adjusted 205-day weaning weight for male calves and dividing it into the individual calf's adjusted 205-day weaning weight. The herd Plan A form must accompany calf health record when animals are delivered to the station or complete the entry form AHE No. 12 11/75.

4. Dates of Tests: Spring test will begin in May. Fall test will begin in November.

5. Delivery of Calves: Calves will be delivered to the station between the hours of 8:00 a.m. and 4:00 p.m. on three specified days the first part of November and the first part of May. No exceptions will be made on hours of delivery and announced days of arrival.

6. Age of Cattle: Birth date limits are as follows:

Fall test--calves born February 15 to May 15.
Spring test--calves born August 15 to November 15.

7. Application for Entry must be submitted by September 15 for the fall test, and March 15 for the spring test. These are to be mailed to R. K. Leavitt, 125 Mumford Hall, University of Missouri, Columbia, MO 65211.

Application Forms are available from the area livestock specialists in care of the local University Extension Center or by writing Mr. Leavitt.

8. Fees should accompany application and will be accepted 45 to 90 days prior to start of test. Make checks payable to University of Missouri.

North Missouri Center: Fee is $225 per lot with one pen allotted to each consignor, selected on a lottery system. If space is available additional entries from each cosignor will be allotted by drawing.

Central Testing Station, Columbia: Fee is $25 per head to accompany application, plus 10 cents/day/head payable at close of test. One to ten head are accepted. When the number of entries exceeds the available space acceptance is determined by lottery.

If entry is not delivered, the fee shall be forfeited. If entry is not accepted by the station, the entry fee will be returned.

Out-of-state applications and fees will be accepted if space is available and allotted within 30 to 0 days before start of test.

9. Entries

North Missouri Center: Preference will be given to calves by a single sire.

a. Minimum of 8 bull calves and maximum of 12 calves per pen, all sired by one bull.
b. Pens of 8 bulls or more will have first preference.
c. Minimum of 5 bull calves least number to be accepted.

Central Testing Station: One to ten head per entry are acceptable, and may consist of more than one sire, but all horned entries must be dehorned and healed unless breeder's animals have been assigned to a horned pen.

Steers may be fed with bulls as a sire group, but with no adjustment for sex on postweaning data. The 365-day weight, however, will show a plus 5 percent for sex adjustment on steers for 205-day adjusted weight.

Data Form AHE No. 12 11/75 must be completed and given to station superintendent when cattle are delivered to the station.

10. The entry fee is charged to pay for the depreciation of facilities and to pay all cost of testing except the cost of feed, bedding, veterinary charges, labor for treating sick animals, and data processing.

11. Feed and veterinary charges will be paid one month in advance, at the rate of $50 per head per month. (This figure could fluctuate with anticipated costs.) Final adjustment, plus or minus advance payments will be made before cattle are released from the station. There will be an interest charge of 1½ percent on all accounts over 60 days, maximum annual rate of 12 percent.

12. Animal Health rules and treatment are the responsibility of the College of Veterinary Medicine, University of Missouri-Columbia. All cattle must have health certificate by accredited veterinarian within 30 days upon arrival at and departure from the station. Health data should include:

a. Tests for tuberculosis, Bang's disease, and anaplasmosis.
b. Vaccinations which are mandatory before arrival at the station are: five strains of leptospirosis, blackleg, and malignant edema.
c. Vaccinations which are optional before arrival at the station are: BVD (bovine virus diarrhea) and IBR (infectious bovine rhinotracheitis). The health paper (AHE No. 12 11/75) should indicate if the vaccinations have been given and the date given.

Parasite control:

a. External parasites--All animals entering the station may be sprayed with a parasiticide prior to being placed in the testing pens.
b. Internal parasites--Composite fecal samples will be collected and examined for presence of internal parasites, and treatment administered if necessary.

Admission hours will be strictly adhered to so personnel will be present to handle routine health procedures.

13. The test for any bull may be terminated if station veterinarian decides it is too ill to continue the test.

14. Feeding. Calves will be self-fed by sire groups or pen. There are two pinpointers to give individual feed efficiency on each animal at an additional fee.

15. Ration

a. The break-in ration will contain 60 percent concentrate plus long hay *ad libitum*.

b. The test ration will contain 80 percent concentrate and will be self-fed *ad libitum*. The roughage portion of the ration will contain cobs or hulls.

Ration sheet is attached.

16. Cattle will be given a break-in period of approximately 28 days before beginning the official 140-day feeding test.

17. Two weights will be taken on and off test and averaged on alternate days.

Start test: $\frac{0 + 2}{2}$ = day-one on-test weight.

End test: $\frac{139 + 141}{2}$ = 140-day weight

Cattle will be weighed full on and off test.

18. Record will be reported to consignor after each 28-day weigh period according to the schedule in rule 19.

a. All records will be summarized and published for public use at end of test.

b. All data and information collected shall be available to the University of Missouri for research purposes.

19. Data will be collected and computer printouts mailed to breeders each 28 days while animals are on test. A final printout will be mailed giving the 140-day gain, 160-day postweaning gain, 365-day adjusted yearling weight, and the ratios within group, breed and station.

20. The cost of the test is tentative and must be self-supporting. Therefore adjustments will be made at end of test based on actual cost.

21. Insurance of animals is to be provided by the consignor.

22. Breeders have three days after the close of the test to pick up their animals. All monthly installments must be paid before animal will be released. The University of Missouri has the authority to sell the bull or animals to recover testing expense if left at station past four days.

Rations for Progeny Testing

Ration #1 (40% Roughage)

	Lbs	C.P.	TDN	Ca	P
Shelled corn	745	66.3	596.0	0.15	2.31
Soybean meal	325	147.9	248.0	0.98	2.08
Molasses	110	3.3	59.3	0.90	0.09
Alfalfa meal (13%)	150	21.5	74.5	2.07	0.43
Cottonseed hulls	650	23.3	222.2	0.87	0.54
Limestone	6	-	-	2.00	-
Dicalcium phosphate	4	-	-	1.06	0.82
Trace mineral salt	10	-	-	-	-
Total	2,000	262.3	1,200.0	8.03	6.27
Percent		13.12	60.0	0.40	0.31

Ration #2 (20% Roughage)

	Lbs	C.P.	TDN	Ca	P
Shelled corn	1,245	110.8	996.0	0.25	3.86
Soybean meal	270	112.9	206.0	0.81	1.73
Molasses	60	1.8	32.3	-	-
Alfalfa meal (13%)	100	14.3	49.7	1.38	0.29
Cottonseed hulls	300	11.6	111.0	0.43	0.27
Limestone	15	-	-	5.08	-
Trace mineral salt	10	-	-	-	-
Total	2,000	251.4	1,395.00	7.95	6.15
Percent		12.57	69.8	0.397	0.30

Vitamin A, 1,500 I.U./lb feed; antibiotics, 3.5 mg/lb feed.

Feeding Recommendations

1. First day--full feed of hay plus 2 lbs of concentrate.

2. Increase concentrate (grain and protein supplement) to 1 lb/100 lbs body weight in 10 to 14 days with long hay free choice.

3. When cattle are eating 1 lb/cwt body weight, place on self-feeder filled with 40 percent roughage ration (Ration #1), with long hay fed free choice.

4. When official test begins, change to 20 percent roughage ration in self-feeder and remove long hay.

5. Feed Aureo S-700 for first 28 days of break-in period.

RESULTS

Since November, 1970, there have been 211 breeders who have tested the progeny of 398 sires.

The average performance (140 days on feed) from Fall, 1975, through Fall, 1977, is shown by breeds, seasons and locations, in the following table:

		Central Testing Station Columbia				North Missouri Center Spickard	
		Regular		Pinpointer		Regular	
Year	Season	N	ADG	N	ADG	N	ADG
ANGUS BULLS							
1975	Fall	44	3.37	-	-	49	3.35
1976	Spring	20	3.24	-	-	-	-
1976	Fall	58	3.44	5	2.97	40	3.35
1977	Spring	30	3.34	6	3.38	-	-
1977	Fall	61	3.26	16	3.04	64	3.32
Av.		186	3.38	27	3.10	153	3.34
BRANGUS BULLS							
1976	Spring	3	3.35				
1976	Fall	4	3.00				
1977	Fall	7	2.77				
Av.		14	2.96				
CHAROLAIS BULLS							
1975	Fall	1	3.99				
1976	Spring	9	4.10				
1976	Fall	3	3.20	2	2.76		
Av.		11	4.09	2	2.76		

		Central Testing Station Columbia				North Missouri Center Spickard	
		Regular		Pinpointer		Regular	
Year	Season	N	ADG	N	ADG	N	ADG
CHIANINA BULLS							
1975	Fall	2	3.14				
Av.		2	3.14				
HEREFORD BULLS (HORNED)							
1975	Fall					19	3.26
1976	Spring	1	2.91				
1977	Fall	12	3.37				
Av.		13	3.33			19	3.26
HEREFORD BULLS (POLLED)							
1975	Fall	19	3.20			7	3.39
1976	Spring	4	3.54				
1976	Fall	30	3.52	4	3.54	42	3.26
1977	Spring	13	3.05	3	3.09		
1977	Fall	29	3.41	6	3.12	39	3.37
Av.		82	3.38	13	3.24	88	3.32
LIMOUSIN BULLS							
1976	Fall					12	3.53
Av.						12	3.53
RED ANGUS BULLS							
1975	Fall	3	2.83				
1976	Fall	1	3.56				
1977	Spring	3	3.27	2	3.61		
1977	Fall	2	3.31	2	3.31		
Av.		5	2.93	4	3.46		

		Central Testing Station Columbia				North Missouri Center Spickard	
		Regular		Pinpointer		Regular	
Year	Season	N	ADG	N	ADG	N	ADG
SANTA GERTRUDIS BULLS							
1975	Fall	7	3.14				
1976	Fall	5	2.66				
1977	Fall	2	3.52				
Av.		14	3.02				
SHORTHORN BULLS							
1975	Fall					20	3.34
1976	Spring	8	3.53				
1976	Fall	5	3.24			12	3.16
1977	Fall	11	3.26	1	3.40	6	3.48
Av.		23	3.34	1	3.40	38	3.31
SIMMENTAL BULLS							
1975	Fall	3	3.36				
1976	Spring	1	3.76				
1976	Fall	15	3.66	2	3.38		
1977	Spring	5	3.48	3	3.20		
1977	Fall	11	3.72	3	3.78		
Av.		27	3.68	8	3.46		

BREED PERFORMANCE TRENDS AND PRICE-PERFORMANCE RELATIONSHIP IN 13 YEARS OF MISSOURI TESTED BULL SALES

Dave Danker, Mark Ellersieck, John Massey and John Lasley

SUMMARY

Sale price has increased significantly during the time period studied. The determination of the amount of this increase due to increased demand, as opposed to simple inflation of price, was beyond the scope of this study as was the effect of breeder reputation on sale price. Seasonal variation in sale price is significant and is most probably related to supply and demand interactions. Breed effects on sale price are minimal and basically related to the current popularity of the breed.

The performance:price relationship is significant. Performance trends of bulls tested in this program illustrate the effectiveness of the testing in increasing red meat production. However, it appears that the discrimination of the bull buyers, in general, has not kept pace with the innovations of the performance testing program.

INTRODUCTION

Sale Price Relationships

During the period 1963-1975 sale prices have increased significantly. Inflation may have been a key factor in this price increase; however, an increasing awareness of the value of performance testing has caused demand for tested bulls to rise rapidly.

Based on sale price, buyers have shown a significant preference for Polled Hereford bulls.

Sale price was significantly correlated with sale day grade, sale day weight, 365-day weight, and yearling conformation grade. Sale day grade was by far the most important factor in sale price variation ($r^2 = 0.33$). On the average, buyers paid $293.38 for each increment increase in sale day grade.

Season affected sale price significantly. Bulls sold in the spring sales averaged $150 more per head than those sold in fall sales.

Sale day weight accounted for 9 percent of the sale price variation. Three hundred sixty-five day weight was responsible for 2 percent of the sale price variation and yearling conformation grade accounted for the remaining 1 percent of the sale price variance explained in this study.

Breed Frequency Trends

Angus and Polled Herefords have rapidly increased in the number of bulls tested and sold and in the number of breeders participating in the sale. Hereford numbers have fluctuated slightly, but have failed to keep pace with the Angus or Polled Herefords. Mean prices have increased in all breeds, although less for Herefords than for the Angus or Polled Herefords.

RESULTS

Performance Trends

Adjusted 205-day weight, postweaning average daily gain, and adjusted 365-day weight have all increased significantly over the years. Yearling weight has increased 1.3 percent compounded annually.

Longissimus dorsi area measurements have not increased significantly, considering all breeds measured. However, Anugs bulls have produced significantly ($P < .05$) larger longissimus dorsi area measurements.

Five hundred forty-day adjusted fat free body and percent fat free body have increased significantly ($P < .01$).

Yearly conformation grade and sale day grade have improved significantly, from a mean of "B-" to a mean grade of "B" in both traits.

Sale day backfat has decreased significantly ($P < .01$), and sale day weight has varied between years. However, no trend has developed.

A significant ($P < .01$) breed difference was observed in sale day weight.

Weaning Weights

Weaning weight of sale bulls has improved significantly ($P < .01$) over the time period studied (Figure 1). Average adjusted 205-day weight has improved from 511.7 lbs in 1963 to 596.0 lbs in 1975. Weaning weight was lowly correlated with sale price ($r = 0.19$, $P < .01$). However, adjusted 205 day weight was not a factor in sale price variation. Due to the moderate heritability of weaning weight one would expect both heredity and environment to be important factors affecting this trait.

This hypothesis was supported in this study when significant ($P < .01$) breed, year, season, and breed x year interactions were found. Hereford bulls were heaviest at 205 days, followed by Polled Hereford, and Angus. Mean adjusted 205-day weights were 583.6, 577.1, and 556.5 lbs, respectively.

Bulls sold through the spring sales, which primarily would have been weaned the previous spring, had a mean adjusted 205-day weight of 567.2 lbs compared to a mean weight of 580.8 lbs for those bulls sold in the fall sales.

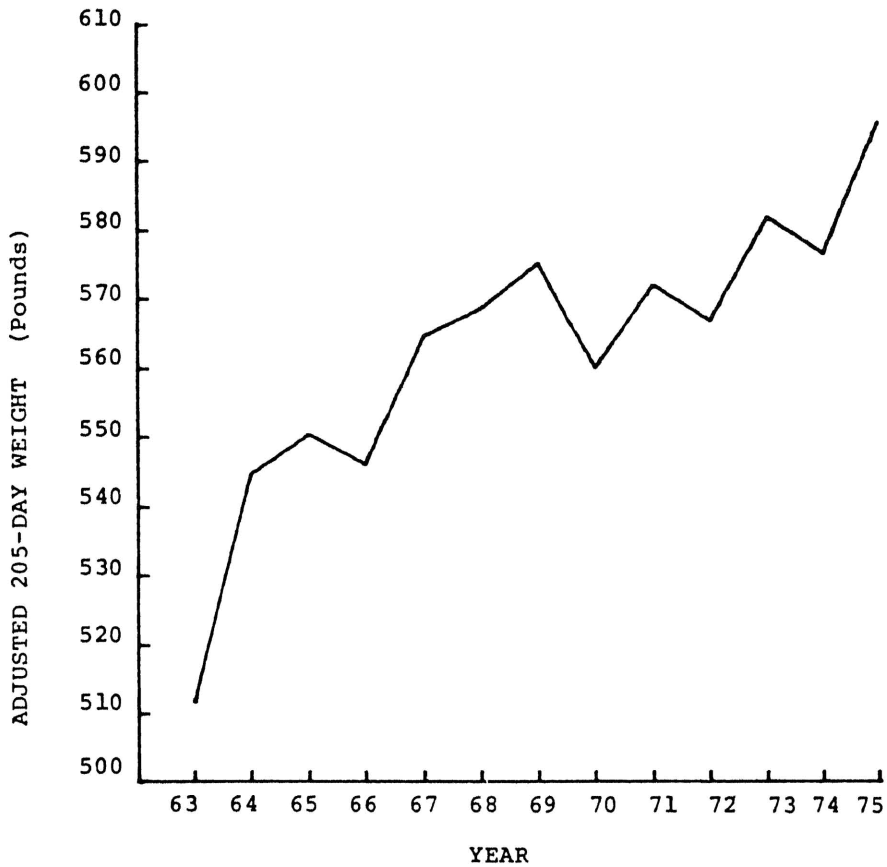

Figure 1. Adjusted 205-day Weight By Year. (Regression of adjusted 205-day weight on year was significant.)

Postweaning Average Daily Gain

Average daily gain was significantly (P < .01) affected by breed, year, season, and breed x year interactions. Angus bulls recorded the highest average daily gains, followed by Polled Herefords and Herefords. Mean average daily gains were 3.03, 2.94, and 2.71 lbs per day, respectively. Average daily gains have improved significantly (P < .01) from a mean of 2.64 lbs per day in 1963 to a mean of 3.16 lbs per day in 1975 (Figure 2).

Seasonal effects were significant (P < .01). Bulls sold in the spring sale had a mean average daily gain of 3.07 lbs per day and bulls sold in the fall sale had a mean average daily gain of 2.98 lbs per day. A portion of this variation in average daily gain most probably was due to thermal stress. Bulls sold in the fall sales began their 140-day test in May and were tested through the summer, while bulls sold in the spring sales began their test period in November.

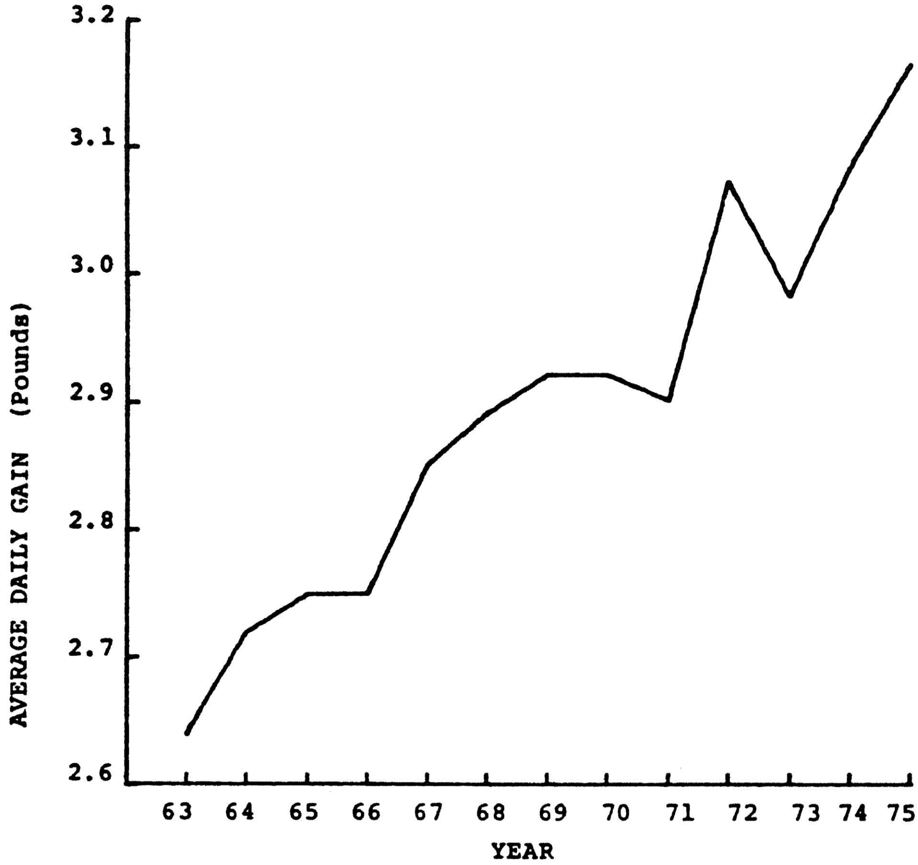

Figure 2. Postweaning Average Daily Gain By Year. (Regression of average daily gain on year was significant.)

Yearling Weight

Adjusted 365-day weight was significantly (P < .01) affected by breed, year, and breed x year interactions. Polled Hereford bulls were the heaviest at 365 days, followed by Angus and Herefords. Mean adjusted 365-day weights were 1,044.2, 1,036.5, and 1,009.4 lbs respectively. Mean adjusted 356-day weights have improved significantly (P < .01) from 901.3 lbs in 1963 to 1,099.7 lbs in 1975 (Figure 3).

Percent Fat Free Body

Adjusted 540-day fat free body has increased significantly (P < .01) over the time period 1971-1975. From 1972-1975, FFB weights increased from 813.7 to 876.5 lbs.

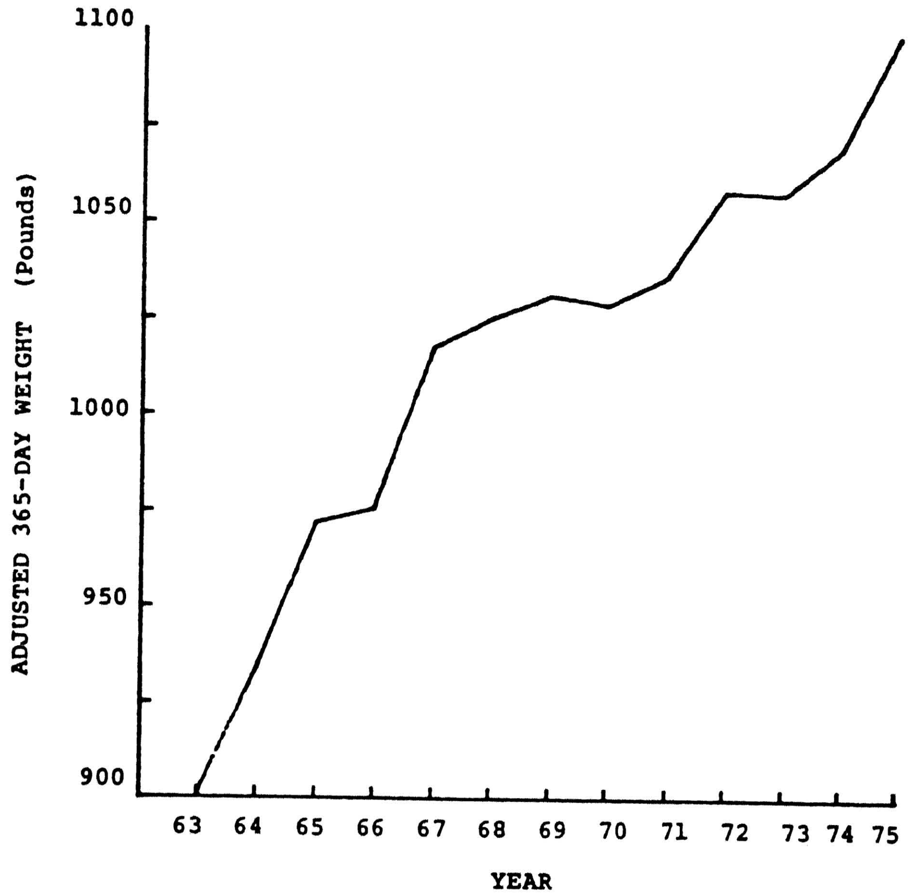

Figure 3. Adjusted 365-day Weight By Year. (Regression of 365-day weight on year was significant.)

Percent Fat Free Body (continued)

There was not a significant difference between breeds in pounds of fat free body. However, percent fat free body did show a significant ($P < .01$) breed effect. Angus bulls were significantly meatier than Herefords or Polled Herefords according to the ^{40}K evaluations. Mean fat free body percentages were 70.5, 69.5, and 68.8, respectively.

Adjusted 540-day fat free body was lowly correlated with sale price ($r = 0.09$, $P < .05$) but did not cause significant variation in sale price.

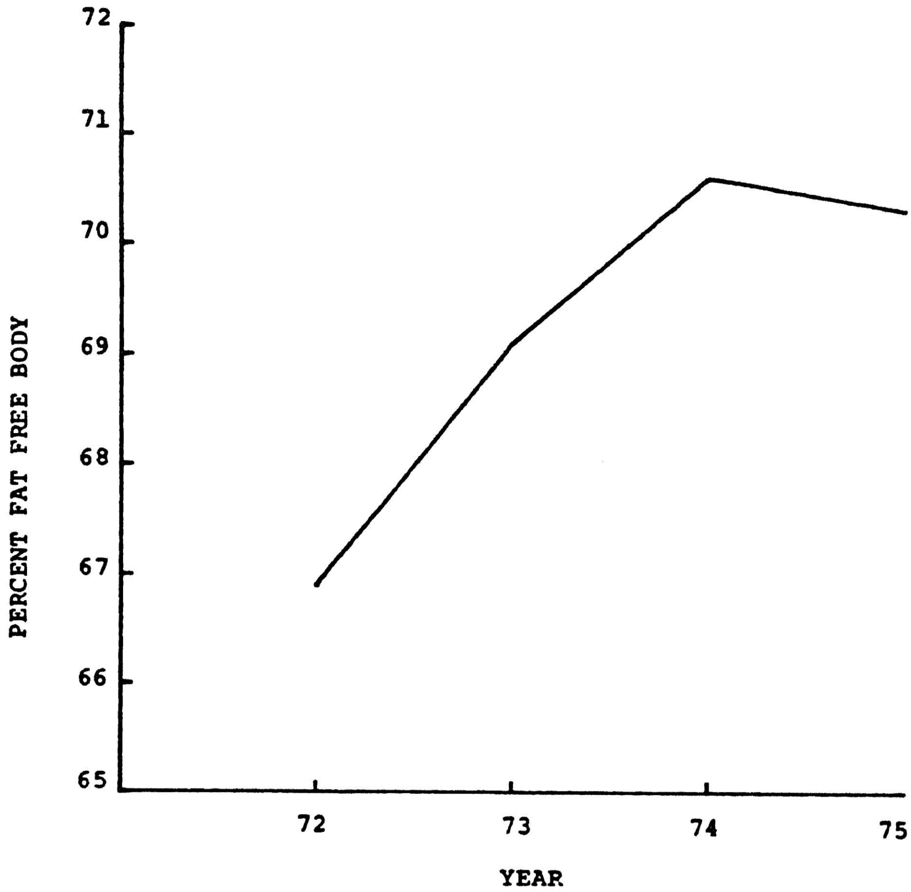

Figure 4. Percent Fat Free Body By Year. (Regression of percent fat free body on year was significant.)

Sale Day Backfat

Sale day backfat was significantly ($P < .01$) affected by breed, year, and season. Angus bulls carried the least backfat on sale day compared to Herefords and Polled Herefords. Mean sale day backfat measurements were 0.34, 0.40 and 0.42, respectively. Sale day backfat measurements have decreased from a mean backfat measurement of 0.48 inches in 1971 to a mean of 0.31 inches in 1975 (Figure 5).

Seasonal effects on sale day backfat measurements were significant ($P < .01$). Bulls in the spring sales carried 0.41 inches of backfat compared to 0.34 inches of backfat for bulls sold in the fall. Possibly some of the increased gain observed in the spring sale bulls was reflected in their increased backfat thickness. However, the fact that spring sale bulls had just finished a winter grain feeding period while many fall sale bulls had been recently taken off grass, seems to be a more plausible cause.

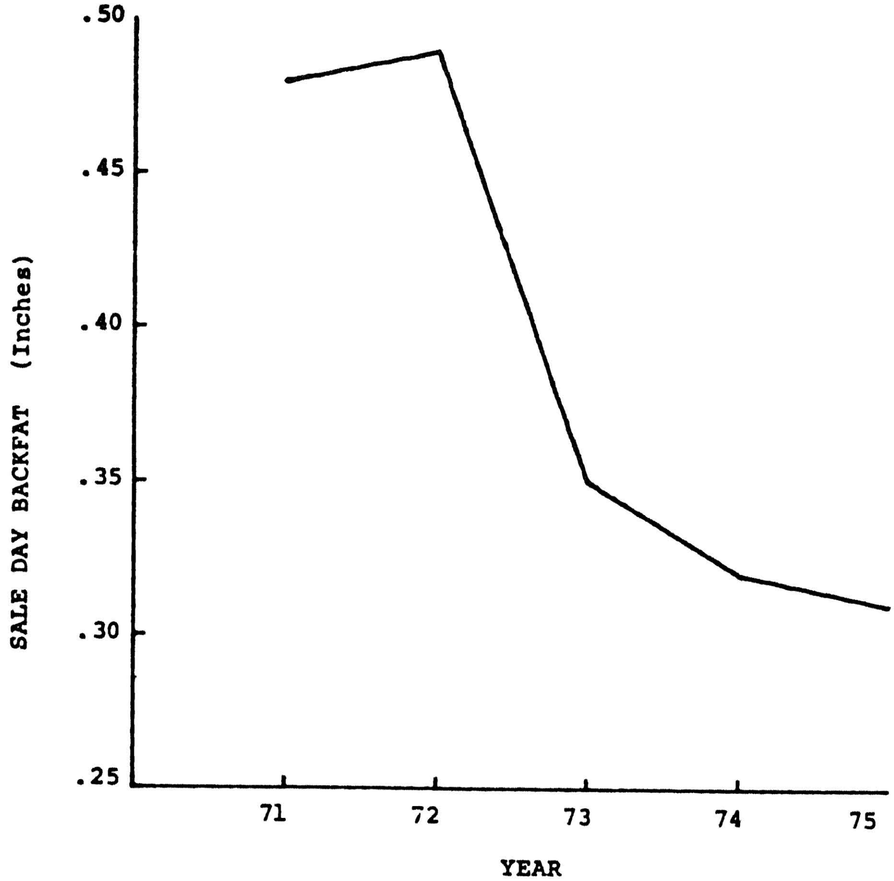

Figure 5. Sale Day Backfat By Year. (Regression of sale day backfat on year was significant.)

Sale Day Height

Sale day height was significantly ($P < .01$) affected by breed and year. Breed differences were significant but slight. Polled Hereford bulls had higher average sale day heights than Hereford or Angus. Mean sale day heights were 48.0, 47.9, and 47.8 inches, respectively. Mean sale day heights have increased significantly from 47.0 inches in 1972 to 49.1 inches in 1975. (Figure 6).

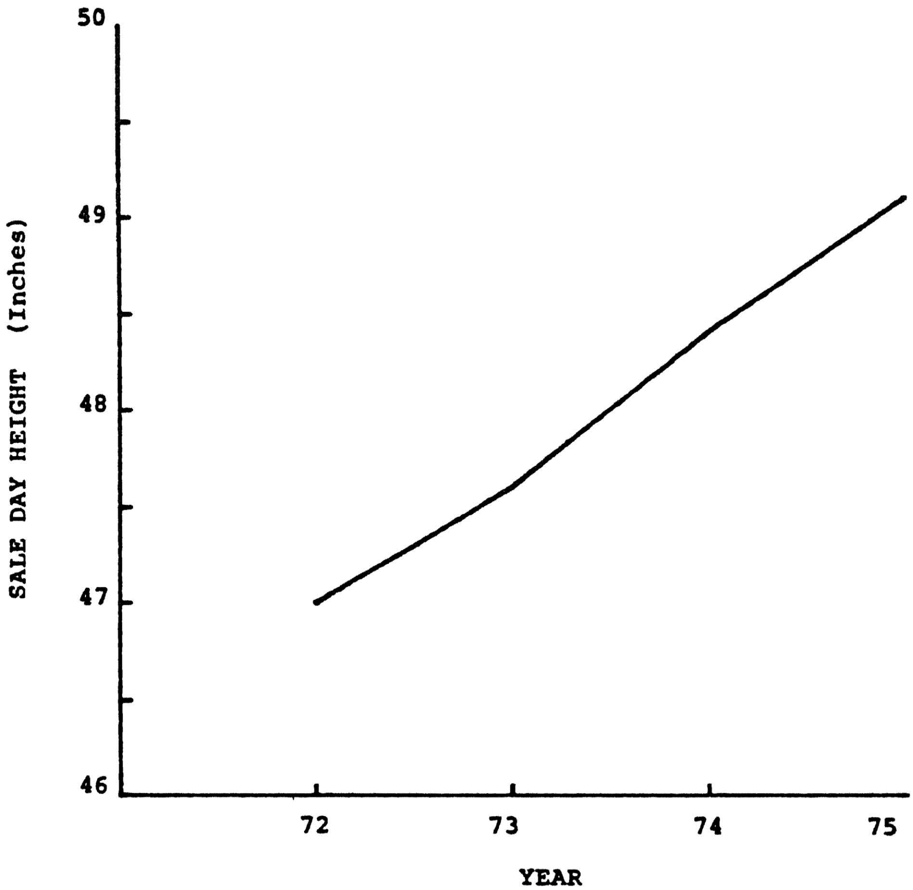

Figure 6. Sale Day Height (Adjusted to 540 Days) by Year. (Regression of sale day height on year was significant.)

Further data relating to 205-day adjusted weight, postweaning average daily gain, adjusted 365-day weight, percent fat free body, sale day backfat, and sale day height may be found in the appendix tables of the Missouri Agricultural Experiment Station Research Bulletin 1017.

VALUE OF OBJECTIVE MEASUREMENTS IN SELECTING FOR WEIGHT AND HEIGHT

John Massey

INTRODUCTION

The genetic improvement of beef cattle is very slow compared with swine because of birth rate, sex ratio, generation interval, heritability of economic traits, and number of traits selected.

Growth rate as defined by average daily gain or weight for day of age is the most important individual trait to select for in beef cattle. The industry, however, has specification end points for the desired product or carcass weight and quality. The research data show that if animals are slaughtered at the same physiological or composition end point, efficiency is the same regardless of size or frame. If the purpose is to breed specification cattle; for example, 1,100 lbs, low choice live weight; then all sizes or types of cattle will not give maximum efficiency in the industry.

The three variables in a 700 lb carcass from a 1,100 lb steer are muscle, bone, and fat, all of which are measured as carcass weight per day of age and highly heritable. In order to get this specification in a steer that will produce the 700 lb carcass with optimum efficiency, we will need to look at skeletal size and fat along with muscle, all of which will make up gain in a selection program.

We can produce this animal with different breed combinations or sizes of cattle within a breed; but when you make unequal size parental matings, expect some loss in either reproductive efficiency or production efficiency. There is nothing free that I know of in the cattle business except heterosis.

RESULTS

Missouri uses frame size (height at shoulder) to characterize or describe cattle. If you have evaluated two bulls that weigh 1,200 lbs at 12 months of age and find one 43 inches tall and the other 47 inches tall at the shoulder, their composition will be considerably different in most cases. The short bull will be fat and the tall bull will be trim.

We are not inferring that bigger or taller is better for either weight or height, but they can both be objectively measured. Since the traits are fifty percent heritable they will respond to selection pressure. The individual breeder needs to evaluate his herd and if he wishes to make a change in either trait he can do it with a high degree of predictability. Based on past data and experience the 1,100 lb steer can be produced from a combined parent weight of 2,700 to 2,800 lbs. If you select for a difference of 1 to 1.6 or 1.7 between the female and male parents you will be changing your base population if replacements are kept from within the herd. If you deviate from this ratio you can expect to change in either reproduction or production efficiency.

Table 1. Postweaning heifer height adjustments for herd or management group for average daily gain.

Compute Group Postweaning ADG and Adjust Each Calf on Basis of Group Average	Adjustment Factor Per Day to Adjust Height to 160 Days Postweaning Period	Adjustment Coefficient to Adjust Postweaning 160-Day Ht to 1.2 lbs Average Daily Gain

British Breeds--Quadratic Adjustment
(Angus, Hereford, Polled Hereford, Red Polled, Galloway, Shorthorn, and Red Angus)

Gain Rate	Height/Day	% Adjustment to 1.2 lbs/Day
0.0 to .3	.0170	154
.301 to .5	.0179	140
.501 to .7	.0187	128
.701 to .9	.0195	117
.901 to 1.1	.0203	108
1.101 to 1.3	.0211	100
1.301 to 1.5	.0219	93
1.501 to 1.7	.0227	87
1.701 to 1.9	.0235	81
1.901 to 2.1	.0243	76
2.101 to 2.3	.0252	71
2.301 to 2.5>	.0259	67

Parameter	Estimate	Sig (T)	Standard Error Est.
Intercept	0.01267377	0.0001	.000528
Gainrate x Gainrate	0.00058160	0.0001	.000052
Gainrate	0.00680978	0.0001	.000433

N = 983 Heifers; Mean Height/Day, .0203; SD, .0072; r = .455

Large Breeds--Linear Adjustment
(Simmental, Brangus, Santa Gertrudis, Brahman, Limousin, Beefmaster, Charolais and Friesian.)

Gain Rate	Height/Day	% Adjustment to 1.2 lbs/Day
0.0 to .3	.0101	216
.301 to .5	.0126	173
.501 to .7	.0149	146
.701 to .9	.0172	127
.901 to 1.1	.0195	112
1.101 to 1.3	.0218	100
1.301 to 1.5	.0242	90

Table 1. Continuation

Compute Group Postweaning ADG and Adjust Each Calf on Basis of Group Average	Adjustment Factor Per Day to Adjust Height to 160 Days Postweaning Period	Adjustment Coefficient to Adjust Postweaning 160-Day Ht to 1.2 lbs Average Daily Gain

Large Breeds--Linear Adjustment (Continued)

Gain Rate	Height/Day	%Adjustment to 1.2 lbs/Day
1.501 to 1.7	.0265	82
1.701 to 1.9	.0288	76
1.901 to 2.1	.0311	70
2.101 to 2.3	.0334	65
2.301 to 2.5>	.0357	61

Parameter	Estimate	Sig (T)	Standard Error Est.
Intercept	0.00791567	0.0001	0.00113348
Gainrate	0.01160097	0.0001	0.00090902

N = 233 Heifers; Mean Ht./Day, .0216; SD, .0057; r = .645

Computing Heifer Height Adjustments

Use 0.03 inch per day height growth to compute the 205-day height for heifers when measurements are taken between 160 and 240 days of age. (The inch per day height growth for adjusting bulls to 205 days of age is .033.)

The age of dam adjustment for height to weaning for the British breeds is as follows:

2-year-old heifers	0.5 inch
3-year-olds	0.3 inch
4-year-olds	0.15 inch
5 to 9-year-olds	0.0
10-year-olds	0.15 inch
11-year-olds	0.3 inch
12-year-olds	0.5 inch

The age of dam adjustment for height to weaning for the large breeds is as follows:

2-year-old heifers	1.5 inches
3-year-olds	1.0 inch
4-year-olds	.5 inch
5 years & older	0.0

The height is to be computed the same as weight is computed.

Example: Angus heifer calf from a 3-year-old cow.

Actual data: Born January 1, 1976. Birth weight 70 pounds.
Weaned July 20, 1976. Weight 470 pounds;
Height 38 inches; 201 days old.
Yearling weight 670 pounds on January 10, 1977;
41.5 inches high; 174 days in postweaning period.

To adjust weaning weight to 205 days and for age of dam:

$\frac{(470-65)}{201}$ = 2.01 x 205 = 413 + 65 + 18 = 496 lbs 205-day adjusted weight.

To adjust weaning height to 205 days and for age of dam:

205 days - 201 days = 4 days.
38 inches + (4 x .03) dam adjustment = 38.42 inches

To adjust yearling weight: (This heifer was average for group.)

670 lbs. - 470 lbs. + $\frac{200}{174}$ = 1.15 lbs. postweaning average daily gain x 160 days = 184 lbs. + 496 lbs (205-day adj. wt.) = 680 lbs. 365-day adjusted weight.

To adjust height at yearling: (Use group average coefficient which is 100 to adjust to 1.2 lbs/day.)

41.5 inches - 38 inches = $\frac{3.5}{174}$ = .0201 x 160 days = 3.218 x 100 (% Adj. to 1.2 lbs/day) = 3.22 + 38.42 = 41.64 adjusted yearling height.

Summary

Figure the preweaning height adjusted for management, then the 160-day growth. Add the adjusted 160-day height to the adjusted 205-day height to get the 365-day adjusted height for 1.2 lbs average daily gain. If you want to frame score the heifer, mentally add 2 inches to her height and read from the full frame score card.

AN ANALYSIS OF PRICES AT COOPERATIVE FEEDER CALF SALES IN MISSOURI (MERAMEC AREA)

Ron Morrow, Crawford Price and Susan Ward

SUMMARY

Data from three cooperative feeder calf sales in Southeast Missouri (Meramec Area) were analyzed to determine the effect of certain factors on price per hundredweight of animals in these sales. Variables included in the data collection were breed, sex, weight, condition, frame, grade, age and lot size. Separate analyses were run for each location and sex. Significant effects ($P<.01$) included year, breed and lot size. Price per hundredweight increased as number of animals per lot increased. The means indicated that lots with 1 or 2 animals sold at a significantly less price than other lots. The price increased significantly again when lot size increased to 10 or 20 head per lot. Black whiteface (BWF) and Hereford cattle sold for approximately the same. Angus cattle and cattle of "mixed" breeds sold at significantly less amount than Herefords or BWF. Other variables were not consistently significant and will not be reported at this time. More analyses will be performed and a more complete discussion of these data published at a later date.

INTRODUCTION

Missouri is the number two cow-calf state with 2.4 million beef cows. Missouri is also a feeder calf "exporting" state in the sense that less than one-fourth of the calves produced are fed out in the state. These facts indicate that Missouri beef cattle producers need a well-developed and efficient marketing system for feeder cattle.

An important method of marketing feeder cattle in some areas of the state is through the cooperative feeder calf sales, sponsored by the Missouri Cooperative Feeder Livestock Association. Approximately 50,000 head of cattle are marketed through these sales each year. The objective of this study was to determine the effect of certain animal factors (description of animal) on price in cooperative feeder calf sales in the Meramec area.

This project was under the direction of the University of Missouri Rural Development Beef Cattle Committee:

Bob Finley, Vic Jacobs (Ag Econ)
John Massey, Ron Morrow, Jim Ross, Homer Sewell (An Hus)
Crawford Price, Allan Boesch, Ralph Brantley (Meramec Extension Area)
Ken Kuebler, Jackie Laurence (UMR Computing Center)
Gary Krause, (Ag Exp Sta)
Daryl Hobbs, (Director, Missouri Rural Development Beef Cattle Committee)

PROCEDURE

Beginning in 1974 animal and price data were collected at two feeder calf sales (Vienna and Owensville). In 1975 the St. James sale was added to the data collection. Analyses were performed only on fall sales and from 1974 through 1977.

The procedure at these sales is to assemble cattle into uniform lots as to breed, sex, weight, condition, frame and grade. The sorting is done by trained personnel, usually University of Missouri extension specialists. For this project, after all cattle were sorted, the sorters classified each lot for each of the above factors, based on visual appraisal of the animals in the lot. This data was made available to the buyers prior to the sale.

Cattle are initially sorted by breed. For these analyses there were enough numbers represented in only the Angus, Hereford and black whiteface (BWF) breed categories at St. James and Owensville. A "mixed" breed category was added to the analysis at Vienna. This category included primarily red calves of Hereford and Angus ancestry.

The age classifications were wet calf, calf, long calf, short yearling and yearling. In analysis of the Vienna data, two age categories were used: 1) wet calves and calves, 2) long calves, short yearlings and yearlings. The animals were classified as average, fat or thin condition and graded. Grade was not included in any of these analyses since it was felt that other descriptive classifications were more meaningful.

Average weight per lot was broken into five discrete categories: 1) less than 400 lbs, 2) 400-499 lbs, 3) 500-599 lbs, 4) 600-699 lbs, and 5) 700 lbs or heavier. The average number of animals per lot was also divided into categories: 1) 1 and 2 animals per lot, 2) 3-5, 3) 6-9, 4) 10-19, 5) 20-29, and 6) 30 or more. Frame score was estimated as described in the Missouri Beef Cattle Performance-Testing Program.

The linear model used to analyze price per hundred weight per lot contained the main effects year, lot size, breed, frame and condition plus the two-factor interactions involving all the main effects. A separate analysis was performed on steer and heifers by location. In other words, sale location and sex of calf were not direct comparisons. In performing a means separate procedure for significant effects, and presentation of means in this article, unadjusted means were used for year and all interactions involving year. Adjusted means were used for all other components of the model. Therefore, the means for year are simple means that are not adjusted for any animal or lot size variation. The other means are adjusted and should not reflect variation due to differences in animal quality (as described by factors scored) or lot size.

RESULTS

Means of price/cwt for the significant main effects are shown in Tables 1-4. The main effects year, lot size and breed were consistently significant ($P<.01$) in these analyses. Therefore, they are the only ones that will be discussed in this paper. There was a scattered significance of weight and condition. Frame was not significant in any of the analyses, but frame would be the one variable that would be the hardest to visually appraise and would contain the most error, especially in large lots. For the sake of brevity, the interaction terms will not be presented in this paper. The two interactions that are consistantly significant were year x breed and year x weight, reflecting more the economics of the feeder calf business the first four years than any marketing method or design.

Year: Every feeder calf producer is aware of the cattle prices in 1974-1977 without having to consult the means shown in the tables. There were significant differences between all years for all locations, except for older heifers at Vienna in 1974 and 1975. Although very little can be gained from a sales management standpoint by looking at the means by year, it appears that steers were the cheapest in 1974 while heifers did not reach the low point until 1975. There was a consistent $5-$8 difference between steers and heifers, except in 1974 when the difference was $3-$4.

Lot Size: Much can be discussed in relation to the significance of lot size. First, it was highly significant (P<.01) at all locations. Secondly, price/cwt increased as lot size increased, sometimes at a dramatic rate. Thirdly, even though the means are adjusted for difference in breed, frame, weight, etc., the cattle in lot size 1 (1 and 2 animals per lot) were significantly cheaper than other lot size categories. The animals in these lots were probably there because of quality differences not accounted for by the traits used in these analyses.

The animals that sold in lots of 1 and 2 head were $3-$4 cheaper than lots that contained 3-5 animals. In some cases, after the increase in price for lots with more than 2 animals, price did not change significantly until lot size reached 20 animals, and in others it changed when lot size reached 10. Nevertheless, it can be said that buyers were willing to pay more for larger lots, either because they did not want to group 1 and 2 animal lots or because the animals were not of type and/or quality desired. Possibly, producers need to be aware of consigning uniform animals to feeder calf sales and marketing animals that will not sort into uniform groups at other types of sales. Also, sorters need to make every attempt to sort 1 and 2 animal lots in with other lots.

Breed: The feeder calf business in Missouri would naturally revolve around Angus, Hereford and the "black baldy" since Missouri is #1 in registration of both Angus and Polled Hereford cattle.

There was usually no significant difference in price of Hereford and BWF cattle. In some cases, straight Hereford cattle sold for more than the popular BWF (keep in mind these are adjusted means). The straight Angus cattle were usually $3-$4 below the Herefords and BWF. Vienna was the only sale that had enough lots of a "mixed" breed category to include in the analysis. In every case but one (Vienna heifer calves) they sold for a lesser price than the Angus, although the only time this difference was significant was steer calves. The mixed breed category indicates that even with the popularity of the BWF, buyers are continuing to discriminate against crossbred feeder calves. In some cases the "mixed" calves were of the same parentage as the BWF calves. Although this author is a strong proponent of crossbreeding and of using crossbred cows, the breeds and "color" of calves, apparently need to be considered when marketing feeder calves.

Table 1. Vienna price analysis (steers) - Means[1] of significant main effects for price/cwt

	Calves	Long Calves, Yearlings
Number of lots	545	1398
Year		
1974	30.90[a]	29.39[a]
1975	32.44[b]	32.57[c]
1976	34.59[c]	31.92[b]
1977	42.17[d]	40.16[d]
Lot Size		
1 & 2	32.23[a]	31.67[a]
3 - 5	35.95[b]	33.00[b]
6 - 9	36.63[b]	33.85[c]
10 - 19	36.30[b]	35.56[d]
20 - 29	42.49[c]	------
Breed		
Angus	35.83[b]	32.31[a]
Black whiteface	38.59[c]	35.17[c]
Hereford	38.97[c]	34.23[b]
Mixed	33.25[a]	32.26[a]

[1]Unadjusted means are employed for the main effect year and all interactions involving year. Adjusted means are used elsewhere. Means with the same letter or without letters are not significantly different.

Table 2. Vienna price analysis (heifers) - Means[1] of significant main effects for price/cwt

	Calves	Long Calves, Yearlings
<u>Number of lots</u>	408	809
<u>Year</u>		
1974	27.27[b]	25.19[a]
1975	24.15[a]	25.17[a]
1976	27.47[b]	27.53[b]
1977	33.97[c]	35.32[c]
<u>Lot Size</u>		
1 & 2	26.14[a]	26.95
3 - 5	27.63[b]	27.50
6 - 9	27.52[b]	29.27
10 - 19	31.58[c]	28.65
<u>Breed</u>		
Angus	26.27[a]	27.51
Black whiteface	29.02[c]	28.38
Hereford	30.03[d]	29.84
Mixed	27.55[b]	26.64

[1]Unadjusted means are employed for the main effect year and all interactions involving year. Adjusted means are used elsewhere. Means with the same letter or without letters are not significantly different.

Table 3. St. James price analysis - Means[1] of significant main effect for price/cwt

	Heifers	Steers
Number of lots	323	491
Year		
1974	23.97[a]	27.22[a]
1975	24.84[b]	32.97[b]
1976	29.04[c]	35.25[c]
1977	32.91[d]	40.46[d]
Lot Size		
1 & 2	24.74[a]	31.86[a]
3 - 5	27.01[b]	32.50[b]
6 - 9	28.28[c]	36.05[c]
10 - 19	28.90[c]	36.31[c]
20 - 29	30.48[d]	37.82[d]
Breed		
Angus	27.05	32.80[a]
Black whiteface	28.02	37.35[c]
Hereford	28.57	34.58[b]

[1]Unadjusted means are employed for the main effect year and all interactions involving year. Adjusted means are used elsewhere. Means with the same letter or without letters are not significantly different.

Table 4. Owensville price analysis - Means[1] of significant main effect for price/cwt

	Heifers	Steers
Number of lots	309	418
Year		
1975	24.83[a]	31.39[a]
1976	29.55[b]	36.64[b]
1977	32.24[c]	38.86[c]
Lot Size		
1 & 2	25.93[a]	31.77[a]
3 - 5	28.26[b]	35.38[b]
6 - 9	28.23[b]	35.99[b]
10 - 19	30.51[c]	36.94[c]
20 - 29	30.24[c]	-----
Breed		
Angus	26.71[a]	34.19
Black whiteface	29.49[b]	35.41
Hereford	29.70[b]	35.48

[1]Unadjusted means are employed for the main effect year and all interactions involving year. Adjusted means are used elsewhere. Means with the same letter or without letters are not significantly different.

RESULTS OF THE MISSOURI CROSSBREEDING PROJECT WITH BEEF CATTLE

Doug Barney, Mark Ellersieck, John Lasley, Larkin Langford and Bub Reber

SUMMARY

Services per conception were lowest in the three-breed cross as was dystocia score. Dystocia score and services required per conception showed no difference between the two-breed cross and two-breed backcross. The three breed cross maintained a higher percentage calf crop from birth to weaning than did the two-breed cross or two-breed backcross. The two-breed cross was slightly favored over the two-breed backcross for percent calf crop born and weaned. Pounds of calf weaned per cow exposed to the bull was 66 lbs greater for the three-breed cross than for the two-breed cross. The two-breed cross produced seven pounds more calf at weaning per cow exposed than did the two breed backcross.

Superiority of the three-breed cross for pounds of calf weaned per cow exposed to the bull can be related mainly to the superiority of this cross for calf livability. Of the calves born to cows in the three-breed cross, 97.5 percent were weaned. This compares to 93.5 and 90.0 percent for the two-breed cross and two-breed backcross, respectively. Adjusted 365-day weights and carcass qualities showed virtually no differences among the three crosses.

INTRODUCTION

The second phase of the Missouri crossbreeding project is designed to compare the performance of purebred and crossbred beef cows. Both groups will produce crossbred calves. The purebred cows are Angus, Charolais and Herefords. The crossbred cows represent all possible crosses among these three breeds. Three mating systems are being used. One is the two-breed cross where purebred cows of the three breeds are mated with bulls of another breed. A second is the two-breed backcross, or crisscross, where crossbred cows are mated with bulls of one of the breeds originally used to produce the crossbred cows. A third mating system is the three-breed cross where crossbred cows are mated with bulls of a third breed.

PROCEDURE

The females for the second phase of the study were selected from the fourth, fifth and sixth calf crops of the first phase of the study where the performance of purebred and crossbred calves was compared. The cows are bred artificially to three bulls of each of the Angus, Charolais and Hereford breeds each year. Different bulls are used for breeding each year so that a wider sampling of bulls from each of the three breeds can be made during the course of the experiment.

The first calf crop on this second phase of the experiment was produced in 1971. Six calf crops have now been produced. This experiment will continue for several years in order to compare the lifetime production of purebred and crossbred cows. The results of the experiment to date are shown in Table 1. These figures represent only average figures and have not been adjusted for yearly differences or differences between ages of the cows.

The dystocia scores (calving difficulty) in this experiment range from 1 to 6 with 1 representing no difficulty and 6 resulting in the death of both the cow and calf.

Carcass grade scores were:

8 ---- good
9 ---- good plus
10 ---- choice minus
11 ---- choice
12 ---- choice plus
13 ---- prime minus
14 ---- prime

Marbling scores were:

3 ---- traces
4 ---- slight
5 ---- small
6 ---- modest
7 ---- moderate
8 ---- slightly abundant
9 ---- moderately abundant amount

RESULTS

The results comparing the three different mating systems are presented in Table 1.

These results show that there is very little difference among the three mating systems in the 205-day and 365-day weights of the calves and carcass quality and quantity. The most important difference between the three mating systems appears to be in the fertility of the cows and the livability of the calves. For some reason not readily apparent, the purebred cows producing a crossbred calf were equal to the two-breed cross cows producing backcross calves in the pounds of calf weaned per cow exposed to the bull. However, crossbred cows bred to bulls of the third breed exceeded the purebred cows by 17.0% and crossbred cows producing backcross calves by 19.2% in the pounds of calf weaned per cow exposed to the bull. The backcross system of mating is improving in recent years as compared to the two-breed cross.

A comparison of the two-breed cross with the three-breed cross is actually a comparison of the performance of purebred and crossbred cows since both produced crossbred calves. The advantage for the crossbred cows over the purebred cows is 17.0% in pounds of calf weaned per cow exposed to the bull. The advantage of the crossbred cow was about 13.0 pounds heavier calves at weaning and 11.3% more calves weaned per cow exposed than by purebred cows. The results have been consistent year after year.

Table 1. Results of the Missouri beef cattle crossbreeding project (phase 2)

Trait	Breeding of Calves		
	2-Breed cross	2-Breed backcross	3-Breed cross
Number of cows bred	195	240	167
Services per conc. of cows calving	1.44	1.43	1.39
Number of cows calved	170	210	159
Dystocia scores	1.49	1.49	1.19
Number of cows weaned a calf	159	189	155
% calves weaned per cows exposed	81.5	78.8	92.8
% calves weaned per calves born	93.5	90.0	97.5
Adjusted 205-day weight of calves	476	484	489
Pounds of calf weaned per cow exposed to bull	388	381	454
Number of calves	65	89	51
Adjusted 365-day weights	879	870	871
Carcass items:			
Fat thickness	.47	.45	.44
Carcass conformation	11.6	11.6	11.7
Marbling score	5.0	5.3	5.2
Carcass grade	9.7	10.0	10.0
Rib eye area	12.2	12.1	11.9

TEST TUBE STUDY FOR MEASURING HYBRID VIGOR
(Mix Lymphocyte Reaction)

Mark Ellersieck and John Lasley

INTRODUCTION

The Mixed Leucocyte or Lymphocyte Reaction or Culture (MLR) is mainly used to test for tissue transplantation between two individuals. Basically what the MLR does is to measure the likeness or difference of some genes at different loci. The more genes that are different at different loci the more unrelated two individuals are. The MLR has mainly been applied to laboratory animals and man.

Today the main use of the MLR is to determine the compatability of tissue transplants. It would be very convenient if an immunological response were not involved in tissue transplantation. If such responses were not involved, tissue transplantations would be every day occurrences. However, the phenomenon of host versus graft reaction does exist and this is the main problem for people involved with tissue transplantation.

The animal breeder may look at the incompatability of individuals in a different manner. All animals are genetically different except for identical twins. There is a phenomenon known as heterosis (hybrid vigor) which increases as the relationship between animals becomes distant.

If there were a good method to measure the relationship between animals, this might give an indication of how similar animals are genetically. This could be useful in predicting the amount of heterosis. The MLR may be the answer. As yet, the MLR has not been applied in this direction.

The procedure that was developed to measure cell proliferation proved to be an excellent method. Once the time period of DNA replication of the cell cycle was determined, the method was sensitive and proved to be accurate for the measurement of any type of lymphocyte stimulation, including the MLR.

The lymphocyte, which is the blood cell responsible for antibody production and cell mediated immunity, is normally in a resting stage in the healthy individual. Once a foreign substance like a bacteria enter the blood stream the lymphocyte reacts against that bacteria and begins to divide. A foreign lymphocyte will give the same response. In order for the lymphocyte to maintain the amount of genetic material (DNA) it has to replicate its DNA. If a radioactive hydrogen molecule is attached to a thymidine molecule, which is one of the constituents of DNA, and added to the lymphocyte, the new DNA will become radioactive. If a cell is stimulated it will become radioactive and if it is not stimulated it will be non-radioactive.

PROCEDURE

To test this idea a Jersey steer and four cow/calf pairs, mainly consisting of the Charolais breed, were used. Blood samples which contain the lymphocyte were taken from every animal and mixed in every combination. Also unmixed samples were prepared for a control. The following discussion is the result of these mixtures.

RESULTS

The comparison of the mixed blood cultures versus the straight blood cultures are presented in Table 1. The highest amount of stimulation occurs when the dairy steer (001) was mixed with the beef animals. Also the mixtures among beef animals were generally much lower than the response of the dairy X beef blood mixtures.

The blood mixtures of the cows with their calves showed a negative percent hybrid vigor in three of the four cow/calf mixtures. The calf gets 50% of its gene from the cow. In this experiment the cow/calf blood mixture has virtually no stimulation in the mixed blood sample. The results give validity to the hypothesis which states when genetic differences increase so does the response of the MLR.

The measurement of relationship between animals by the MLR proved to be promising. Most of the blood mixtures of cow/calf pairs showed negative stimulation indicating that there was no reaction between their blood cells. If blood from unrelated animals was mixed, such as between breeds, a high degree of positive stimulation occurred. This is due to one animal's blood recognizing the other animal's blood as foreign and vice versa. This study showed the possible use of the MLR as a measurement of relationship between animals, at least on a gross basis. Further investigation is needed using these methods between and within breeds to test nicking ability between lines of animals within a breed. If this is accomplished and the results prove to be specific for mixtures between and within breeds, animals or herds of animals could be tested before mating in a short period of time for heterosis and nicking ability.

Table 1. Mixed blood culture compared to the average of the straight blood culture

Animal No.	Mixed	Straight	Difference	% HV[c]
001 X 023[a]	.710[b]	.436	.274	63
001 X 151	.817	.570	.246	43
001 X 555	1.836	.896	.940	105
001 X 558	1.475	1.340	.136	10
001 X 021	.328	.288	.090	31
001 X 333	.588	.248	.340	137
001 X 550	1.712	.783	.929	119
001 X 552	1.361	.771	.589	76
023 X 151	.985	.801	.180	22
023 X 555	1.350	1.131	.219	19
013 X 558	1.207	1.575	-.368	-23
151 X 555	1.430	1.266	.164	13
151 X 558	1.904	1.709	.194	11
555 X 558	2.225	2.035	.190	9
021 X 333	.450	.349	.100	29
021 X 550	.440	.885	-.446	-50
021 X 552	.697	.872	-.176	-20
333 X 550	1.244	.845	.400	47
333 X 552	.727	.833	-.109	-13
550 X 552	1.827	1.368	.460	34

[a]Jersey steer = 001. Cow/calf pairs = Cow 023 with calf 558; cow 151 with calf 555; cow 021 with calf 550; cow 333 with calf 552.

[b]$X10^{-2}$ counts/minute/lymphocyte

[c]$\% \text{ hybrid vigor} = \frac{\text{mixed - straight}}{\text{straight}} \times 100.$

PITUITARY RESPONSIVENESS IN POSTPARTUM SUCKLED BEEF COWS

Henry Irvin, Allen Garverick, Ron Morrow and Bill Day

SUMMARY

Improvement of reproductive efficiency is one of the most important problems confronting the beef cattle industry. Cows must conceive within 85 days following parturition to obtain a 12 month calving interval. In the beef cow, a large portion of the postpartum period is spent in anestrus (lack of heats).

Synthetic gonadotropin-releasing hormone (GnRH) has been shown to release luteinizing hormone (LH) in cattle, and has recently been approved for the treatment of cystic ovaries in cattle. In addition, this hormone has shown some promise of shortening the period from calving to conception, thus increasing the chances of a yearly calving interval. More basic research is required to define the factors which affect the response to GnRH in the postpartum beef cow. Results from this report demonstrate that pituitary hormone release to GnRH increases as the time from calving to treatment increase. However, the lack of pituitary responsiveness does not seem to be a major limiting factor in the delay of suckled beef cows to initiate cyclic ovarian activity since pituitary responsiveness to GnRH is regained by 15 to 16 days postpartum (Exp. 1). In addition prior treatment with estradiol benzoate greatly enhances LH release in response to GnRH as early as 2 to 3 days postpartum (Exp. 2), and the response is GnRH dose dependent.

INTRODUCTION

Saiduddin *et al*. (1968) have shown that pituitary luteinizing hormone (LH) content increased from day 1 postpartum to 30 days postpartum. Furthermore, occurrence of the first postpartum estrus is preceded by increasing episodic releases of LH from 5 weeks to 1 week prior to estrus. (Humphrey *et al*., 1976). Synthetic gonadotropin releasing hormone (GnRH) has been shown to cause the release of LH and follicle stimulating hormone (FSH) from the bovine pituitary gland. Kesler *et al*. (1977) has shown that the responsiveness of the pituitary to GnRH is regained by 7 to 8 days in postpartum in dairy cows, and that the sensitivity of the pituitary to GnRH is highly correlated with pretreatment estradiol-17β levels in the plasma.

More basic research is needed to define GnRH response in the postpartum beef cow so that effective treatments to shorten the postpartum interval can be developed.

The authors would like to acknowledge A. A. Zaied, V. M. Pflantz and Dr. R. S. Youngquist for their assistance in the collection of these data.

The objective of the following experiments were: Experiment I-1) to determine when the responsiveness of the pituitary to GnRH is regained in the postpartum suckled beef cow; and Experiment II-1) to determine if prior treatment with estradiol benzoate affected the pituitary LH response; and 2) define the GnRH dose dependant nature of this response.

Experiment I

Procedure

The responsiveness of the pituitary to GnRH, as determined by release of LH from the pituitary, was measured in 20 Charolais X Hereford multiparous, suckled beef cows and 5 lactating Holstein dairy cows, milked twice daily. Beef animals received a single injection of 100 μg GnRH (IM) at either 2 to 3, 7 to 8, 15 to 16, or 31 to 32 days postpartum; Groups I through IV, respectively. Group V consisted of the 5 Holstein cows 8 to 16 days postpartum, which received the same treatment and served as a point of reference to previous studies (Kesler *et al.*, 1977). Plasma LH was measured by radioimmunoassay (RIA) in blood samples collected prior to treatment (time = 0) and at .5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0 and 6.0 hours after treatment.

Results and Discussion

Mean preinjection plasma LH concentrations were not significantly different among groups (.8 ± .1, .8 ± .1, 2.5 ± 1.3, 1.1 ± .2, and .9 ± .1 ng/ml, Groups I through V, respectively). Mean LH concentrations across collection periods posttreatment were significantly lower ($P<.05$) in Groups I and II, compared to Groups III, IV and V (2.9 ± .4, 6.3 ± 1.4, 23.9 ± 3.2, 19.9 ± 3.2 and 13.9 ± 2.7 ng/ml, respectively). Concentrations of LH in plasma increased following GnRH in Groups II, III, IV and V, but not in Group I. Similarly, the peak LH response was greater ($P<.05$) for Groups III, IV and V in comparison to Group I and II, and these peak levels were 5.8 ± 1.2, 15.0 ± 7.7, 55.2 ± 7.9, 62.1 ± 12.0 and 41.0 ± 15.1 ng/ml, Groups I through V, respectively (Figure 1). The results from this experiment indicate that pituitary responsiveness to GnRH increases as the time from calving to treatment increases (up to 15-16 days postpartum). Apparently lack of pituitary responsiveness is not a major limiting factor in the failure of suckled beef cows to resume cyclic activity by 15 to 16 days postpartum.

Two of the animals in Group I were deleted from the above comparisons due to a prior treatment which appeared to have a significant effect upon LH release. Specifically these cows had been treated prepartum with dexamethasone, Vetalog (a long acting corticoid) and estradiol benzoate for induction of parturition. Estradiol benzoate was determined to be responsible for the increased (17.8 and 19.0 ng/ml peak release) release of LH in the cows 2 to 3 days postpartum. The effect of estradiol benzoate upon GnRH induced LH release in early postpartum cows was studied further in Experiment II.

Experiment II

Procedure

Thirty-six Hereford cows were assigned to one of 6 treatment groups by date of calving. Groups 1 and 2, 3 and 4 and 5 and 6 received either 0, 100 or 200 μg GnRH at 72 hours postpartum, respectfully. In addition, cows in groups 2, 4 and 6 received 5 mg estradiol benzoate (EB) at 36 hours postpartum. Blood samples were collected at 2 hour intervals from 54 to 62 hours postpartum (18 to 24 hours post-EB) and at half hour intervals from 78 (pre-GnRH) to 82 hours postpartum. Samples were assayed for LH and estradiol-17β by RIA.

Results and Discussion

Differences in the mean concentrations of LH among Groups at 36, 54 to 62 and 72 hours postpartum were not significantly different. A LH surge in response to EB treatment was not observed 18 to 24 hours (54 to 62 hours postpartum) after EB administration in cows 1 to 2 days postpartum as observed by other researchers with cows later in the postpartum period. Estradiol-17β concentrations in plasma were not significantly different among groups at 36 hours postpartum, however estradiol-17β levels were significantly higher at all other collection periods for Groups 2, 4 and 6 compared to Groups 1, 3 and 5. Following GnRH, plasma LH increased for Groups 3 through 6, but not for Groups 1 and 2, which did not receive GnRH (Figure 2). Peak LH response to GnRH was greater ($P<.05$) for Groups 4 and 6, which received EB as compared to Groups 3 and 5 which did not receive EB. In Groups 3 and 5 there were no significant differences in LH concentrations in plasma between cows receiving 100 or 200 μg GnRH. However, the LH response in cows receiving 200 μg GnRH following EB was greater ($P<.05$) than in cows receiving 100 μg GnRH following EB. Peak LH release in plasma at 2 hours following GnRH treatment were 1.6 $\pm$ .2, 2.0 $\pm$ .3, 8.7 $\pm$ 1.3, 15.0 $\pm$ 7.5, 11.5 $\pm$ 1.3 and 29.3 $\pm$ 5.7 ng/ml for Groups 1 through 6, respectively. Beck and Convey (1977) postulated that estradiol may act on the hypothalamus to produce a sustained release of GnRH and also positively affect the synthesis and/or availability of LH and pituitary GnRH receptors. From this experiment it is evident that estradiol benzoate 36 hours prior to GnRH administration markedly enhance LH release, but whether or not this effect is caused by increased LH synthesis is not known. More importantly, there is indirect evidence (absence of estradiol-induced LH surge at 18 to 24 hours post-EB) that hypothalmic GnRH stores are limited.

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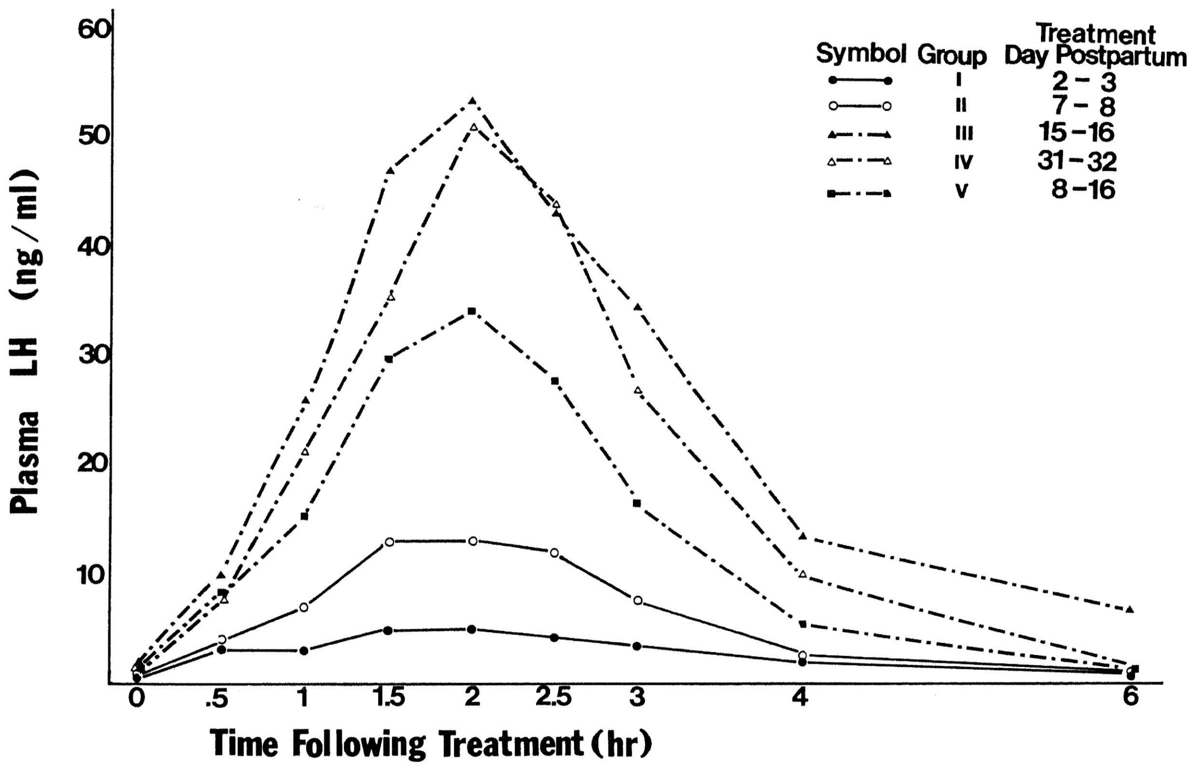

Figure 1: Experiment I-LH release in response to GnRH administered at various times postpartum to suckled beef cows.

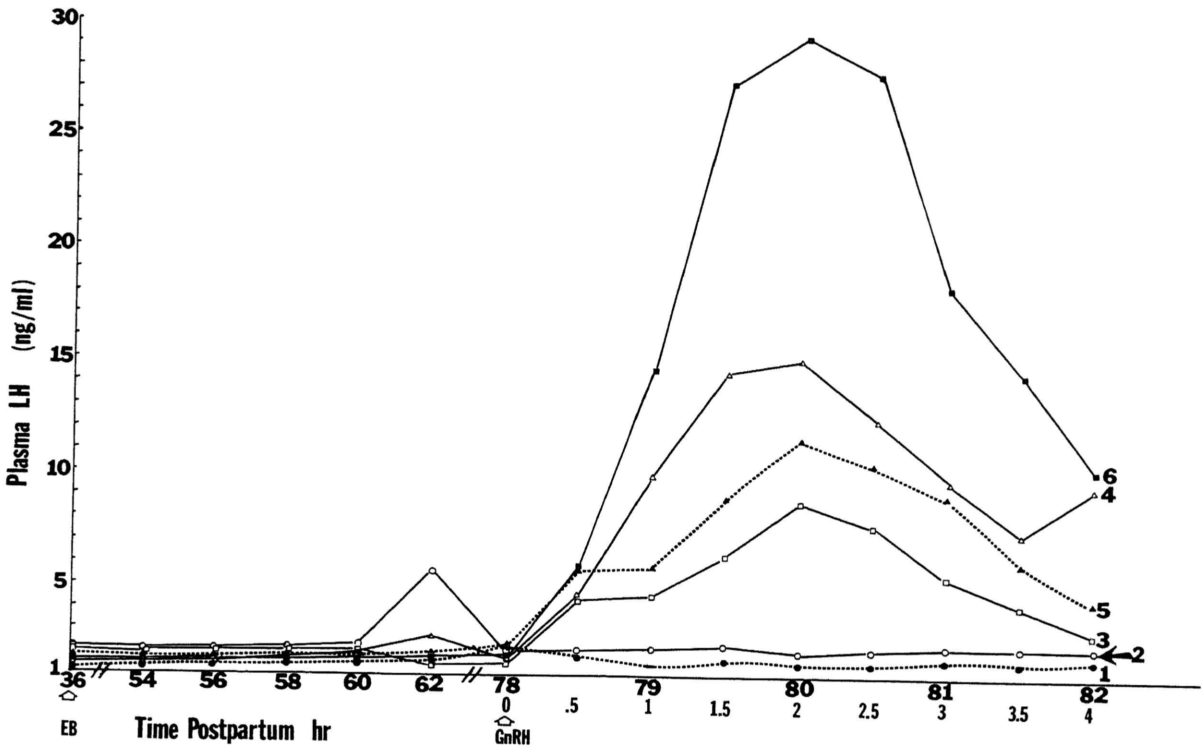

Figure 2: Experiment II-Plasma LH concentrations in early postpartum suckled beef cows following estradiol benzoate and/or GnRH treatment. Treatment in Groups 1 and 2, 3 and 4, and 5 and 6 with 0, 100 or 200 μg GnRH, respectively, and in Groups 2, 4, and 6 with 5 mg EB.

EFFECTS OF GnRH AND ONCE-A-DAY SUCKLING ON REBREEDING EFFICIENCY OF BEEF COWS

Vi Pflantz, Henry Irvin, Ron Morrow, Allen Garverick and Jim Berger

SUMMARY

Maintenance of a 12-month calving interval helps maximize production for the cattle producer. The interval from calving to first estrus generally ranges from 46-104 days in suckled beef cows. Many management methods have been studied to reduce the calving interval. Factors influencing this interval are plane of nutrition, level of milk production and suckling.

In this study, fifty-four multiparous beef cows were used to study the effect of gonadotropin releasing hormone (GnRH) and once-a-day suckling on days to estrus and days to conception after parturition. Cows were allotted by calving date to four treatment groups: 1) GnRH, _ad libitum_ suckling, 2) control, _ad libitum_ suckling, 3) GnRH, once daily suckling, and 4) control, once daily suckling. Experimental animals received an intramuscular injection of 100 μg GnRH 28-32 days postpartum with once-a-day nursing beginning at that time. Number showing estrus, days to estrus, days to conception and number of services per conception were 8, 51.6, 57.3, 1.0; 13, 52.0, 57.4, 1.4; 7, 53.9, 51.0, 1.2; and 11, 50.6, 63.0, 1.6 for Groups 1, 2, 3 and 4, respectively.

INTRODUCTION

Early weaning and limited nursing of calves have been shown to be beneficial in reducing the calving interval. Once-a-day suckling in beef cows has been reported to decrease the interval to first estrus even on a low energy diet (Randel _et al._, 1977). Following parturition, the cow must establish progressive ovarian function before pregnancy again occurs. In dairy cows, the first ovulation usually occurs about 3 weeks after calving (Morrow _et al._, 1966, Kesler _et al._, 1977). However, this interval is usually 46-104 days in suckled beef cows. GnRH causes a release a luteinizing hormone (LH) and follicle stimulating hormone (FSH), which are necessary for follicular growth and ovulation. The pituitary is not responsive to exogenous GnRH at calving. However, pituitary responsiveness is regained by 7-8 days postpartum in dairy cows (Kesler _et al._, 1977) and 15-16 days in suckled beef cows (Irvin _et al._, 1977). Response to GnRH is probably related to the size of existing follicles Inskeep _et al._, 1977, Kesler _et al._, 1978) and/or level of plasma estrogen (Zolman _et al._, 1974). GnRH has been used to initiate cyclic ovarian activity in postpartum dairy (Britt _et al._, 1974) and beef cows (Carter _et al._, 1977). The objective of this experiment was to study the effect of GnRH and once-a-day suckling on reproductive performance in postpartum suckled beef cows.

PROCEDURE

Fifty-four mature fall calving Hereford cows were allotted by calving date to four treatment groups: 1) 100 μg GnRH, _ad libitum_ suckling, 2) control, *ad libitum* suckling, 3) 100 μg GnRH, once daily suckling, and 4) control, once daily suckling. The animals used in this experiment were cows from the fall calving herd at the Cornett Research Farm. There was considerable variation in condition and age. The average age was 8 years with a range from 5-11 years. Cows and calves were put in drylots approximately 25 days postpartum and were fed 50 lbs of corn silage per day. Cows in Groups 1 and 3 received an intramuscular injection of 100 μg GnRH 28-32 days postpartum with once-a-day nursing beginning at that time (Groups 3 and 4). All cows were palpated per rectum for ovarian structures and/or any abnormalities prior to treatment. Calves in Groups 3 and 4 were allowed to nurse for 2 hours every morning. Estrus was checked twice daily for 30 minutes at first and last daylight with cows being inseminated 8-12 hours after detected in standing heat. Pregnancy was determined by rectal palpation approximately 60 days after insemination.

RESULTS AND DISCUSSION

Number of days to first estrus, days to conception, number of cows pregnant and number of services per conception were not significantly different between groups (Table 1). Average days to conception were slightly less in the GnRH, once daily suckled group (Group 3). Twice daily milking plus *ad lititum* suckling in dairy cows has been shown to increase the interval to first postpartum ovulation, but the interval to the first detected estrus was not affected (Carruthers *et al.*, 1977). In beef cows once-a-day nursing was shown to be beneficial in reducing the interval to first estrus when cows were fed a high or low energy ration (Randel *et al.*, 1977). However, a reduced interval was not observed in this study for once daily suckling. Warnick *et al.*, 1977 has reported that cows in confinement have a tendency not to exhibit estrus or have less intense behavior which may have influenced these results. Previous reports have shown that GnRH may reduce the postpartum interval in dairy (Britt *et al.*, 1974) and beef cows (Carter *et al.*, 1977). Michigan (Fonseca *et al.*, 1977) reported that GnRH given 21 and 34 days postpartum increased the number of estrus cycles by 60 days postpartum and had some beneficial effect on the days to conception. Wisconsin (Carter *et al.*, 1977) has shown that GnRH decreased the number of quiet ovulations in suckled cows, however, it increased the number of cows not nursing calves. They also reported GnRH to be as effective as weaning in suckled cows, but GnRH had no added effect in cows not being suckled. Kesler *et al.*, (1978) has proposed that follicular growth and maturity are necessary for a beneficial response to GnRH. Garverick *et al.*, (1978) has shown that a GnRH induced LH release causes ovulation in postpartum dairy cows with large follicles, but has no effect on cows with small follicles. Therefore, management techniques that initiate follicular growth should also tend to show beneficial results for treating beef cows with GnRH to reduce the calving interval.

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Table 1. Reproductive parameters of cows by group

	Treatment			
	GnRH ad libitum	Control ad libitum	GnRH Once Daily Suckling	Control Once Daily Suckling
Number	13	14	14	13
No. of cows showing estrus	8	13	7	11
No. pregnant	6	8	5	7
Days to estrus[1]	51.6	52.0	53.9	50.6
Days to conception[2]	57.3	57.4	51.0	63.0
No. of services per conception	1.0	1.4	1.2	1.6

[1]Calculated on cows showing estrus.

[2]Calculated on cows conceiving.

RALGRO IMPLANTS FOR SUCKLING CALVES

Homer Sewell

SUMMARY

A 36-milligram implant of Ralgro increased the weaning weight of suckling steer calves an average of 10 lbs per head in twelve herds in a 1976 field study conducted by Area Extension Livestock Specialists. Results were variable with changes in weaning weight being minimal or negative for implanted steer calves in six of twelve herds. Implanted calves average 20 to 28 lbs heavier at weaning than nonimplanted calves in the other six herds.

In fourteen herds, Ralgro implants increased the average weaning weights of heifer calves by 14 lbs. Implanted calves had heavier weaning weights in twelve of the fourteen herds. Field trials in 1972 also showed Ralgro to give a more consistent and greater response for heifers than for steer calves.

PROCEDURE

Suckling calves in a herd were eartagged and blocked into similar initial weight groups. Calves within a group were randomly implanted with 36 milligrams of Ralgro. Implanted and nonimplanted calves and their dams were grazed in the same fields.

RESULTS

Steer Calves

Treat-ment	No. Head	No. Days	Av. Initial Weight	Av. Final Weight	Gain	Diff.	A.D.G.	% Inc.
			(lb)	(lb)	(lb)	(lb)	(lb)	
Control	11	100	378	464	86		0.86	
Ralgro	11	100	416	517	101	15	1.00	16.3
Control	20	102	152	333	181		1.77	
Ralgro	20	102	168	343	175	-6	1.72	-2.8
Control	8	120			114		0.95	
Ralgro	8	120			147	33	1.23	29.5
Control	10	174	225	430	205		1.18	
Ralgro	10	174	237	435	198	-7	1.14	-3.4
Average								
Control		124			146.5		1.19	
Ralgro		124			155.2	8.75	1.27	

Heifer Calves

Treatment	No. Head	No. Days	Av. Initial Weight	Av. Final Weight	Gain	Diff.	A.D.G.	% Inc.
			(lb)	(lb)	(lb)	(lb)	(lb)	
Control	9	100	462	552	90		0.90	
Ralgro	9	100	456	547	91	1	0.91	+
Control	18	102	149	312	163		1.60	
Ralgro	18	102	155	334	179	16	1.75	9.4
Control	16	182	135	355	220		1.21	
Ralgro	29	182	138	374	236	16	1.30	7.4
Control	10	106	163	308	145		1.37	
Ralgro	21	106	164	333	169	24	1.59	16.6
Control	9	174	226	431	205		1.18	
Ralgro	9	174	199	432	233	28	1.34	13.6
Control	23	100	147	178	31		0.31	
Ralgro	34	100	166	200	35	4	0.35	12.9
Average								
Control		127			142.5		1.12	
Ralgro		127			157.2	14.8	1.23	

Mixed Steers and Heifers

Treatment	No. Head	No. Days	Av. Initial Weight	Av. Final Weight	Gain	Diff.	A.D.G.	% Inc.
Control	16	91	118	258	140		1.53	
Ralgro	32	91	128	284	156	16	1.71	11.2
Control	14	103	174	323	149		1.45	
Ralgro	15	103	161	327	166	17	1.61	11.0
Control	20	90			83		0.92	
Ralgro	20	90			109	26	1.21	31.5
Average								
Control		94.7			124		1.31	
Ralgro		94.7			143.7	19.7	1.51	
Overall Average								
Control		118.8			139.5		1.17	
Ralgro		118.8			153.5	14	1.29	

PERFORMANCE OF EARLY-WEANED CALVES IMPLANTED WITH RALGRO

Ron Morrow, Steve Krueger, Dennis Jacobs, Vi Pflantz,
Mark Smith and Duane Sicht

SUMMARY

Two groups of Hereford calves were weaned at low weights (203 and 303 lbs). Half of each group was implanted with Ralgro. Implanted calves in the first group averaged 3.04 lbs per day the first two weeks after weaning versus 2.76 for the controls. In the second group the implanted calves gained 2.55 versus 2.26 for the controls over a two-week period. The gain of the calves demonstrated that in times of extreme weather stress, early weaning of calves could be feasible.

INTRODUCTION

Considerable work has been done in some states on early weaning of calves. This has not been practiced in Missouri, primarily because of most beef cows being on forage systems. In some cases, there appears to be justification for early-weaning, such as low milk producing cows on a low plane of nutrition. Since most beef cows reach peak lactation three to four months after parturition and decline rapidly after that point and since winter feed requirements can be critical, the feasibility of weaning fall calves early and feeding them rather than creep feeding is a realistic possibility.

In recent months much interest has been shown in the implant Ralgro. There also has been some indication that Ralgro might reduce stress on calves at weaning. The objective of this trial was to demonstrate the performance of early-weaned calves and determine whether there was a beneficial response of calves implanted with Ralgro prior to weaning.

PROCEDURE

Fall-born (September-October) Hereford calves were used in two separate trials and were allotted to implant or nonimplant groups by age and source. In each trial calves were implanted one week before weaning. The first trial was conducted at South Farm in January on 55 calves averaging 202 lbs. The second trial was on 32 calves at Cornett Farm in March. These calves averaged 303 lbs. The second group had been nursing dams supplemented with one pound or four pounds of grain during the breeding season. The calves in Group 2 were wormed when implanted while the calves in Group 1 were not. All calves in each group were handled as one unit and were not fed separately. Rations for each group are shown in Table 1. Group 2 had access to creep feed prior to weaning but had been severely stressed from existing weather conditions.

RESULTS

The performance of calves in Group 1 (South Farm) is shown in Table 2.

In a period of six weeks the implanted calves gained 11 lbs more than the calves not implanted. The difference in ADG between the two groups was not any greater at the first weight after weaning (.28) than either of the two other weigh periods.

The performance of the calves in the second group (Cornett Farm) is given in Table 3. The difference between the implanted and nonimplanted calves at six days after weaning was .94 lbs while the difference at two weeks (.29) was very similar to magnitude of the differences shown in Group 1. The larger difference at six days could be the effect of less stress on the implanted calf at weaning or weighing errors since the weight increase ranged from 0 to 30 lbs during that period and scales may be accurate only within a five-pound range.

All animals were checked daily for sickness and no animals were observed to exhibit signs of weaning stress other than normal behavior patterns of weaned calves. The lack of sickness could be due to the weather stress that both groups of calves had experienced while nursing dams.

The data summary presented in Table 4 shows the difference in performance of the calves that had been nursing dams supplemented with one and four pounds of grain during the breeding season. Nonimplanted calves that had been nursing the cows supplemented with four pounds of grain gained less than a pound a day the first week after weaning. This group of calves had the heaviest initial weight and could have experienced less compensatory gain when going on grain.

Table 1. Rations for calves when weaned

South Farm (Group 1)	
Cracked shelled corn	37%
Soybean meal (44% protein)	15%
Bran (wheat)	10%
Crimped oats	27%
Cottonseed hulls	5%
Molasses	5%
Trace mineral salt	0.5%
Dicalcium phosphate	0.5%
Cornett Farm (Group 2)	
Whole oats	55%
Corn chop	30%
32% protein supplement	10%
Dry molasses	5%

Table 2. Performance of calves at South Farm

	Implant	No Implant
Number	29	26
Initial weight	201	205
Final weight	309	302
ADG (implanting to weaning)	1.10	1.14
ADG (weaning to 2 weeks)	3.04	2.28
ADG (weaning to 4 weeks)	2.50	2.27
ADG (weaning to 6 weeks)	2.42	2.26

Table 3. Performance of calves at Cornett

	Implant	No Implant
Number	14	18
Weaning weight	295	312
ADG (6 days)	2.32	1.38
ADG (13 days)	2.55	2.26

Table 4. Performance of calves by subgroup (Cornett)

	Implant		No Implant	
	1 lb	4 lbs	1 lb	4 lbs
Number	6	8	8	10
Weaning weight	316	279	294	326
ADG (6 days)	2.36	2.28	1.8	.99
ADG (13 days)	2.56	2.54	2.20	2.31

PINKEYE - INVESTIGATION OF THE CARRIER STATE

Jonathan Webber, Lloyd Selby, Duane Sicht and Ron Morrow

INTRODUCTION

Bovine Infectious Keratoconjunctivitis, or "Pinkeye", is an ubiquitous disease affecting the eyes of cattle and a perennial problem for farmers in Missouri. Pinkeye is a debilitating disease, causing substantial economic losses due to lower milk yields in dairy cattle, lower weaning weights and decreased performance in beef animals, and a considerable amount of time and money is spent trying to treat cattle, often with little success.

PROCEDURE

The overall objective of our research is to identify more clearly the many factors which contribute to outbreaks of pinkeye. It would seem that the one constant requirement is the presence of an infectious agent (usually the bacterium Moraxella bovis) in the herd. This, on its own, however, will not necessarily cause pinkeye--other factors are necessary for an outbreak to occur.

Some of the factors are:

1. increased levels of ultra-violet radiation,
2. large numbers of face flies,
3. presence of mechanical irritants, e.g., long pastures in seed, face flies, pastures with a lot of brush, dust
4. poor nutritional state of the cattle -- Vitamin A, protein, minerals and trace elements being especially of concern.

Traditionally, the approach to controlling pinkeye has been to use a vaccine, in conjuction with various husbandry and management practices, to try to minimize the effects of the many factors which interact to cause pinkeye. Use of the Moraxella bovis vaccine under field conditions has met with mixed success--some reporting excellent results; others, that use of the vaccine made no difference to their pinkeye problem. With this in mind, our approach is to characterise and define, more clearly, the carrier state during the winter months. Our theory is that some of the breeding cows and heifers can carry Moraxella bovis through the winter months, and thus, serve as an immediate source of infection to their newborn calves which would be highly susceptible. Control of pinkeye would then be attempted by treating all animals in the herd prior to calving to eliminate the carrier state in the cows. This would give more time for an effective vaccine to be administered to the calves, before they become infected, and give them time to develop an effective immunity.

RESULTS

Three herds from the University of Missouri South Farm were sampled in December, again in early March and early May. Swabs were taken from the eyes of all mature cattle in these herds and processed in our laboratory by culturing the swabs on 5% bovine blood agar and doing biochemical tests to confirm the presence of *Moraxella bovis*. In addition, we have developed a fluorescent antibody test (F.A.) whereby smears taken from the eyes of cattle can be readily examined for the presence of *Moraxella bovis*. This is a more sensitive test than culturing on blood agar. Both methods were used on all specimens collected.

In the three herds on which the tests have all been completed, the results are as follows:

	% Carriers in December	% Carriers in March
Fall calving herd:	11%	17%
Heifers:	46%	20%
Spring calving herd:	22%	*

*results not yet available

It would appear that carrier animals definitely do exist and that these cattle can carry the bacterium in their conjunctival sacs, from one summer to the next, and thus could serve as a source of infection for newborn calves. Hopefully, further study along these lines will further clarify the significance of the carrier animal and whether we can use this in a control program to minimize the serious economic effects of pinkeye.

The cooperation of the UMC Animal Husbandry and Extension Departments in this project is greatly appreciated. Only with a concerted cooperative effort by veterinary and animal science researchers will we begin to control and solve what has become one of the major concerns of cattlemen in the Midwest.

GENETIC RESISTANCE OF BEEF CATTLE TO PINKEYE AND FLIES

Jerry Fry and John Lasley

INTRODUCTION

Pinkeye in beef cattle is a very costly problem for cattle farmers in Missouri as well as those all across the United States. Some cattle seem to never be afflicted by this disease while, regardless of treatment, other cattle get it repeatedly.

Some cattle are highly bothered by flies, causing them to gain less weight and to be less efficient in their gains. Other cattle seem to be naturally resistant to flies and repel them more than other animals in the herd.

For years it has been proposed that flies carry pinkeye from cow to cow and from herd to herd. Thus, it seems only natural to study the resistance of cattle to pinkeye and flies and the correlations that exist between them. That is the purpose of this study.

PROCEDURE

To begin this work it was necessary to determine which animals in a herd of beef cattle were most susceptible to pinkeye and large numbers of flies. To determine those animals which have pinkeye, cattle are being checked at regular intervals and those showing definite cases of pinkeye are being noted. Each week these same animals are also being observed and records kept showing the approximate number of flies on the face of each animal. This work enables us to rank all the animals both in regards to pinkeye and fly counts.

The second part of this research is an attempt to determine why some cattle are resistant to pinkeye and flies and other cattle are not. To do this several different factors are being looked at comparing the most resistant animals to the most highly susceptible animals. These animals are being compared for skin thickness, hair length and density, face pigmentation, red and white blood cell counts, immunoglobulin levels and resistance to stress. Correlations between the number of flies and the cases of pinkeye are also being examined to try and determine the role of flies in the transmission of pinkeye.

If definite physiological differences can be found between the different animals studied, it may benefit the cattlemen in several ways. This study, when completed, will give us a strong indication of the possible success one would have breeding cattle which are naturally resistant to flies. Perhaps, more importantly, if we can determine why some animals are resistant it will enable us to make repellents and medicines that will be more effective in repelling flies and treating pinkeye. It should be noted that much of the work being done in this project is preliminary in nature and will indicate to us where we should concentrate our efforts in the future.

THE ROLE OF ANTIBODIES IN THE HEALTH OF THE NEWBORN CALF

Terry McGary and John Lasley

INTRODUCTION

Missouri is fortunate among the states of the Union in that it ranks second in number of beef calves produced. Missouri however, along with the other beef producing states is plagued with the most costly problem facing cattlemen today, calf mortality. It is interesting to note that 24 percent of the total farm income of the state is attributed to cow-calf operations.

Many factors can be responsible for the death of a newborn calf ranging from poor management to unavoidable to environmental factors. If one considers the management side of this problem we are destined to look at the available statistics that tell us that 20 percent of all death loss in cattle may be attributed to intestinal complications associated with the newborn calf. These complications, resulting in the scouring calf, are associated with the bacteria Escherichia coli (*E. coli*) often found in the intestinal tract and sometimes the blood stream of the newborn calf afflicted with scours.

Mother Nature has a means of combating this bacteria thus protecting the calf. When the calf's defense mechanisms break down because of poor husbandry practices or a malfunction of the animals physiological processes the cattleman is often faced with economic loss from early calf mortality in his cow-calf operation.

With these and other basic thoughts in mind, a research project to study these defense mechanisms of beef cattle to determine if genetics could be involved in this problem was designed. More specific, are crossbred cows and calves (taking advantage of hybrid vigor) more prolific because they are superior in the transfer and acceptance of antibodies (the defense mechanism against bacteria) over purebred cattle?

Cattle are unlike humans in that upon birth they are immunologically deficient. That is, the newborn calf does not have sufficient antibodies in his blood and G.I. tract to protect himself from disease. Therefore, the calf must rely upon its mother, via her colostrum, soon after birth to provide the necessary antibodies orally. This is a very critical period for the newborn calf and it is imperative that he receive this antibody laden colostrum no later than 36 hours after birth. After this time, and sometimes before, the calf loses his ability to absorb these antibodies into the blood stream even though he has filled his stomach with his mother's rich colostrum. Hence, without sufficient antibodies he is most likely doomed for either a very poor weaning weight or possibly an early death.

PROCEDURE

To approach this problem, six crossbred and four purebred cows nearing parturition were selected. The animals were from the same farm located in

Central Missouri. The crossbred cows were of Charolais X Brown Swiss breeding and bred to a purebred Simmental bull. The purebred cows were of the Charolais breed and were bred to a purebred Charolais bull. The animals were all managed under similar conditions through this prepartum period until weaning of their calves.

Blood sample collections and colostrum or milk samples were taken from the cows and blood samples from their calves at parturition, 24 and 36 hours after birth. After this three day period, similar samples were collected from the cow-calf pairs up to weaning (six months). These samples were then analyzed for antibody content. Therefore, we had a means of examining the level of antibody in the cows blood and colostrum and then determining how much antibody was absorbed from the stomach (via the colostrum) of the calf into its blood stream.

RESULTS

The analysis provided several interesting conclusions. Upon analyzing the data collected, it was evident that crossbred cows in this experiment had more antibodies in their blood than did the purebred cows measured after birth. It is interesting to note, however, that the same crossbred cows had fewer antibodies in their colostrum after the birth of their calves than did the purebred cows. Further blood analysis on the calves revealed that calves from crossbred mothers also had more antibodies in their blood than did calves from purebred cows. These findings are in accordance with those reported above in the dam's colostrum. The crossbred cows apparently had less antibody in their colostrum than the purebred cows because the calves from crossbred cows were more vigorous and thus nursed more efficiently.

In conclusion, it is appropriate to say that the more antibodies a calf can absorb into its blood stream from the stomach the first 36 hours after birth, the greater chance it may have to survive the neonatal period. Therefore, it can get a healthy start and with the proper nutrition will mature producing a fine weaning weight.

It is evident that a great deal of the success of the cow-calf unit depends upon the proper functioning of the immune system of the animals from a physiological standpoint. Other factors, however, are probably just as important if not more important than the genetic capabilities of the animal. Management of the cow-calf unit along with the environment play a considerable role in the survival of the neonate to weaning and healthy future calf production by the dam. Several areas are basic requirements for prevention of diarrhea and death among problem cattle herds. Some are: 1) intelligent application of known husbandry and veterinary principles and methods to insure the birth of healthy calves into a favorable environment, 2) prompt feeding of colostrum and 3) prompt and intelligent administration of appropriate drugs to offset both avoidable and unavoidable deficiencies which will arise from implementation of the first two requirements are necessary for a successful program.

STERILITY IN BEEF CATTLE

Jerry Fry, Edward Johnson and John Lasley

INTRODUCTION

Low conception rates represents a major problem to the beef cattle industry. In recent years one Missouri beef producer discovered that only eight or nine of one hundred five of his heifers settled when exposed to the bulls for both the spring and fall breeding seasons. A joint study of the problem was undertaken by the University of Missouri College of Veterinary Medicine and the College of Agriculture.

PROCEDURE

One area of the project undertaken by the College of Agriculture was a genetics study performed under the supervision of Dr. John Lasley. In this study both a pedigree analysis and a chromosomal analysis is being performed. Although the analysis is not completed, work done to date strongly indicates that this is a hereditary problem with a recessive gene being the mode of inheritance. The original mutation apparently occurred six or seven generations ago. The apparent reason for the high incidence of affected heifers is that nine half-brothers were used to sire the defective heifers. These nine half-brothers were produced by a sire and dams both of which may have been carriers of the recessive gene. In addition to this, the majority of the dams of the defective heifers also trace back through one or more pathways to the original carrier of the recessive gene. This unusually high concentration of recessive pathways being brought together through the use of the nine half brothers whose sire and dams may both have been carriers, as well as the possibility of the dams of the defective heifers being carriers would seem to account for the high number of defective heifers suddenly appearing. Also there exists the possibility of a gene segregation distorter causing the high incidence. This recessive gene does not appear to have any affect on the bulls, but does cause the heifers to have abnormal reproductive tracts. (Clinical study - C. J. Bierschwal, College of Veterinary Medicine.)

RESULTS

A chromosome analysis was performed on approximately thirty of the affected animals. This study has shown that many of the affected animals have a mixture of normal and abnormal chromosomes. The normal chromosome karyotype for female beef cattle (Bos Taurus) consists of fifty-eight acrocentric or telocentric chromosomes and two metacentric or submetacentric chromosomes (often referred to as XX for females). The affected cattle showed a 3X in about five percent of the spreads examined. Some spreads showing a 4X karyotype were also observed. Work is now being performed to determine if the number of chromosomes present varies with the different abnormalities. Chromosome studies were done on open heifers, heifers that had settled, and the fetuses from the bred heifers. In all groups of animals the 2X spread was the predominate one with some 3X and 4X spreads present. This would indicate that some of the heifers carrying the recessive gene can conceive and pass the trait on to their offspring. This may be due to variable expressivity - the ability of the gene to express itself to different degrees.

Perhaps the most promising aspect of this study is the strong correlation that was shown between the abnormal karyotype and the abnormal reproductive tract which leads to poor fertility. This would indicate that poor or difficult breeders, as well as nonbreeders, could be checked for this recessive gene by means of a chromosome study. In this way the beef farmer might eliminate this detrimental gene from his herd.

SELECTION PROCEDURES AND RESPONSE IN BEEF CATTLE

Edward Johnson and John Lasley

INTRODUCTION

One of the problems facing the livestock producer is how to select replacements for his breeding herd. To further complicate this matter any number of so-called "experts" have published their opinions in various publications with few of these experts agreeing as to what to look for. Many state that conformation is of no significant value in a selection procedure while others think it is. To try to gain an insight into this problem an 11-year study utilizing a herd of purebred Herefords located at the Weldon Springs Experiment Station was conducted by the University of Missouri.

PROCEDURE

Prior to the first breeding season, the herd, which consisted of approximately 200 cows, was divided into 2 lines designated as Line I and Line II. This division of the herd into 2 lines was intended to establish two selection lines with the foundation stock having as similar genetic backgrounds as possible. The herd was divided on the basis of bloodline, age and levels of production. The lines were then closed to outside breeding with the numbers being maintained at a fairly constant level throughout the experiment.

The difference in the selection procedures were as follows:

Line I - Selection based solely on individual performance

a) Bulls were selected on the basis of a 392-day weight which was taken after 140 days on full feed.

b) The heifers were selected on the basis of a 550-day weight calculated after the first pasture season.

Line II - Selection on the basis of a selection index comprised of the 392-day weight (bulls), the 550-day weight (heifers) and the conformation score which was taken at the time of weighing (this score was an average of two scores).

The indexes were as follows:

Bull Index = .065 (392-day weight) + .67 (conformation score)

Heifer Index = 10 + .065 (550-day weight) + .67 (conformation score).

RESULTS

At this time a complete analysis of these data is not available, but some of the overall means can be compared to give an indication of how these particular selection procedures performed. A comparison of the average of the first two years (Table 1) and the last two years (Table 2) gives an estimate of the progress made in selection for each trait over the 11-year period.

In the preliminary analysis of these data it was found that there were significant yearly variations in all traits measured and, in fact, the data collected for the first year indicated that it was a better than average year which prevents getting a clear picture of the progress made over the range of the experiment.

From this data it would seem logical to conclude that selection pressure either on weight alone or on an index of weight plus conformation would lead to a significant improvement in the above mentioned traits or any correlated traits.

Table I. Performance of the lines as measured by an average of first 2 years

	Line I		Line II	
Trait	Bulls	Heifers	Bulls	Heifers
Adj. Weaning Wt.	381.86	372.06	390.18	365.72
392-day wt.	768.54		783.10	
550-day wt.		588.46		579.54
Yrscr.	73.95	74.10	74.48	73.33
Index	99.52	97.60	100.81	96.78

Table 2. Performance of the lines as measured by an average of last 2 years

	Line I		Line II	
Trait	Bulls	Heifers	Bulls	Heifers
Adj. Weaning Wt.	398.97	367.14	396.07	367.21
392-day wt.	891.12		898.69	
550-day wt.		706.56		698.70
Yrscr.	74.33	75.47	76.30	75.81
Index	107.75	106.49	109.59	106.21

MANAGEMENT OF LARGE ROUND BALES

Bill Hires

SUMMARY

Research with large round bales is being conducted both a the Cornett Farms, Linneus and Southwest Center, Mt. Vernon. Purpose of this research is to develop an analytical tool for forage systems planning and management. This paper will provide an overview of a total large round bale system incorporating ideas and findings of this research.

DISCUSSION

Large Round Bales

Research has shown that roll baling systems are well suited to beef cow calf operations related to cost and labor savings. Reduced need for permanent storage buildings and temporary cover, also make the round bale advantageous for the cow-calf operation.

Proper management during storage and feeding of the large round bale determines how much savings can be made over other forage handling systems. Work at the Southwest Missouri Research Center, Mt. Vernon showed a loss as high as 40 percent in feed value with some management practices used in storing and feeding the big bales. With this type of loss the cost advantage of the large round bale handling system is lost and some management practices will need to be changed to regain this advantage.

An outline of the better management practices supported by research done at the Cornett Research Center, Linneus, Southwest Research Center, Mt. Vernon and other research data will follow.

Large Round Balers

In analyzing the different round balers it was determined that maximum work rate was limited by pick up performance and not by bale chamber capacity. Total leaf loss ranged from 5% in ideal windrows to as high as 27% in light dry windrows. The largest amount of leaf loss occurs in the bale chamber and this is determined by how long the bale is in the chamber.

Specific recommendations to reduce leaf loss are: windrows should be as heavy as possible, the hay should be conditioned to aid in stalk curing and moisture content should be at the maximum level which permits safe storage. Feed rate should be as high as possible to minimize time in the baling chamber. It is often more economical to allow some pick up loss by driving too fast as the total loss level will be reduced due to decreased bale chamber loss. Under ideal conditions, bale chamber loss may be as low as 0.5%. Bale chamber losses in a light crop can be reduced by running the tractor at a lower power take-off speed and in a high gear to maintain proper ground speed. This results in few turns to form a bale. Power take-off speed must, however, be fast enough for satisfactory pick up performance.

Windrow width determines bale configuration and should just be slightly narrower than the baler pick up or just slightly narrower than one-half the pick up width and then use a weaving action to maintain a uniform bale diameter.

The more a bale is to be moved the more twine wraps that should be used, also to prevent twine rotting a better quality plastic twine should be used.

Moving Large Round Bales

For proper pasture management as related to bare spots, weed control, and hay waste, large round bales should be moved to a central bale yard close to the area used for feeding. Although inside stored hay did have slightly higher protein and dry matter these savings are not great enough to economically justify ownership of permanent storage structures for roll bales.

One advantage of large round bales is that once it is made it can be left in the field until time is available for moving. If the bale is left in the field long enough to form a weather thatch and a flat bottom it should be moved and placed so the thatch is disturbed as little as possible and the bottom is oriented in the bale yard the same as in the field.

One popular method for moving bales is a three-point (stinger) mounted on a tractor loader, rear tractor hitch or a 4-wheel drive pick-up. These are satisfactory for short distances, however, the loader mounted bale mover is by far the most dangerous and should be operated with extreme caution. Numerous methods of hauling from 2-5 bales are available and their use is determined by the total tonnage of hay handled and the distance to be moved.

Storing Large Round Bales

The bale yard should be well drained, even so far as to use a good rock base; other methods of base construction such as ties, poles or platforms have not proven to be a great advantage. It is best to place the bales with the ends facing North and South. For prevention of wind damage the rounded sides should be placed facing the prevailing winds. Bale yards used for a number of years should have the weeds controlled so as to prevent the weeds forming a mat around the bale and the wind whipping the weeds against the bale. Studies have been conducted butting the bale ends tightly against each other and spacing them apart about 12 inches. Data has been inconclusive as to which method is best.

Feeding Large Round Bales

Hay wasted in feeding had the highest loss when fed free choice - in some cases as much as 36%. Daily feeding from bunks had the lowest amount of waste from 1.0-2.5% and controlled feeding with panels ranked second at 2.5-5.5%. The best method is probably the panel type round or rectangular feeder that can be moved easily from one feeding area to another.

CONCLUSIONS

The large round bale systems are basically close to a one-man operation with a limited amount of easy to manage hired help. Cost reduction as compared to the traditional hay systems is possible and in some cases these costs can be cut in half. Hay must be harvested at optimum conditions and quality. There is no system that will improve the quality of the hay above that at the time of harvest. It is essential to select a storage and feeding system that will keep the amount of wastage to the minimum to make the maximum savings of labor and costs. Like all systems the capable farm manager will make a success of his forage handling system.

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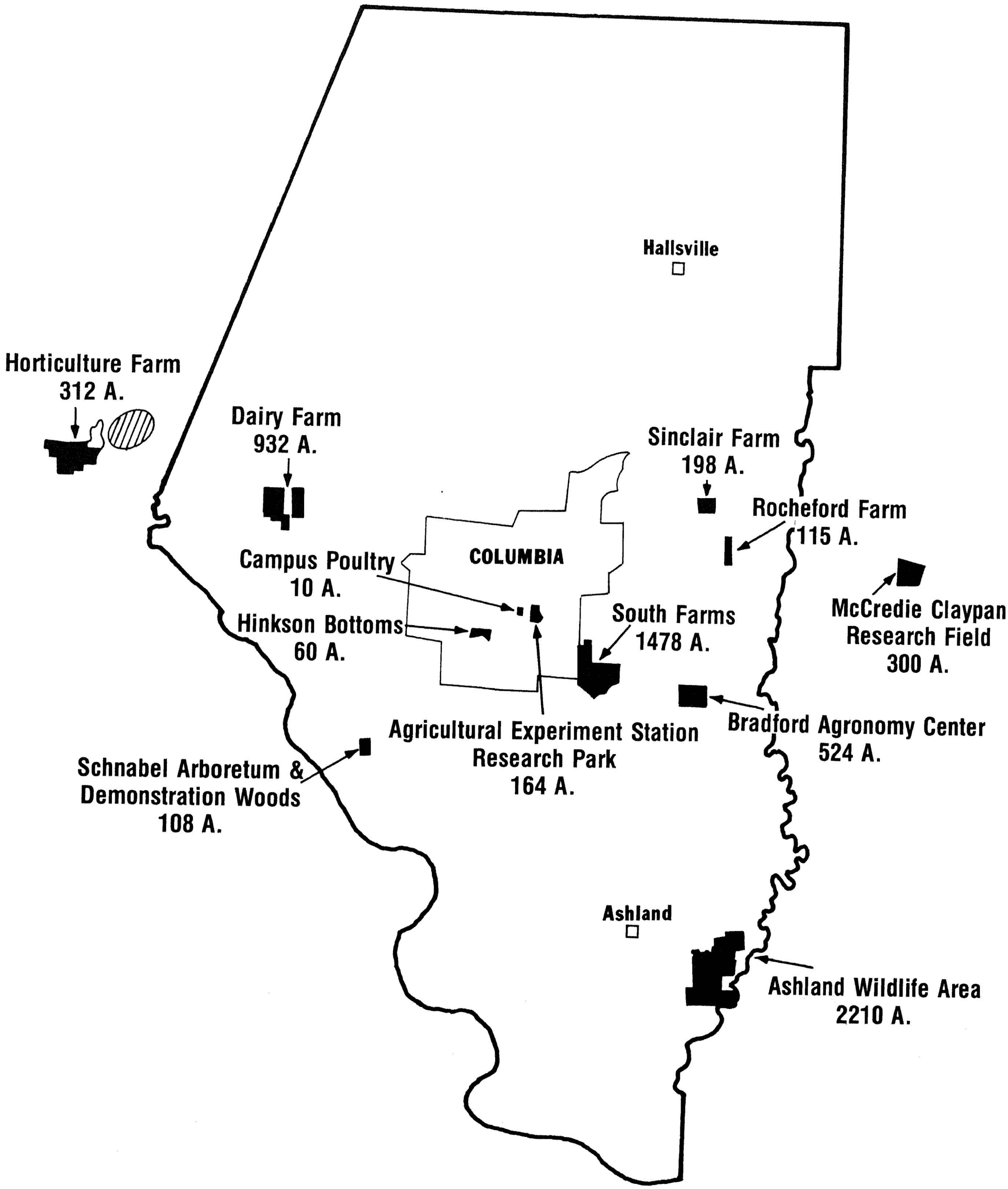

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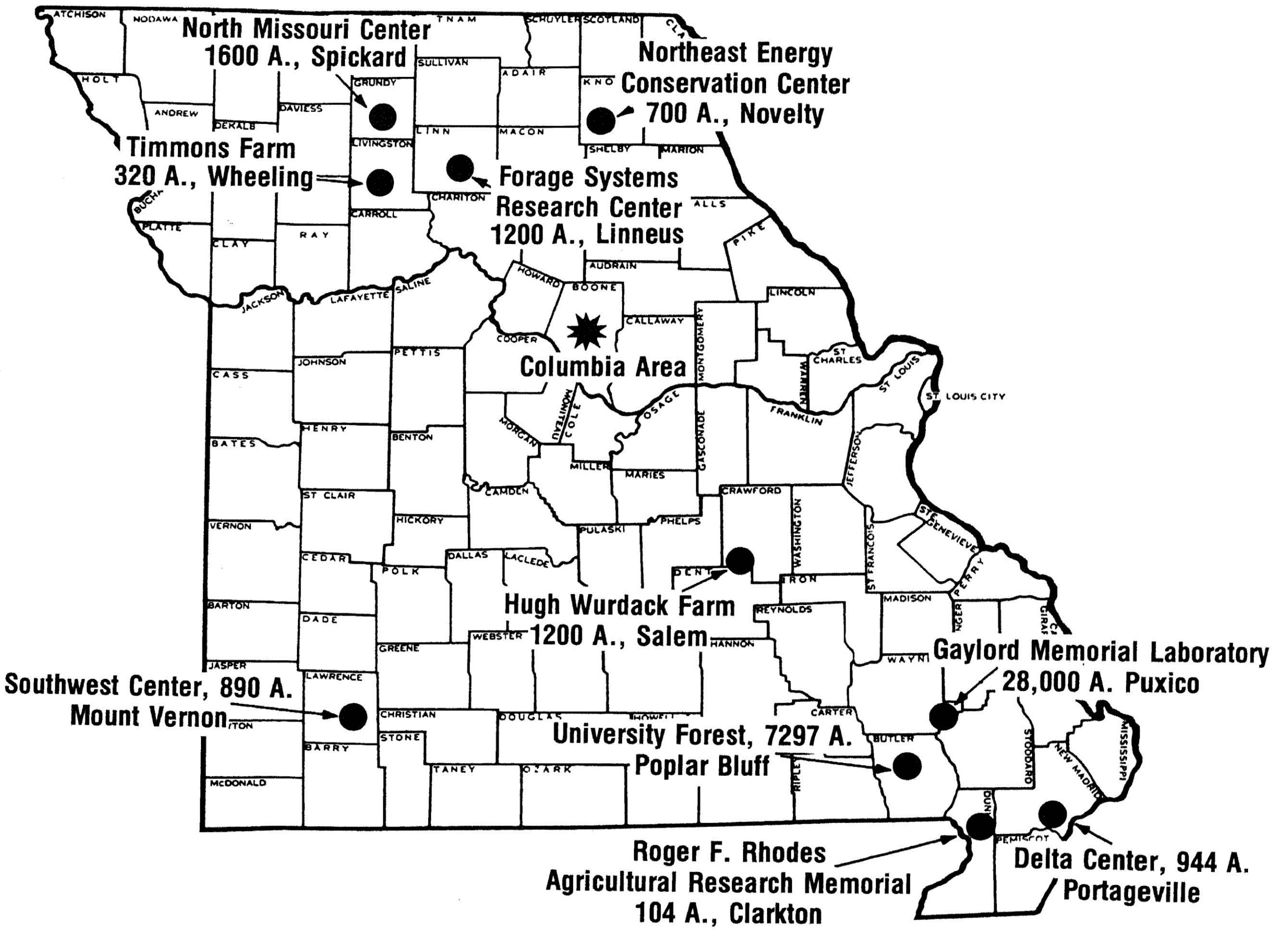

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