Winter Nutrition of Fall-Calving Cows and Calves

Station Bulletin 665
October 1985

Agricultural Experiment Station
Oregon State University, Corvallis
in cooperation with
Agricultural Research Service
U.S. Department of Agriculture

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ABSTRACT

Studies were conducted over a 10-year period to determine the feasibility of supplementing lactating cows being wintered on native meadow hay. The interaction between cow feed levels and creep feeding of calves was also investigated. Results show that a full feed of meadow hay to the cows and no creep to the calves may be the most profitable. When cattle prices are high in relation to feed costs, supplementing the cows with protein and energy along with creep feed for the calves may be profitable. Under favorable price conditions winter creeping of calves without supplementing cows also may return a profit. Supplementing the cows without creeping the calves did not pay under any conditions in these trials.

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INTRODUCTION

Fall calving was initiated on the Squaw Butte Station to see if there were nutritional and managerial advantages to dropping calves at some time other than the traditional spring calving on high desert range operations. A discussion and comparison of the two calving times will appear in a companion bulletin. This bulletin will summarize 10 years of work on winter nutrition of fall calving cows and their calves.

One of the major concerns, nutritionally, of calving in the fall was the nutrient requirements during the winter. This is a critical time since during cold weather, energy must be provided for maintenance as well as for lactation and conception. Most range cattle in the western United States are wintered on grass hay. Cut at the proper time, this hay will run 7 to 8% crude protein. This is adequate for maintaining pregnant cows through the winter. However, it is deficient in both protein and energy to provide for adequate gains on weaners and yearlings without a supplement. The early assumption was that lactating cows and their calves would need additional energy and possibly protein to meet maintenance, productive and reproductive requirements.

The main objective of these studies was to determine the minimal feed level necessary for wintering lactating cows and their calves, while providing for optimum production. The interaction between energy levels fed to cows and creep levels was a major part of this objective, exploring the possibility of feeding a minimal level of energy to the cow and feeding more energy directly to the calf to increase efficiency of production. A secondary objective was to evaluate protein sources in the cow supplement.

EXPERIMENTAL CONDITIONS

The cow herd was of Hereford breeding with 80 to 120 head used on the study each year. Heifers were not assigned to the study until they had dropped their second calf. The herd had been closed for 30 years with only enough outside breeding to keep the inbreeding coefficient down. Even then, outside breeding was from one of the original herd lines. Cows were bred in January and February to calve in October and November.

Experimental cow rations and creep feeding were initiated about December 10 each year. The herd was gathered each day and sorted into pens to receive supplements. Meadow hay, running 7 to 8% crude protein, was fed free choice and water, salt and a salt-bonemeal mix were available at all times. Two fields were utilized with sorting facilities in each field.

Creep areas, with windbreaks, were set up for the calves. Hay or straw bedding was provided which, along with the windbreaks, encouraged calves to use this area and facilitated getting them to their creep ration. Creep pellets were provided to calves in self feeders.

Treatments were terminated about April 10 each year and cattle were turned out on range after that date. Ranges were either crested wheatgrass or native bunchgrass - sagebrush pastures. Calves were weaned during the last week of July and cows remained on range until mid-September. Cows were then brought back in on flood meadows and put on rakebunched hay or aftermath until the start of the trial. When feed became short or snow cover too deep, hay was fed. Cows were kept on the same treatment from year to year to study the long-term effects of the nutritional regimes. Originally, cows were stratified by age, weight and production index and randomly assigned to treatment. When new animals were added to the trial each year and when new treatments necessitated reassignment, cows were allotted to treatment in the same manner. In general, cattle were in excellent condition going onto the study each winter.

All cows and calves were individually identified. At birth, calves were tagged, dehorned, castrated and weighed. All cows and calves were weighed periodically throughout the year. Weights were taken after an overnight confinement without feed or water. Cows were pregnancy checked by rectal palpation shortly after weaning, with open cows sold. Most cows that were pregnant were retained on study unless they had cancer eye, prolapse problems or other maladies, including age, that made it questionable whether they could have and wean another calf. The study was initiated in 1967 and ran through 1977.

RESULTS AND DISCUSSION OF THE FIRST THREE YEARS

During the first 3 years, cows were supplemented at two energy levels and with three protein sources. The low energy supplement consisted of 1.5 pounds of cottonseed meal (CSM) or its equivalent and the high energy, 2.5 pounds of barley, .75 pounds of CSM and .15 pounds fat or the equivalent. Fat was included in the supplements to balance energy levels without changing the protein component. Daily cow supplements are presented in Table 1. Supplements were designed to provide equal energy and protein within an energy level.

Table 1. Daily Supplements - First 3 Years[1/]

	Protein Source			Energy source	
Supplement #[2/]	Cottonseed meal	Urea	Biuret	Barley	Fat
Low energy	lb	lb	lb	lb	lb
1	1.46	-	-	-	-
2	-	.17	-	1.23	-
3	-	-	.19	1.23	-
4	.53	-	.12	.75	-
High energy					
5	.75	-	-	2.50	.15
6	-	.09	-	3.13	.15
7	-	-	.10	3.13	.15
8	.55	-	.05	2.61	-

1/ Supplements were designed to be isonitrogenous and isocaloric within an energy level.
2/ Supplement numbers 1, 3, 5 and 7 were fed all three years with Numbers 2 and 6 fed in Year 1 and 4 and 8 in Year 2.

Winter and summer creep rations for the first 3 years are presented in Table 2. These were fed in self feeders in the form of pellets and on a free choice basis, except on treatments where creep was limited to one-half of the creep consumed by the free choice group. Salt was added to the summer creep to provide some control on intake.

Table 2. Creep Rations - First 3 Years

Ingredients	Winter 1 & 2	Winter 3	Summer 1	Summer 2	Summer 3
	%	%	%	%	%
Alfalfa	40	19	40	8	18
Cottonseed meal	20	38	20	30	37
Barley	40	38	32	53	36
Molasses	-	4	-	-	4
Salt	-	1	8	9	5

Results of the first year are shown in Table 3. The higher energy level to the cows did not improve calf performance, with adjusted weaning weights actually being 7 pounds less than those on the low energy supplement. Calves from cows receiving CSM as the protein source weaned at 526 pounds as compared to 512 for urea and 505 for biuret. The high level of creep added 14 pounds to weaning weights, with this difference occurring during the winter period. Calves on the high level of creep consumed 63 more pounds of creep feed than those limit fed.

Table 3. Calf Data - Year 1

Treatment	Number	Winter ADG[3/]	Summer ADG	Adjusted weaning weight[2/]	Calves lost
		lb	lb	lb	%
Energy level					
Low	45	1.41	1.97	518	2
High	45	1.41	1.93	511	2
Protein source					
Urea	30	1.36	1.99	512	3
Biuret	30	1.41	1.90	505	3
CSM[4/]	30	1.46	1.96	526	0
Creep level[1/]					
Low	48	1.37	1.95	508	0
High	42	1.45	1.94	522	5

1/ Calves were fed creep free choice on the high level over the winter with the low level being limited to 1/2 of the high. Summer creep was free choice for all calves. Winter creep intake was 1.46 lbs per head per day on the high and 0.79 on the low. Summer creep intake was 1.56 lbs.
2/ Adjusted for sex and age of calf.
3/ Average daily gain.
4/ Cottonseed meal.

Table 4 presents the cow data from the first year. Weight change was not different between the supplemental energy levels. Conception and attrition rates both favored the low energy group, with calving interval being similar. Overall, the total pounds of calf produced per cow, taking into consideration conception rate, calving interval, calf losses and adjusted weaning weight, favored the low energy group. Weight change of cows was similar between the protein sources. However, primarily because of lighter weaning weights and lower conception rates, cows receiving biuret only weaned 437 pounds of calf as compared to 494 on urea and 507 on CSM. Creep level of the calf did not have an effect on cow weight change, but conception rate, attrition rate and calving interval data all favored the high creep. Cows with calves that received the high creep level, produced 39 more pounds of calf at weaning than those from the low creep level.

Protein sources represented a naturally occurring protein (CSM), a highly soluble fast releasing non-protein nitrogen (urea) and a slow releasing non-protein nitrogen (biuret). After the first year, urea was dropped as a treatment. There was already a great deal of data from this station and other research units on urea. Biuret, on the other hand, was a new product and a great deal of interest was developing on its use as a protein source in situations where intake could not be tightly controlled. It did not possess the toxicity problems of urea, because of its low solubility, and, therefore, was a safe non-protein nitrogen supplement. The urea treatment for the second year was replaced by a biuret-CSM combination. Previous studies had shown a beneficial response to a natural protein and urea used in combination. After 1 year, it appeared that biuret in combination with CSM improved performance over biuret alone, but did not perform as well as CSM used alone. For the last 8 years of the study, biuret alone and CSM alone were compared to each other as a protein source. Despite the early interest in biuret, it was not available commercially because of problems encountered in production of the material. Currently it is back on the market.

Calf data from year 2 are shown in Table 5. Adjusted weaning weights were not greatly different between any of the treatments. Calves from high energy cows were 4 pounds heavier at weaning and calves from cows on CSM were 9 pounds heavier than those on biuret or the combination. Calves on the high level of creep consumed 90 pounds more creep but weighed only 7 pounds more at weaning.

Table 6 presents cow data for the second year. Cows on the high energy supplement were 29 pounds heavier at the end of the wintering period and retained a 23-pound advantage at weaning. Conception rates, attrition rates and calving intervals were not greatly different but all favored the high energy cows. However, primarily because of calf losses, the low energy cows produced 25 pounds more calf per cow at weaning. Cows from the CSM treatment gained the most weight throughout, with the combination treatment intermediate and the biuret-fed animals gaining the least. Conception rate was 80% from the CSM treatment, 71% on the combination and only 54% from biuret. Attrition rate followed the same pattern. Those cows fed CSM weaned 385 pounds of calf per cow, combination 328 and the biuret group only 245 pounds. The reason for the poor performance of the biuret fed cows is not known. Differences were small between cow performance on the two creep levels, except that cows with calves on the high creep level produced 18 more pounds of calf at weaning.

Table 4. Cow Data - Year 1

Treatment	Number	Cow weight change			Conception	Attrition	Calving interval	Calf produced per cow[1/]
		Winter	Summer	Overall				
		lb	lb	lb	%	%	days	lb
Energy level								
Low	45	-78	+99	+21	98	9	366	495
High	45	-77	+96	+19	93	11	365	465
Protein source								
Urea	30	-87	+104	+17	100	3	367	494
Biuret	30	-77	+100	+23	90	17	366	437
CSM	30	-69	+89	+20	97	10	363	507
Creep level								
Low	48	-69	+89	+19	92	17	368	462
High	42	-88	+109	+22	100	2	362	501

1/ Takes into consideration conception rate, calving interval, calves lost and adjusted weaning weight.

Table 5. Calf Data - Year 2

Treatment	Number	Winter ADG	Summer ADG	Adjusted[2/] weaning weight	Calves lost
		lb	lb	lb	%
Energy level					
Low	52	1.28	2.27	516	0
High	52	1.37	2.24	520	8
Protein source					
Biuret	35	1.31	2.22	515	3
CSM	35	1.35	2.30	524	3
Biuret-CSM	34	1.31	2.25	515	6
Creep level[1/]					
Low	49	1.26	2.28	514	6
High	55	1.37	2.23	521	2

1/ Calves were fed creep free choice on the high level over the winter with the low level being limited to 1/2 of the high. Summer creep was free choice for all calves. Winter creep intake was 1.81 lbs per head per day on the high and 1.15 on the low. Summer creep intake was 2.35 lbs.

2/ Adjusted for sex and age of calf.

The experimental procedure was changed for the third year of the study. Previously, cattle had been divided into their respective fields by creep level. For the third year they were separated by the supplemental energy level of the cow. This was done in an attempt to measure hay and creep intake between the two energy levels to see if this would help explain the poor response to the additional supplemental energy.

Third year results for the calves are shown in Table 7. Calves from low energy cows gained more throughout the winter and summer and weaned at 547 pounds as opposed to 516 pounds from high energy cows. Calves from cows receiving CSM weaned 23 pounds heavier than those from the biuret treatment.

Cow data presented in Table 8 shows an advantage in cow weight for the high supplemental energy group with other measures being similar. However, cows from the low energy group weaned 43 pounds more calf per cow than those from the high energy group. Biuret fed cows lost considerably more weight over the winter, but compensated on range to make overall weight change similar to those on CSM. Overall, CSM fed cows weaned 11 pounds more calf.

Table 6. Cow Data - Year 2

Treatment	Number	Cow weight change Winter	Summer	Overall	Conception	Attrition	Calving interval	Calf produced per cow[1/]
		lb	lb	lb	%	%	days	lb
Energy level								
Low	52	-13	+109	+97	67	35	375	330
High	52	+16	+99	+120	69	31	372	305
Protein source								
Biuret	35	-4	+93	+92	54	46	376	245
CSM	35	+10	+111	+120	80	20	376	385
Biuret-CSM	34	-2	+109	+107	71	32	369	328
Creep level								
Low	49	-3	+104	+106	69	33	374	309
High	55	+5	+104	+111	67	33	373	327

1/ Takes into consideration conception rate, calving interval, calves lost and adjusted weaning weights.

Before being put in each field, hay was weighed and an attempt was made to rake up and weigh the refusals. This was conducted over an 115-day period from December 7 to April 1. Based on these estimates, cows and calves on the low energy supplement consumed 38 pounds of hay per pair per day and those on high energy 35 pounds. Calves on the low energy cows also consumed more creep feed, 3.4 vs 2.9 pounds, than those from high energy groups. If these figures are accurate and if this was occurring through the years, it is a probable cause of the additional supplemental energy creating a negative response.

Table 7. Calf Data - Year 3[1/]

Treatment	Number	Winter ADG	Summer ADG	Adjusted weaning weight[2/]	Calves lost
		lb	lb	lb	%
Energy level					
Low	49	1.71	1.86	547	2
High	50	1.62	1.72	516	4
Protein source					
Biuret	50	1.61	1.76	520	2
CSM	49	1.73	1.82	543	4

1/ Calves were all fed creep free choice with winter intake of calves on high energy cows being 2.89 lbs per head per day and 3.40 on low. Summer intake was 2.29 lbs.
2/ Adjusted for sex and age of calf.

Calf data for the 3 years combined are presented in Table 9. Calf gains over the winter were virtually equal for calves from cows on the high and low energy supplements. Summer gains favored calves from the low energy cows and this resulted in weaning weights of 527 pounds on low energy and 516 on high. Calf losses were also higher (5% vs 1%) from cows on the high energy treatment. Most calf losses were due to respiratory problems such as pneumonia and a few to scours. Calves on cows supplemented with CSM as opposed to biuret gained more over the winter and summer periods resulting in weaning weights of 532 pounds from CSM and 514 on biuret. Calf losses were identical between the protein sources. Calves on the high creep level gained slightly more over the winter with gains being equal through the summer. Weaning weights were 522 pounds from the high creep and 511 from the low. Calf losses were identical. The 11 pounds extra weaning weight was produced with 77 pounds additional creep intake. If we look at adjusted weaning weights, ignoring conception rates, calf losses and calving interval, the value of each additional pound of weaning weight would have to exceed the value of 7 pounds of creep feed for the high creep level to be economically sound.

Table 8. Cow Data - Year 3

Treatment	Number	Cow weight change Winter	Cow weight change Summer	Cow weight change Overall	Conception	Attrition	Calving interval	Calf produced per cow[1/]
		lb	lb	lb	%	%	days	lb
Energy level								
Low	49	-127	+91	-38	96	12	370	505
High	50	-112	+95	-18	94	12	366	462
Protein source								
Biuret	50	-138	+114	-27	94	12	365	478
CSM	49	-99	+69	-29	96	13	371	489

1/ Takes into consideration conception rate, calving interval, calves lost and adjusted weaning weights.

Table 9. Calf Data - 3 Years Combined

Treatment	Number	Winter ADG	Summer ADG	Adjusted weaning weight[2/]	Calves lost
		lb	lb	lb	%
Energy level					
Low	146	1.46	2.04	527	1
High	147	1.47	1.96	516	5
Protein source					
Biuret	115	1.46	1.94	514	3
CSM	114	1.53	2.01	532	3
Creep level[1/]					
Low	97	1.32	2.11	511	3
High	97	1.40	2.11	522	3

1/ Includes the first 2 years.
2/ Adjusted for sex and age of calf.

Combined results for the cows are presented in Table 10. Cows on the lower supplemental energy lost more weight over the winter (13 pounds) than those on the high, with summer gains slightly in favor of the low group. Overall, cows from the low energy group gained 31 pounds from initiation of the supplemental period to weaning and those from the high, 42 pounds. Conception rates were 86 and 85%, respectively, for low and high energy cows and attrition rates of 19 and 18%. Calving interval was 370 days for the low energy group and 367 on high. Total calf weight produced per cow favored the low supplemental energy group 440 to 410 pounds.

Cows receiving CSM lost less weight over the winter but gained less weight over the summer than those fed biuret. Overall, by weaning time the CSM cows gained 12 more pounds than the biuret group. Conception rates were 10% lower for biuret supplemented cows (91 vs 81%) as opposed to those receiving CSM. Primarily because of the conception rate, biuret cows left the herd at the rate of 23% each year as opposed to 14% on CSM. Calving interval was 368 days for biuret supplemented cows and 370 for CSM. Cows receiving CSM produced 459 pounds of calf as opposed to only 396 on biuret. Conception rate of the cow and performance of the calf contributed to the difference.

Weight changes of cows with calves receiving the two creep levels show those from the high level losing slightly less weight over the winter and gaining more over the summer for an overall advantage of 13 pounds. Conception rates were 80 and 81%, respectively, for the low and high creep levels and attrition rates 25 and 20%. Calving interval was 371 days for the low creep level and 368 for the high. Overall, cows with calves on the low creep level produced 383 pounds of calf as opposed to 402 on the high.

Table 10. Cow Data - 3 Years Combined

Treatment	Number	Cow weight change			Conception	Attrition	Calving interval	Calf produced per cow[1/]
		Winter	Summer	Overall				
		lb	lb	lb	%	%	days	lb
Energy level								
Low	146	-70	+100	+31	86	19	370	440
High	147	-57	+97	+42	85	18	367	410
Protein source								
Biuret	115	-82	+104	+23	81	23	368	396
CSM	114	-57	+88	+35	91	14	370	459
Creep level								
Low	97	-37	+96	+60	80	25	371	383
High	97	-34	+106	+73	81	20	368	402

1/ Takes into consideration conception rate, calving interval, calves lost and adjusted weaning weights.

The relationship of pounds of calf produced at weaning and the supplemental feed is presented in Table 11. Cows on the high energy supplement consumed 230 pounds more supplement than those on the low (399 vs 169 pounds), but weaned 30 pounds less calf per cow. So the additional supplement actually had a negative effect on production. The only advantage to the higher level of supplement was slightly heavier cows at weaning. However, except for salvage value, additional cow weight does not add much to the total income unless it is reflected in additional calf weight or higher conception rates. Based on these results, the high energy treatment was dropped for the remaining 7 years of the study with the low level being compared to no supplemental feed for the cows.

Total Supplement fed was essentially the same for CSM and biuret supplemented cows. However, those receiving CSM weaned 63 pounds additional calf as compared to those receiving biuret. Because of the interest shown in biuret as a protein source, this comparison was retained for the next 7 years and animals fed without additional energy were compared to those receiving no supplement. Biuret was pelleted with hay and fed in that manner, with the assumption being that the hay fed via the pellets would not affect total hay intake.

Calves on the high creep level, free choice, consumed 77 pounds more creep feed (192 vs 115 pounds), than the limit fed group. Cows with calves receiving the high creep level weaned 19 pounds more calf at weaning. This represents a conversion of 4.3 pounds of creep to produce 1 pound of weaning weight. For the high creep to be economically feasible, the 1 pound of gain would have to be worth more than 4.3 pounds of creep feed. The labor and cost of creep facilities would not be greatly different. In most years, the gains would pay for the additional creep feed. In subsequent years, based on these results, the free choice creep level calves were compared to calves not receiving creep.

RESULTS AND DISCUSSION OF THE LAST SEVEN YEARS

Based on the results after 3 years, it was decided to eliminate the previous high energy cow supplement and compare the previous low energy to hay alone and compare free choice calf creep feeding to no creep and all the interactions.

Cows were supplemented at two energy levels and with two protein sources. Daily cow supplements are shown in Table 12 and composition of the creep ration in Table 13. Cow feed remained constant throughout the 7 years and the creep was fed to one-half of the calves over the winter during this time. Calves receiving creep during the winter also were creeped during two summers and in 1 year, one-half of the calves previously receiving creep were creep fed in the summer with the others not receiving creep. Also, one-half of the calves not creep fed the previous winter were creeped during the summer and half were not.

Calf performance by winter treatment of the cows and creep treatment is presented in Table 14. Biuret supplement of the cows alone did not improve performance of calves either with or without creep and calf death loss was slightly higher in each case as compared to the hay alone treatment. Very little difference in calf performance between biuret and CSM was evident on the high energy cow supplement, however, death losses were higher on the biuret.

Table 11. Relationship of Pounds of Calf Produced at Weaning and Supplemental Feed

Treatment	Number	Days	Winter supplemental feed[1/]	Difference	Effect on calf production	Supplemental feed required to produce an additional pound of calf
			lb	lb	lb	lb
Energy level						
Low	146	118	169			
High	147	118	399	+230	-30	Negative
Protein source						
Biuret	115	117	281			
CSM	114	117	284	+3	+63	<.1
Creep level						
Low	97	117	115			
High	97	117	192	+77	+19	4.3

1/ Consumption over the trial period per cow or calf.

Table 12. Daily Cow Supplements - Last 7 Years

Supplement #1/	Feedstuff CSM	Biuret	Barley
	lb	lb	lb
Low energy			
1	--	--	--
2	--	.25	--
High energy			
3	1.46	--	--
4	--	.19	1.23

1/ Supplements were designed to be isocaloric within an energy level and isonitrogenous between protein sources on the high energy level.

Table 13. Creep Ration - Last 7 Years1/

	Ingredient
	%
Alfalfa	80
Barley	13
Molasses	5
Salt	2

1/ Ration was fed to one-half of the calves each winter and to the same calves during the summer in Year 1 and 3. In Year 2, 1/2 of the calves previously receiving creep in the winter received creep in the summer and one-half of those not previously on creep. No creep was fed during the summer of the last 4 years.

Table 15 presents calf data from Table 14 combined to show cow treatment, energy level, creep level and cow energy level by creep treatment effects on overall calf performance. Energy along with protein supplements improved calf performance very little over the hay alone treatment and protein alone in the form of biuret did not improve calf performance. Calves from cows on high energy winter treatments gained slightly more over the winter and slightly less during the summer for a net weaning weight advantage of 7 pounds. Creep feeding in the winter improved winter gains of calves by 0.42 pounds per head per day with summer gains essentially the same. Creeped calves weaned 53 pounds heavier and death loss was 2% less. Breaking creep out by energy level of the cow shows there was not much of an interaction between energy level and creep, with creep feeding calves of cows on low energy increasing weaning weights by 56 pounds whereas creep added 51 pounds to calves from high energy cows. Calf losses for non-creeped calves were slightly greater in each case.

Table 14. Calf Data by Cow Winter Treatment and Creep Treatment

Treatment	Number	Winter ADG	Summer ADG	Adjusted weaning weight[2/]	Calves lost
	lb	lb	lb	%	
Creep					
Hay only	87	1.52	1.85	504	1
Hay + Biuret	87	1.51	1.83	501	2
Hay + Biuret + Barley	87	1.57	1.78	506	2
Hay + CSM	86	1.58	1.81	508	1
No Creep					
Hay only	86	1.06	1.79	446	3
Hay + Biuret	87	1.08	1.82	448	5
Hay + Biuret + Barley	87	1.16	1.83	459	5
Hay + CSM	87	1.17	1.75	453	2

1/ Adjusted for sex and age of calf.

Comparison of the various creep feeding regimes are presented in Table 16. One year, when four creep treatments were compared, showed summer creep feeding after winter creeping only added 4 pounds to the calves' weaning weight. However, creep feeding calves not previously creeped added 26 pounds to weaning weights. Calves creep fed only in the summer were 30 pounds lighter at weaning than those creeped during the winter and summer and 26 pounds lighter than those creep fed during the winter only. These data show little advantage of creeping both winter and summer as opposed to winter only. Comparing creep feeding during the winter or summer, there was an advantage to those creeped in the winter.

Combining data over 2 years showed creep feeding both winter and summer improved gains of calves over both periods and added 81 pounds to the weaning weights. Creep feeding during both periods added 49 pounds at weaning compared to those creeped only during the summer. Calf losses were consistently higher for calves not creeped during the winter.

Data combined over a number of years show winter creeped calves gained 0.38 pound more per head per day than those not receiving a creep over the winter without affecting summer gains. Weaning weights were 498 pounds for winter creeped calves as opposed to 454 for the noncreeped calves.

Table 15. Calf Data - Combined by Cow Winter Treatment and Creep Treatment

Winter Treatment	Number	Winter ADG	Summer ADG	Adjusted weaning weight[1/]	Calves lost
		lb	lb	lb	%
Hay only	173	1.29	1.82	476	2
Hay + Biuret	174	1.30	1.83	475	3
Hay + Biuret + Barley	174	1.37	1.80	483	3
Hay + CSM	173	1.37	1.78	480	2
Creep	347	1.54	1.82	505	2
No Creep	347	1.12	1.80	452	4
Low Energy	347	1.29	1.82	475	3
High Energy	347	1.37	1.79	482	3
Low Energy					
Creep	174	1.51	1.84	503	2
No Creep	173	1.07	1.80	447	4
High Energy					
Creep	173	1.58	1.80	507	2
No Creep	174	1.16	1.79	456	3

1/ Adjusted for sex and age of calf.

Table 16. Calf Gains by Creep Treatment

Creep Treatment (Season) Winter	Summer	Number	Winter ADG	Summer ADG	Adjusted weaning weight[1/]	Calves lost
			lb	lb	lb	%
Creep	Creep	24	1.41	2.11	519	0
Creep	No creep	24	1.42	2.03	515	0
No creep	Creep	23	1.07	2.15	489	4
No creep	No creep	25	1.11	1.95	463	4
Creep	Creep	80	1.53	2.11	540	3
No creep	No creep	80	1.03	1.89	459	5
Creep	Creep	67	1.57	1.94	518	0
No creep	Creep	66	1.18	2.03	479	3
Creep	No creep	152	1.51	1.80	498	3
No creep	No creep	153	1.13	1.81	454	3

1/ Adjusted for sex and age of calf.

Cow data by winter treatment of the cows and creep treatment are presented in Table 17. Protein alone in the form of biuret seemed to effect cow performance negatively, particularly when their calves were creep fed. With and without creep, cows receiving biuret lost more weight over winter, gained less during summer and ended up lighter at weaning than those on hay alone. In general, conception rates were lower and attrition rates higher in cows receiving biuret. Overall calf production per cow of cows fed hay alone was 35 pounds heavier with creep and 8 without creep over those fed biuret. The same general trends were evident when comparing biuret with CSM on the high energy treatments. Cows fed CSM weaned calves 12 and 18 pounds heavier than those fed biuret and barley with and without creep, respectively. The reason for the relatively poor performance of cows receiving biuret is not obvious. One important interaction was also evident. Total calf production per cow was increased with additional energy provided by barley or CSM when calves were creep fed, but actually had a negative effect when calves were not creep fed. This was primarily a function of conception percentage, but was partially caused by calving intervals and weaning weights. Cow weight changes followed trends similar to trends of the overall calf production.

Combined cow data showing overall effects of cow treatments, energy levels, creep treatments and cow energy level by creep treatment are presented in Table 18. Cows fed biuret without additional energy lost slightly more weight over winter and gained less over summer which left them 18 pounds lighter at weaning than those receiving hay only. Conception rates of those receiving biuret were 2% below those fed hay only, and the attrition rate was 5% higher and calving interval 1 day longer. Overall calf production per cow was 16 pounds less from cows receiving biuret. Overall calf production was also 4 pounds less from cows receiving barley and biuret than those receiving hay alone. They lost less weight over the winter, but gained less during the summer and were 15 pounds lighter at weaning, with conception rate down 1% and attrition rate up 4% as compared to those fed hay alone. These values were all intermediate to those receiving hay alone and those receiving hay and biuret without additional energy. Calving interval was not different. Cows receiving CSM lost only 6 pounds over winter as compared to 53 for those receiving hay only, gained less weight during the summer and were 7 pounds heavier at weaning. Conception rate of CSM fed cows was equal to the hay group with attrition rate 1% less and calving intervals 1 day less. Overall cows fed CSM produced 5 pounds additional calf. Cows receiving CSM outperformed those receiving biuret and barley in all measures except summer weight gains by the cows, with an overall weaning weight produced per cow advantage of 9 pounds.

Cows fed the high energy supplements lost 31 pounds less over the winter, gained 25 pounds less during the summer and were 7 pounds heavier at weaning than those not receiving an energy supplement. Conception rate was 1% less and calving interval 1 day shorter for cows receiving the high energy. Overall calf production per cow was improved 12 pounds with the additional energy.

Cows with calves being creep fed lost more weight over the winter with summer gains virtually equal and an overall weight disadvantage of 14 pounds at weaning. Conception rates of cows with creep fed calves were 1% higher, attrition 1% less and calving interval 2 days longer than those with calves not

Table 17. Cow Data by Cow Winter Treatment and Creep Treatment

Winter Treatment	Number	Cow weight change			Conception	Attrition	Calving interval	Calf produced per cow[1]
		Winter	Summer	Overall				
		lb	lb	lb	%	%	days	lb
Creep								
Hay only	87	-58	134	73	84	20	371	415
Hay + Biuret	87	-63	106	37	79	30	373	380
Hay + Biuret + Barley	87	-54	106	52	87	21	369	430
Hay + CSM	86	-10	104	91	88	20	369	442
No creep								
Hay only	86	-47	134	83	87	24	369	375
Hay + Biuret	87	-52	126	75	86	22	369	367
Hay + Biuret + Barley	87	-33	111	75	80	30	370	346
Hay + CSM	87	+1	79	78	83	21	368	368

1/ Takes into consideration conception rate, calving interval, calves lost and adjusted weaning weights.

Table 18. Cow Data - Combined Cow Winter Treatment and Creep Treatment

Winter Treatment	Number	Cow weight change			Conception	Attrition	Calving interval	Calf produced per cow[1/]
		Winter	Summer	Overall				
		lb	lb	lb	%	%	days	lb
Hay only	173	-53	134	78	85	21	370	393
Hay + biuret	174	-58	116	56	83	26	371	377
Hay + biuret + barley	174	-44	108	63	84	25	370	389
Hay + CSM	173	-6	92	85	85	20	369	398
Low energy	347	-55	125	67	84	24	370	383
High energy	347	-24	100	74	85	23	369	395
Creep	174	-46	113	64	85	23	371	416
No creep	173	-32	112	78	84	24	369	362
Low Energy								
Creep	173	-61	120	56	82	25	372	397
No creep	174	-50	130	79	87	23	369	371
High Energy								
Creep	173	-32	105	71	88	20	369	436
No creep	174	-16	95	77	82	25	369	360

1/ Takes into consideration conception rate, calving interval, calves lost and adjusted weaning weights.

receiving creep. Overall calf production per cow was 54 pounds greater for those with creep fed calves.

Cows from the low energy group with creep fed calves produced 26 pounds more calf than those not creep fed, however, cows from the high energy group produced 76 pounds more calf. This points out the same interaction noted in Table 17. The additional energy to the cows seems to have a negative effect unless the calves are creep fed and the creep without supplements to the cows does not produce nearly as much additional calf weight as when the cows receive a supplement. Most of the differences are caused by conception rates. Cows from the low energy treatments whose calves received creep experienced a 5% reduction in conception rates compared to those whose calves were not creep fed, whereas conception rates of cows whose calves were creep fed from the high energy group were 6% higher than those whose calves were not creep fed.

Cow data by the various creep treatments are shown in Table 19. Numbers are limited in the year in which four creep treatments were compared which makes comparison on conception rates, attrition rates, calving interval and calf production per cow weak. Weight losses of cows were greater with winter creep as opposed to no creep, with the highest summer weight gain occurring when calves were not creep fed in the winter but were in the summer. Conception rates were lowest by cows whose calves were creep fed winter and summer. Numbers are low here but this trend is also evident with larger numbers with a direct comparison. Attrition rates were highest for cows whose calves were creeped winter and summer or received no creep either period. Calf production was also highest from those cows whose calves were creep fed either winter or summer as opposed to continuous or no creep. Because of the low conception rates from cows whose calves were creep fed to weaning, calf production was only 5 pounds greater than from those whose calves received no creep.

Comparing 3 years data of winter and summer creep to no creep during either period, cows with creep fed calves lost more weight over the winter and were 19 pounds lighter at weaning. Conception rate was 8% lower and calving interval 3 days longer for cows with creep fed calves and the attrition rate was 6% higher. Overall, cows with creep fed calves through to weaning only produced 29 pounds more calf at weaning.

Comparing winter and summer creep to summer creep only again shows larger weight losses in the winter and reduced conception rates of cows with calves creep fed to weaning. Cows with calves creep fed in the summer actually produced 5 pounds more calf per cow than those creeped during the winter and summer. These data indicate that creep feeding from birth to weaning reduces conception rates.

Cows with calves creeped during the winter lost more weight over the winter and gained less during the summer than the group not receiving a creep and were 28 pounds lighter at weaning. Conception rates were 2% higher for those cows with calves creep fed in the winter and had 1 day longer calving interval. Attrition rates were 3% greater for those cows whose calves did not receive creep. Cows with calves on creep produced 44 pounds more calf than those not receiving a creep.

Table 19. Cow Data by Creep Treatment

Creep Treatment		Number	Cow weight change			Conception	Attrition	Calving interval	Calf produced per cow[1/]
			Winter	Summer	Overall				
			lb	lb	lb	%	%	days	lb
Season									
Winter	Summer								
Creep	Creep	24	-76	111	35	75	25	366	389
Creep	No Creep	24	-81	118	38	96	4	364	497
No Creep	Creep	23	-28	136	108	100	4	369	464
No Creep	No Creep	25	-26	106	78	88	24	369	384
Creep	Creep	80	-31	133	101	79	24	371	407
No Creep	No Creep	80	-9	131	120	87	18	368	378
Creep	Creep	67	-58	118	59	87	18	372	446
No Creep	Creep	66	-11	124	112	98	9	372	450
Creep	No Creep	152	-57	90	33	88	15	369	423
No Creep	No Creep	153	-39	101	61	86	18	368	379

1/ Takes into consideration conception rate, calving interval, calves lost and adjusted weaning weights.

The relationship of pounds of calf produced at weaning and supplemental feed is presented in Table 20. When calves were not creep fed, all supplements to the cows produced a negative response in pounds of calf produced per cow. Based on this information, it would not be recommended to supplement cows without creeping the calves.

Table 20. Relationship of Pounds of Calf Produced at Weaning and Supplemental Feed

Winter Treatment	Supplement Cow	Supplement Calf	Calf produced in relation to hay only no creep treatment	Conversion of supplemental feed to pounds of calf
	lb	lb	lb	lb
No Creep				
Hay only	0	0	0	0
Hay + biuret	29	0	-8	negative
Hay + biuret + barley	162	0	-29	negative
Hay + CSM	166	0	-7	negative
Creep				
Hay only	0	345	+40	8.6
Hay + biuret	29	345	+5	74.8
Hay + biuret + barley	162	345	+55	9.2
Hay + CSM	166	345	+67	7.6

When calves were creep fed and cows received only hay, 8.6 pounds of feed were required to produce an additional pound of weaning weight. If calves are worth $.50 per pound, the cost of creep including facilities and labor would have to equal a maximum of $116 per ton to break even and if calves are worth $1.00 per pound, the cost of feed would have to be $232 per ton or less to break even or make a profit. Feeding biuret with hay and calves creeped required 74.8 pounds of feed to produce 1 pound of calf and would not pay under any circumstances. The high energy supplement of barley and biuret with creep feed required 9.2 pounds of feed to produce the extra pound at weaning. Fifty cent calves would break even at $108 per ton feed cost and dollar calves at $216 per ton. The most efficient treatment requiring feed in addition to hay alone was when cows were fed CSM and the calves were creep fed. This regime required 7.6 pounds of feed to produce an extra pound of calf at weaning. Break even cost of feed would be $132 per ton when calves are worth $.50 and $264 per ton when calves are worth $1.

Combined data on relationship of pounds of calf produced at weaning and supplemental feed are presented in Table 21. Supplementation of the cows produced negative effects in most cases and would not be feasible. Cottonseed meal supplementation did provide five additional pounds of calf at weaning, but this treatment required 33.2 pounds of feed for each additional pound of calf and certainly would not be an economical practice.

Comparing high energy supplements with low, the data showed 12 additional pounds of calf at weaning with the high energy and 12.5 pounds of feed for each additional pound of calf. Very high cattle prices in relation to feed costs would be needed to make the extra feed pay.

Overall, creep feeding added 54 pounds of calf with a conversion of 6.4 to 1. If the creep could be fed for $156 per ton, this would provide a break even point of $.50 calves or $312 per ton on $1 calves.

Table 21. Combined Data on Relationship of Pounds of Calf Produced at Weaning and Supplemental Feed

Winter Treatment	Supplement Cow	Supplement Calf	Calf produced in relation to hay only no creep treatment	Conversion of supplemental feed to pounds of calf
	lb	lb	lb	lb
Hay only	0	172	0	0
Hay + biuret	29	172	-16	negative
Hay + biuret + barley	162	172	-4	negative
Hay + CSM	166	172	+5	33.2
Low energy	14	172	0	0
High energy	164	172	+12	12.5
Creep	89	345	+54	6.4
No creep	89	0	0	0
Low energy				
Creep	14	345	+26	13.3
No creep	14	0	0	0
High energy				
Creep	164	345	+65	7.6
No creep	164	0	-11	negative

Looking at creep feeding by supplemental energy level of the cow again shows that creep feeding efficiency was increased when cows were supplemented with additional energy. Creep feeding required 13.3 pounds of feed per pound of calf produced when cows were not supplemented and 7.6 pounds when cows received additional energy.

Table 22 presents relationships of pounds of calf produced at weaning and creep treatment. The year in which four creep treatments were compared show that creeping both winter and summer was very inefficient, but either creep in the winter or summer provided efficient gains. However, as stated before, numbers are very limited on these treatments and, therefore, questionable.

Table 22. Relationship of Pounds of Calf Produced at Weaning and Creep Treatment

Creep Treatment		Creep Consumption	Calf produced in relation to lowest creep consumption group	Conversion of supplemental feed to pounds of calf
		lb	lb	lb
Season				
Winter	Summer			
Creep	Creep	404	+5	80.8
Creep	No creep	286	+113	2.5
No creep	Creep	118	+80	1.5
No creep	No creep	0	0	0
Creep	Creep	452	+29	15.6
No creep	No creep	0	0	0
Creep	Creep	497	-4	negative
No creep	Creep	116	0	0
Creep	No creep	322	+44	7.3
No creep	No creep	0	0	0

A direct comparison of creeping from birth to weaning compared to no creep showed 15.6 pounds of creep were required for each additional pound of calf produced. With calves priced at $.50 per pound, the creep would have to be fed for $64 per ton and $128 per ton for $1 calves to break even. Creeping year round compared to creep only in summer produced negative results.

Comparing winter creep with no creep, revealed 44 pounds more calf with a conversion of 7.3 to 1. Fifty-cent calves would have to be fed for $137 per ton before the gain would cover feed costs and $274 per ton on $1 calves.

In summary, the data indicate feeding good quality meadow hay alone may be the most profitable way to winter fall-calving cows and their calves. During times of high cattle prices in relation to feed costs, it may be profitable to supplement the hay with both protein and energy and creep the calves. Winter creeping of calves without supplementing cows may also pay when price conditions are favorable. Supplementing cows without creeping the calves did not pay under any conditions in these trials. These results are somewhat surprising, however, some of the treatments may have altered hay intake. These conclusions are valid with good quality meadow hay or better but results may be different with poor quality hay. Heavier milking cows would have higher nutrient requirements and may also change results somewhat.