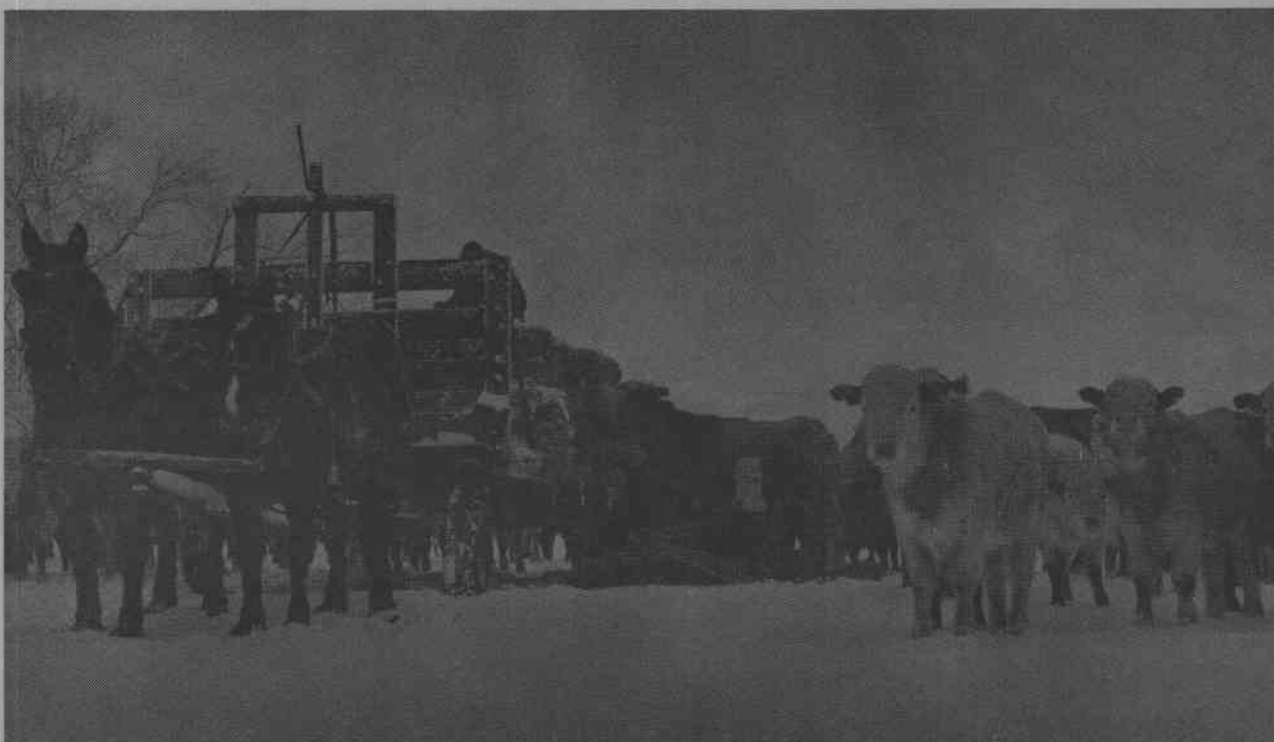
1978 Progress Report . . .

Research in Beef Cattle Nutrition and Management



Special Report 505 **March 1978**

Agricultural Experiment Station • Oregon State University • Corvallis

in cooperation with the Agricultural Research Service, USDA

AUTHORS: H. A. Turner is Assistant Professor of Animal Science at the Squaw Butte Station. R. J. Raleigh is Superintendent of the Eastern Oregon Agricultural Research Center and Professor Animal Nutrition at the Squaw Butte Station. M. Vavra and R. L. Phillips are Associate and Assistant Professors of Animal Science at the Union Station. Jon Skovlin is with the Pacific Northwest Forest & Range Experiment Station in LaGrande. J. L. Holechek and Dale ZoBell are Ph.D and M.S. candidates at the Union and Squaw Butte Stations, respectively.

The Eastern Oregon Agricultural Research Center, which includes the Squaw Butte Station and the Union Station, is jointly operated and financed by the Agricultural Research Service, United States Department of Agriculture and the Agricultural Experiment Station, Oregon State University, Corvallis, Oregon

Index to previous progress reports on back pages.

Cover picture: Winter feeding on the Allen Turner ranch (Photo by C. M. Britton)

ARTIFICIAL INSEMINATION CONSIDERATIONS FOR BEEF CATTLE

H. A. Turner and R. J. Raleigh

Artificial insemination (AI) offers tremendous potential for the beef cattle industry and for individual operators, but also offers an opportunity for disastrous results. Both of these ideas will be explored throughout this paper.

With natural breeding you may expose 100-300 cows to a sire and this usually occurs in a given locality over a period of a few years. However, with AI 100,000-200,000 exposures are possible and this may occur throughout the United States as well as being used world wide. Semen can be stored almost indefinately so a sire may be used for an indefinate number of years.

So with AI if you have superior sires and the semen is disease free, the potential is staggering. On the other hand, if the sires selected are not so good, as was the case with some of the dwarf carries during the "comprest" cattle cycle, or the semen is not clean the problems have been magnified. Tuberculosis, brucellosis, trichomoniasis, vibriosis, leptospirosis, foot and mouth disease and other diseases can be transmitted in the semen. However, the reputable breeding companies are extremely careful in both their selection of sires and in their health programs.

Many benefits are accredited to AI, such as shortened breeding season, uniform calf crops, facilitating cross breeding, improved records, increased production, etc. Some of the benefits are due to AI, but much of it is because of intensified management which AI forces you into to have a successful program. Most of these improvements are possible without an AI program.

Even though AI has some drawbacks it does offer fantastic potential. So why don't more cattlemen AI? Over 50% of the dairy herds do, but only 2% of the beef herds. Obviously there are some problems.

Before going into an AI program an individual has to train himself, hire someone, or work through a breeding association to attain the expertise necessary to run the program. It is time consuming and takes a dedicated effort to have a successful program.

Heat detection is one of the major problems. We really have no viable alternative to visual observation. The labor and time required and difficulty of heat detection is one of the major reasons only 2% of the beef cattle are artificially bred. There are aids available such as vasectomized bulls with chin ball markers and mounting devices which are stuck on the backs of cows and change color with the pressure of mounting. These all help but they don't replace visual observation. Synchronization has not been satisfactory on a practical basis. Prostaglandins do offer some possibilities, if and when they are cleared for use. With prostaglandins it is possible to inject twice, about 12 days apart, and then breed about 80 hours after the second injection. This eliminates the need for heat detection. Research data indicate that results are comparable and often superior to the normal AI routine with heat detection. Like most of the tools available, it is not a cover up or cure all for poor management. If the cow herd is not in condition to come into estrus and breed, prostaglandins will not help. It is still imperative that the cows have enough rest from calving, proper nutrition, and free of reproductive diseases before they can be bred.

Artificial insemination requires intensified management and good facilities. It is important that the physical set up allows for quiet and efficient handling of these animals. In some cases this may mean building of lanes, alleys or drift fences into the breeding facilities. The pastures or fields must be close enough and convenient enough so that a good job of heat detection can be accomplished. Once the cows are identified, they need to be brought into the breeding areas as quietly as possible. Once there, the holding pens, corrals and chutes need to be designed for quiet and easy handling. Poor fences, poorly designed facilities, inadequate chutes or chutes that are too wide all lead to harassment and excitement of the animals. The use of a trained gentle "gopher" cow put into the chutes ahead of the cows to be bred often makes them easier to get in and calms them while they are in the chute. Excited upset cows do not breed well and without the proper facilities, results are likely to be disappointing.

Individual identification of the animals, along with records, is an aid to a successful AI program. These records will help keep track of cows that have been bred, heat cycles, breeding problems and other valuable information. It may also be beneficial to further identify cows that have already been bred, such as with colored tape on the tail or long lasting markings on the animals, for field identification. In beef cattle 5 to 10% will exhibit estrus after they have conceived. So when breeding cows (AI) the second time it is advisable to deposit the semen at the mouth of the cervix rather than into the cervix. Penetration of the cervix after conception will terminate that pregnancy. The records from individual identification can also provide this information, but it is handy to have them marked for field identification and at the time of breeding. Good records not only aid an AI program, but are a valuable management tool for any cow herd, particularly for making selection and culling decisions.

An area close to the breeding facilities for the semen storage tank and AI equipment is also necessary. If the two locations are too far apart it makes it difficult to protect the semen until ready for use. It is also beneficial, in the case of straws, to have a warm water source and thermometer so as to thaw at the proper rate. In the case of straws or ampules, when breeding in cold weather, it is necessary to protect semen from cold shock. This is usually done by carrying the unit inside of a coat or shirt.

The size of range or pasture the breeding is being done on is also an important consideration. In Eastern Oregon the average carrying capacity of the ranges is 10 acres/AUM. This means on a 45-day breeding program, 15 acres would be required per cow. A 300 head cow herd then would require 4500 acres. Areas of this size would add considerable to the problems of heat detection described earlier. Cross fencing is an alternative, but expense can be prohibitive. High quality ranges, introduced grasses or improved pastures may be necessary to cut down the size of the area for breeding. This is one of the areas where AI forces you into a more intensive system, but smaller breeding pastures would also facilitate natural breeding.

How long should the AI breeding season be? Table 1 presents expectations from various AI exposures. The number detected in heat and conception rate per exposure listed here are pretty good performance levels. So in general you could expect about 50% of your herd bred AI after 21 days or one heat cycle and 75 and 90% after 42 and 63 days. The most common system used is about a 42 day AI season with a 21-day period using clean up bulls. If you have confidence in your AI program, there may be some merit to going a full 63-70 days and eliminating the need for clean up bulls. In any event the goal should be to limit the breeding season to about 3 heat cycles or around 60 days.

Table 1. Expectations from various AI exposures.

Days	Detected in heat	Conception rate/exposure	Total bred
	%	%	%
21	70	70	50
42	90	70	75
63	95	70	90

Table 2 presents some effects of using higher quality bulls on sale weight and income. These data assume there are 100 calves to sell each year, bulls are turned over every four years, calves are weaning at 400 lb. and selling at 40¢ per pound. It is also assuming that the improved sires are adding 5% to the calf weights and calf weights are improved 15% with F_1 cows. It is obvious that the maximum return on the initial investment is slow and will take 10 to 13 years under natural breeding. Artificial insemination would speed it up considerably. With AI you would reach year 4 in calves from the improved sires in the first year and by heavier than normal culling and replacement selection, the number of calves from the F_1 cows could be increased considerably. The time to maximum returns from the improved breeding could be realized in 6 to 7 years. The cost of breeding may not differ too much between AI and natural. Cost of natural breeding, including cost of the bulls, feed, net return for replacing him with a cow, etc., are estimated to be $17-19 per calf. It appears that we may be able to approach this figure with AI.

Table 2. Effect of improved sires on added sale weight and income.

Year	Calves from improved sires	Calves from improved dams	Added sale wt.	Added income
	No.	No.	lb	$
1	25	0	500	200
2	50	0	1000	400
3	75	0	1500	600
4	100	14	2600	1040
5	100	28	3200	1280
6	100	42	3800	1520
7	100	56	4400	1760
8	100	70	5000	2000
9	100	84	5600	2240
10	100	98	6200	2480

The critical aspect of the effect on income is if in fact the bulls are of higher quality. Just because the weaning or yearling weights are heavier does not mean that efficiency has been improved or net income increased. The larger animals and heavier milk producing animals may require enough more feed to more than offset the gain in weight. Without adequate feed both added size and milk production can cause reproductive problems. There is no evidence showing that one size of cow is any more efficient than another. So when we talk about improved quality in cattle it refers to cattle that are productively efficient and produce more pounds of beef for each unit of feed. This is what improves net income.

Table 3 presents some actual data from trials on cow size efficiency. Because of the increased feed requirements of the larger cows, 123 small cows could be fed for the same amount of feed as 100 large ones. To be equally efficient the large cows would have had to of weaned calves 90 lb. heavier, assuming equal reproductive rate in each. In this case the large cows' calves only weighed 13 lb. more at weaning. Increased size does not mean increased efficiency.

Table 3. Cow size efficiency.

Item	Large	Small
Dam weight, after calving, lb	1155	924
Total TDN, maintenance & lactation, lb	4208	3423
Carrying capacity/unit of feed, %	100	123
Actual 205 day calf wts., lb	508	495
Wt. of calf required for equal efficiency, lb	585	495

Size can also be important in reproductive performance. Table 4 presents about the average net calf crop experienced in cattle. A good portion of the 15% that fail to conceive and 6% that are lost at birth are due to calving difficulties. Loss of a calf represents a cow's total production for that year and the expenses connected with her, but on top of that, next years' calf is also jeoparidzed. In cows having calving difficulty, we find conception rate is 10 to 15% less and calves are about 45 lb. lighter at weaning. The lighter weaning weights are due to cows that require assistance at birth and need two weeks to a month longer rest from birth to breeding. In another study it was found that 85% of the cows experiencing no calving difficulty bred back compared to only 64% that required assistance. So 21% of the next year's calf crop was lost.

Table 4. Net calf crop.

Item	Percent
Failed to conceive	15
Lost during gestation	5
Calves lost at birth	6
Calves lost after birth	5
Weaned	69

Dystocia or calving problems are primarily due to large birth weights and larger birth weights are highly correlated with larger mature size of the bull. The optimum birth weight for 1000 to 1100 pound cows appears to be around 80 lb. for maximum weaning weight produced per cow. Heavier birth weights increase weaning weights but decrease weaning percentage. So larger weaning weights did not result in more weight produced per cow. It has been estimated that for each pound of increased birth weight, calving difficulties are increased by 1% in mature cows and 3% in first calf heifers. Large cows have large pelvic areas but also large claves. First calf heifers present special problems because they are about 75% of their mature size and has a calf 90% of normal size. It is beneficial to breed first calf heifers 2 to 3 weeks early to give them an opportunity to breed back with the rest of the herd the following year. Mature cows require a minimum of 45 to 60 days rest, whereas heifers require 60 to 75 days from birth to breeding.

Artificial insemination does facilitate cross breeding. It allows access to breeds that may be difficult to purchase in some locations and eliminates the need to separate herds during breeding. Unfortunately, it also leads to more abuse of sire size. Table 5 presents some data on bull size in relation to cow size. A bull of equal size, genetically, will be 40 to 50% larger in actual size than a cow. In general, bulls can be 25% larger genetically or 75 to 88% larger in actual size before a calving problem would be expected. However, when breeding the British breeds to some of the exotic breeds it is common to have bulls 50 to 75% larger, genetically and 110 to 155% larger in actual size. Calving problems can be guaranteed with these differences, with the possible exception of Jersey cows bred to larger bulls. With first calf heifers the genetic difference should be zero or less. Many of the reproductive problems connected with heifers are due to calving difficulty and too often nutrition of the animal is blamed. When comparing bull size to cow size the animals need to be in equal condition or adjusted to an equal condition. We can have the same bull a thin 1500 lb or fat 2500 lb.

Table 5. Bull size in relation to cow size.

Cow size	Bull size	Larger in weight	Genetically larger
lb	lb	%	%
1000	1400-1500	40-50	0
1000	1750-1875	75-88	25
1000	2100-2250	110-123	50
1000	2380-2550	138-155	70

Artificial insemination does offer some tremendous potential, even though some problems do exist. For AI to be widely used in beef cattle an improvement in heat detection methods will have to be made.

CATTLE PERFORMANCE ON FORESTED AND GRASSLAND RANGE[1]

J. L. Holechek, M. Vavra, J. M. Skovlin and R. L. Phillips

Currently, little information is available regarding the change in livestock performance and diet quality during the grazing season on forest and grassland plant communities found in Oregon's Blue Mountains. Livestock production could be increased if each plant community was used at a nutritional peak.

This study was designed to determine when forest and grassland plant communities could be used to maximize livestock production through proper grazing.

In the summer of 1975 forest and grassland pastures of equal grazing capacity were delineated and fenced at the Starkey Experimental Range and Forest in northeastern Oregon. These pastures were moderately stocked using 18 yearling heifers per pasture during the 1976 grazing season. Weight data was collected at 28-day intervals using portable corrals and scales. The grazing season lasted 120 days extending from June 20 to October 10.

Four heifers equipped with esophageal forage collection devices were grazed in each pasture. Esophageal fistula samples were collected twice per week every other week in each pasture. These samples were analyzed for percent crude protein and lignin. *In vitro* digestibility was determined and daily intake calculated.

RESULTS AND DISCUSSION

Crude protein percentages in the diet of cattle are listed in Figure 1. There was little variation in crude protein percent between the two pastures during the entire grazing season. Heavy rainfall in August resulted in considerable regrowth on the grassland. This probably accounts for the high percentage of crude protein in the diet of cattle on the grassland throughout the grazing season.

The protein requirements for growing yearling heifers, as outlined by the National Research Council, indicate that 700 pound yearling heifers require 8.2% crude protein for a one pound per day gain. This requirement was more than satisfied on both pastures throughout the 1976 grazing season (Table 1, Figure 1).

---

[1]Results reported are part of a cooperative study entitled "Influence of Cattle Grazing Methods and Big Game on Riparian Vegetation, Aquatic Habitat and Fish Populations" with the Pacific Northwest Forest and Range Experiment Station, U.S. Forest Service, Project Number USDA-FS-PNW-1701.

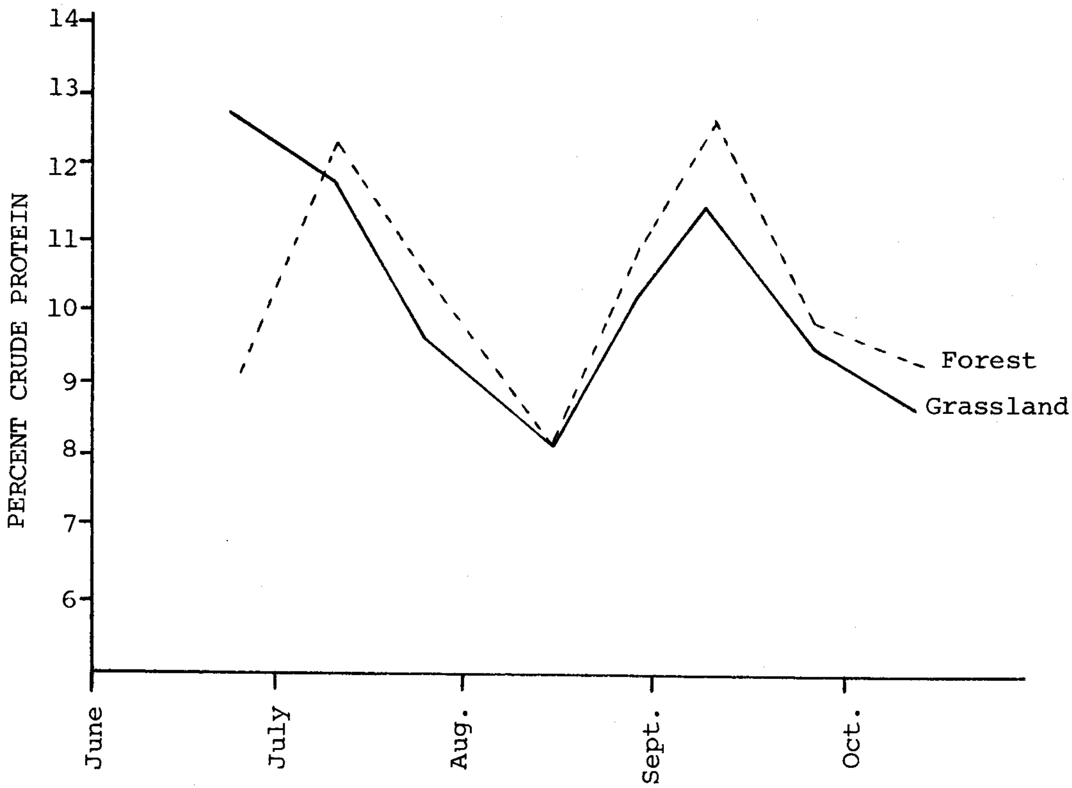


Figure 1. Average change in the crude protein content of the diet on forest and grassland plant communities.

Table 1. Average daily gain (pounds) for cattle during the 1976 grazing season.

Sampling Period	Grassland	Forest
6/21-7/19	+.48	-.13
7/20-8/21	+.95	+1.34
8/22-9/14	+.90	+1.12
9/15-10/11	+1.25	+.92
Average Daily Gain	0.88	0.84

Lignin was much higher on the forest than on the grassland during the latter part of the grazing season (Figure 2). An increase in lignin content results in a decrease in forage quality. The rapid rise in lignin values on the forest during the last half of the grazing season suggest both a decline in diet quality and an increase in the browse content of the diet. On the forest in vitro digestibility and daily intake were adversely affected by rising lignin values during the last period (Table 2). As would be expected, average daily gain was likewise affected (Table 1).

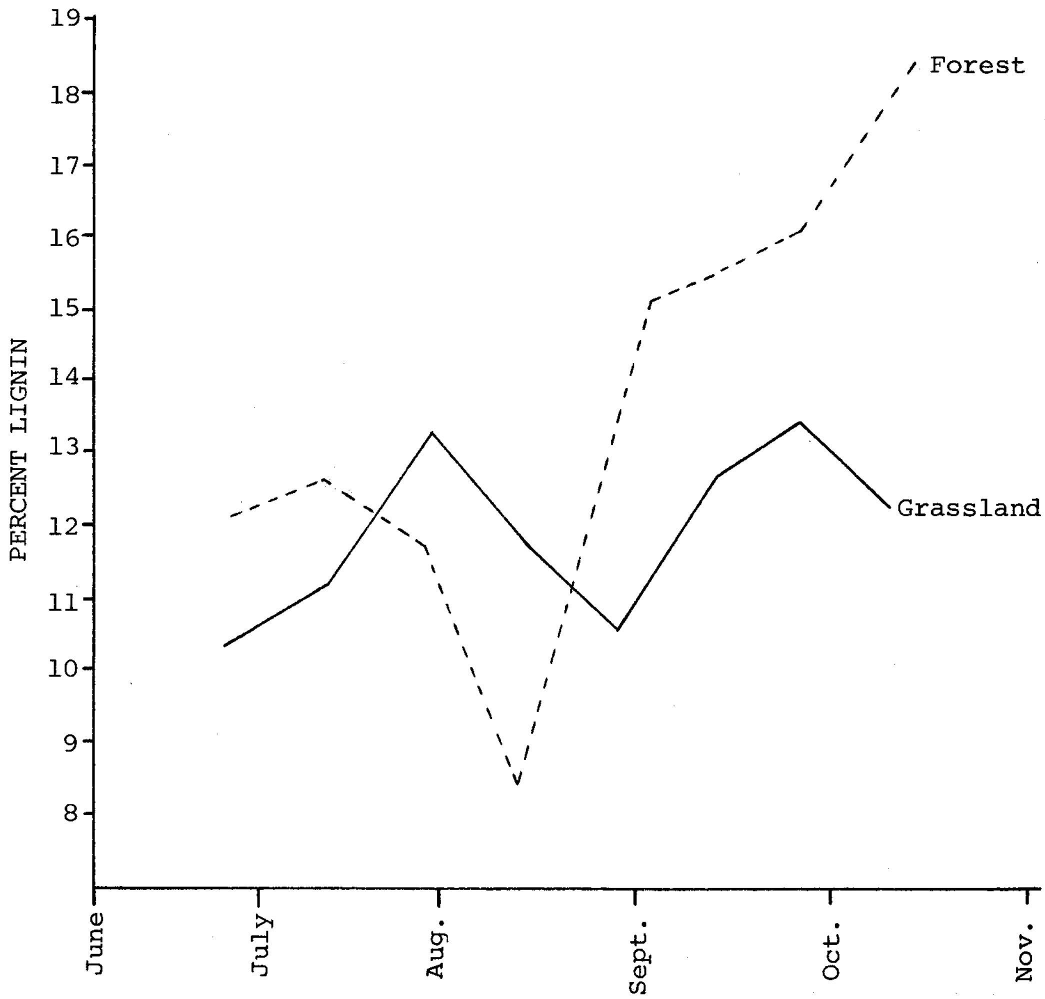


Figure 2. Average change in lignin content of the diet on forest and grassland plant communities.

Table 2. *In vitro* digestibility (IVDMD) and daily intake values for the 1976 grazing season.

Sampling Period	Grassland		Forest	
	IVDMD(%)	Intake(lb.)	IVDMD(%)	Intake(lb.)
6/21-7/19	50.7	11.2	56.2	8.4
7/20-8/21	51.3	15.0	52.4	16.1
8/22-9/14	49.2	15.6	46.3	16.5
9/15-10/11	46.3	16.1	41.8	15.2

The average overall daily gains for the grassland and forest plant community were 0.88 and 0.84 pounds, respectively. The relatively poor performance of cattle in the first period is attributed to the fact that drinking water was low in quantity and quality on both pastures. A pumping system was installed to correct this problem in the early part of July.

Cattle weight gain on the forest was greater than on the grassland between July 20 and September 14. This difference, however, is not attributed to diet quality. Cattle on the forest were observed to spend much of their time grazing under the forest canopy during the heat of the day. Grassland cattle, in contrast, were usually observed resting under what shade was available. Greater forage intake (Table 2) by the cattle on the forest may explain why livestock performance was better on the forest during this time period.

Considerable fall regrowth on the grassland along with rapidly rising lignin values and decreasing *in vitro* digestibility and daily intake on the forest probably account for the superior performance of the grassland cattle between September 14 and October 11. The weather cooled off rapidly in this period and the grassland cattle were observed to spend much more time grazing during the day.

The results from this study indicate that the grassland can be most efficiently utilized by cattle during the spring until early July. Between early July and the middle of September the forest appears to give the best livestock performance. In years when late summer/early fall precipitation occurs, cattle can be moved back to the grassland in the latter part of September to make use of forage regrowth.

FUTURE WORK

Data for this study was also collected during the 1977 grazing season and will be collected in 1978. Since diet quality samples for 1977 had not yet been analyzed, only 1976 data was included in this report.

WINTER MANAGEMENT OF WEANER CALVES

R. L. Phillips

The wintering of weaner calves can be an important part of beef cattle management in terms of net income to an operation. Winter management of calves should begin with good weaning practices such as weaning calves before summer gains drop below 0.75 pounds a day, moving calves out of sight of their mothers and feeding to gain 1 to 1.5 pounds a day following weaning. These practices can reduce problems in the subsequent wintering period.

Before starting a wintering program feed resources should be evaluated. The economic prospects of increasing income or decreasing losses by maintaining ownership of the calves rather than selling the calves as weaners should also be considered. In most situations maintaining ownership of calves through the winter can increase returns that can be applied toward the investment to maintaining the cow herd. Maintaining ownership of the calf can provide more flexibility in an operation.

The management of steers and heifers that will be sold should be different from the replacement heifers. Whether the calves will be sold as yearlings in the spring or run on range or pasture next summer should be considered in the feeding management.

Figure 1 shows the relationship of rate of gain to cost per pound of gain. The curve for cost per pound of gain decreases sharply to about 1.5 pounds a day. Table 1 shows return above feed cost for calves being fed to gain at 0.4, 1.0, 1.6 and 2.0 pounds a day. The calves in the examples were 350 pounds and were wintered on cottonseed meal, barley and meadow hay to achieve the desired gains (Table 2) for 180 days. Traditionally, heavier calves have brought less per pound so adjustments were made in calculating value of gain. The value of gain for the animals gaining at 0.4, 1.0, 1.6 and 2.0 pounds a day was 45¢, 44¢, 43¢ and 41¢, respectively. Calves that gained at 0.4 pounds showed a loss of $12.60. When the daily gain was increased from 0.4 to 1.0 pounds, return over feed cost was increased by $27.00 per head ($-12.60 vs. $14.40). Returns over feed costs were increased $23.04 ($14.40 vs. $37.40) when gains were increased from 1.0 to 1.6 pounds a day. The return over feed cost for calves fed at 2.0 pounds a day was $45.00 which was $7.56 more than for calves gaining at 1.6 pounds a day. These results clearly show that wintering calves at 1.5 pounds a day or more will increase returns under certain feed and cattle price situations.

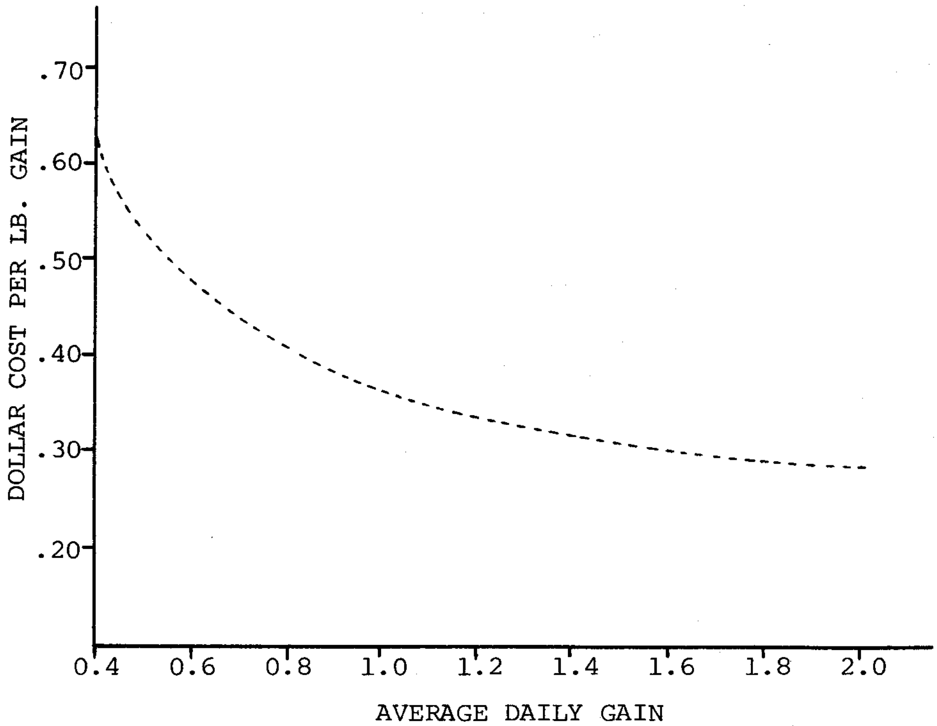


Figure 1. The relationship of cost per pound of gain to rate of gain. (Data taken from OSU Technical Bulletin 56.)

Table 1. The gain, feed cost and return over feed cost for a 350 pound calf wintered at four levels for 180 days.

	.4	1.0	1.6	2.0
350 lb. calf @ 45¢/lb.	$157.50	$157.50	$157.50	$157.50
Gain (lb.)	72	180	288	360
Value of gain[1]	$32.40	$79.20	$123.84	$147.60
Feed costs	$45.00	$64.80	$86.40	$102.60
Return over feed cost	$-12.60	$14.40	$37.44	$45.00
Spring wt.(lb.)	422	530	638	710
Spring value of calf[1]	$189.90	$233.20	$274.34	$291.10

[1]Value of gain for calves gaining at 0.4, 1.0, 1.6 and 2.0 lb. a day are 45¢, 44¢, 43¢ and 41¢, respectively.

Table 2. Daily ration composition used at four different rates of winter gain.[1]

Average Daily Gain	Average Daily Ration Composition & Cost			
	Cottonseed Meal	Barley	Meadow Hay	Cost[2]
lb.	lb.	lb.	lb.	$
0.4	0.5	0.4	7.9	0.25
1.0	0.5	2.5	8.2	0.36
1.6	0.5	5.5	7.3	0.48
2.0	0.5	8.0	6.0	0.57

[1] Data used in this table was taken from OSU Technical Bulletin 56, "Optimum Feeding Rate for Wintering Weaner Calves."

[2] Value of feed per ton: cottonseed meal-$210; barley-$95; meadow hay-$45.

Feeding calves during the winter to gain at 1.5 pounds or more a day provides an opportunity to make adjustments in management to take advantage of market situations and feed resources. When summer feed resources are limited calves wintered to gain at 1.5 pounds a day or more could be sold in the spring with a good return over feed costs. Calves gaining at less than 1.0 pound would show a loss to only a marginal return. Also, calves that gain 1.5 or more pounds a day can be run on good range or pasture the following summer and still return more than calves wintered to gain at 1.0 pound a day or less. Yearlings weighing 800 pounds or more in the spring could be sold to a feedlot or placed in a feedlot with the producer maintaining ownership. Also, calves could be fed a grain supplement and finished on grass.

Replacement heifers should be separated and fed to weigh at least 600 pounds by breeding time in the spring. The standard British beef breeds will breed at 600 pounds but the larger, later maturing introduced breeds will probably need to be larger at breeding. Heifers must be in good condition and gaining weight at breeding time.

The type of feed used in a wintering program will depend on the quality of feed raised on a given ranch and the size of the calves at weaning. Generally, weaner calves do not have the capacity to consume enough low quality roughage to gain at a desired rate without an energy and/or protein supplement. Most of the by-product roughages (grass or cereal straws) are not suitable for wintering weaners. Meadow hay can be used in a wintering program for weaners if an adequate supplement is provided (see Table 2). Most meadow hays are low in protein and energy when compared to alfalfa hay. Alfalfa or alfalfa-grass hays that are cut in the pre-bloom stage are a good source of protein and energy. A 350 pound calf can consume about 10.5 to 11 pounds of a medium quality alfalfa-grass hay which allows for a growth rate of about 1.5 pounds a day. The same size calf will consume about 12 to 14 pounds of a high quality alfalfa hay and gain 1.5 to 2.0 pounds a day. A full feed of medium quality alfalfa-grass hay plus one pound of barley would provide enough additional energy for 1.75 to 2.0 pounds gain a day. Poorer quality alfalfa hay cut in late bloom is more bulky and lower in TDN. A 350 pound calf could not consume enough of this type of hay to gain at 1.5 pounds a day. The addition of one pound of barley would supply enough energy to provide for a 1.5 pound gain a day. Two pounds of barley and a full feed of hay should produce a 1.75 to 2.0 pound gain a day.

HAY SAVINGS WITH MONENSIN

H. A. Turner, Dale ZoBell and R. J. Raleigh

In earlier studies conducted at Squaw Butte, monensin (trade name Rumensin) increased the feed efficiency of spring-calving cows being maintained over the winter on a full feed of meadow hay plus enough barley to get monensin into the animal. Daily gains were doubled from about ½ pound on the controls to 1 pound on those receiving 200 mg of monensin. This additional gain was accomplished on slightly less hay intake, so feed efficiency was substantially improved.

Research at other locations has shown that monensin has reduced feed intake without a reduction in daily gain of feedlot cattle and increased gains on pasture fed cattle. Monensin improves feed efficiency by increasing the production of propionic acid, with total volatile fatty acids remaining the same. This is a more efficient energy pathway and increases energy available to the animal.

The study reported here was conducted to determine if the increased feed efficiency as a result of monensin feeding will allow cows to be wintered on less hay and to determine the most effective level of monensin. The cows in the previously discussed trial were all in better condition than they needed to be, which suggests that hay could be limited. If similar results with monensin can be obtained with cows on limited hay intake, this would result in a substantial savings of hay.

EXPERIMENTAL PROCEDURE

Ninety-six pregnant spring-calving Hereford cows were selected for this trial and stratified by age, breeding date and weight of cow for allotment to treatment. Pregnancy was determined by rectal palpation. Cows had been artificially inseminated to a single Angus sire over a period of 42 days and bred to Hereford clean up bulls for 21 days. Cows are bred to calve in March and April.

The experimental design consisted of 4 treatments with 3 replications. Cows were replicated by expected calving dates into early, middle and late. Treatments included a control group receiving no monensin and groups receiving 50, 200 or 300 mg of monensin daily. Each replication or pen consisted of 8 head. Cows received monensin plus 1 pound of barley (barley alone in the case of the control group) to assure intake of monensin each morning. One replication received their supplement in a barn on an individual basis, with the other 2 replications being group fed in outside pens. Free access to water, salt and a 50-50 mix of bonemeal and salt was provided.

Meadow hay was weighed in daily and refusals were weighed back weekly. Initially the control cows were fed hay free choice with the 50 mg group receiving 95% of this amount and the 200 and 300 mg groups getting 90%.

Cows were weighed every 28 days. Cow weight gains were higher than desired during the first 28 days, and feed levels for all treatments were adjusted downward. Throughout the study all cows were kept in a thrifty condition with hay levels being adjusted to maintain equal weight gain between treatments. In early March, feed levels were increased to insure adequate nutrition for lactation and rebreeding.

The trial was initiated on November 16, 1977 and the confinement feeding portion terminated on May 9, 1977. This period was terminated about 3 weeks early due to a lead toxicity problem. Calves were chewing the corral fences and obtaining enough lead from a lead base paint cover put on some 16 years earlier to kill them. Eleven calves were lost to lead poisoning before the problem was diagnosed and this phase of the study terminated. Cows and claves were then turned out and fed meadow hay free choice through breeding and to weaning on August 29, 1977. Monensin was not fed during this period.

At calving, birth weights were taken, bull calves castrated and all calves identified with ear tags. First estrus postpartum was obtained by utilizing vasectomized bulls equiped with chin ball markers. Visual observations were also made at least 3 times daily. When the oldest calf in a pen reached seven days of age a bull was turned in for two hours in the morning and evening for heat detection. Bulls were randomly assigned to pens each day. Heat detection was continued on a group basis when cows were removed from the pens. Cows were bred as described before and in mid October pregnancy was determined by rectal palpation. Fetus age was estimated by breeding dates and palpation estimations.

Monensin is used as an anti-coccidial in poultry so prior to the initiation of the study fecal samples were analyzed for coccidiosis. Tests were negative. Rumen samples were obtained during the trial to determine individual volatile fatty acid concentrations.

RESULTS AND DISCUSSION

Cow weight gains and hay intake prior to calving are shown in Table 1. Cattle on monensin treatments gained more on 7 to 10% less hay than the controls. Cows on the 200 mg level of monensin were the most efficient, gaining 0.10 lb. more per day on 10% less hay than the control treatment.

Table 1. Pre-partum cow gain and hay intake (11/16 to 3/1).

					Hay intake	
Treatment	No.	Initial wt.	Gain	ADG	Per day	Percent of control
		lb	lb	lb	lb	%
Control	24	1002	77	0.74	25.8	100
50	24	986	87	0.84	24.1	93
200	24	1005	87	0.84	23.1	90
300	24	1007	84	0.81	23.5	91

Table 2 presents the weight loss and hay intake of these cattle during the calving period. The 200 mg level cows lost about the same weight as the controls on 13% less hay and the 50 mg group on about 10% less hay. The cows on the 300 mg level consumed 11% less hay but lost more weight, indicating they should have received more hay during this period.

Table 2. Cow gain and hay intake through calving (3/1 to 5/9).

					Hay intake	
Treatment	No.[1/]	Initial wt.	Loss	ADG	Per day	Percent of control
		lb	lb	lb	lb	%
Control	21	1083	121	-1.75	28.4	100
50	23	1071	122	-1.77	25.5	90
200	19	1095	120	-1.74	24.7	87
300	21	1084	147	-2.13	25.3	89

1/ Missing values are due to 11 calves dying of lead poisoning and one cow getting sick and being removed from the trial.

In Table 3 the entire confinement period is summarized. Both the 50 mg group and 200 mg group lost less weight than the controls and received 8% less hay on the 50 mg level and 12% less on the 200 mg level. If this portion of the trial had not been terminated early both the 50 mg and 200 mg treatments would have had their hay further reduced in comparison to the controls to even out weight gains and losses. The 300 mg group would have received an increase from the 90% they were receiving.

Table 3. Cow gain and hay intake for the entire confinement period (11/15 to 5/9).

					Hay intake	
Treatment	No.	Initial wt.	Loss	ADG	Per day	Percent of control
		lb	lb	lb	lb	%
Control	21	1006	44	-0.25	26.8	100
50	23	984	20	-0.11	24.7	92
200	19	1012	37	-0.21	23.7	88
300	21	1002	65	-0.37	24.2	90

1/ Missing values are due to 11 calves dying of lead poisoning and one cow getting sick and being removed from the trial.

Monensin did improve feed efficiency throughout the duration of the treatment feeding portion of this trial. The 200 mg level appears to be the optimum and netted a savings of 12% in hay requirements. Over a 180 day wintering period this would save some 575 lb. of hay per cow. Also, if this study had continued it appeared hay intake on the 200 mg level could have been reduced a little further. On a 500 head cow herd this savings would reduce hay needs by some 144 tons or make it possible to feed another 60 head on the same feed resource.

Cow data after the termination of the treatments and calf performance to weaning are presented in Table 4. Cow weight gains were similar between the cows from the controls and 300 mg treatments and those from the 50 and 200 mg levels a little higher. Cows on all treatments, except the 300 mg, were about the same weight at weaning as they were at the start of the trial. The 300 mg group was 30 lb. lighter.

Table 4. Calf gain data (birth to 8/29) and cow gain data (5/9 to 8/29).

	Treatment			
Item	Control	50	200	300
Number[1/]	19	23	19	21
Initial wt., lb	962	949	975	937
ADG of cows from 5/9 to 8/29, lb	0.37	0.47	0.44	0.36
Gain, lb	41	53	49	40
Birth wt., lb	75	77	78	77
ADG birth to 5/9, lb[2/]	1.80	1.98	1.78	1.89
ADG 5/9 to 8/29, lb	1.37	1.48	1.41	1.45
Adjusted weaning wts., lb[3/]	269	281	292	295

1/ Missing values are due to calves dying of lead poisoning, 2 dying of other causes and 1 cow getting sick and being removed from the trial.

2/ Calf gain data were adjusted for sex of calf.

3/ Weaning weights were adjusted for sex and age of calf.

During the period of confinement the calves from control and 200 mg cows were about the same, with the 50 and 300 mg groups performing a little better. However, in looking at the calves that were lost from lead poisoning, it shows that calves lost from the control and 200 mg groups were steers and from high production index cows, particularly those on the 200 mg level. So in reality these gains between the four groups were quite comparable.

The adjusted weaning weights were 269, 281, 292 and 295 lb., respectively, for calves from cows on the control, 50, 200, and 300 mg monensin treatments. These differences were not significantly different, although calves from the monensin fed cows were somewhat higher. Calves were weaned at an average age of 139 days.

Reproductive performance is presented in Table 5. Days to first estrus were essentially the same between treatments. Pregnancy rates on these small numbers have limited value, but do show that all monensin fed groups bred at least as well or better than the controls. Projected calving interval is similar on the control, 50 and 200 groups, but about 10 days longer on the 300 mg group. Remember this group lost more weight through the calving period and gained less to weaning. This may have caused them to breed back somewhat later.

Table 5. Reproductive performance.

Treatment	No.	Birth to first estrus	Pregnancy rate		Projected calving interval
		Days	No.	%	Days
Control	19 1/	44 2/	16	84	344
50	23	44	21	91	349
200	19	41	19	100	348
300	21	45	18	86	358

1/ Missing values are due to 11 calves dying of lead poisoning, 2 dying of other causes and one cow getting sick and being removed from the trial.

2/ One cow did not cycle and was not included in the first estrus data.

In summary, monensin continues to be very consistent in its response and looks like it has a real place in cow feeding. Feed efficiency is improved and increased gains on the same feed can be realized or a reduction in hay requirements on the same gain. Current trials are looking at the possibility of a supplement savings on poor quality roughage, such as straw.

PREVIOUS LIVESTOCK FIELD DAY REPORTS
SQUAW BUTTE EXPERIMENT STATION

These reports are available upon request from the Squaw Butte Experiment Station, P. O. Box 833, Burns, Oregon 97720.