# FORAGE AND ANIMAL MANAGEMENT IMPLICATIONS OF SPRING AND FALL CALVING

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## SUMMARY

Forage dry matter intake (FDMI), body weight changes and milk production were determined for six fall-calving and six spring-calving cow-calf pairs grazing in common on crested wheatgrass pasture over a 125-day period from April 29 to August 31. For fall- and spring-born calves, respective daily FDMI averaged 4.25 kg and .94 kg (P<.01); and respective daily gains averaged 1.00 kg and .75 kg (P<.01). Mean fall-calving cow FDMI was 11.37 kg and 11.39 kg for spring-calving cows (P>.10). Spring-calving cows gained an average .65 kg/day and produced a mean of 5.24 kg of milk daily; fall calving cows gained .98 kg/day and produced 2.47 kg milk/day (both P<.01). The metabolizable energy required for milk production and weight gain was calculated for fall- and spring-calving cows. The energy required for additional milk production in the spring cow appeared to be quantitatively offset by body weight gain in the fall-calving cow. Based on forage consumption for the study period utilized, it is suggested that the animal unit equivalency of the fall-calving pair relative to the spring-calving pair be approximately 25% greater.

**(Key Words:** Fall Calving, Forage Intake, Milk Production, Cow-Calf, Beef Cattle, Forage Management.)

## INTRODUCTION

In much of the intermountain region of the western United States and other areas where severe winter conditions prevail, spring calving is the predominant calving management system. Recent research (Mueller and Harris, 1967; Raleigh *et al.*, 1970) has pointed to some advantages of a fall calving program in comparison to spring calving. Benefits include a reduced incidence of disease in the young calf, better control of the cow herd at breeding and production of a calf that is old and large enough to efficiently utilize the range forage at its peak of quality.

This study is a contribution to an on-going research project initiated in 1964 at the Squaw Butte Station to evaluate the relative merits of fall and spring calving. The winter management program at the Station has been previously described by Raleigh *et al.* (1970) and Turner *et al.* (1970). The objective of this study was to evaluate the comparative management implications of pasturing fall- and spring-calving cow-calf pairs during the spring-summer grazing season. (Henceforth, the fall- and spring-born calf and fall- and spring-calving cow will be referred to as fall and spring calf and fall and spring cow, respectively.)

## MATERIALS AND METHODS

Under the management system in effect at the Squaw Butte Station at the time of this study, fall cows were calved in October and November on meadowlands at the Station's winter headquarters. Fall calves were creep-fed until turned out on range with their dams in the spring. Fall cows were bred on winter meadowland pastures in multiple sire herds during the months of January and February. Weaning of fall calves took place in late July. Spring calves were dropped in March and April at Station headquarters and turned out on pasture or range with their dams around May 1. Spring cows were bred during June and July in multiple sire herds on range. This management system was used for the cows and calves involved in

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[4] Jointly operated by Oregon Agricultural Experiment Station, Oregon State University and Science and Education Administration-Federal Research, U. S. Department of Agriculture. Technical Paper No. 4045, Oregon Agricultural Experiment Station.

the present study except that fall calves were maintained with their dams until the end of the study in August.

The animals used in this study consisted of commercial grade Hereford cows ranging from 6 to 10 years of age and suckling steer calves of Hereford breeding. Mean birth date was October 23 for fall calves (range: October 6 to November 10) and March 19 for spring calves (range: March 14 to March 27). Six cows each were selected from the fall-calving and spring-calving herds at the Station on the basis of disposition, approximate uniformity of mature body size and suckling a healthy male calf. All cows and calves were grazed on common on crested wheatgrass pasture *(Agropyron desertorum)* from April 22 to August 31, 1974. A description of the area is provided by Raleigh (1970).

Six trials were conducted to determine forage consumption by each cow and calf. Trials 1 through 6 began April 29, May 20, June 10, July 1, July 29 and August 26, respectively. Intake was calculated as follows:

$$\text{DM intake, g} = \frac{F_o}{1-F_d} \div F_1$$

where $F_1$ was the concentration of the forage component used for reference and expressed as a decimal proportion of the forage dry matter. $F_d$ was the digestibility of the reference component expressed as a decimal; and $F_o$ was the fecal output in grams of the reference component.

Dry matter was used as a reference component for determining forage intake in cows, and cellulose was used for determining intake in calves. The latter was used with calves to distinguish between dry matter intake of forage origin and that derived from milk. Samples of forage consumed were obtained from a minimum of four esophageal fistulated cattle on each of 4 days during each intake trial. Fistula-collected forage samples were dried at 60 C, composited across animals and days within each trial and the composite sample ground to pass through a 1 mm screen in a Wiley mill. Cellulose was determined by the method of Crampton and Maynard (1938). Dry matter digestibility was estimated by the two-stage *in vitro* procedure of Tilley and Terry (1963), and cellulose digestibility was estimated using a 48-hr *in vitro* digestion.

Fecal output for each cow and calf was determined with total collection fecal bags for a 5-day collection period for each trial. Bags were weighed and a fecal sample taken from each bag for dry matter determination twice daily for all cows and fall calves and once daily for spring calves. The dried fecal samples for each calf were composited within each trial and a subsample ground for cellulose analysis.

Immediately following each fecal collection period, all animals were weighed and 24-hr milk production determined utilizing the weigh-suckle-weigh procedure described by Rutledge *et al.* (1971).

Treatment differences within trials were tested for significance using a standard t-test. Treatment by trial interactions were tested for significance by analyzing the data as a fixed model randomized complete block (Steel and Torrie, 1960) with trials being treated as blocks.

## RESULTS AND DISCUSSION

Forage consumption was similar ($P>.10$) for fall cows and spring calves at each intake measurement (figure 1). At the May 4 weighing, fall cows averaged 34 kg heavier than spring cows (table 1) and tended to gain more or lose less throughout the study period, resulting in a significant ($P<.01$) gain differential of 42 kilograms. Spring cows produced more milk than fall cows (table 1; $P<.05$ or $P<.01$) at each measurement with differences ranging from a low of 2.33 kg/day to a high of 3.13 kg/day. The level and consistency of milk production by the fall cow was unexpected considering the relatively advanced stage of lactation. Furr and Nelson (1964), however, found a substantial

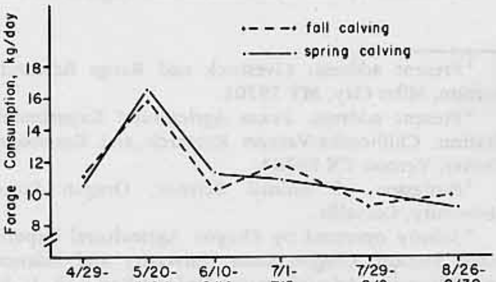


Figure 1. Daily forage dry matter consumption of fall- and spring-calving cows.

TABLE 1. BODY WEIGHT, DAILY GAIN AND MILK PRODUCTION OF FALL- AND SPRING-CALVING COWS ON SPRING-SUMMER PASTURE

| Item | Fall | Spring |
|---|---|---|
| No. animals | 6 | 6 |
| Body weight, kg | | |
| 5/4 | 409 | 375 |
| 8/31 | 525 | 449 |
| Avg daily gain, kg | | |
| 5/4–5/24 | 1.94 | 1.80 |
| 5/25–6/15 | 2.13 | 1.66* |
| 6/15–7/5 | 1.32 | .78 |
| 7/6–8/2 | .27 | -.12 |
| 8/3–8/30 | .16 | -.35 |
| 5/4–8/30 | .98 | .62** |
| Milk production, kg | | |
| 5/4 | 3.34 | 6.19** |
| 5/25 | 3.12 | 6.06** |
| 6/15 | 3.37 | 6.33** |
| 7/6 | 3.37 | 5.70* |
| 8/3 | 1.23 | 4.36** |
| 8/31 | .38 | 2.79** |
| Mean | 2.47 | 5.24** |

* Treatment means differ ($P<.05$).
**Treatment means differ ($P<.01$).

increase in milk production when fall cows were turned out on spring grass in comparison to production just prior to turnout.

The cows utilized in this study were considered to be of comparable mature size, despite the heavier initial weight of the fall cows. This disparity was a result of the difference in stage of production and management of the two groups of cows. The contrast was consistent with the 30 kg difference in spring turnout weights generally exhibited by the entire fall and spring herds at the Station (R. J. Kartchner, *unpublished data*) even though the two herds were genetically very similar.

On the basis of body size, it might be expected that fall and spring cows would have similar capacities for forage consumption as indeed is seen in figure 1. However, given the difference in milk production and its associated energy demands, the lack of intake difference is surprising. The spring cow produced roughly 332 kg more milk over the study period (calculated by multiplying the mean of two consecutive milk production determinations by the number of days represented by that mean and then summing the totals for all periods). Neville and McCullough (1969) determined that the energy cost of producing milk in beef cattle was 1.014 mcal ME/kg milk. This would amount to approximately 337 mcal additional metabolizable energy required by the spring cow for milk production compared to the fall cow.

In contrast, the fall cow gained an additional 42 kilograms. Applying the value of Neville and McCullough (1969) of 8.2 mcal ME/kg gain, the additional gain by the fall cow would require 344 mcal of metabolizable energy. Therefore, the energy required for extra milk production in the spring cow was nearly quantitatively offset by body weight gain in the fall cow (338 *vs* 344 mcal).

The fact that there was no increase in forage consumption by the spring cow relative to the fall cow to compensate for the additional demands for milk production suggests that both fall and spring cows were consuming forage to capacity. This was true even when demands for milk production in the spring cow were being met at the expense of her body tissue stores. Only during the first intake trial was forage availability considered to be a potentially limiting factor. At all other times, other factors such as rumen size and fiber content of the forage (Van Soest, 1965) would have limited intake.

This suggests that selecting range cows of a given size for greater milk production would, in effect, penalize the cow since she would not be able to compensate for the greater nutrient demand for milk production by increasing her nutrient intake from range forage. The work of Streeter *et al.* (1974) indicated there might be breed differences. Charolais × Angus crossbred cows tended to produce more milk and consume more forage than Hereford cows of similar mature weight although the limited number of cows per subgroup (two, three or four cows) restricted the conclusions that could be drawn. In view of the current emphasis placed on selection for higher milk production in beef cattle and the potential physical and physiological limitations on nutrient intake, further investigation into the relationships between cow size, milk production and nutrient intake under range conditions shoud be made.

Spring calves weighed 55 kg at the May 4 weighing compared to 147 kg for fall calves, and respective off-test weights were 145 and 265 kg (table 2). Fall calves gained more ($P<.01$ or $P<.05$) the first three weigh periods, but not in the last two, resulting in a significant ($P<.01$) treatment by weigh date interaction.

TABLE 2. DAILY GAIN OF FALL- AND SPRING-BORN CALVES ON SPRING-SUMMER PASTURE

| Item | Treatment | |
|---|---|---|
| | Fall | Spring |
| No. animals | 6 | 6 |
| Body weight, kg | | |
| 5/4 | 147 | 55 |
| 8/31 | 265 | 145 |
| Avg daily gain, kg[a] | | |
| 5/4–5/24 | 1.27 | .81** |
| 5/25–6/14 | 1.67 | .98** |
| 6/15–7/5 | 1.02 | .78* |
| 7/6–8/2 | .85 | .78 |
| 8/3–8/30 | .41 | .50 |
| 5/4–8/30 | 1.00 | .75** |

[a]Significant treatment × date interaction (P<.01).
* Treatment means differ (P<.05).
**Treatment means differ (P<.01).

Overall, the fall calf gained an average .25 kg/day more (P<.01) than the spring calf or 28.7 kg for the 119-day weigh interval.

Spring calf forage intake was minimal initially at .12 kg/day but increased steadily to 1.71 kg/day in August (figure 2). Fall calf intake jumped from 2.63 kg/day in early May to 4.67 kg/day 3 weeks later only to drop back again in mid-June. Forage consumption reached a peak of 5.5 kg/day in early August as the calf increased in size and milk consumption declined.

The difference in forage intake between fall and spring calves is not surprising considering the difference in body size and quantity of milk received. However, there is a paucity of information in the literature on forage intake of suckling calves. Consequently, these data are valuable in gaining an understanding of the direct role of forage consumption in calf development. Regression analysis of factors affecting forage intake in fall and spring calves (Kartchner *et al.*, 1976) indicated that an interaction between forage quality and milk produced by the dam was most influential in determining spring calf forage intake, whereas increasing calf size was the most important factor affecting forage intake in fall calves.

Despite the increased forage intake by both fall and spring calves during July and August, the intake of digestible nutrients declined in relationship to need as evidenced by the decline in rate of gain. This was relatively more severe for the fall calf.

The combined cow-calf intake is shown in figure 3. As indicated in figure 1, differences in fall and spring cow forage consumption were small. Therefore, the differences between fall and spring cow-calf intake can be attributed almost entirely to the differences in intake by the calf. This resulted in significant differences in combined intake at the 5% or 1% level of significance for all except the trial beginning July 29. The increase in fall intake, expressed as a percent of spring intake, ranged from a low of 16% in mid-June to a high of 42% at the end of August. All values combined gave an approximate 26% increase in forage consumption by the fall pair over that of the spring cow and calf. Thus, it appears that a reasonable adjustment for calculating the animal unit equivalent of the fall cow and calf relative to the spring pair would be a factor of 1.25. A cattle operator considering the merits of a fall or spring calving

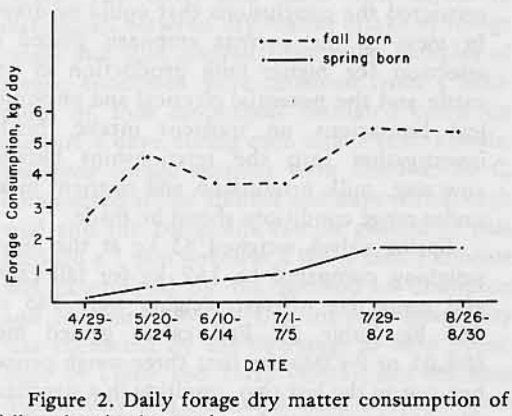


Figure 2. Daily forage dry matter consumption of fall- and spring-born calves.

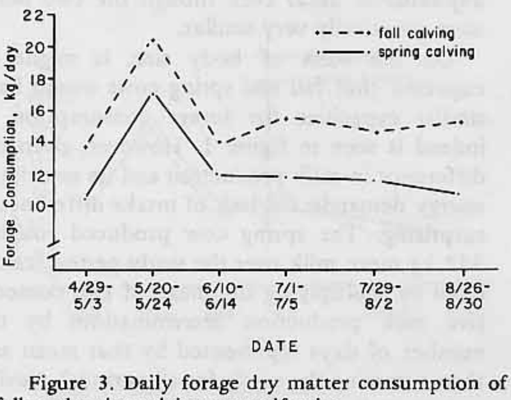


Figure 3. Daily forage dry matter consumption of fall- and spring-calving cow-calf pairs.

program must take into account both managerial and economic factors. From an economic viewpoint, considering only the 4-month period covered by this experiment and ignoring other management factors, the additional animal unit month (AUM) charged against the fall pair (.25 AUM × 4 months = 1 AUM) would need to be balanced against the additional 28.7 kg of fall calf gain.

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