Effect of calving season on cow/calf production in the Northern Great Plains - herd size and culling management -

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Abstract

There is current interest in the Northern Great Plains in shifting calving season away from the traditional late winter and early spring period. Records from North Dakota cow/calf herds over 6 years (1994-1999) were available to evaluate the effect of calving season on cow/calf production. Records (718 herd-years) were obtained from the central-processed CHAPS database of the ND Beef Cattle Improvement Association. Specific calving seasons were chosen based upon the distribution of mean annual calving dates in the database. Herd-years representing summer (10) and fall (5) calving seasons were excluded due to insufficient data. Remaining calving seasons and associated mean calving dates were late winter (LW; March 7), spring (S; April 2) and late spring (LS; April 20). There were no significant differences among calving seasons ($P > .1$) in the number of cows kept for breeding or calving, number of calves at calving, culling or replacement percentages or mean cow age. There were interactions between calving season and calving year in the number of cows (SPA-adjusted) exposed to breeding ($P < .05$) and mean cow age ($P < .01$). A modest overall increase in the number of cows kept for breeding ($P < .01$) was observed from 1994 through 1999, with most of the increase occurring in S and LS. This modest increase in cow numbers accounted for numerically larger herds in S (30%) and LS (28%) over LW. Over time mean cow age increased in LS, decreased in LW and was relatively stable in S. There were significant interactions between calving season and calving year in culling management. Differences among calving seasons within specific years were seen in number ($P < .01$) and percentage ($P < .05$) of cows culled as dead, in number ($P < .1$) and percentage ($P < .01$) of cows culled for inferior performance and percentage of cows culled for unknown reasons ($P < .05$). Differences among calving seasons in culling decisions did not appear to establish a consistent pattern, with the exception of an increase in the number of cows culled as dead in LS ($P < .05$). Much of this difference seemed to reflect the response of LS to the particularly harsh winter of 1997. There were few significant differences in herd size and culling decisions among herds calving from late winter till late spring in the Northern Great Plains. Although there was a numerical tendency for larger herds in later calving seasons, there was similarity among herds in different calving seasons for culling and replacement rates. Differences in the magnitude of specific culling decisions within a herd seems to reflect specific environment imposed (e.g. increase in cows dying in a particularly harsh winter) and does not significantly impact overall herd management.

Objective

Determine the effect of calving season on herd size and description and culling management of beef cattle operations in North Dakota.

Materials and Methods

The analysis was conducted on records from North Dakota herds using the CHAPS record keeping system from 1994 to 1999. Seven hundred eighteen (718) herd years were available for use in the analysis. The purpose of the analysis was to evaluate the effect of calving season on standard production variables. Calving seasons chosen were based on the distribution of mean calving dates represented in the database. Herd years representing summer (10) and fall (5) calving seasons were excluded from analysis due to insufficient data for these seasons. Remaining calving seasons were late winter (LW; 115 individual herd years), spring (S; 503 individual herd years), and late spring (LS; 85 individual herd years). Beginning and mean calving dates (tables 5a and 5b) for LW, S, and LS were February 13 and March 7, March 12 and April 2, and March 28 and April 20, respectively. Distribution of individual herd years within calving season are shown in figure 1.

Data were analyzed using the GLM procedure of SAS (SAS, 2002). Analysis included the effects of calving season, herd year within calving season, calving year and the interaction between calving season and year. Herd year within calving season was used as the error term to test for significant effects of calving season.

Results

There were no significant overall differences ($P > .1$) between calving seasons in the number of cows kept for breeding, SPA-adjusted cows kept for breeding, the number of cows kept for calving, the number of calves

at calving, the culling percentage, replacement percentage and the mean cow age (Table 1a).

There were significant overall differences between years in the number of cows kept for breeding, SPA-adjusted cows kept for breeding, the number of cows kept for calving and the number of calves at calving (Table 1a). There was a modest increase in herd size from 1994 to 1999 (Table 1b). This increase was primarily due to an increase in number of SPA-adjusted cows kept for breeding in S and LS ($P < .05$; Figure 2). Herd size in LW increased only slightly over this time period. There was also a divergent trend in cow age over time ($P < .01$; figure 3). Cow age increased in LS, decreased in LW and was relatively stable in S.

Although there were no significant overall differences between calving seasons in the number or percentage of cows culled from the herd (Table 1a), there were differences ($P < .1$) among calving season within specific years in the number and percentage of cows culled as dead or for inferior performance and for the percentage culled for unknown causes (Table 2a and Figures 4 – 8). These differences did not appear to establish a consistent pattern, with the exception of an increase in the number of cows culled as dead in LS ($P < .05$; Table 2b). This difference was magnified in 1997 (Figure 4). This was most likely due to the infamous winter of 1997 in the Northern Great Plains.

Implications

There were few significant differences in herd size and culling decisions among herds calving from late winter till late spring in the Northern Great Plains. Although there was a numerical tendency for larger herds in later calving seasons, there was similarity among herds in different calving seasons for culling and replacement rates. Differences in the magnitude of specific culling decisions within a herd seems to reflect specific environment imposed (e.g. increase in cows dying in a particularly harsh winter) and does not significantly impact overall herd management.

Table 1a. Effects of calving season and year on herd size, replacement and culling rates and mean cow age.

			Probability[a]		
Item	Mean[b]	SD[b]	Season	Year	Interaction
Number of cows exposed to breeding	149.6	19.1	-	***	-
SPA-adjusted	137.7	16.7	-	***	**
Number of cows kept for calving	126.6	15.4	-	***	-
Number of calves at calving	128.2	15.5	-	***	-
Number of cows culled from the herd	20.7	12.7	-	**	-
Culling percentage	15.7	10.6	-	*	-
Number of female replacements kept	23.9	8.9	-	*	-
Replacement percentage	20.1	7.0	-	-	-
Cow age	5.5	.48	-	-	***

[a] ***. **, * and - indicate probability levels of P < .01. .05 and .10 and P > .1, respectively.
[b] Mean and SD refer to the overall average and standard deviation.
[c] Standardized performance analysis methodology used in calculating number of cows exposed to breeding.

Table 1b. Least squares means for effects of calving season and year on herd size, replacement and culling rates and mean cow age.

	Calving Season			Year of weaning					
Item	Late Winter	Spring	Late Spring	1994	1995	1996	1997	1998	1999
Number of cows exposed to breeding	119.4	153.9	150.6	125.5[a]	136.7[b]	142.0[bc]	147.4[c]	146.5[cd]	149.7[c]
SPA-adjusted	108.0	141.7	140.7	115.9[a]	125.2[b]	127.9[bc]	137.4[de]	133.1[cd]	141.3[e]
Number of cows kept for calving	100.5	130.1	128.1	109.8[a]	113.9[ab]	117.6[bc]	123.0[c]	120.8[c]	132.6[d]
Number of calves at calving	100.9	132.4	129.7	111.6[a]	116.0[ab]	119.3[bc]	125.8[cd]	123.0[c]	130.3[d]
Number of cows culled from the herd	17.5	20.9	20.5	13.9[a]	20.5[bc]	22.4[c]	21.2[bc]	22.8[c]	16.8[ab]
Culling percentage	18.3	15.5	14.2	12.9[a]	17.2[ab]	17.7[b]	16.3[ab]	18.6[b]	13.1[a]
Number of female replacements kept	19.9	25.4	20.3	19.8[a]	20.6[a]	21.8[a]	22.3[ab]	20.8[a]	26.0[b]
Replacement percentage	20.2	21.0	17.5	19.8	20.6	20.1	20.2	18.8	17.9
Cow age	5.2	5.4	5.8	5.4	5.5	5.5	5.5	5.4	5.5

[a,b,c,d,e] Means within an effect with differing superscripts differ (P<.05).

Table 2a. Effects of calving season and year on rationale and magnitude of cow removal from herd (culling).

			Probability[a]		
Item	Mean[b]	SD[b]	Season	Year	Interaction
Number of cows					
Dead	1.2	1.4	**	***	***
Age	3.5	4.9	-	-	-
Structural defect	2.0	2.3	-	*	-
Non pregnant	7.7	5.2	-	***	-
Inferior performance	1.7	3.1	-	-	*
Replacement	3.2	8.9	-	-	-
Unknown	1.4	3.0	-	-	-
Total	20.7				
Percentage of total cows culled					
Dead	7.4	10.2	-	***	**
Age	16.0	17.2	-	-	-
Structural defect	11.1	12.0	-	-	-
Non pregnant	41.1	23.9	-	-	-
Inferior performance	8.2	13.2	-	-	***
Replacement	9.0	17.8	-	-	-
Unknown	7.2	15.3	-	**	**
Total	100				

[a] ***. **, * and - indicate probability levels of P < .01. .05 and .10 and P > .1, respectively.

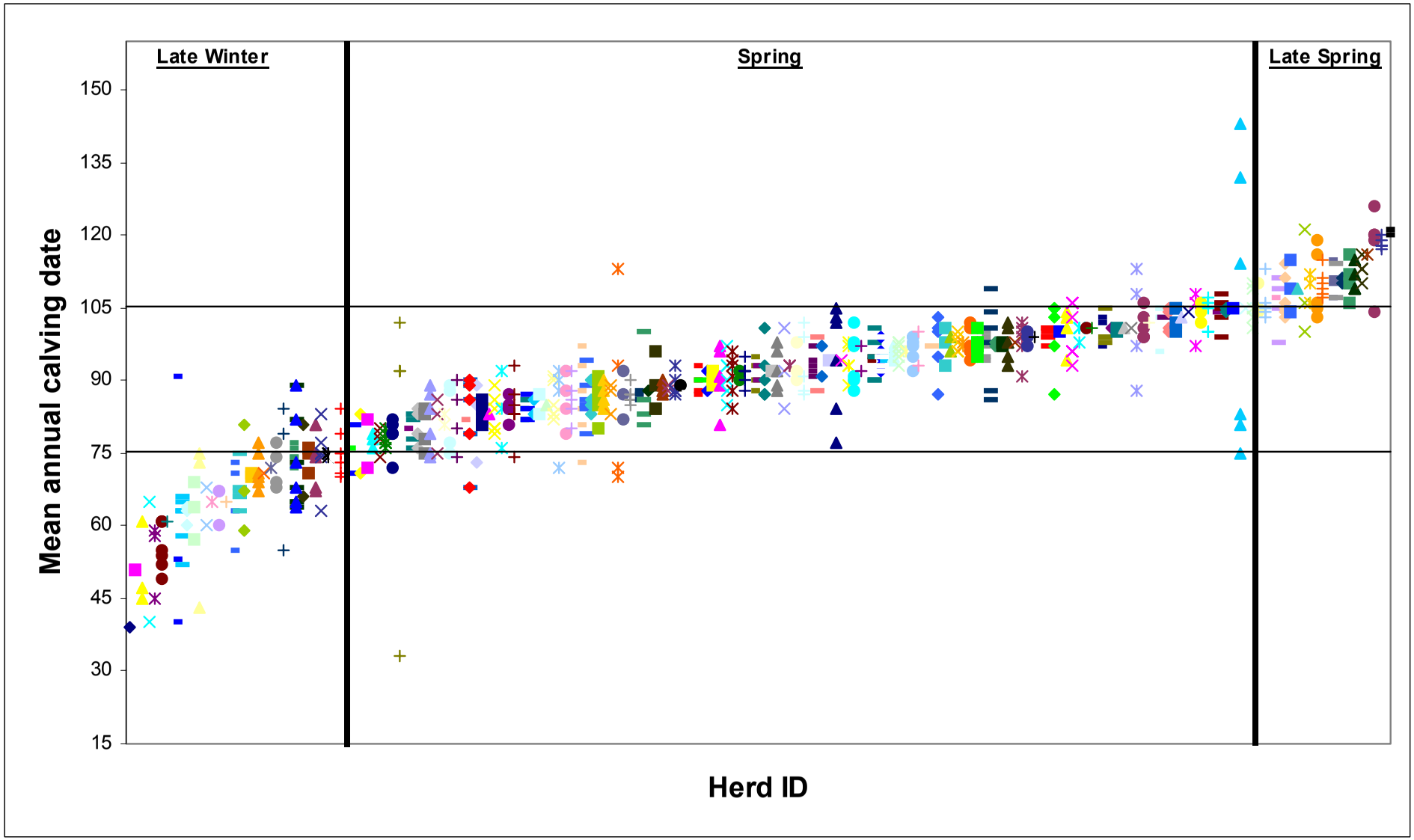
[b] Mean and SD refer to the overall average and standard deviation.

Table 2b. Least squares means for effects of calving season and year on rationale and magnitude of cow removal from herd (culling).

	Calving Season			Year of weaning					
Item	Late Winter	Spring	Late Spring	1994	1995	1996	1997	1998	1999
Number of cows									
Dead	1.0[a]	1.2[a]	2.0[b]	.9[a]	1.4[a]	1.3[a]	2.5[b]	.9[a]	1.2[a]
Age	2.1	3.7	3.5	3.1	3.2	3.6	3.2	2.4	3.0
Structural defect	1.9	1.7	1.6	1.3[a]	1.7[a]	2.7[b]	1.7[a]	1.7[a]	1.5[a]
Non pregnant	5.2	7.5	8.5	3.3[a]	7.7[b]	7.0[b]	8.7[b]	8.5[b]	7.2[b]
Inferior performance	1.3	1.5	1.9	1.5	1.8	1.8	1.4	1.9	1.0
Replacement	4.8	2.6	2.5	2.7	3.6	4.7	2.2	5.5	1.1
Unknown	1.3	2.6	0.5	1.0	1.2	1.3	1.5	2.0	1.9
Total	17.6	20.8	20.5	13.8	20.6	22.4	21.2	22.9	16.9
Percentage of total cows culled									
Dead	9.4	7.9	11.5	8.8[ab]	7.9[ab]	8.0[ab]	16.2[c]	5.7[a]	11.1[b]
Age	12.6	17.0	16.2	19.4	15.7	15.5	14.9	12.9	13.3
Structural defect	10.6	9.9	8.1	9.8	9.2	12.8	7.7	7.8	10.0
Non pregnant	36.6	40.3	48.3	38.6	43.0	42.0	42.9	45.2	38.8
Inferior performance	8.4	6.8	7.7	8.4	7.9	7.3	8.0	6.7	7.5
Replacement	10.1	7.7	5.0	9.5	10.4	8.2	4.0	10.1	3.5
Unknown	12.2	10.3	3.1	5.4[a]	5.9[a]	6.2[a]	6.3[a]	11.6[ab]	15.8[b]
Total	99.9	99.9	99.9	99.9	100	100	100	100	100

[a,b,c,d,e] Means within an effect with differing superscripts differ (P<.05).

Figure 1. Scatter-plot of mean annual calving Julian date by individual herds. Herds were categorized into three calving seasons using average calving date for each herd. Average calving dates less than 75 (March 16), between 75 (March 16) and 105 (April 15), and greater than 105 (April 15) were classified into a late winter (LW), spring (S) and late spring (LS) calving season, respectively.



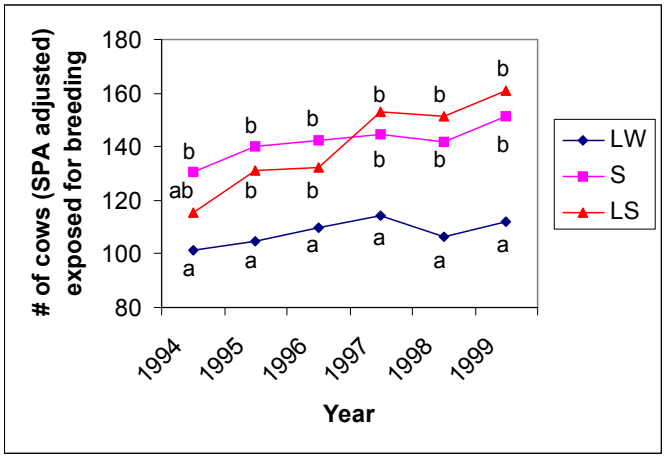


Figure 2. Effect of calving season and year on the number of cows (SPA-adjusted) exposed for breeding. Average calving dates less than 75 (March 16), between 75 (March 16) and 105 (April 15), and greater than 105 (April 15) were classified into a late winter (LW), spring (S) and late spring (LS) calving season, respectively. Means within year with differing superscripts differ (P < .05).

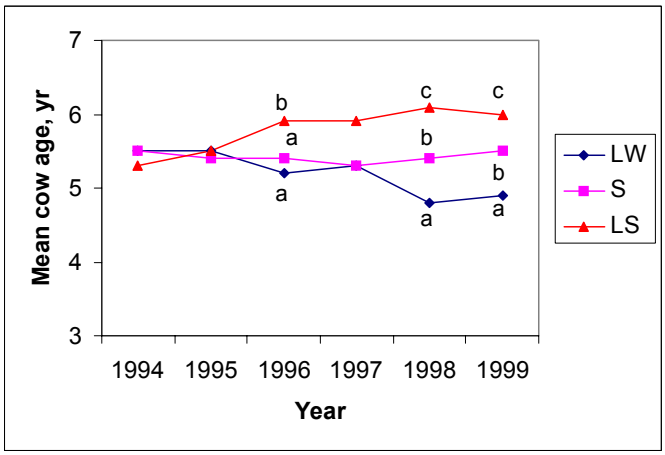


Figure 3. Effect of calving season and year on mean cow age. Average calving dates less than 75 (March 16), between 75 (March 16) and 105 (April 15), and greater than 105 (April 15) were classified into a late winter (LW), spring (S) and late spring (LS) calving season, respectively. Means within year with differing superscripts differ (P < .05).

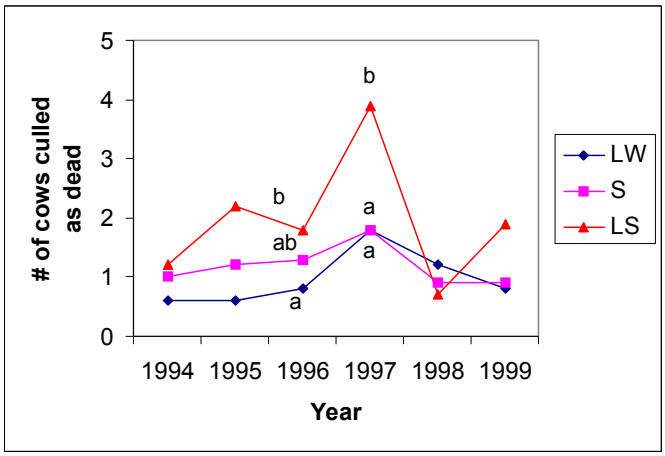


Figure 4. Effect of calving season and year on the number of cows culled as dead. Average calving dates less than 75 (March 16), between 75 (March 16) and 105 (April 15), and greater than 105 (April 15) were classified into a late winter (LW), spring (S) and late spring (LS) calving season, respectively. Means within year with differing superscripts differ (P < .05).

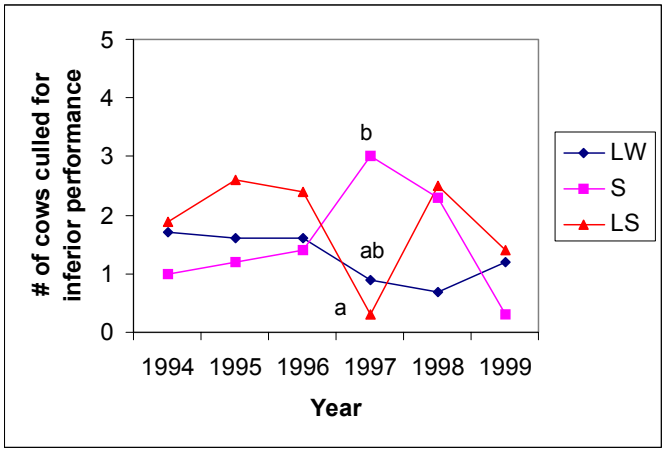


Figure 5. Effect of calving season and year on the number of cows culled for inferior performance. Average calving dates less than 75 (March 16), between 75 (March 16) and 105 (April 15), and greater than 105 (April 15) were classified into a late winter (LW), spring (S) and late spring (LS) calving season, respectively. Means within year with differing superscripts differ (P < .05).

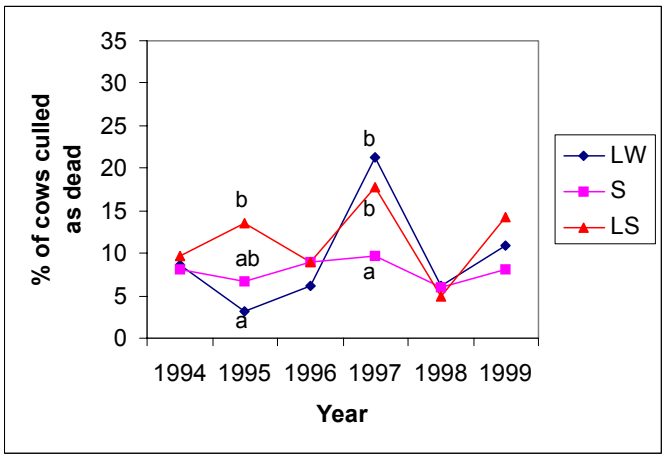


Figure 6. Effect of calving season and year on the percentage of cows culled as dead. Average calving dates less than 75 (March 16), between 75 (March 16) and 105 (April 15), and greater than 105 (April 15) were classified into a late winter (LW), spring (S) and late spring (LS) calving season, respectively. Means within year with differing superscripts differ (P < .05).

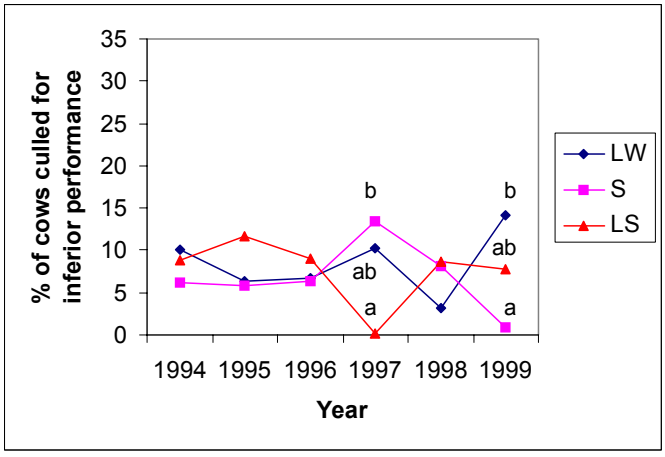


Figure 7. Effect of calving season and year on the percentage of cows culled for inferior performance. Average calving dates less than 75 (March 16), between 75 (March 16) and 105 (April 15), and greater than 105 (April 15) were classified into a late winter (LW), spring (S) and late spring (LS) calving season, respectively. Means within year with differing superscripts differ (P < .05).

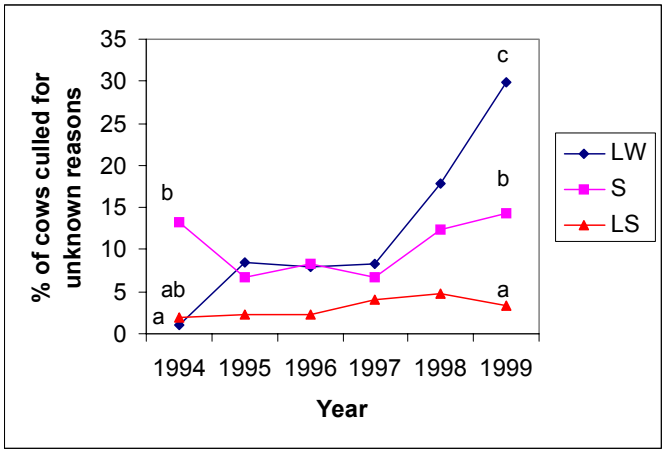


Figure 8. Effect of calving season and year on the percentage of cows culled for unknown reasons. Average calving dates less than 75 (March 16), between 75 (March 16) and 105 (April 15), and greater than 105 (April 15) were classified into a late winter (LW), spring (S) and late spring (LS) calving season, respectively. Means within year with differing superscripts differ ($P < .05$).