

sheared by the flock but unless light shearing ewes were also poorer than average performers for lamb production, they probably should not be culled.

Procedures for mass identification of ewes according to general level of performance for the various traits were suggested. The immediate economic loss vs. the long time gain to be expected from culling and the advisability of culling ewes that were deficient in more than one trait were considered.

The Lifetime Reproductive Performance of a Hereford Cow Herd

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A beef cow herd yields only one source of income, a marketable calf at weaning time. Thus, the gross monetary return to the producer is completely dependent upon the number, weight and quality of the calves weaned. Anything that can be done to improve the performance of the beef cow herd in any of these categories will make an important contribution towards increasing the gross income of the cattleman.

The rather obvious importance of numbers of calves at weaning is shown in Table 1. This table gives the price per cwt. necessary to break even at various herd average weaning weights and calf crop percentages, assuming an annual cow cost of \$80.00. It can be seen that raising the calf crop weaned percentage 10% is equivalent to an increase of 50 lbs. in average weaning weight.

Table 1.—The Necessary Selling Price Per Cwt. to Break Even at Different Herd Average Weaning Percentages and Weaning Weights Assuming an Annual Cow Cost of \$80.00.

Percent Calf Crop Weaned	Average Weaning Weight (lbs.)			
	400	450	500	550
100	\$20.00	\$17.80	\$16.00	\$14.55
95	21.05	18.70	16.85	15.30
90	22.20	19.75	17.80	16.20
85	23.55	20.90	18.80	17.10
80	25.00	22.20	20.00	18.20
75	26.70	23.70	21.35	19.40
70	28.60	25.40	22.85	20.80

The importance of regular reproduction is evident since every cow failing to calve represents a total economic loss for the year. However, another important factor determining the size of the calf crop weaned is the death loss of calves from birth to weaning. In many herds this latter loss may be as great, or greater, than that resulting from complete reproductive failure.

Although regularity of reproduction is basic, prompt rebreeding so that as many calves are born as early as possible is also important to the cattleman. Not only will the earlier calves be heavier calves at weaning time, but there is the possibility that cows calving extremely late may not come in heat until after the end of the breeding season, and thus will be open the following year.

It hardly seems necessary to point out to cattlemen that reproductive efficiency is usually less than the theoretically possible 100%. Even in well managed herds in which every effort is made to insure reproductive efficiency and herd health, there are unavoidable calf losses. However, many are not aware of the nature, extent and causes of these losses in the industry as a whole. This report is an attempt to point out some factors affecting reproductive efficiency by summarizing the reproductive performance of an experimental cow herd through 14 years of age.

Materials and Methods

The data summarized in this report were taken from the records of the Fort Reno project 650-1 that has been described in a series of earlier Feeders Day reports (Okla. Agr. Exp. Stat. MP-22, 27, 31, 34, 43, 45, 51, 55, 57 and 67). The herd was established as a nutritional research herd in the Fall of 1948 with 120 weaner Hereford heifer calves. Because of losses, for one reason or another, prior to calving, only 117 heifers are used in this analysis as producing females in the herd.

Three rates of supplemental winter feed have been provided on native grass, with a pasture allowance of approximately six to eight acres per head, year-long. One half of the heifers in each winter treatment were bred to calve first as two-year-olds, while the remainder calved first at three. The winter feeding period extended from early November to mid-April each year. All cows have had continuous access to a mineral mixture of two parts salt and one part steamed bone meal. Except for one season, as will be discussed later, breeding has been pasture exposure to bulls from May 1 to August 15 each year. Breeding dates were not obtained.

All calves were identified at birth by an individual ear tattoo, weighed and this and other pertinent data recorded. Records were, therefore, available on each cow each year as to date of calving, sex and weight, weaning weight, and sire of calf. Cows have been removed from the herd for the following reasons: death; failure to raise a calf two successive years; disease, injury, or other unsoundnesses rendering them unfit for future production. For the purpose of this summary the cows were considered as a group ignoring differences in winter treatments.

While there were marked differences in several economic traits between the three wintering groups, there were no consistent differences in any aspects of reproductive performance that could be studied. Therefore, it was felt that the data were most useful in studying the nature and extent of reproductive losses in a cow herd through 14 years of age. The records permitted calculation of: calf crop percentages; average calving date; percent of cows calving in each 20 day period of the calving season; the frequency of occurrence of open cows; and the calf losses from calving to weaning.

Results and Discussion

The data presented in Table 2 is a summary of the reproductive performance of the cow herd through 14 years of age. Although one half of the cows calved first at two years of age and the remainder at three years of age, the two groups were combined for computing these averages. Calving percentages and weaning percentages are calculated on the basis of the number of cows in the herd at breeding time.

The data represents a total of 1225 cow years. The herd average through 14 years was a 91.9% calf crop born and an 86.9% calf crop weaned. Comparable figures for the herd through 8 years of age were 94.9% born and 90.0% weaned; through 10 years of age, 94.5% born and 89.5% weaned; and through 12 years of age, 93.8% born and 88.6% weaned. Three sets of twins were dropped by the 1126 cows calving, for a twinning rate of 1 set in 375 calves. The survival rate of twins was 50%.

The decline in reproductive efficiency at ages of 12 years and older is one of the most striking features of Table 2. Actually, although the performance of the 11 year old cows was good, the decline started at 10 years of age.

The data reveals that through 9 years of age the two losses contributing to a reduced calf crop weaned percentage, cows failing to calve and calves born dead or dying before weaning, are approximately the same. However, each year after 9 years of age open cows account for an increasingly larger percent of the total loss from breeding to weaning.

The cows in this herd were bred for a limited period of approximately 100 days starting May 1 of each year. Since breeding dates were not obtained, an accurate measure of breeding efficiency, such as services required per conception, cannot be calculated. However, a crude estimate can be made by considering average calving date and the number calving in each 20 day period after the start of the calving season.

The average calving date of the two-year-old heifers is a little over a week later than the average for 3- and 4-year-old heifers. This should be expected since some of the yearling heifers bred for two year old calving may not have reached puberty until after the breeding season began. That this is the case is indicated by the observation that, although nearly as many of the 2-year-olds calved in the first 40 days, a greater percentage calved later than 60 days after the start of the calving

Table 2.—Summary of the Lifetime Reproductive Performance of a Grade Hereford Cow Herd.

	Age of Cows (years)												
	2	3	4	5	6	7	8	9	10	11	12	13	14
No. of cows	59	116	111	110	110	108	107	103	99	91	81	73	57
Percent calf crop													
Born	93.2	95.7	93.7	95.5	97.3	92.6	95.3	98.1	87.9	94.5	85.2	80.8	70.2
Weaned	84.7	92.2	89.2	90.9	91.8	88.0	90.7	93.2	81.8	90.1	76.5	76.7	66.7
Percent open cows	6.8	4.3	6.3	4.5	2.7	7.4	4.7	1.9	12.1	5.5	14.8	19.2	29.8
Percent calves dying													
before weaning	8.5	3.4	4.5	4.5	5.5	4.6	4.7	4.9	6.1	4.4	8.6	4.1	3.5
Ave. calving date	3-14	3-5	3-5	3-6	3-1	3-10	3-26	3-18	3-13	3-10	3-10	3-15	3-17
Percent cows calving													
1st 20 days	52.8	54.6	37.5	45.7	57.9	54.0	21.6	26.7	42.9	40.7	48.5	40.7	41.0
2nd 20 days	22.6	28.7	44.2	30.5	28.0	36.0	20.6	42.6	34.5	32.6	27.9	37.3	33.3
3rd 20 days	7.5	9.3	5.8	15.2	9.3	6.0	31.4	11.9	10.7	14.0	17.6	11.9	5.1
Later	16.9	7.4	12.5	8.6	4.7	4.0	25.4	18.8	11.9	12.8	5.9	10.2	20.5

season than was observed in older heifers. Of course it could also mean that all of the heifers were cycling at the time the breeding season began, but that a larger percentage of yearling heifers than of older heifers require more than one service to conceive.

There was little change in average calving date through 7 years of age, but a marked drop at 8 years of age. It is probable that this drop reflects a change in management rather than a decline in reproductive efficiency of the cows. An attempt was made to use yearling bulls by hand mating in the breeding season for the 8-year-old calving. Considerable difficulty was encountered in detecting all cows in heat and in getting satisfactory performance from the young bulls early in the breeding season. This early season difficulty is confirmed by the fact that only 42% of the cows calved in the first 40 days of the calving season, compared to 75% to 90% in the same period in all previous calving seasons.

Although the reason for the late calving date of the 8-year-old cows was probably management rather than a reduced fertility level of the cows, there is a lesson in the calving performance of the herd in the next two years. As 9-year-old cows the calving date was one week earlier than that of the 8-year-old cows, but is still more than a week later than the average for the years prior to 8 years of age. Also, the pattern of more cows calving later than 60 days after the start of the calving season continues. This suggests that if the average calving date of a herd is late one year, whether it be the result of poor feeding, poor management, or using bulls of low fertility, a pattern of later calving is set for several years even though the original causes have been corrected.

The average calving date of 13- and 14-year-old cows indicates some decline in breeding efficiency. However, in each year approximately 75% of the cows calved in the first 40 days of the calving season. This suggests that there is little or no reduction in the percentage of cows settling to first service as compared to their performance at younger ages. The later calving date is probably the result of the older cows requiring a somewhat longer time to recover from calving and resume cycling. Since nearly 21% of the 14-year-old cows calved later than 60 days after the start of the calving season, there is some indication that at this age there is a reduction in the fertility of some of the cows. However, the most important effect of advancing age on reproduction is the greatly increased number of open cows. The data suggests that at this age reproduction is largely an all or none proposition. The fertility of the cow is either nearly as good as it was at younger ages or she fails completely. It is unfortunate that more detailed observations were not made. It would be very enlightening to know what percent, if any, of the open cows did not show heat during the breeding season.

Two-Year-Old Calving vs. Three-Year-Old Calving

As was shown in Table 2, the heifers calving at two years of age had an average calving date that was 9 days later than the average calving date for all heifers at three years of age. Since heifers calving first at two years of age require somewhat longer to reach mature

weight, there is a possibility that it could also retard reproductive performance.

Table 3 persons the reproductive performance of the two groups of heifers through 12 years of age. There were 4 more of the 3-year-old calvers left in the herd at 12 years of age. There was essentially no difference in regularity of reproduction, 65.8% of the 2-year-old calvers and 66.7% of the 3-year-old calvers had never been open. The average calf crop born percentage for 2-year-old calvers was 95.9% compared to 95.5% for the 3-year-old group. Average calf crop weaned percentages were 92.8% and 91.2% for 2-year-old and 3-year-old calvers respectively.

The later calving date of the 2-year-old heifers is reflected in a week later date for these heifers through 4 years of age. However, from 5 to 12 years of age there is no consistent difference between the two groups. On the basis of these observations alone one would conclude that the future reproductive performance of heifers is not adversely affected by calving her first at two years of age.

Table 3.—Summary of the Reproductive Performance Through 12 Years of Age of Hereford Heifers Calving First and 2 Years of Age and Those Calving First at 3 Years of Age.

	Age at First Calving	
	2 Years	3 Years
No. at Start	59	58
No. at 12 years of age	38	42
Calf crop percent		
Born	95.9	95.5
Weaned	92.8	91.2
No. never open	25	28
No. open		
1 time	9	9
2 times	3	5
3 times	1	0
Average Calving Date		
2 years	3-14	---
3	3-10	2-28
4	3-9	3-2
5	3-7	3-5
6	3-1	3-3
7	3-10	3-9
8	3-24	3-27
9	3-17	3-19
10	3-11	3-12
11	3-10	3-11
12	3-9	3-10

Culling Open Cows vs. No Culling of Open Cows

One question that is currently of great interest to cattlemen is whether open cows should be culled at the end of the breeding season on the basis of a pregnancy check. This management practice could have two effects on the reproductive performance of the herd: the temporary effect of raising calf crop percentages in the next calf crop; and a permanent effect in raising the over-all reproductive efficiency of the herd by removing cows of low fertility.

The temporary effect listed above has, of course, the obvious consequence of improving the calf crop percentage in the next calving season. This is shown in Table 4 in which the actual reproductive performance of the herd is compared with what theoretically would have occurred had all open cows been culled in the fall after the end of the breeding season. The assumption is made that all open cows would have been detected by a pregnancy check. The data is somewhat biased because culling of open cows was carried out if the cow was open two years in a row.

The increase in the percentage of calves weaned through 10 years of age averages about 5%, ranging from an increase of 1.9% in 9 year old cows to an increase of 11.1% at 10 years of age. The improvement is marked in cows 12 years of age and older, and certainly suggests that if cows of these advanced ages are in the herd they should be checked at the end of the breeding season and culled if open.

The improvement in calf crop percentage is not without cost. With the culling actually practiced in the herd, 84% of the original cows were still in the herd at 10 years of age. This is in contrast to an estimated 60% that would still have been in the herd with strict culling of open cows. To have maintained numbers at the original level through 10 years of age would have required 47 replacements had strict culling been practiced, compared to 18 required with no culling of cows the first time that they were open. Since this means that more first calf heifers would have been in the herd each year, the advantage of an increased number of calves at weaning would have been partially offset by a lower average weaning weight. It is also likely that the added cost of a replacement heifer would not have been completely offset by the salvage value of the cow culled.

Just how effective the culling of open cows would be in permanently improving the reproductive efficiency of the herd could not be adequately studied in the data available. As mentioned previously the data is biased somewhat because cows were culled if they were open two years in a row. Thus, their future reproductive performance could not be determined. However, the data reported in Table 5 provides some estimate of just how effective culling often open cows one year would be in eliminating the cows that were open in later years.

It can be calculated from the data in Table 5 that the percentage of cows still in the herd at 8, 10 and 12 years of age that had been open one or more times were, respectively, 21.5%, 28.3% and 33.3%. How-

Table 4.—Summary of the Theoretical Reproductive Performance of Cows in Ft. Reno Project 650-1, 1950 Through 1962, had there been no Culling of Open Cows in the Fall and had there been Culling of All Open Cows on the Basis of a Pregnancy Check in the Fall.

Year	Age of Cows	No Culling of Open Cows					Culling of Open Cows in Fall after Breeding				
		No. of Cows in Herd at Calving	Percent of Original No. of Cows	Percent Calf Crop		No. Replacements Needed	No. of Cows in Herd at Calving	Percent of Original No. of Cows	Percent Calf Crop		No. Replacements needed
				Born	Weaned				Born	Weaned	
1950	2	59	100	93.2	84.7	0	55	93.2	100	90.9	4
1951	3	116	99.1	95.7	92.2	1	110	94.0	100	96.4	3
1952	4	111	94.9	93.7	89.2	5	103	88.0	100	95.1	7
1953	5	110	94.0	95.5	90.9	1	99	84.6	100	93.9	4
1954	6	110	94.0	97.3	91.8	0	96	82.1	100	93.8	3
1955	7	108	92.3	92.6	88.0	2	88	75.2	100	94.3	8
1956	8	107	91.5	95.3	90.7	1	84	71.8	100	96.4	4
1957	9	103	88.0	98.1	93.2	4	81	69.2	100	95.1	3
1958	10	99	83.8	87.9	81.8	4	70	59.8	100	92.9	11
1959	11	91	77.8	94.5	90.1	8	67	57.3	100	95.5	3
1960	12	81	69.2	85.2	76.5	10	54	46.2	100	87.0	13
1961	13	73	62.4	80.8	76.7	8	40	34.2	100	95.0	14
1962	14	57	48.7	70.2	66.7	16	24	20.5	100	100.0	16

ever, of the cows that had been open, the percent at each age that had been open only once were: at 8 years of age, 82.6%; at 10 years of age, 82.1%; and at 12 years of age, 70.4%. It is evident that the bulk of the cows that would have been culled because they were open would never have been open again through 10 years of age. Thus, culling of open cows in this herd would have had little effect in reducing the number of open cows in future years. This also points to an added cost of this management practice, the culling in their peak years of production of many cows that would have been regular producers thereafter.

One observation that is not reported in Table 5 does point out one situation in which culling open cows would have been beneficial in this herd. Five heifers open their first year were kept through the second calving season, and four were also open the second year. Since they had been open two years in a row they were culled so their future performance was not determined. However, the observations that were made indicates that culling based on failure to calve their first year may eliminate heifers that, for a variety of possible reasons, will never breed. In this instance the culling of open heifers would result in a permanent improvement in the reproductive efficiency of the herd in future years.

The decision as to whether to cull open cows must be based on several considerations. This practice must be considered to be of value primarily in reducing the number of open cows that are wintered. It will be relatively ineffective in reducing the numbers of cows that have calved at least once that will be open in future years. A large number of cows culled prior to ten years of age will probably be regular producers thereafter. Many of these cows will be entering their years of peak production, so the probable increased value of their calves over those from the replacement heifers must be considered.

It is not possible from the data summarized in this study to make many concrete recommendations as to whether culling of open cows should be regularly practiced. It does appear that one should give serious consideration to culling heifers that fail to calve their first

Table 5.—Summary of the Regularity of Reproduction of Hereford Cows Still in the Herd at 8, 10 and 12 Years of Age.

	Age of Cows		
	8 Years	10 Years	12 Years
No. of cows in herd	107	99	81
No. weaning a calf every year	64	50	36
No. that had never been open	82	71	54
No. in herd at each that had been open			
one time	19	23	19
two times	4	3	7
three times	0	2	1

year. This is especially true if they are culled on the basis of a pregnancy check in the fall of their yearling year. At this time their net salvage value is most nearly equal to the cost of a replacement heifer. The data also indicates that if cows older than 10 years of age are in the herd they should be checked after each breeding season and all open cows culled. For cows of all other ages the decision cannot be simply arrived at in many cases. There is little reason for suggesting that poor producing cows should be kept if open in preference to replacing them with heifers. However, it is questionable whether high producing cows should be culled on the basis of one open season. The genetic loss to the herd may offset by several times the net economic gain from the elimination of the feed cost of one open cow.

Summary

The lifetime reproductive performance of a grade Hereford cow herd through 14 years of age was studied. The data includes 1225 cow years. There were 117 heifers at the start of the experiment, and the number of cows remaining in the herd and the average percent calf crops were: through 8 years of age, 107 cows, 94.9% born and 90.0% weaned; through 10 years of age, 99 cows, 94.5% born and 98.5% weaned; through 12 years of age, 81 cows, 93.8% born and 88.6% weaned; and through 14 years of age, 57 cows, 91.9% born and 86.9% weaned.

The cows in this study began to decline in reproductive performance at 10 years of age, with a marked decline in cows 12 years of age or older. The decline in older cows was almost entirely one of failure to conceive, since the average calving dates of older cows differs little from that of younger cows.

There was no adverse effect of two year old calving on the future reproductive performance of the heifers. At 8, 10 and 12 years of age respectively, 21.5%, 28.3% and 33.3% of the cows still in the herd had been open only once in this group of cows was; at 8 years of age, 82.6%, at 10 years of age, 82.1%, and at 2 years of age, 70.4%. It appears that culling of open cows would have increased the calf crop percentage approximately 5% in the following calving season, but would have been relatively ineffective in reducing the number of open cows in the herd in future years.