ANALYSIS OF THE BREEDING RECORDS OF THE OKLAHOMA A. AND M. COLLEGE DAIRY HERD FROM 1926 TO 1937, INCLUSIVE

ANALYSIS OF THE BREEDING RECORDS OF THE OKLAHOMA A. AND M. COLLEGE DAIRY HERD FROM 1926 TO 1937, INCLUSIVE

By

LEEMAN W. TEETES
Bachelor of Science
Agricultural and Mechanical College of Texas
College Station, Texas

1938

Submitted to the Department of Dairying
Oklahoma Agricultural and Mechanical College
In Partial Fulfillment of the Requirements
for the Degree of
MASTER OF SCIENCE

1938

Approved:

A. N. Kuhlman
In Charge of Thesis

A. N. Kuhlman
Acting Head of Department of Dairying

D. G. McIntosh
Dean of Graduate School

ACKNOWLEDGEMENTS

The author wishes to express his gratitude to Dr. A. H. Kuhlman for the assistance and guidance during the preparation of this thesis.

To Professor P. C. McGilliard the author is grateful for useful information and suggestions.

TABLE OF CONTENTS

INTRODUCTION

Among the problems confronting the dairymen is breeding efficiency in the dairy herd. Some dairymen consider troubles in reproduction as the most serious. It is one of the many factors that affect the breeding efficiency of dairy cattle. Breeding efficiency in this study is expressed in terms of services per conception and calving interval.

This study is an analysis of the breeding records of the Oklahoma A. & M. College dairy herd from 1926 to 1937, inclusive, to determine the breeding efficiency of this herd.

The herd consists of the four major breeds of dairy cattle, namely, Jersey, Holstein, Guernsey, and Ayrshire. The Jersey breed exceeds each of the other breeds in number.

Data for this study was obtained from the records kept by the Dairy Department. In addition to these records, Professor P. C. McGilliard, who is in charge of the herd, furnished additional valuable information. The data compiled included the name and breed of every cow that freshened in the herd, age at which she freshened, her age on January first of each year, number of male and female calves dropped each calendar year, number of services per conception, calving interval, number of first calf heifers, number of abortions, and number of milking cows in the herd each year of the twelve year period.

The data was studied and analyzed to determine how the Oklahoma A. & M. College dairy herd compared with other herds in breeding efficiency. Very little data has been published on the breeding efficiency of dairy herds, especially commercial herds in dairy herd improvement work.

REVIEW OF LITERATURE

Eckles (1) studied the breeding records of the University of Minnesota dairy herd, covering a period of twenty-nine years. He determined the conditions confronting the practical breeder in regard to troubles of reproduction since there is an inclination among the breeders of the highly developed herds to consider troubles of reproduction the most serious in the maintenance and development of their herds.

During this period of twenty-nine years he found that only 39.7 percent of the services resulted in conceptions and the average abortion rate was 14.6 percent.

An increase in breeding difficulties has been thought to be associated with the raising of the level of milk production by better selection and feeding. His results did not bear this out. When the non-breeders were removed from the more highly developed herds, the number of services per conception was above that in some commercial herds. His conclusion was that in the more highly developed purebred herds, the owners keep cows with big records long after they have failed to conceive, hoping to get them with calf, because their offspring would be valuable for breeding purposes. In the smaller herds, that is, herds on a commerical basis, animals developing the same trouble would be sold.

The age of the cow is an important factor in the efficiency of breeding; however, it may be overestimated. Eckles found that up to ten years of age there was no marked variation due to age alone in the number of animals becoming non-breeders. In studying the relation of the number of service periods to conception, he found that the chances of conception decline with each successive service period, slowly at first, then rapidly. He found no correlation between the season of the year and conception, but the character of the diet may be a factor in the efficiency of breeding. Abortion is closely associated with sterility as indicated in his study.

In the University of Minnesota herd, about one-half of the pregnancies occurred from the first service. After a cow had passed five service periods without conceiving, her chances for conception are about one in six and only about one in thirteen in the tenth service period.

Taylor (4) studied the breeding records of a herd composed of the five breeds: Jersey, Guernsey, Brown Swiss, Holstein, and Ayrshire. The records covered the period from 1926 to 1935, inclusive. The herd was accredited for tuberculosis and partially accredited for Bang's disease during the period studied. His study of the breeding records included ninety-seven animals.

This report shows that three bulls used in the herd during this period proved to be shy breeders. For short periods, usually not longer than three months at a time, there three bulls were shy breeders. Breeding difficulties appeared at different intervals during the period studied.

The ages of the females at first breeding ranged from less than fourteen months to twenty-five months. He found the average number of services per conception for heifers of all ages to be 2.398. More services per conception were required for heifers under seventeen months of age when first bred.

This does not bear out the opinion of some dairymen that younger heifers conceive with fewer number of services than older heifers. The majority of the animals sold for breeding purposes in this herd were young animals.

Taylor's report shows that the practice of delayed breeding increases the number of services required for conception. The practice of breeding cows so that they will freshen within approximately twelve months is recommended.

Leighton (3) studied selection and culling in the Oklahoma A. & M. College dairy herd for the period 1921 to 1936, inclusive. Table I gives

the causes for the removal of cows from the herd as found in his study. The majority of the cows removed from the herd were sold as milk cows.

Leighton also found (Table II) that forty-two cows, or 55 percent of the cows sold to reduce the herd, were between the ages of two and five years. His report shows that all four breeds have been severely culled.

Herman (2) states that one of the most common failures on the part of dairy farmers in general is the policy of raising all their heifers. Only in the best of purebred herds and when the calves are from selected ancestors should this policy be practiced. In the average dairy herd 20 percent to 30 percent of the herd is replaced every year.

Table I. Reasons for Removal of Cows from the Oklahoma A. & M. College Dairy Herd, 1921-1936

Reasons for Removal	Breed				
	Jerseys	Holsteins	Guernseys	Ayrshires	All Breeds
Total Number Removed	109	61	44	47	261
Sold as Milk Cows:					
To Reduce the Herd	35	11	8	20	74
Low Producers	1	1		1	3
Poor Type		1		1	2
Undesirable - Sold for Beef	12	5	5	8	30
Udder Defects	1	8	2		11
Non-breeders	10	6		3	19
Reacted to Blood Test or Aborted	12	3	9	3	27
Old Age	6	9	4	4	23
Production Decreased	1	1	1		3
Other Reasons	1		3		4
Unknown Reasons		1			1
Died (Calves)	23	4	9	6	42
Died (Cows)	7	11	3	1	22

Table II. To Reduce the Herd (Table I, Column 1)

Breeds	Number	Age Range				Average Production of Cows Sold for This Reason	Average Production of Present Herd
		Under 2	2 - 5	5 - 8	Over 8		
Jerseys	35	6	15	14		396 lbs. butter fat	456 lbs. butter fat
Holsteins	11		6	4	1	382 lbs. butter fat	465 lbs. butter fat
Guernseys	8		6	2		416 lbs. butter fat	432 lbs. butter fat
Ayrshires	20	2	14	2	2	315 lbs. butter fat	465 lbs. butter fat
All Breeds	74	8	41	22	3	377 lbs. butter fat	454 lbs. butter fat

HERD HISTORY

The Oklahoma A. & M. College dairy herd was established in 1916 and the early part of 1917. Jersey and Holstein foundation cows composed the small herd. In 1923, Guernseys and Ayrshires were added, and to date these four breeds have made up the dairy herd.

GENERAL HERD PLAN

The general herd plan is to have cows bred to calve about the same time each year. The majority of the cows are bred to calve in the fall. Calving in the fall of the year tends to increase milk production and lower cost in raising the calves. High producing cows calving in the fall tend to hold up in milk production longer than cows calving in the spring and summer.

Cows on Register of Merit and Advanced Registry tests are not always bred to calve in the fall. It is well known that delayed breeding and a consequent long calving interval is conducive to a high three hundred and sixty-five day record, and the system of Register of Merit and Advanced Registry testing has consequently favored such a practice. Therefore, cows on such tests usually freshen between fourteen and sixteen months after their previous calving. Their breeding time is delayed as long as possible in order to get increased production and still meet the calving requirements as prescribed by the various breed associations.

All heifers are kept in the herd until they have begun their first lactation. No culling is done until they have shown what they can produce as two year olds. Coming into the milking herd as two year olds, they are, with few exceptions, placed on official test, because it is the policy of the Dairy Department to prove the herd sires as early as possible.

The two year olds that make a creditable record in production and meet the requirements of the Dairy Department in regard to type are again placed

on official test after they become mature cows.

In addition to the records of cows on official tests, milk and butter fat yields are also obtained for every cow in the milking herd each month by the Dairy Department. These records are kept as a guide in culling, and to further prove the bulls in service.

DISCUSSION OF THE BREEDING RECORDS

In the general dairy program, improved feeding methods and culling of the low producers are the basis of sound herd improvement. The number of cows leaving the herds each year culled as low producers is small compared to the number of replacements required.

Shy breeders and sterile cows are removed from the herd each year. These are not always low producers but are often cows with considerable producing ability. Keeping shy breeders lowers the average breeding efficiency of the herd.

Table IV shows the number of calves dropped each year, services per conception, first calf heifers, abortions, and number of cows in the milking herd. In 1926 the abortion rate was 18 percent (Table III and Figure I). The herd was infected with Bang's disease, and the practice of isolating the cows at calving time was instituted as a means to prevent an increase in abortion. However, this method was not successful for in 1927 the abortion rate increased to 23 percent. Of the sixteen Jerseys in the milking herd, seven aborted in 1927. Abortions also occurred among the Guernseys. Since the herd was increasing in size and abortion was also increasing, a system of eradication was then set up to free the herd of Bang's disease.

Beginning in 1928 a series of blood tests were made and of the thirty-eight cows in milk, sixteen head or 42 percent of the herd reacted positively. Some of these reactors proved to be spreaders and were immediately culled from the herd.

Blood testing continued in 1929 and of the fifty-four cows tested, nineteen animals or 35 percent of the herd reacted positively. This was a decreaso in the number of positive reactors.

By 1930 the effects of isolation and blood testing began to show in the herd for the abortion rate dropped as shown in Figure I. Many of the old cows had been removed from the herd and the young cows calved normally. No abortions occurred that year, but the herd was still infected with abortion as 18 percent of the herd tested positive. This was a decided decrease in positive reactors from the previous year.

Table III. Yearly Average Breeding Efficiency

Year	No. Services per Conception	Percent Abortions	Average Calving Interval Days
1926	1.4	18.18	395
1927	1.6	23.07	386
1928	2.3	7.89	392
1929	2.0	7.40	393
1930	1.3		388
1931	1.2	9.09	350
1932	1.6	8.62	388
1933	2.4	6.66	451
1934	1.9	5.71	398
1935	1.9		379
1936	1.7	1.40	376
1937	1.4		393

In 1931, 16 percent of the herd tested positive and the abortion rate increased to 9 percent. The number of cows increased and the number of reactors remained the same. In 1932, the size of the herd continued to

Figure I. Percentage of Abortions During Twelve Year Period

increase, but the number of cows reacting to abortion decreased. Only six of the fifty-eight cows in milk reacted to the blood test and the abortion rate was 10 percent.

This decrease in number of positive reactors was due to the culling of some of the old cows in the herd. Some of the old cows were of the desired breeding and were kept under isolated conditions for the purpose of securing their offspring.

The herd was relatively clean in 1933 as only one cow reacted to the series of blood tests. The abortion rate had declined steadily since 1931 and in 1935 the herd was free of Bang's disease. No abortions occurred in 1935, but in 1936 there was one abortion. There is no evidence that this was due to Bang's disease since the cow was negative. Since 1936 there have been no reactors in the herd.

During the twelve year period the average calving interval for all four breeds was 393 days, and the average number of services per conception was 1.72. The average calving interval ranged around 390 days from 1926 to 1930 (Table III and Figure II). In 1931 the average calving interval was 350 days, the lowest during the twelve year period. In 1932 the average calving interval was about 390 days, but it increased to 450 days in the following year. This was the longest period during any of the years studied.

The number of services per conception is closely related to the length of the calving interval as shown in Table III and Figures II and III. The number of services per conception increased in 1933 for all four breeds.

The Jerseys showed the largest number of services per conception, and since they outnumber each of the other breeds they exerted much influence on the length of the average calving interval for the entire herd (Figure II).

As shown in Figure IV and Table IV, the Holsteins required 3.7 services per conception in 1929, but there were only seven cows in the Holstein herd

Figure II. Herd Average Calving Interval

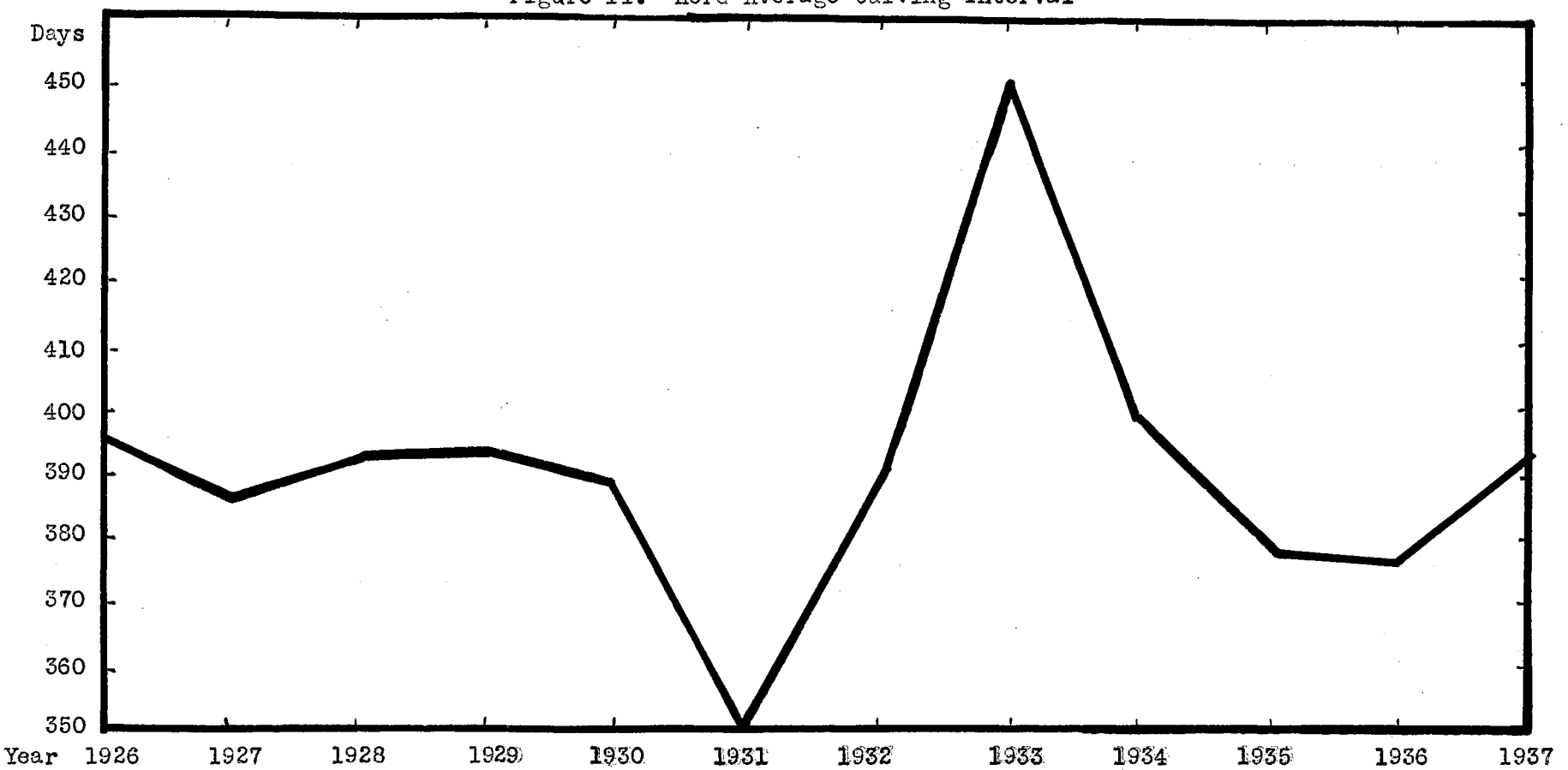


Figure III. Herd Average for Number of Services per Conception

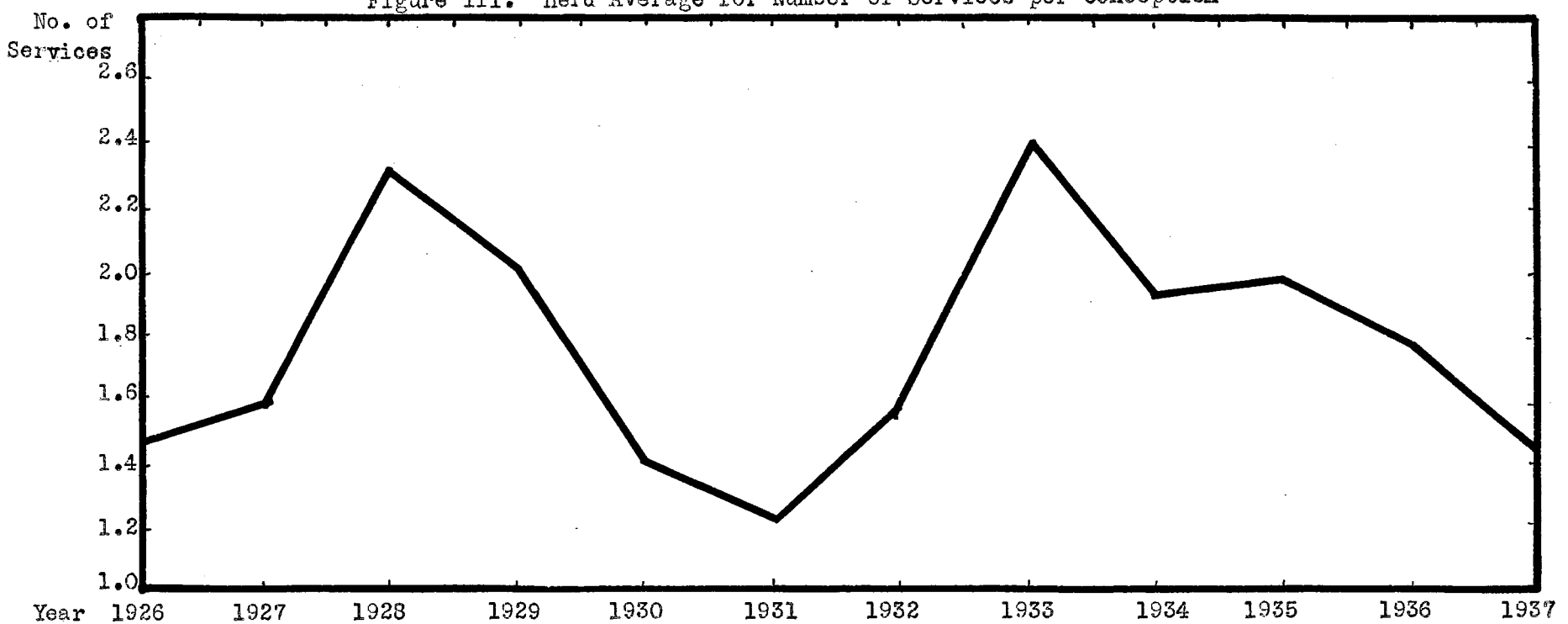


Figure IV. Yearly Average Number of Services per Conception for Each Breed

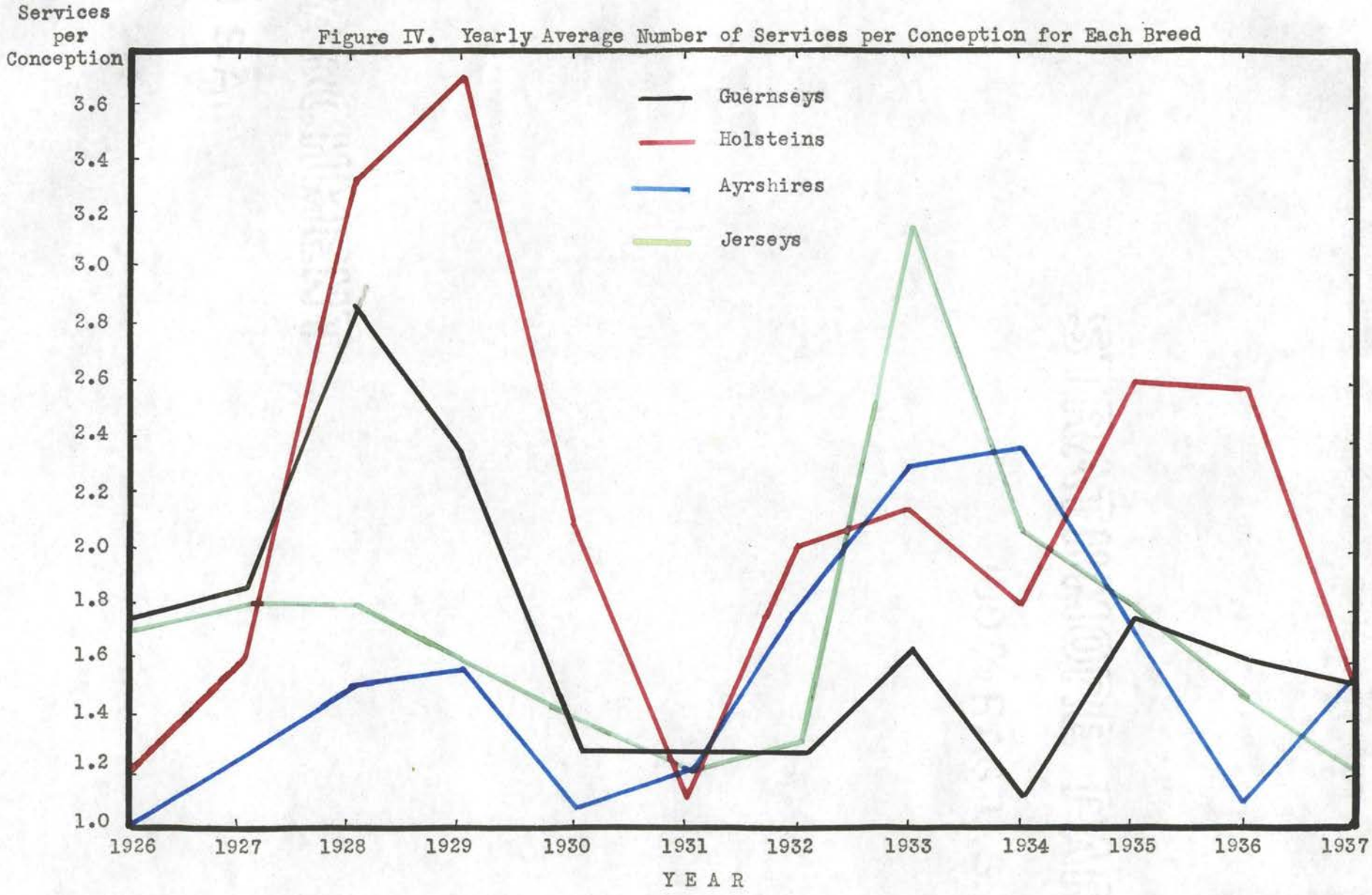


Table IV. Record of Number of Calves, Services, Calving Interval Days, First Calf Heifers, Abortions, and Cows in College Herd

Year	JERSEYS Sex of Calf M	F	Number Services per Conception	Calving Interval Days	First Calf Heifers	No. of Abortions	No. of Cows	HOLSTEINS Sex of Calf M	F	Number Services per Conception	Calving Interval Days	First Calf Heifers	No. of Abortions	No. of Cows
1926	5	6	1.7	381	2	3	14	6	4	1.2	404	2	1	10
1927	6	11	1.8	363	6	7	16	5	3	1.6	409	2		8
1928	8	5	1.8	402	3	1	14	5	5	3.3	340	3	1	9
1929	7	16	1.6	391	9	1	23	4	3	3.7	439	2		7
1930	12	8	1.4	400	3		20	0	7	2.1	418	2		7
1931	11	10	1.2	333	7	2	21	8	5	1.1	363	7	1	12
1932	11	12	1.3	408	12	2	23	7	8	2.0	384	4	2	16
1933	10	10	3.15	445	4	1	20	13	7	2.15	481	12	1	20
1934	12	21	2.09	391	13	3	32	9	5	1.8	387	4		13
1935	14	22	1.8	388	9		36	10	3	2.6	416	4		13
1936	17	17	1.5	385	12		32	10	7	2.59	424	5		17
1937	28	21	1.2	376	19		47	6	14	1.5	423	7		19

Year	GUERNSEYS							AYRSHIRES						
1926	2	1	1.75	431		2	4	3	2	1.0	386			5
1927	5	3	1.87	401	4	2	8	1	6	1.26	391	4		7
1928	4	3	2.85	416		1	7	5	3	1.5	397	1		8
1929	6	3	2.3	366	1	3	10	6	8	1.57	400	6		14
1930	3	5	1.28	361	3		7	9	5	1.07	368	1		14
1931	6	6	1.25	367	5		12	6	4	1.2	359	5	2	10
1932	1	5	1.28	382	2	1	7	4	8	1.8	467	4		12
1933	5	6	1.63	405	6	1	11	6	2	2.3	460	1	1	9
1934	6	7	1.1	380	4		12	3	10	2.38	450	6	1	13
1935	5	3	1.75	386	4		8	4	7	1.7	317	1		11
1936	7	9	1.6	304	6	1	16	0	6	1.1	368	4		6
1937	7	8	1.5	398	3		15	7	9	1.5	402	9		16

that year, consequently, they exerted very little influence on the length of the average calving interval for the entire herd.

These seven cows required a total of twenty-six services for conception. One cow required nine services, two required five, one required three, one required two, and only two required one service each.

Irregularities occur quite frequently in a large herd of this kind. Some irregularities seem to occur in cycles. No explanation can be offered for these as well as other irregularities. One of the outstanding irregularities noticed during this period studied was the behavior of the four breeds in regard to the number of services per conception in 1933.

The average number of services per conception for the Holsteins for the twelve year period was 2.1 as compared to 1.7 for the Jerseys, 1.65 for the Guernseys, and 1.5 for the Ayrshires. Since the Holsteins were under the same environment and management as the other breeds, no explanation can be given for this behavior. No bulls used during this twelve year period were considered to be shy breeders. It is known that breeding difficulties occur from year to year for which nc explanation can be offered.

During 1931, as shown in Table II and Figure IV, all four breeds required less than 1.4 services per conception. This is a very unusual record for it is the only year in which the four breeds required practically the same number of services per conception. During the other eleven years, the four breeds were very irregular.

In large purebred herds there is often a tendency to keep cows which are shy breeders. Breeders are often tempted to keep such cows in hopes of getting offspring which would be valuable for breeding purposes. Little thought is given to the economy of such a practice. During some years the number of services per conception may be quite high for many cows in the herd while in other years a very few cows may be responsible for a high average

number of services per conception for the entire herd.

As shown in Figure V, a valuable foundation cow may in one of her gestations require eight or more services before conceiving. Even a few cows with such breeding records would lower the average breeding efficiency of an entire herd for a single year. The cow requiring three services for her first gestation, three for the second, one each for the third and fourth, and three for the fifth gestation, represents the 90 percent of the herd that required between one and three services per conception.

The number of services per conception for all cows in the herd during the twelve year period studied is shown in Table V. The first impression from this table is the outstanding record of a number of cows bred at one service period. Practically 64 percent of all the cows bred during this period studied required one service per conception, and 90 percent required from one to three services per conception. The data presented in this table shows that most of the cows passing five service periods without conceiving were usually removed from the herd. Four and five services per conception were required by 3.47 percent of all cows bred during the period studied, and 0.43 percent required six services per conception. Those that were retained were cows that were considered valuable and further breeding was continued in hopes of getting them with calf.

Table VI and Figure VI show the total number and ages of the females in the herd on January 1 of each of the twelve years. The total number has increased as might be expected. It is interesting to note that the number of cows of five years of age and older remained quite constant from year to year increasing from nineteen head in 1926 to twenty-nine head in 1937. The herd showed only a slight increase in numbers to 1930. Since 1930 there has been a rapid increase in the number of cows in the herd, and 50 percent of the herd was between the ages of one and three years. From 1935 to 1937 much

culling has been practiced. To reduce the size of the herd, many of the cows removed were not low producers or poor in type, but were good enough to be sold as breeding or milk cows. Due to the limited pastures and barn room and the practice of testing all the heifers, only a few outstanding animals are kept in the herd over a long period.

Table V. Percentage of Cows Requiring from 1 to 12 Services

No. of Cows	No. of Services	Percentage
442	1	63.96
113	2	16.35
73	3	10.56
24	4	3.47
24	5	3.47
3	6	0.43
2	7	0.28
3	8	0.43
4	9	0.58
1	10	0.14
0	11	0.00
2	12	0.28

The ages of all the animals that calved as first calf heifers during this period was recorded and the average age of the heifers at first calving was calculated for each breed. The average age for all Jerseys calving for the first time was two years, four months, and seventeen days; for Guernseys, two years, five months, and nine days; for Ayrshires, two years, six months, and ten days; and for Holsteins, two years, eight months, and one day. These ages compare favorably with the ages for first calving recommended by the respective breed associations.

Figure V. Number of Services for Each Gestation of Two Cows in Herd

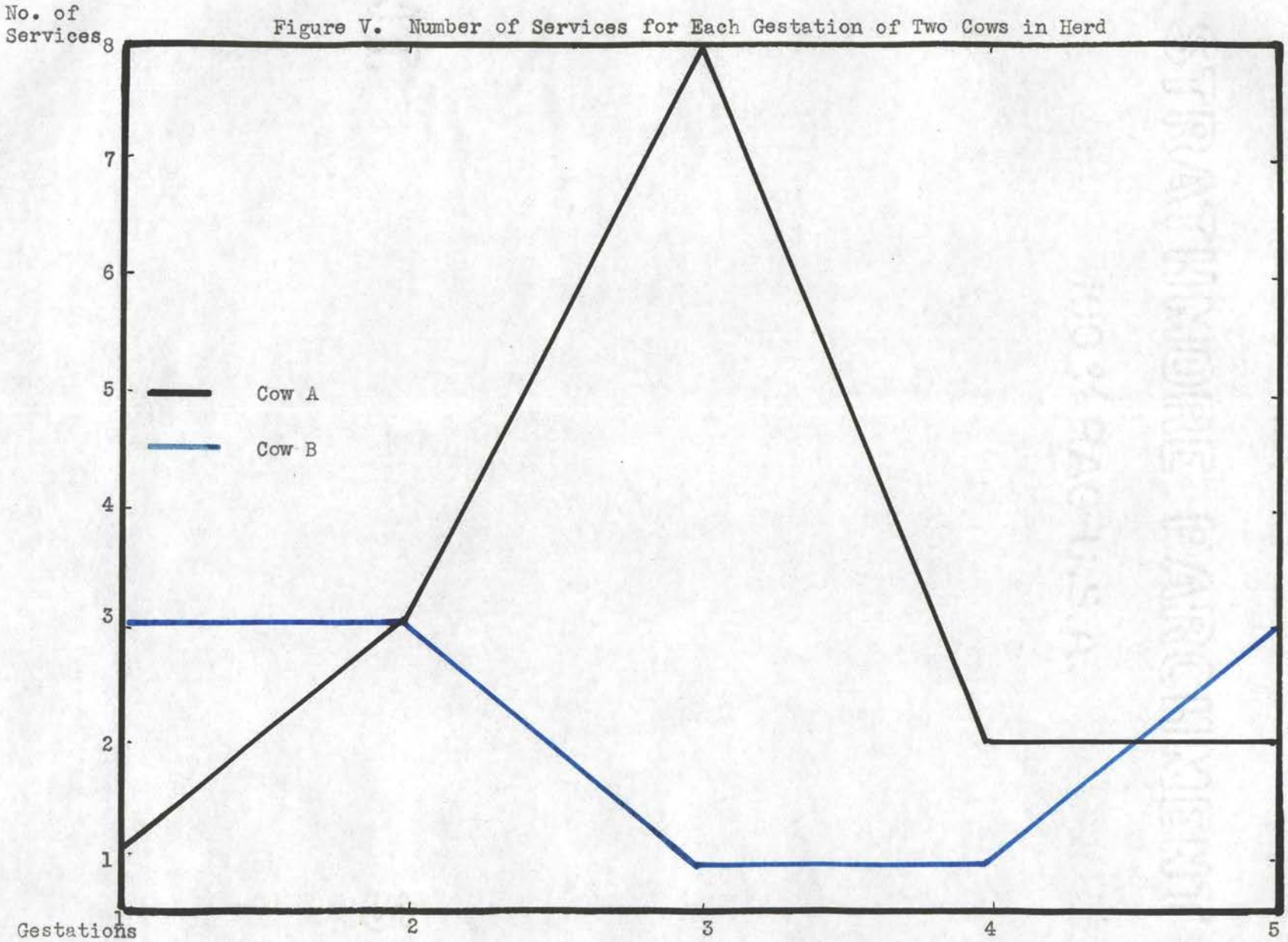


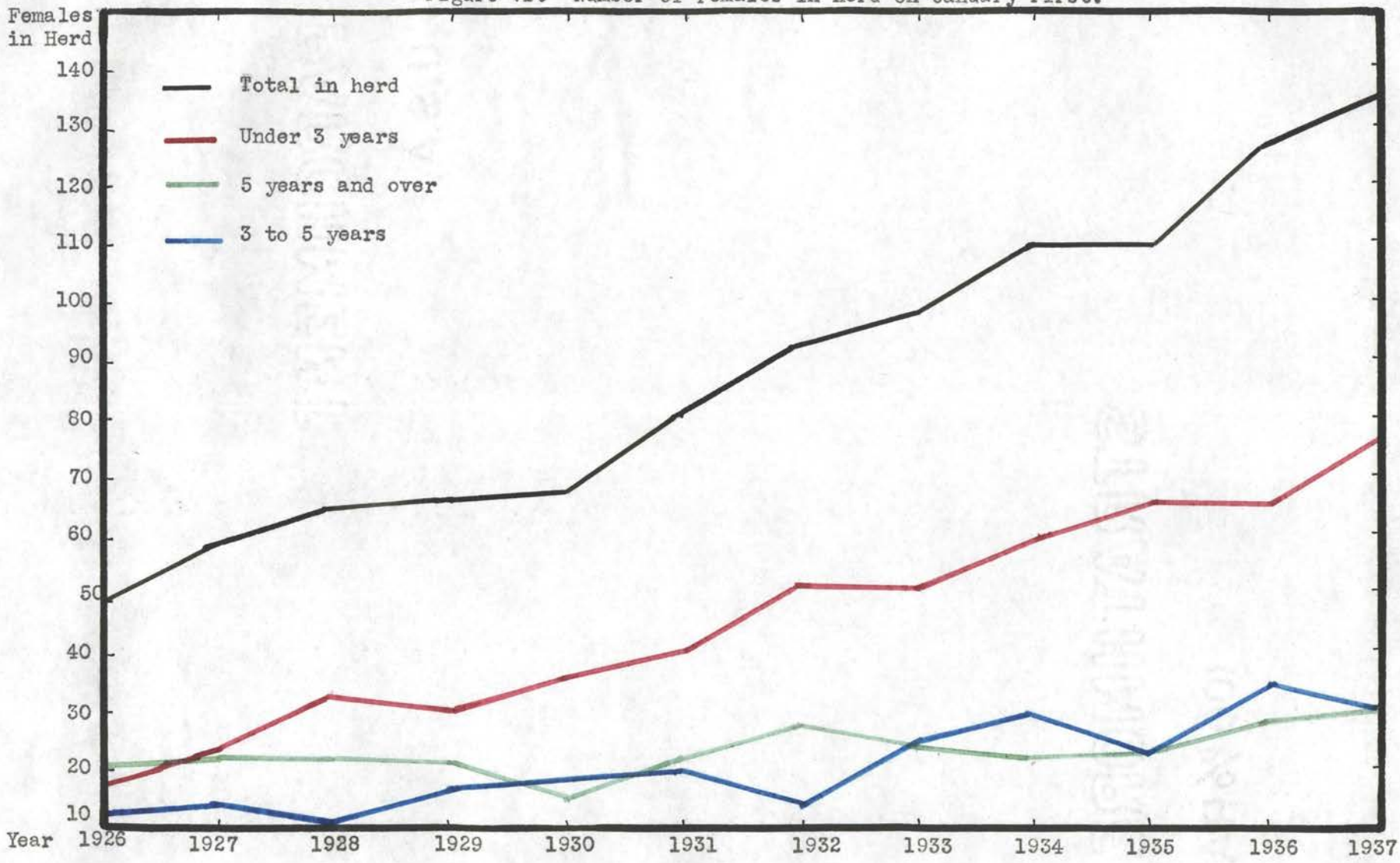
Table VI. Number of Females in Herd on January First

Years	Age in Years: 1 to 3	3 to 5	5 and over	Total
1926	17	12	19	48
1927	23	14	21	58
1928	32	11	21	64
1929	30	16	20	66
1930	35	18	14	67
1931	40	19	21	80
1932	51	14	27	92
1933	51	24	23	98
1934	59	29	21	109
1935	65	22	22	109
1936	65	34	28	127
1937	77	30	29	136

Percent Females in Herd on January First

Years	Age in Years: 1 to 3	3 to 5	5 and over
1926	35.5	25.0	39.6
1927	39.6	24.1	36.2
1928	50.0	17.1	32.9
1929	45.4	24.2	30.3
1930	52.5	26.8	20.8
1931	50.0	23.7	26.2
1932	55.4	15.2	29.3
1933	52.0	24.4	23.4
1934	54.1	26.6	19.2
1935	59.6	20.1	20.1
1936	51.1	26.7	22.0
1937	56.7	22.0	21.3

Figure VI. Number of Females in Herd on January First.



There were six hundred and ninety-four calves dropped during this twelve year period (Table IV). The Jerseys produced one hundred and forty-one males and one hundred and fifty-nine females; Ayrshires, fifty-four males and seventy females; Holsteins, eighty-three males and seventy-one females; and Guernseys, fifty-seven males and fifty-nine females. In the total number of calves produced, there were three hundred and thirty-five males and three hundred and fifty-nine females. This is a sex ratio of 100 females to 93.3 males. The Guernseys had a more equal distribution of males and females than did each of the other breeds.

SUMMARY

Except during the year 1930, the abortion rate was high in the college herd from 1926 to 1934, inclusive. In 1927 the abortion rate was 23 percent. During 1928, 42 percent of the herd reacted positive to the blood test for Bang's disease. With the exception of the year 1930, from 5.7 to 9.1 percent of all cows aborted each year during the years 1928 to 1934, inclusive. After the herd became free of Bang's disease in 1935, there has been only one abortion and according to the blood test this was not due to Bang's disease.

Bang's disease affected the breeding efficiency of this herd, since more services were required per conception during those years in which many cows showed positive reactions to the blood test.

Breeding records for all the cows in the herd during this twelve year period show that on the average 1.72 services were required per conception. The Holsteins required 2.1 services per conception as compared to 1.7 for the Jerseys, 1.65 for the Guernseys, and 1.5 for the Ayrshires. Practically 64 percent of all the cows bred during this twelve year period conceived to the first service, and 90 percent conceived with one to three services. Cows failing to conceive in five service periods were usually removed from the herd. Some were retained in the herd in the hope of getting offspring which would be valuable as breeding animals. For example, the records show that two cows kept in the herd required twelve services each per conception.

The average length of the calving interval for the entire herd was three hundred and ninety-three days. Relatively long calving intervals were associated with the years in which abortions were numerous or many services were required. The shortest calving intervals of three hundred and fifty and three hundred and seventy-six days each followed the two years in which no abortions occurred.

The number of cows five years of age and older remained quite constant from year to year. From 1930 to 1937, inclusive, 50 percent of the herd was between the ages of one and three years.

The average age for all Jerseys calving for the first time was two years, four months, and seventeen days; for Guernseys, two years, five months, and nine days; for Ayrshires, two years, six months, and ten days; and for Holsteins, two years, eight months, and one day.

There was a tendency to delay breeding with cows on Advanced Registry and Register of Merit testing.

During the period studied, six hundred and ninety-four calves were dropped. Of this total number, three hundred and thirty-five were male calves and three hundred and fifty-nine were female calves. This is a sex ratio of 100 females to 93.3 males.

BIBLIOGRAPHY

1. Eckles, C. H. A Study of Breeding Records of Dairy Herds. Minnesota Agr. Exp. Sta. Bul. No. 258. 1932.

2. Herman, H. A. Calf Raising Problems. Jersey Bulletin. January 19, 1938.

3. Leighton, R. E. Selection in the Oklahoma A. & M. College Dairy Herd, 1921 to 1936, Inclusive. Unpublished data. 1936.

4. Taylor, George E. Some Factors Affecting Breeding Efficiency in Dairy Cattle. The Quarterly Bulletin. Michigan Agr. Exp. Sta. February, 1937.

Typed

by

Ruby G. Bevins