RELATION OF CALVING INTERVAL, DAYS DRY AND PERIOD OF CALVING TO MILK PRODUCTION

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Max Erwin Benne

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by

MAX ERWIN BENNE

AN ABSTRACT

Submitted to the College of Agriculture
Michigan State University of Agriculture and
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ABSTRACT MAX ERWIN BENNE

Research samples of Holstein, Guernsey and Jersey herds were used in studying the relation of average length of calving intervals, average number of days dry and period of calving for a herd to its milk production. The information was obtained from the Michigan Dairy Herd Improvement Association--International Business Machine records.

Regressions of milk production on calving interval were calculated as well as average milk production for herds falling into various calving interval groups. The results indicate that calving intervals less than 12 months are associated with a decrease in milk production. The upper limit for the optimum calving interval range was not evident in this study. Calving intervals of 13 and 14 months did not appear to have a detrimental relationship to milk production.

Regressions were also calculated for herd milk production on the average number of days dry. They indicate that a decrease in milk production was associated with an increase in the number of days dry. Average milk production was determined for herds falling into various number of days dry groups. The optimum number of days dry for maximum milk production would appear from this study to be 10 to 15 days shorter than the normal 60 day dry period. Milk production decreases from this point on as the number of days dry increases.

Herds were classified as first, second, third or fourth quarter freshening herds if over 50 per cent of the cows reported in each herd freshened in that quarter. The quarters followed the calendar year

with January, February and March being the first quarter. Herds classified as first and second quarter freshening herds had on the average lower milk production than those in the third or fourth quarter classification. The percentage of herds falling into the four quarters paralleled milk production fairly closely.

It should be stressed that the results of this study are only indications of these complex herd relationships, and definite conclusions cannot be stated.

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INTRODUCTION

The Problem and Objectives

The many factors influencing milk production make it difficult to study the specific relations of length of calving interval, number of days dry and period of calving to the milk production of even an individual cow. It is still more difficult to try to deal with these relations on a herd basis. Nevertheless, these factors are of concern to dairymen who must make numerous decisions in their regard. To attempt to study these relationships, granting that definite conclusions can never be reached, is still better than completely ignoring them. To sort out the exact influence of one of these factors and exclude the influence of the multitude of other factors is nearly impossible. However, indications can be gained which may be helpful with proper interpretation.

Even though it is necessary and desirable to work with the cows in a herd as individuals and to plan individual programs for them, it is also beneficial to consider the herd as a whole and to plan, compare and evaluate on a herd basis. This has been widely done in regard to herd milk production, but practiced much less in regard to some of the factors affecting production. A comparison of these factors might be of much greater help to the dairyman in evaluating the strengths and weaknesses of his herd than a comparison of the resulting milk production. Therefore, it has been attempted to study some of these relationships on a herd basis. This increases the interaction of factors and the difficulty of sorting them out. It is hoped that some comparison

standards can be developed from this study that could be used by dairymen in evaluating their herds.

Definitions

Calving interval as used in this thesis can be defined as the period of time from one freshening date to the next freshening date. On a herd basis, the average calving interval is an average of all the individual cows' calving intervals. On a yearly basis, those intervals that ended within the specified year were used to calculate the average herd calving interval for that year.

Days dry refers to the number of days from the last milking to the freshening date. This is also often called the dry period. The herd average for days dry is an average of the days dry of the individual cows in the herd.

Period of calving denotes the time of year in which a cow calved. The four quarters of the calendar year were chosen as periods of calving. A herd was designated as being a first, second, third or fourth quarter calving herd if over 50 per cent of the freshening dates reported in this study were in one of these periods. It was assumed that this was an indication that the dairyman was attempting to have a large portion of his herd freshen in that period.

REVIEW OF LITERATURE

The review of literature has been divided into the following sections: calving interval, days dry, and period of calving. The main emphasis has been placed on work done with the relations of these three factors to milk production.

Calving Interval

The bulk of the work with calving intervals has been done on a cow basis. Sanders (15) in England did a great deal of work along this line about thirty years ago. Instead of working with calving interval he chose to use service period. He defined service period as the interval between calving and the next fertile service. Thus an 85 day service period was assumed to be a twelve month calving interval. In his work, Sanders found the regression of milk yield on service period of 3918 lactations to be $+0.444 \pm 0.018$ for first calvers and $+0.407 \pm 0.010$ for the older cows. The regression for the Friesians in this group was $+0.410 \pm 0.029$. He tested these regressions for linearity and as expected found them not to be of a linear nature. He found the mean length of service period to be 83.5 days which is nearly a one year calving interval. The Friesians had a service period mean of 93.3 days, nearly ten days longer than the mean of the total group. It is interesting to note that the mean milk yield for the Friesians was 7899 pounds. He also broke the lactations into a high yield group (mean of 8879 pounds) and a low yield group (5434 pounds). The mean length of service period for the high yielders was 82.1 days as compared to 78.3 days for the low yielders.

In drawing conclusions, Sanders (15) said, "The average weekly yield appears therefore to be markedly influenced by the frequency of calving; too short calving intervals depress the average considerably as also do too long ones. The optimum interval is a little difficult to determine from these figures, but apparently it is not less than twelve months."

Gaines and Palfrey (8) also studied the relationship of the length of calving interval to milk yield. Their work was based on a report published by Langmack in Denmark. The records of 186 Red Danish cows, all of which had nine normal calving intervals, were used. They found a mean calving interval of 401 days with the most common interval between 350 and 370 days. They found a uniformly negative correlation between length of calving interval and the average daily milk yield for the current lactation and a uniformly positive correlation for the average daily yield during the following lactation. The correlation for the current lactation being -0.134 ± 0.018 and $+0.142 \pm 0.018$ for the following lactation. They had thirteen different herds represented by these animals and the average calving intervals for the herds ranged from 370 days to 418 days with the average herd milk yields per day not showing any consistent pattern. Consequently, they did their work using the records of individual cows.

In a study of 4406 calving intervals, Tyler and Hyatt (19) found four per cent of them 10 months in length and 19.2 per cent of them 12 months in length. Only 7.3 per cent of the cows had two consecutive intervals of either 10 or 11 months. They report no significant difference between the butterfat production of cows with a 14 or 15 month

interval and those with a 12 or 13 month interval.

A great deal of work has been done in trying to evaluate breeding efficiency. Anderson (1) calculated breeding efficiency by multiplying the average interval from the first to the third calvings for the herd, times the actual interval from the first breeding to the third calving for the individual; and then dividing the result by the standard deviation of the interval from first breeding to third calving. From his work Anderson concluded that: "A correlation coefficient for the herd of -0.155 between reproductive efficiency and lifetime average lactation yield, was found to be statistically significant but too small to afford a high degree of predictability."

Boyd and co-workers (2) studied the relationship of milk production to breeding efficiency. They defined breeding efficiency as the number of services needed for conception. They found a correlation coefficient of -0.04 between milk production and the number of services needed for conception. This was not statistically significant.

Currie (6) in her work with this same relationship divided 9234 cows in 524 herds into two groups. One group consisted of cows that conceived on the first service and the other of cows requiring more than one service. She found no significant difference between the milk production of the two groups and consequently concluded that the amount of milk yield during the month of service does not adversely affect the fertility of dairy cows.

Gaines (7) also concluded that there was no evidence from his study to indicate that a high rate of milk production interfered with recurrence of conception.

Carman (3) determined a correlation between level of milk production and the period of parturition to first estrus, although he found little effect of age of the cow or season of the year upon breeding efficiency.

Initial work by Lewis and Horwood (11) seemed to be in agreement with Currie (6) and Gaines (7) in that they found no significant relation between production and breeding results. However, after sorting the data on level of milk production the higher producing animals showed a tendency toward delayed rebreeding. They concluded that: "Cows beginning a lactation at a high level of production were not rebred as quickly and did not conceive as readily as those producing at lower levels."

Lewis and Horwood (11) also seemed to agree with Carman (3) that age had little effect upon the variation in calving interval.

Trimberger and Davis (18) in their analysis of the University of Nebraska herd indicated that it was not possible to predict the succeeding year's breeding efficiency from the previous number of services required for conception. They did find, however, that the summer months took on the average more services per conception than any other period of the year.

Boyd and co-workers (2) after analyzing 29 herds serviced by the Kentucky Artificial Breeding Association, arrived at 1.68 ± 0.74 as a mean for the number of services for conception. Olds and Seath (13) in more work with the Kentucky herds found that nearly 55 per cent of the cows required the same number of services for conception for the two

years they were observed. They also found that on a herd basis about 54 per cent of the herds needed approximately the same average number of services for conception for the two years. About six per cent of the herds required 2.1 or more services per cow although only 9.3 per cent of these herds remained in this category for both years.

Many factors affect the average length of calving interval for a herd. Some work done on the relation of age and season to calving interval was previously cited. Length of time from calving to first service is another factor and is one that the dairyman has a relatively high degree of control over.

Green (9) concluded after working with a number of Michigan Artificial Breeder's Cooperative herds that better results were gained if the cows were not bred for at least 50 days after calving. On the average he found that cows that did not conceive on the first service took an additional 50 days before conception. He warns that: "Dairy men who wish to change the freshening time of their cows to meet the base period should be well aware of the risks involved in breeding cows too soon after calving."

Trimberger (17) also concluded that cows should not be bred until at least 50 days after calving. He found that an average of 2.52 services per cow were needed for those bred less than 50 days after calving as contrasted to 1.55 needed for 60 to 90 days.

The authors of Cornell University Bulletin 924 (5) point out some of the effects that different genetical, pathological, physiological and nutritional conditions can have on breeding efficiency. Studies in New York indicate that at any one time about 10 per cent of

the cows in a herd have some degree of breeding difficulty.

It is understandable after considering the many direct management practices such as detection of heat periods, length of time from freshening to first service, keeping accurate records, plus the indirect factors concerned with genetical, physiological and nutritional conditions, why the optimum twelve month calving interval is difficult to maintain.

Days Dry

Many of the factors affecting the length of calving interval also affect the number of days dry. Usually the length of the dry period can be controlled more easily by management than can calving interval.

Hammond and Sanders (10) working in England, concluded that a cow's yield was considerably lowered by a short dry period but not greatly increased by a long dry period. Sanders (16) in further work found a mean dry period of 54.4 days and a correlation of 0.833 ± 0.003 between milk production and length of the preceding dry period. He states that the length of the dry period has a great effect upon the milk production.

Copeland (4) in work with 1045 Jersey HIR herds determined an average of 53 days dry. The 40 herds in this sample that had less than a 250 pound butterfat herd average had an average of 27.6 cows dry and an average number of 101 days dry. This is in contrast to the 45 herds that had a herd average greater than 500 pounds. They had only 10.4 per cent of the cows dry and an average of 38 days dry. A correlation of $-0.57 \pm .014$ existed between the herd averages and percentage of dry

cows. On the average, 14.5 per cent of the cows in this study were dry at any given time. He also found that the percentage of the herd which was dry varied directly with the size of the herd.

Period of Calving

A great deal of work has been done on the relation of period of calving to milk production. This, of course, varies as greatly as does climatic conditions. Milk pricing procedures are also often influencing factors.

Sanders (14) in England observed that cows freshening from October to December have the best chance of making high records under ordinary farm conditions. He noted a gradual decline in production from January to May with a rather sharp drop to the low month of June. Work in the United States in areas of fairly comparable climatic conditions indicates nearly the same relationship. Workers at the Maine Agricultural Experiment Station (12) report that June and July freshening cows had on the average the lowest milk production and November to February cows had the highest average production. They found that production for cows freshening in the most favorable months exceeded production of those freshening in the least favorable by 11 per cent for two year olds up to 19 per cent for six year olds. They concluded from their study that season of freshening is not as important a factor as usually considered in milk production.

Carman (3) found that it took the longest period of time for cows to come into heat after freshening in March, and the shortest after freshening in September. He also divided up the year on the

basis of hours of sunlight and felt that the optimum breeding period coincided with that period of the year when daylight hours are decreasing and the main heat of summer diminishing.

MATERIALS AND METHODS

Records of the Michigan Dairy Herd Improvement Association--International Business Machines (DHIA-IBM) dairy herds were used for the research data in this project. The information needed to calculate calving intervals, days dry and period of calving was taken from individual cows' permanent lactation summary cards designated as No. 7 cards by the Michigan DHIA-IBM. The milk production information on a herd basis was obtained from the herd summary cards designated as No. 5 cards.

The first step in assembling these data was to sort through the approximately 64,000 No. 7 cards and group as many per cow as possible. These cards carried information concerning lactations finished in 1954, 1955, 1956 and up to October of 1957. It was possible therefore to have up to four cards per cow. Approximately 25,000 cards representing cows with only one lactation summary were discarded from the study. Later, because of the small number, the 1954 cards were also dropped. The approximately 35,000 cards remaining provided the working basis for this study. After going through a trial run with the small number of Brown Swiss cards available, they were also discarded and only the cards for Holstein, Guernsey and Jersey cows were used.

It was then necessary to reproduce on a single card for each cow, all of her freshening dates and number of days dry for each of her lactations. This made it possible to use the IBM 604 calculating machine to calculate to the nearest month the interval or intervals between calvings for each cow.

In keeping with the objectives of studying these relationships on a herd basis, it became necessary at this point to determine a herd value for length of calving interval, number of days dry and period of calving. To do this more new cards were reproduced until every cow had a card for each year she had a calving interval. The calving intervals were classified by years on the basis of the second freshening date determining a calving interval. For example, a cow freshening August 1, 1955 and again August 1, 1956, was designated as a 1956 calving interval. A number 1 was punched into all the cow year cards where the freshening date was in the first quarter; a 2 if it was in the second quarter; a 3 if it was in the third quarter; and a 4 if it was in the last quarter.

Thus there was now a card for each cow in a herd for each year she had a calving interval. On this card was punched the calving interval in months, number of days dry and quarter of the year of calving. From these cards it was possible to calculate an average length of calving interval to the nearest tenth of a month; an average number of days dry; and the percentage of cows calving per quarter for each herd and for each year a herd was on DHIA-IBM. Some herds had averages for three years, some for two years and some for only one. As previously mentioned, the years 1955, 1956, and 1957 were involved.

Cards were now made for each herd for each year that the before mentioned information was available. These cards were matched with the No. 5 herd summary cards. From these No. 5 cards the herd milk production and fat production averages were reproduced onto the herd cards containing the information calculated in this study.

A listing was made of the following information contained on these herd work cards: herd number, year, number of records in each herd, average number of days dry, average length of calving interval, percentage of cows freshening in each quarter, herd milk production and herd fat production. This listing was checked quite closely and several decisions were made regarding selection of the final working deck of herd cards. It was noticed that a number of herds had abnormally low milk and fat records. After investigation, it was found that herds beginning DHIA-IBM in the middle of the testing year had only a part of the year's production recorded on the No. 5 cards. With more machine work only herds with 365 days production recorded were selected. It was also decided that all herds would be discarded in the years where less than five cow records were applicable to this study. Remaining were 1087 Holstein, 181 Guernsey and 93 Jersey herd year cards. This represented 562 Holstein, 105 Guernsey and 46 Jersey herds.

Using this selected deck of cards, information was computed to use in the calculation of curvilinear regressions. It was necessary to make up several new decks of cards in this process and to make use of tabulating, collating, reproducing, summary punching, calculating and other IBM machines. Sums of squares, cross products and other calculations were derived and will be discussed under results and discussion.

The herds were also sorted into groups on the basis of yearly averages of length of calving interval and number of days dry. Milk production for each of these groups was totaled and averaged.

Herds with 50 per cent or more of the cows freshening in one quarter of the year were used to study period of calving. Only the herd year cards for 1955 and 1956 were used because the fourth quarter information of 1957 was not available. After sorting these herds into the four quarters on the basis of the quarter in which over 50 per cent of the herd freshened, milk production for each herd was totaled and averaged.

RESULTS AND DISCUSSION

The results and discussion will be divided into three sections: calving interval, days dry and period of calving. Tables, graphs and a discussion of the results will be found under each of these subject headings.

Calving Interval

The results obtained in the study of the relation of calving interval to milk production can be found in Tables I and II and Figures 1 and 2. There were 562 Holstein, 105 Guernsey and 46 Jersey herds used in this portion of the study. This large difference between the size of breed samples needs to be considered in attempting to interpret the results.

Table I shows the regressions that were calculated for milk production on calving interval. The total regression is an overall indication of the relationship of calving interval to milk production for all the herds involved in each breed. This regression does not attempt to adjust for the differences in management and environment among the various herds. The between herd regression measures the relationship of calving interval to milk production between the herds. The difference between these two relationships is the within herd regression. The within herd regression measures the relation of a change in calving interval to milk production within the herd. For example, the within herd regression of 140 pounds for the Holsteins is an indication that most of the herds increased in production as the length of calving interval increased. This was done in an attempt to reduce as much as

TABLE I

THE CHANGE IN THE AVERAGE YEARLY HERD MILK PRODUCTION ASSOCIATED WITH EACH ONE MONTH INCREASE IN CALVING INTERVAL FOR THE HOLSTEIN, GUERNSEY AND JERSEY HERDS

Breed	Total regression	Between herd regression	Within herd regression
Holstein	99.7 lbs. of milk increase	75.8 lbs. of milk, increase	140 lbs. of milk increase
Guernsey	315 lbs. of milk increase	7.8 lbs. of milk decrease	1204 lbs. of milk increase
Jersey	11.7 lbs. of milk increase	240 lbs. of milk increase	.09 lbs. of milk decrease

possible the influence of the differences in management and environment.

The important observation to be gained from these regressions is the general increase in milk production associated with an increase in calving interval. It was hypothesized by the author that the relation would be of a curvilinear nature. However, a curvilinear test applied to these data gave no indication that this was true. This, of course, is just within the range of calving intervals used in this study.

Figure 1 also indicates that the relation is not curvilinear. Plotting the average milk production of the herds in the various groups gave little indication of any specific relationship between calving interval and milk production. The values plotted are listed in Table II.

TABLE II

THE AVERAGE MILK PRODUCTION AND THE PERCENTAGE OF HERDS HAVING VARIOUS LENGTHS OF CALVING INTERVALS FOR THE THREE BREEDS

Length of calving interval in months	Average milk production	Percent of Herds in each group
	562 Holstein Herds	
Months	Lbs.	%
11.1 & less	10788	2.2
11.2 - 11.3	11650	1.2
11.4 - 11.5	10659	3.9
11.6 - 11.7	11188	5.5
11.8 - 11.9	11494	5.3
12.0 - 12.1	11245	10.2
12.2 - 12.3	11340	10.7
12.4 - 12.5	11627	10.2
12.6 - 12.7	11617	9.9
12.8 - 12.9	11141	9.1
13.0 - 13.1	11525	9.7
13.2 - 13.3	11019	5.3
13.4 - 13.5	11365	5.0
13.6 - 13.7	11147	3.1
13.8 - 13.9	11478	1.8
14.0 - 14.1	11619	2.0
14.2 & above	11769	4.4
	105 Guernsey Herds	
Months	Lbs.	%
11.5 & less	7868	7.2
11.6 - 11.7	8675	6.6
11.8 - 11.9	8046	9.4
12.0 - 12.1	8004	13.2
12.2 - 12.3	8190	11.0
12.4 - 12.5	7952	11.6
12.6 - 12.7	8024	11.6
12.8 - 12.9	7350	6.0
13.0 - 13.1	8270	8.3
13.2 - 13.3	6742	2.8
13.4 - 13.5	7133	1.7
13.6 - 13.7	8570	3.3
13.8 - 13.9	8045	1.7
14.0 & above	7866	5.5

TABLE II (continued)

Length of calving interval in months	Average milk production	Percent of Herds in each group
	46 Jersey Herds	
Months	Lbs.	%
11.5 & less	7186	9.7
11.6 - 11.7	6873	2.2
11.8 - 11.9	7303	8.6
12.0 - 12.1	7566	11.8
12.2 - 12.3	7129	15.0
12.4 - 12.5	7430	9.6
12.6 - 12.7	6732	8.6
12.8 - 12.9	7371	7.5
13.0 - 13.1	7265	13.9
13.2 - 13.3	6332	6.5

13.7 - 13.8	7737	5.4

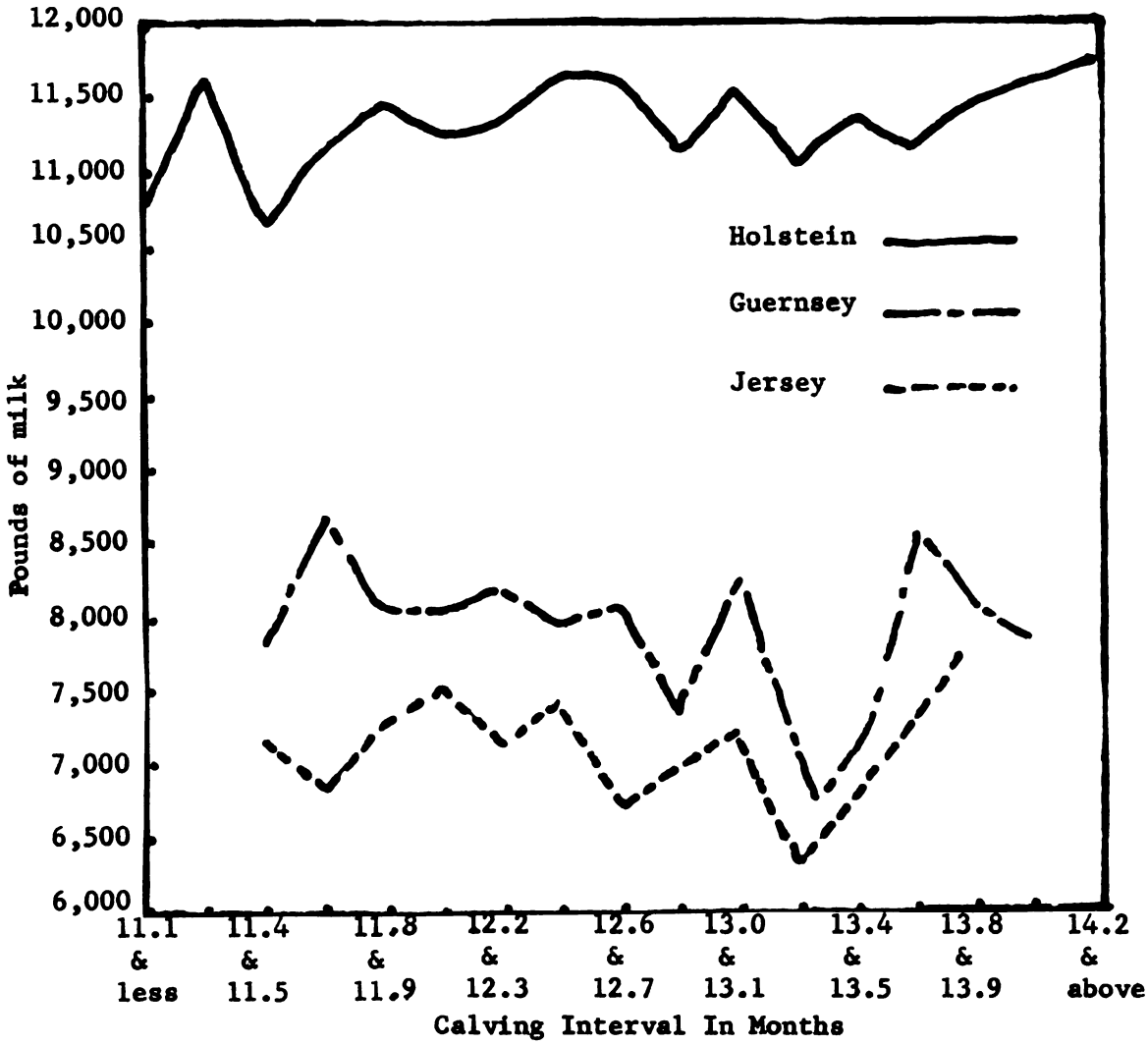

Figure 1. THE AVERAGE MILK PRODUCTION OF HERDS IN THE THREE BREEDS HAVING VARIOUS LENGTHS OF CALVING INTERVALS.

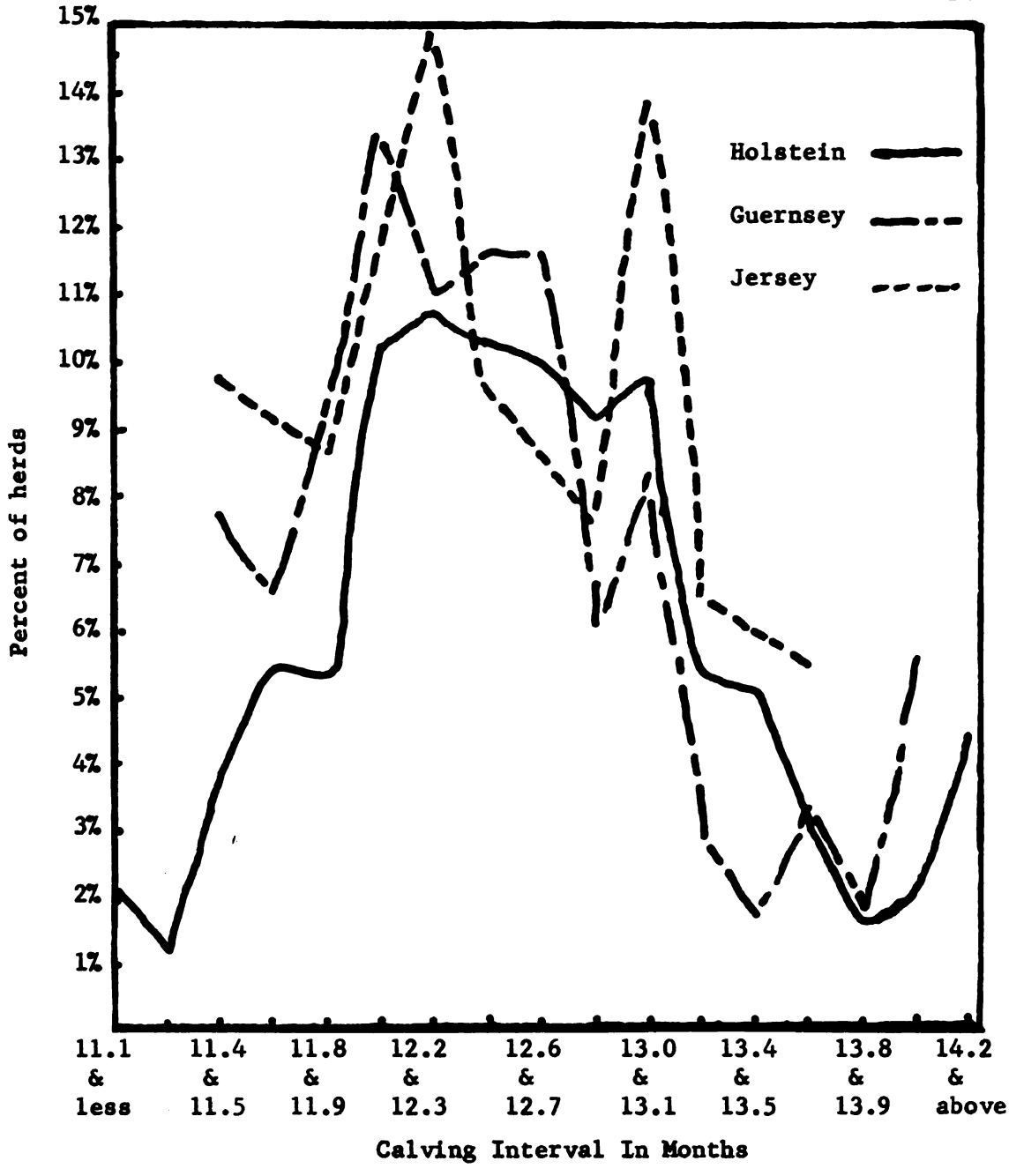

Figure 2. THE PERCENTAGE OF HERDS IN THE THREE BREEDS HAVING VARIOUS LENGTHS OF CALVING INTERVALS.

The percentages of herds in each breed falling into the various calving interval groups are listed in Table II and plotted in Figure 2. Evidently, the majority of the dairymen are trying to maintain a 12 month calving interval. Average calving intervals longer than 12 months were more common than calving intervals less than 12 months.

Days Dry

The results concerning the relation of the number of days dry to milk production are more consistent between the three breeds than are those concerned with calving intervals and milk production. In this part of the study, 556 Holstein, 105 Guernsey and 44 Jersey herds were used.

Total, between herd, and within herd regressions were used in the same respect in Table III for days dry as they were for the relation of calving interval to milk production. A curvilinear test was also applied to these data and again no significant evidence was found that within the range of this study the relation of number of days dry to milk production was curvilinear.

These regressions indicate that average herd milk production decreases as the average number of days dry increases. The within herd regression in particular points out quite strongly that an increase in the number of days dry within a specific herd is usually associated with a drop in production for that herd. Of course, there is still a minimum number of days dry that should be maintained. These regressions do not indicate that minimum.

By averaging the milk production of herds with different lengths

TABLE III

THE CHANGE IN AVERAGE YEARLY HERD MILK PRODUCTION ASSOCIATED WITH EACH ONE DAY INCREASE IN THE AVERAGE NUMBER OF DAYS DRY FOR THE THREE BREEDS

Breed	Total regression	Between herd regression	Within herd regression
Holstein	18 lbs. of milk decrease	24 lbs. of milk decrease	42 lbs. of milk decrease
Guernsey	44 lbs. of milk decrease	48 lbs. of milk decrease	28 lbs. of milk decrease
Jersey	2 lbs. of milk increase	197 lbs. of milk increase	42 lbs. of milk decrease

of dry periods as shown in Table IV and Figure 3, an indication of the minimum number of days dry for maximum milk production is shown. This point is 10 to 15 days shorter than the normal 60 day dry period. Of course, the physiological effects of an extremely short dry period must always be considered.

Some of the long dry periods reported are probably the result of poorer cows that are incapable of producing for a full 305 day period. Yet, the author feels that the dominant factor in determining the average number of days dry for a herd is the management of the dairyman. The extremely large percentage of the herds with an average number of days dry from 55 to 60 days would support this viewpoint. This is shown in Figure 4.

The results would also lead the author to believe that the number of days dry for all cows still producing at a profitable level should

TABLE IV

THE AVERAGE MILK PRODUCTION AND THE PERCENTAGE OF HERDS HAVING VARIOUS NUMBERS OF DAYS DRY FOR THE THREE BREEDS

Number of days dry	Average milk production	percent of herds in each group
	556 Holstein Herds	
Days	Lbs.	%
45 & less	11696	6.6
46 - 50	12042	8.6
51 - 55	11969	13.7
56 - 60	11493	18.4
61 - 65	11754	15.3
66 - 70	11197	12.3
71 - 75	10680	9.1
76 - 80	10854	4.6
81 - 85	10496	3.2
86 - 90	10755	2.1
91 - 95	10560	1.4
96 - 100	10979	1.2
100 & above	9979	1.9
	105 Guernsey Herds	
Days	Lbs.	%
45 & less	8926	11.0
46 - 50	8493	12.7
51 - 55	8605	13.8
56 - 60	8212	19.3
61 - 65	7611	13.3
66 - 70	7566	12.2
71 - 75	7387	8.8
76 - 80	6736	4.2
81 & above	7222	4.2
	44 Jersey Herds	
Days	Lbs.	%
45 & less	6666	7.5
46 - 50	7164	8.6
51 - 55	7488	23.6
56 - 60	7334	19.3
61 - 65	7226	16.1
66 - 70	6488	7.5
71 - 75	7448	6.4
76 - 80	6944	4.3
81 & above	7321	4.3

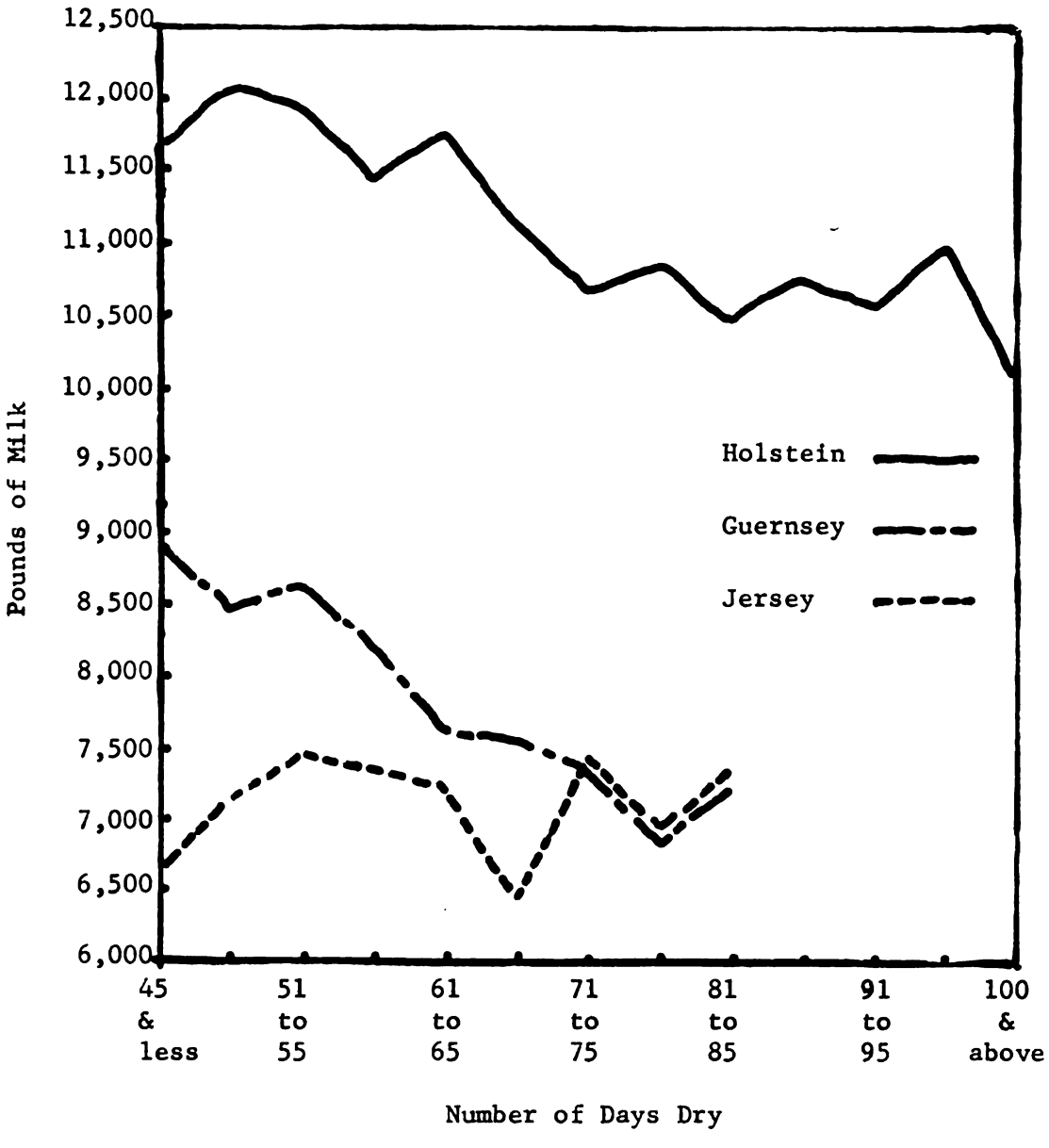

Figure 3. THE AVERAGE MILK PRODUCTION OF HERDS IN THE THREE BREEDS HAVING VARIOUS NUMBERS OF DAYS DRY.

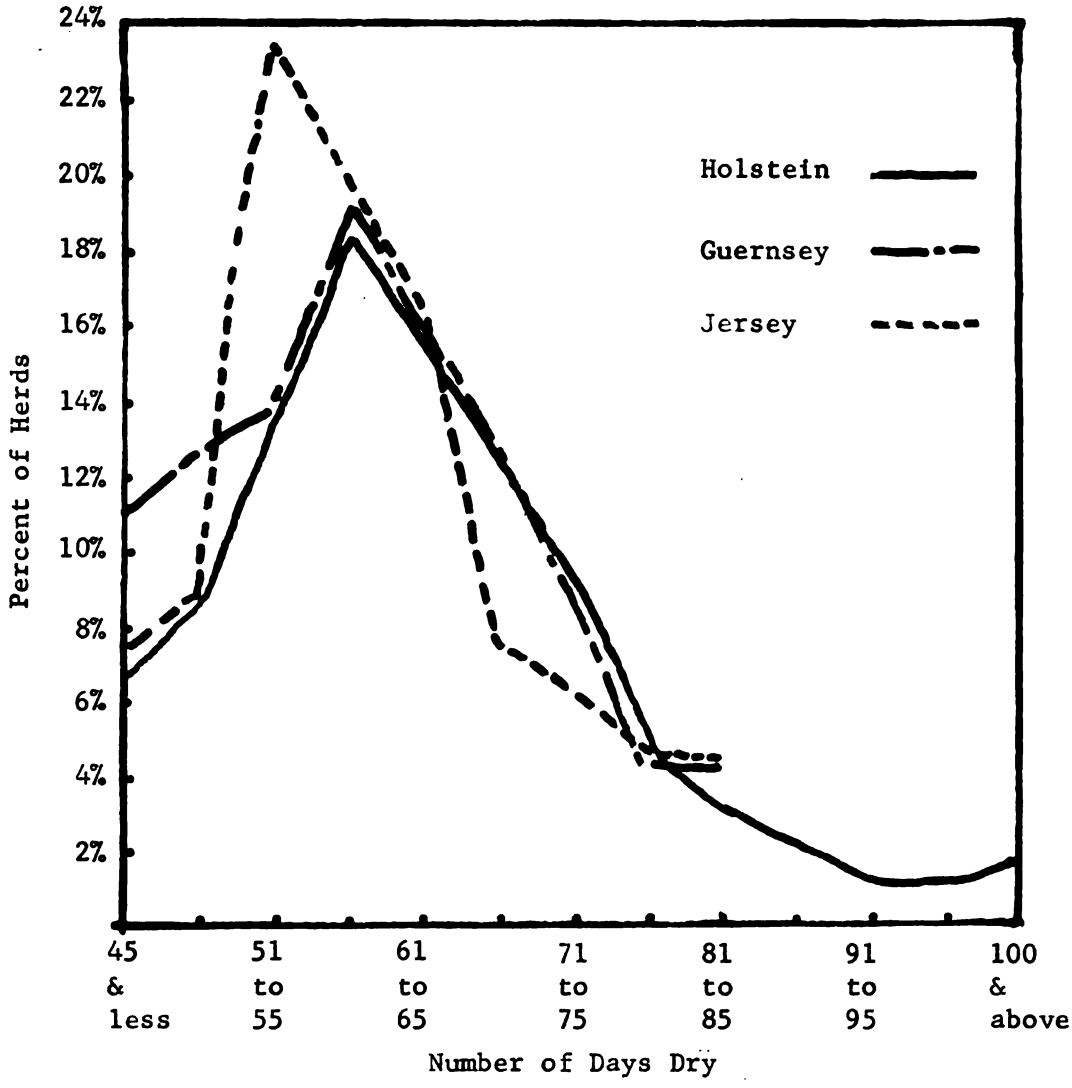

Figure 4. THE PERCENTAGE OF HERDS IN THE THREE BREEDS HAVING VARIOUS NUMBERS OF DAYS DRY.

be as short as physiological conditions allow.

Period of Calving

The average milk production figures and the percentages of herds designated as first, second, third and fourth quarter freshening herds are listed in Table V. There were 306 Holstein, 63 Guernsey, and 33 Jersey herds used in this part of the study. It should be noted that there is only one herd in the first quarter group for the Jerseys. Therefore, it has little meaning.

The results listed in Table V are plotted in Figures 5 and 6. It can be seen that generally those herds in which the majority of the cows freshen in the first or second quarters have lower milk production than those having cows freshening mainly in the third or fourth quarters.

The curve in Figure 6 for the percentage of herds in the different quarters parallels fairly closely the curve for milk production in the four quarters. The large percentage of Holstein and Guernsey herds in the fourth quarter would lead to the speculation that many dairymen who had been trying for third quarter freshenings had had them drift into the fourth quarter. Many dairymen would be trying for third quarter freshenings to establish a large "base". A "base" is the amount of milk produced during a certain base period and is used in determining the prices that the dairyman would be paid for his milk throughout the entire year. The base period is usually the low milk production months of late summer and early fall.

An important consideration here is that the better quality herds

are probably in the third and fourth quarter groups and the poorer herds in the first and second. The author feels that the higher milk production of the third and fourth quarter freshening herds is an indication that the better dairymen strive for predominantly fall freshenings.

TABLE V

THE AVERAGE MILK PRODUCTION AND THE PERCENTAGE OF HERDS HAVING A MAJORITY OF THEIR COWS FRESHENING IN CERTAIN PERIODS OF THE YEAR

Breed	First quarter (Jan. - Mar.)	Second quarter (Apr. - June)	Third quarter (July - Sept.)	Fourth quarter (Oct. - Dec.)
	AVERAGE HERD MILK PRODUCTION			
	Lbs.	Lbs.	Lbs.	Lbs.
Holstein	10874	11083	11234	12418
Guernsey	7436	7248	8257	8094
Jersey	8799	6672	7123	7016
	PERCENT OF HERDS IN EACH QUARTER			
	%	%	%	%
Holstein	15.3	7.1	34.6	43.0
Guernsey	11.0	6.0	16.0	67.0
Jersey	3.0	12.0	55.0	30.0

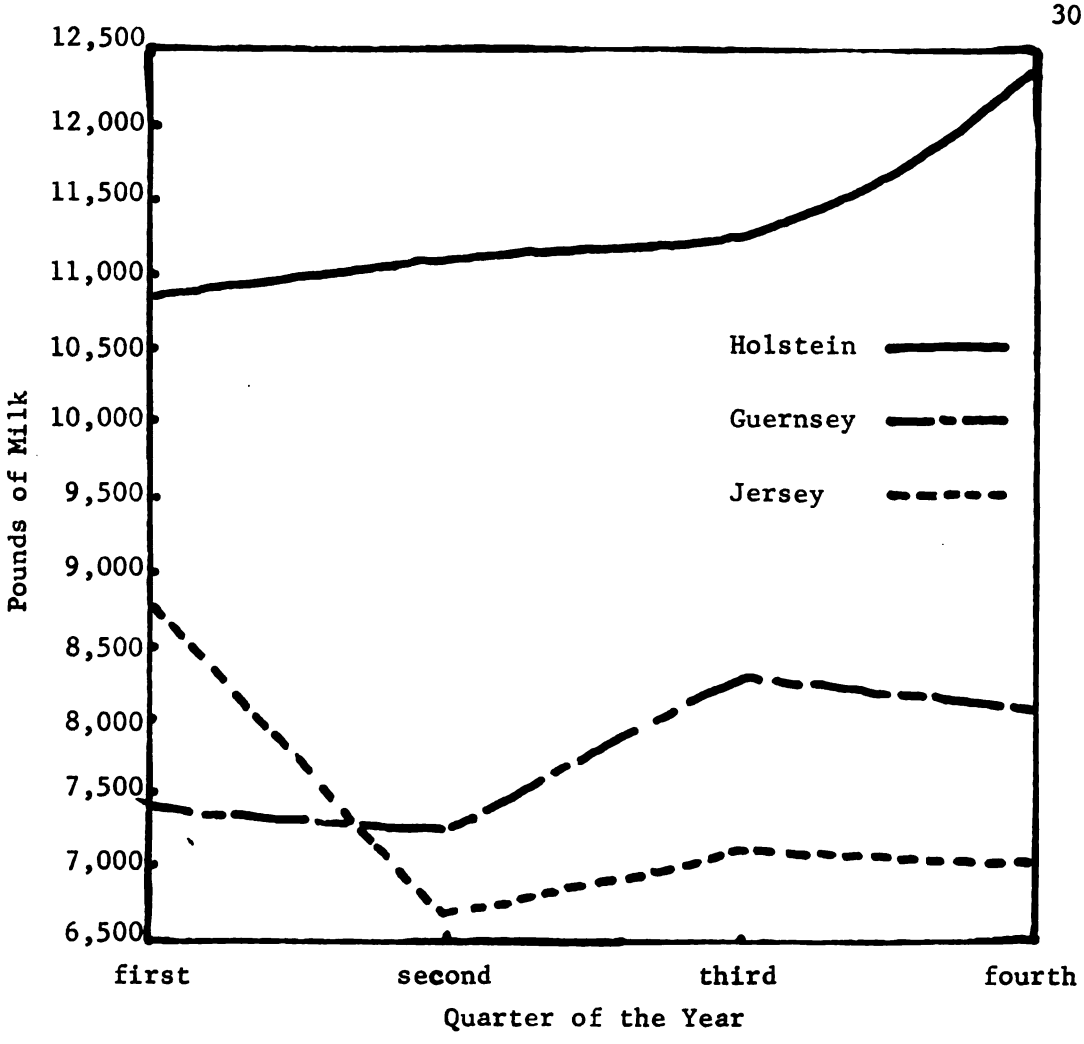

Figure 5. THE AVERAGE MILK PRODUCTION OF HERDS IN THE FOUR PERIODS OF CALVING GROUPS FOR THE THREE BREEDS.

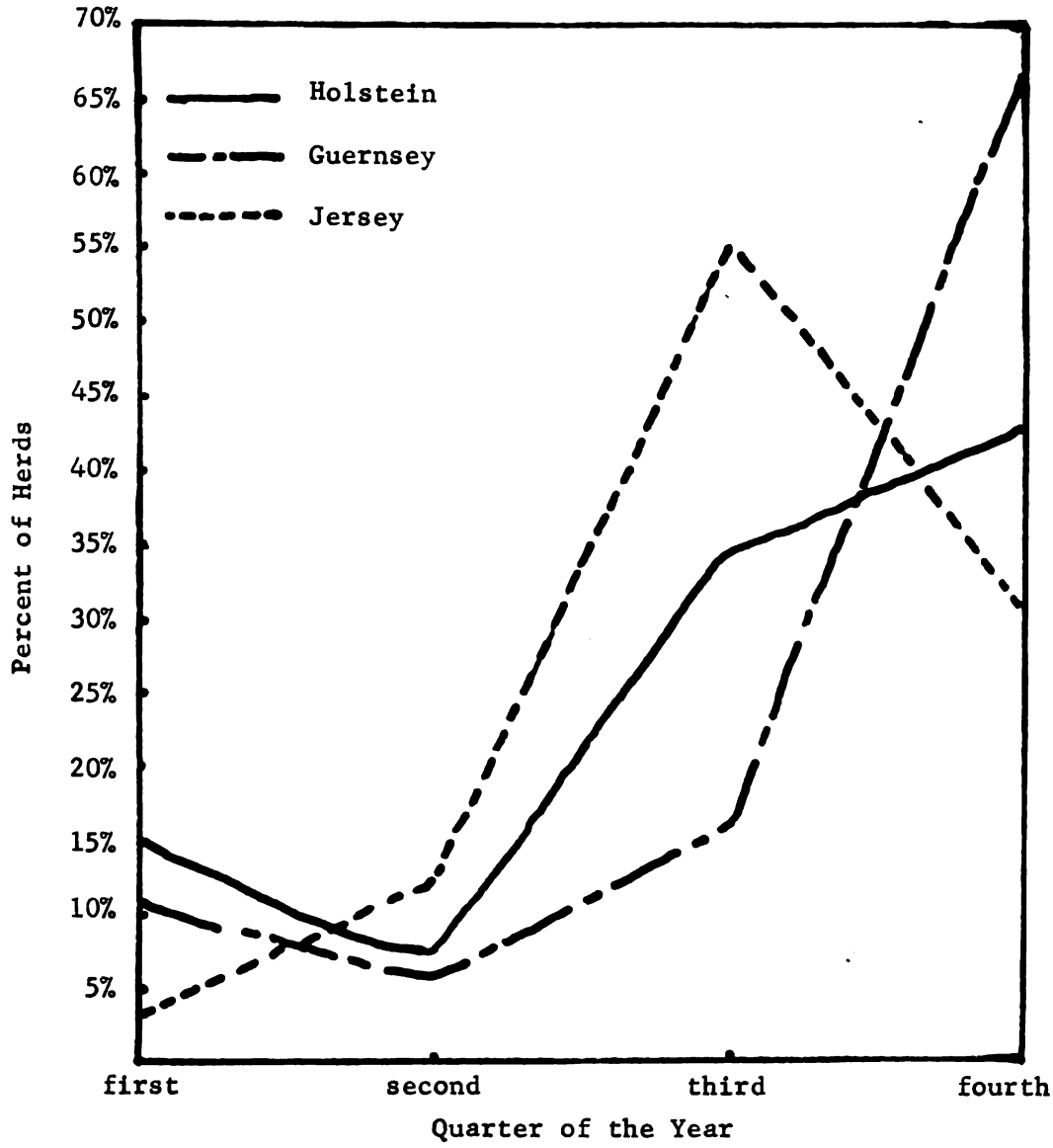

Figure 6. THE PERCENTAGE OF HERDS IN THE FOUR PERIOD OF CALVING GROUPS FOR THE THREE BREEDS.

SUMMARY

In this study, average herd calving intervals of less than 12 months were associated with a decrease in milk production. The upper limit for the optimum calving interval range was not evident. Average calving intervals of 13 and 14 months did not have a detrimental relationship to milk production. The optimum number of days dry for maximum milk production would appear to be 10 to 15 days shorter than the normal 60 day dry period. Herd milk production decreased from this point on as the average number of days dry increased.

Herds classified as first and second quarter freshening herds had on the average lower milk production than those classified as third or fourth quarter freshening herds. Approximately 75 per cent of the herds were third and fourth quarter freshening herds.

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