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To the Graduate Council:

I am submitting herewith a thesis written by Samuel Lane Parkison entitled " A Summary of the Records on the Purebred Jersey Herd at the West Tennessee Experiment Station From 1928 to 1952." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Dairying.

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A SUMMARY OF THE RECORDS ON THE PUREBRED JERSEY DAIRY HERD AT THE WEST TENNESSEE EXPERIMENT STATION FROM 1928 TO 1952

A Thesis

Presented to

the Graduate Council of

The University of Tennessee

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

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by

Samuel Lane Parkison

March 1960

28
33

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INTRODUCTION

Dairy farming is becoming more and more mechanized and is being placed more on the same basis as other types of businesses. Owners and operators of all other enterprizes keep records, take inventory and then study their records to determine how they can better their businesses. The dairy farmer also needs to keep records and study these records to determine how he can improve his business of dairy farming. If the farmer never stops to study and analyze his records, they are useless regardless of how complete a set of records he keeps. Horwood (21) stated that the greatest value in keeping records may come from comparing the current records with similar records kept in previous years.

What is to be gained from keeping records? In a dairy business, as in any other business, one of the main interests is to maximize net income. For a milking herd this could be accomplished in the form of more milk per cow, keeping the good cows in the herd longer and raising or selling more of the offspring. One of the foremost records that needs to be kept is the amount of milk produced by each cow. With production records it is easier to determine the animals that are making a profit and those that are "free boarders". By studying production records a better job of culling the present herd can be done. Production records also serve as a basis for estimating the transmitting ability of the bulls through daughter-dam comparisons and thus are a major tool to be used in selection.

According to Arnold and Becker (3) breeding, feeding and management all play important roles and are interdependent in building a dairy herd. Therefore, breeding better dairy cows requires continued attention to the selection and culling based on dependable records.

REVIEW OF LITERATURE

A study of the available literature was made to determine the type of records kept in other dairy herds and the results obtained when these records were summarized.

Value and Purpose of Records

Dairy farming is a business and record keeping is an important part of any business (21). The extent of the value of records depends upon their use in developing and maintaining an efficient herd. Hoglund (20) stated that a dairy farmer without records was like a clock without hands and the farmer may be just as confused about his business as a person trying to tell the time of day by looking at the handless clock. Records, according to Hodgson (19), will enable the farmer to cull wisely, breed and feed the cows in his herd.

The greatest value in keeping records may come from comparing the current records with similar records in previous years (21). The records that are kept should be used as a guide to avoid past mistakes and to capitalize on successes. In other words, records should be used to help minimize losses and maximize returns.

Milk production efficiency can be improved and production costs lowered when the farmer has the necessary information at hand to guide him in his feeding, breeding and management program (19). The availability of continuous lactation records is the most important tool with which to effect more efficient milk production and can be

the most important guide to the proper feeding, breeding and management program. Success in breeding dairy cattle depends on a continuous study of the records to eliminate undesirable animals and to locate and multiply the desirable cow families (6).

A survey was made by Beam, McLearen, and Borland (7) of Pennsylvania State College to determine the cause of the increased production of milk and butterfat in fourteen state institutional herds. Preliminary results indicated that the increases had been too rapid to be attributed solely to breeding and selection. Evidence pointed to the conclusion that management factors had a marked influence on the increase in production. From the records, they found that a more rigid culling program, shortening the calving intervals, eliminating certain diseases and improving management practices had been the major influences in increasing the production of the herds surveyed.

Types of Records

Realizing that records are a must for the profitable dairy farmer, he must decide what is the best way to keep his records and which records are necessary to keep.

Becker (8) listed two forms of record keeping for the dairyman. The first was a form permitting daily milk yield for individual cows to be recorded in such a way that it could be easily tabulated by calendar months or by lactations. The second form was a loose leaf type record with a separate page for each cow. Space was provided for the cow's name, registration number, tatoo, herd number, date of birth, a two

generation pedigree, monthly and lactation totals for four lactations, breeding records for four calvings and date and reason for disposal. After disposal of an animal, her page or pages in the loose leaf book were removed and placed in a permanent herd file.

Horwood (21) suggested seven charts for the entire herd rather than an individual page for each cow. Every cow had a specific place on each chart. One chart, which served as a herd inventory, provided a convenient summary of the number of animals in the herd by age groups at the end of the calendar year. The second chart showed the number of cows of various age groups in the milking herd and the third chart showed the age of freshening for the heifers. Chart four gave the calving intervals. The fifth chart was a summary of production which showed the lactation totals and averages. The sixth chart showed the age and reason for disposal of the cows and the last chart was on calf losses.

By looking at these charts the farmer can easily determine the number of animals of each age group in the herd, average age of the milking herd, age when heifers freshen, production records, age and reason for disposal and the calf losses. These records can be invaluable in setting up a feeding, breeding and management program.

Founding A Herd

In general, a dairy herd is founded on purchased cows but the continuation and success of the herd depends on the transmitting ability of the individual cows (6). Under average conditions, ten foundation cows are usually reduced to five cow families in ten years.

In selecting cows as foundation stock for a herd, as thorough knowledge as possible of the following facts should be used (6).

1. The ability of the cow to produce milk and butterfat.
2. Freedom from communicable diseases and injurious parasites.
3. Condition of the cow as affected by previous feeding and management.
4. A satisfactory breeding history.
5. Age of the cow.
6. If the cow is registered purebred, proper transfer inscribed by the breed association should be supplied by the last owner.
7. Dairy conformation, including a good mammary system, large feed capacity and spareness of natural fleshening.
8. Wearing ability as indicated by a strongly attached udder, good feet and legs, and a rugged constitution.

According to Arnold and Becker (3) the most important factor which gave value to a cow was her ability to produce a large amount of milk and butterfat in proportion to the total amount of feed she consumed.

Sires

Fohrman (16) reported that the future worth of any herd depended largely on the quality of sires used. Lush and Lacy (26) reported that studies of proved dairy sires have generally shown that about one third decreases production, one third maintains present production and one third gives an actual increase in production. They stated that the surest way to build up a dairy herd was to use good proved sires.

The term proved sire was originated in 1935 by the Bureau of Dairy Industry and has been used since that time to define a bull about which there is evidence of his transmitting ability as determined by daughter-dam comparisons. The sense of this definition is in the evidence provided on the genotype of a bull regardless of whether it is

for high or low production. A common misconception seems to be that a proved bull is good because he was proved (17).

According to Rice et al. (32) most breed associations issue a proof on bulls with ten or more daughter-dam comparisons if the bull was used naturally and 25 or more daughter-dam comparisons for bulls used in artifical breeding. In most cases a bull would be at least five years of age before he was proved. If more than these numbers of daughter-dam pairs were required for proofs, several good bulls would be dead before their breeding value was recognized. Also the use of selected daughters in a proof could give the wrong impression of the breeding value of a bull (2).

Becker and Arnold (9) conducted a survey in conjunction with the breed associations to determine the average useful lifespan of bulls kept in natural service. According to their study, a Jersey bull can be used for an additional five to six years after he is proved. The average useful lifespan for 197 Jersey bulls was 11.07 ± 2.56 years. This did not include the bulls that were disposed of because of unsatisfactory progeny, to avoid inbreeding or because the owner had access to a more desirable bull. The main causes of loss of these bulls were sterility, death from undiagnosed causes and old age.

Becker, Arnold and Spurlock (10) reported that the main reason for the short tenure of bulls in small dairy herds was to prevent inbreeding. Wing and Wilcox (36) reported recently that 25 per cent inbreeding seldom caused trouble and that inbreeding within the dairy breeds was between five and ten per cent and increasing about one per

cent each year. They also pointed out that inbreeding was of no value unless it was followed with careful selection of the future breeding stock.

Fohrman (16) stated that production proved sires carry the dairyman beyond the speculative operation of pedigree selection. Pedigree selection was the main reliance of breeders for many years but its overall effects were not too impressive. Production proved sires at least afford a preview of their future performance whereas, pedigree selection offers only an even chance of success in improving the herd.

He stated that the improvement of the dairy herd depends largely on the quality of sires used. Female selection should be practiced to improve the type and production of the present herd but should not be counted on for rapid improvement of the future herd. The rate of loss of mature cows from bad udders, diseases and accidents made it impossible to make any rapid improvements in the herd merely by culling out the cows of lowest type and production (26).

According to Lush (25) the increased appreciation of the progeny test as a means of rating the real breeding worth of an animal was a noteworthy development in modern animal breeding. It has always been known, in a general way, that a progeny test increased in realiability as the number of offspring included in the progeny test increased. When there are as many as four to six daughters included in a progeny test, that test would be about as accurate as an estimate based on a very complete pedigree. However, the type of treatment which the

daughters received must be considered. Poorly managed daughters from good sires may not produce as well as properly managed daughters from poor sires. Little value was gained from including more than five to eight daughters in a progeny test if the daughters had been in herds with similar management and environmental conditions. This showed that it is necessary to keep records on the entire dairy operation and all of these records must be studied if an accurate evaluation is to be given to the sire proofs.

In comparing the lactation totals of daughters with their dams a problem arose as to what records to use in the comparisons. Copeland (14) recommended the use of the highest single lactation record in daughter-dam comparisons for proving bulls. His theory being that whatever a cow produced on her highest lactation record was her inherited ability to produce.

Putnam, Bowling and Conklin (30) reported that there was a very small and insignificant difference in the results obtained from daughter-dam comparisons using first lactation, 305 day, mature equivalent records and the averages of all records on a similar basis. The first records on a mature equivalent basis averaged slightly higher than the average of all records on a similar basis.

Berry and Lush (11) reported that the averages of all available records were theoretically more useful than single records in evaluating the differences between cows. When the highest record was correlated with the other records, the resulting coefficient indicated

that the high record was somewhere near the reliability of an unselected record but almost certainly less reliable than the average of all records.

Cows

Arnold and Becker (5) reported that too little emphasis has been given to the cow and in accordance with Horwood (21), too much emphasis has been placed on lactation totals disregarding the length of the lactation and calving intervals. They contend that the true measure of a cow should be based on her average daily milk yield over the entire interval from her second birthday to her last dry date.

Age at first calving and calving intervals. Plum and Lush (29) reported an average of 25.5 months for the first freshening of Jerseys in the Iowa Cow Testing Associations. Copeland (13) reported that the results from his survey indicated Jerseys averaged 26.5 months of age at the time of first freshening.

Arnold and Becker (5) reported the average calving interval in the Florida Station herd was close to 14 months. Horwood (21) reported that cows with calving intervals of less than 365 days had a higher average daily milk production for their lifetime and produced more calves but had smaller lactation totals than the cows with longer calving intervals. The length of calving interval is influenced largely by reproductive efficiency. Mead (27) stated that the reproductive history of the entire herd needs to be kept where the dairyman can see at a glance the reproductive performance of any animal for several years.

Superior germ plasm will improve the dairy herd very little unless the better cows can reproduce normally over a period of several years.

Lifespan. Arnold and Becker (5) reported that the productive lifespan for dairy cows was between 3.5 and 6.0 years. Becker, Arnold and Spurlock (10) found the average productive life of dairy cows in the milking herds in Florida that were maintained by purchased replacements to be 3.9 years after entering the herd. In herds where replacements were raised, the productive lifespan of the cows was 4.7 years assuming the cows entered the milking herd at about two years of age. Home replacements had longer tenures than purchased replacements caused by unknown background and past histories of most of the purchased animals. Wing (35) reported that cows remained in the Cornell herd for an average of 3.28 years after calving. From a study of the ages of the cows in herds in the testing associations of Iowa, Cannon and Hansen (12) reported that the cows averaged about 4.7 years of age and the cows in the Iowa State College herd averaged about 4.2 years of age.

Becker (8) and Horwood (21) reported that most cows do not exceed four lactations per cow. Wing (35) reported that only 38 per cent of all cows that freshened in the Cornell herd remained in the herd for four or more lactations while 36.6 per cent dropped out at the end of the first lactation. Volker (33) reported that cows in the dairy herds at South Dakota State College since 1897 averaged slightly over three lactations each.

Reasons for culling. Becker, Arnold and Spurlock (10) reported udder trouble, including mastitis, low production and reproductive failure were the main reasons for disposal of dairy animals. Low production, according to Mead (27), was responsible for only a small percentage of the total number of cows culled. Many were disposed of each year for other reasons among which sterility and difficult breeding were the chief factors responsible for the large number of replacements required annually in dairy herds.

Replacements. Arnold and Becker (5) reported that of the heifers born at the Florida Station herd only 65 per cent ever freshened. If the objective of the dairyman was to maintain the herd at its present size, 82 per cent of all heifers dropped needed to be kept in order that 65 per cent would eventually freshen. If the dairyman's objective was to increase the size of the herd, he could increase it about 20 per cent by saving all of the female calves that were born. This gave only an increase in numbers and prevented improvement of the herd through selection and culling of the less desirable animals. Arnold, Becker and Spurlock (6) suggested that when the heifer calves were being raised as replacements, the dairyman study the herd records and select those calves from good cows and good cow families as the replacements.

Calf Losses

Ragesdale, Elting and Brody (31) reported a total of 943 pregnancies from four breeds of dairy cattle in the University of

Missouri herd during several years prior to 1926. Their calf losses averaged 23.75 per cent which included abortions, stillbirths and other deaths that occurred before the animals were one year of age. The calf losses at Missouri were lower than those reported by Wing (35) from Cornell and by Ormiston (28) from Illinois. From the start of the dairy herd at Cornell in 1889 to 1928 there were 644 births and an average calf loss of 28.1 per cent. Ormiston (28) reported a total of 809 female calf births from five breeds during a 12 year period at the University of Illinois with an average calf loss of approximately 30 per cent prior to one year of age.

In the Michigan State College herd, Weaver, Horwood and Smiley (34) reported an average calf loss of 13.7 per cent for 1467 births from five breeds over a 16 year period. Lassiter and Seath (24) from Kentucky reported a 14.43 per cent calf loss for 1067 births over a 25 year period. Abortions and stillbirths accounted for the greatest percentage of calf losses. After the calves were born alive, the main causes of death prior to one year of age were scours, pneumonia and deformities or accidents (15, 23). Of the calves that were born alive but died in less than a year, about 50 per cent died within the first month (4, 22).

Summary

Dairy farming is a big business and record keeping is a vital part of any business. The records should be used as a guide to avoid past mistakes and capitalize on past successes. The availability

of continuous lactation records is the most important tool with which to bring about more efficient milk production and could be the most important guide to proper feeding, breeding and management of the dairy herd. The main records a dairyman needs to keep are (a) age of all animals in the herd, (b) ages of the cows in the milking herd, (c) age at which heifers first freshen, (d) calving interval, (e) production records, (f) disposal records of all animals and (g) calf losses.

In general, a herd is founded on purchased cows but the continuation and success of the herd depends on the transmitting ability of the individual cows. The most important factor which gives value to a cow is her ability to produce a large amount of milk and butterfat in proportion to the amount of feed she consumes.

Improvement of the future herd rests largely in the quality of sires used. Culling the low producing animals had an effect on the production level of the present herd but selected breeding to good proved sires was the best way to improve the future herd.

Too much emphasis has been placed on lactation totals disregarding the length of the lactation and dry period. Most cows do not exceed four lactations in the herd. The main reasons for culling cows were low production, breeding failure and diseases including udder troubles.

If replacements are being raised, they should be selected from good producing cows and good cow families. Calf losses occurring prior to one year of age range from a low of 13 per cent in Michigan to a

high of 30 per cent in Illinois. Abortions and stillbirths were the main causes of calf losses. Scours took the highest percentage of calf losses after the calves were born alive but died in less than a year.

This study was made to determine the necessary records to keep and the effects of certain management decisions on the future herd. This study has covered a period of time sufficient to reduce environmental effects to a bare minimum; therefore the results expected under certain management changes for Tennessee dairymen could be expected to follow a similar pattern.

PROCEDURE

To give a fair evaluation to a dairy herd, the herd must be maintained under relatively uniform conditions for several years. The purebred Jersey herd at the West Tennessee Experiment Station was established in 1928. The objectives in estabilshing the herd were to demonstrate improved dairy methods, to demonstrate herd improvement, to improve the type of dairy cattle in West Tennessee, to make it possible to undertake experimental work on special dairy problems and to study the possibilities of dairying in West Tennessee.

It was proposed to establish the herd by purchasing six registered purebred Jersey cows and six grade Jersey cows. The registered cows were to be selected for foundation cows and the grade cows were to be replaced by daughters of the registered cows. Four registered cows, Blue Bird's Happy Queen, Majesty Sophie Gamboge, Port's Arminta and Prize's May Belle, were selected and purchased as the foundation cows. Eight other cows were also purchased only to give numbers to the herd. Although these cows were purchased as grades, they were eligible for registration and were later registered with the American Jersey Cattle Club.

In this study, all twelve of the purchased cows are referred to as foundation cows. If the cows were with calf at the time they were purchased, their offspring born at the West Tennessee Experiment Station were not considered as foundation cows. The foundation cows were coded by using a portion of their name as shown in Table 1.

This study covered the first 24 years (1928 to 1952) of the dairy herd and includes the 12 purchased cows and the animals sired by the first 20 bulls. The management of the herd was under the supervision of the same person throughout the entire period. No outside female animals were brought into the herd from 1931 to 1952. The herd was tested annually for brucellosis and tuberculosis with all positive reactors being sold for slaughter.

A copy of the records on each animal as recorded in the permanent herd book at the West Tennessee Experiment Station was made. The records obtained included the cow's name, registration number, herd number, date of birth, date of disposal, reason for disposal, sire, dam, date of calving, age at calving, number of days milked, total milk and butterfat produced, 305 day milk and butterfat production, birth weight of offspring, sex and sire of offspring, number of days in gestation and disposal of offspring.

The herd was milked twice daily and milk weights recorded. The lactation totals were the total actual milk produced as recorded daily. All lactations of at least 270 days in length were considered to be complete unless otherwise stated on the record. All completed lactations were converted to mature equivalent basis using the American Jersey Cattle Club conversion factors effective July 1, 1952 (1). The herd was on Register of Merit test from 1929 to 1940 and from 1940 to 1954 private testing was done each month.

The production records and number of calvings of the foundation cows included only the records made while these cows were in the

West Tennessee Experiment Station herd. No production information was available on the cows prior to purchase. Each foundation cow represented a separate cow family even though four of the foundation cows were descendants of Sharon, another foundation cow. Cow families were considered to be in the herd from the purchase of the foundation cow until the disposal of her last female descendant born prior to 1952. The data on cow families include the female descendants only. Inbreeding coefficients were calculated on the entire herd, including the foundation cows and bulls by the procedure suggested by Wing and Wilcox (36).

All bulls which sired at least one daughter that lived to be a year old were included in this study. Bulls were coded by initals in the order in which they were used as shown in Table 2. The ages of the bulls were figured from the date of birth of the bull to the birth of his first daughter in the West Tennessee Experiment Station herd. Each bull was considered to be in the herd from the birth date of his first daughter to the birth of his last daughter in the West Tennessee Experiment Station herd. In making daughter-dam comparisons, all completed lactations were used. Starting in 1931 some of the cows were placed on an all roughage experiment and others were on a normal grain ration (18). If the sire had daughter-dam pairs by using only the normal lactation records, these comparisons were also listed and discussed.

The actual amount of milk produced was used to study the effects of long lactations and dry periods on the average daily milk production.

The cows were grouped in sire groups and the number of days was determined that the cows remained in the herd from two years of age to their last dry date. This phase included the sixth lactation of two daughters of P.S.O. that were still in the herd as of January 1, 1960.

Due to the policy of the station to dispose of all male calves as soon as possible after birth, the data on calf losses include the female calves sired by the bulls used. Abortions included all still-births when the sex of the calf was not determined.

RESULTS

Foundation Cows

Five Jersey cows were purchased in March of 1928 for the starting of the Jersey dairy herd at West Tennessee Experiment Station. These five cows, as coded in Table 1, were Sharon, two of her daughters, Majesty and Duchess, and two of Sharon's granddaughters, Raleigh and Oakland. Later in 1928 four other purebred Jersey cows, Queen, Belle, Arminta and Sophie were purchased. As pointed out previously, these four cows were selected to be foundation cows and the other cows were purchased as grades for a milk supply only. These nine cows made up the herd until 1930 when Elsa was added. In 1931 two other cows, Sultana and Rosebud, were acquired, bringing the total number of purchased animals to twelve. These twelve cows, which includes all of the purchased females, were considered the foundation cows for the herd. Only three of these cows were inbred. The inbreeding coefficients were 0.78 per cent for Arminta, 6.25 per cent for Sultana and 9.38 per cent for Belle.

Of the twelve foundation cows, four were with calf at the time they were purchased. Three of these cows, Sharon, Duchess and Oakland, were bred to W.S.M., as coded in Table 2, and each delivered a heifer calf. The other cow, Sophie, was bred to V.N.F. and also dropped a heifer calf. The other cows were open at the time of purchase and were bred to sires at the station.

TABLE 1

NAMES, DATE AND AGE WHEN PURCHASED, AGE OF DISPOSAL AND NUMBER OF CALVINGS OF THE TWELVE FOUNDATION COWS IN THE W.T.E.S. HERD

Full Name	Code Name	Date Purchased	Age In Years When Purchased	Age In Years When Disposed	Number Of Calvings
Sharon's Duchess	Sharon	1928	12	17	5
U.T. Majesty Duchess	Majesty	1928	1	8	6
U.T. Raleigh Duchess	Raleigh	1928	1	3	1
U.T. Sharon Duchess	Duchess	1928	7	9	1
U.T. Oakland Duchess	Oakland	1928	5	8	4
Blue Bird's Happy Queen	Queen	1928	4	10	6
Prize May Belle	Belle	1928	5	11	5
Poet's Arminta	Arminta	1928	6	13	5
Majesty Sophie Gamboge	Sophie	1928	3	4	1
Elsa's Pauline	Elsa	1930	8	12	4
Majesty Goldenrod Sultana	Sultana	1931	1	14	11
Majesty Sultana Rosebud	Rosebud	1931	1	7	5
Average			4.4	9.7	4.5

Age. As is to be expected when purchasing several animals, there was a wide range in the ages of the purchased cows as shown in Table 1. The range in the ages of these cows was from one year up to twelve years. The average age for the twelve cows at the time of their purchase was 4.4 years.

Calvings and lactations. All twelve of the foundation cows conceived and calved at least once in the West Tennessee Experiment Station herd as shown in Table 1. The twelve cows had a total of 54 calvings at the West Tennessee Experiment Station for an average of 4.5. They left a total of 26 female offspring that lived to be at least one year old. Three of these cows, Raleigh, Duchess and Sophie, calved only once in the West Tennessee Experiment Station herd. Sultana, with 11 calvings, had more than any other foundation cow. The 12 cows had 33 completed lactations. Five other lactations were interrupted before completion by the disposal of the animals.

Disposal. The average age of the cows at the time of disposal was 9.7 years as shown in Table 1. Sharon was 17 years old when she was sold because of old age. Four cows were disposed of with mastitis, three sold for dairy purposes, three sold for slaughter and one sold because of broken udder. The 12 foundation cows stayed in the West Tennessee Experiment Station herd an average of 5.3 years.

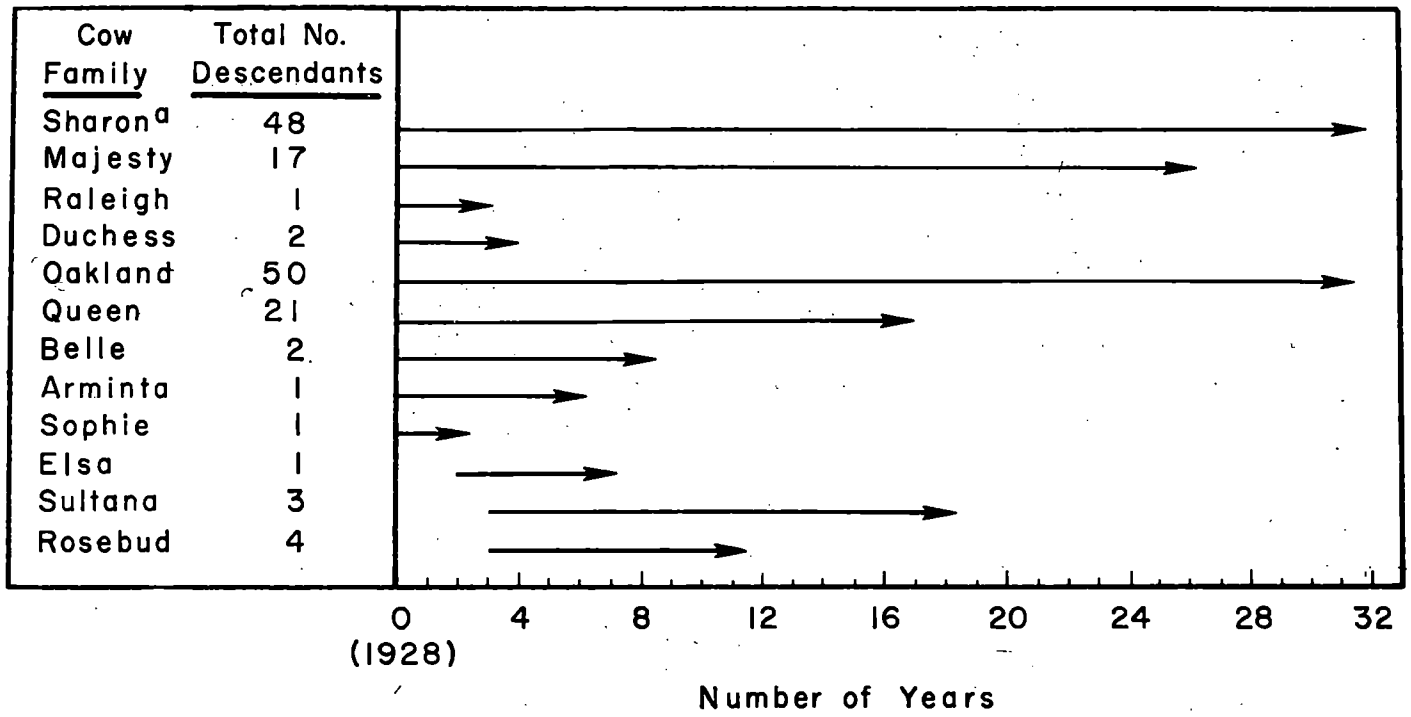
Longevity of cow families. Six of the foundation cow families had disappeared by the end of the eighth year with five disappearing

after the F_1 generation. Figure 1 shows the length of time the cow families were in the herd. During this 24 year period (1928 to 1952) only two of the cows that were selected to be foundation cows had descendants in the herd for over eight years. Queen, one of the cows selected as a foundation cow, had descendants in the herd for 17 years representing five generations. The other three selected foundation cow families disappeared after the F_1 generation. Of the other eight cows that were purchased, Sharon had a total of 48 female descendants representing eight generations and Oakland had 50 female descendants representing seven generations. As of January 1, 1952, three cow families, Sharon, Majesty and Oakland, had a total of 47 female descendants still in the herd. Neither of these three cows was selected to be a foundation cow. The four cow families that were selected to be the foundation cows had completely disappeared by 1946. These descendants include only the female descendants that lived to be at least one year old.

Bulls

The bulls are coded and listed in Table 2 in the order in which they were used in the herd. Three of the twenty bulls, L.N.C., F.T.C.P. and P.S.O. were inbred. The inbreeding coefficients for these bulls were 6.26 per cent, 12.5 per cent and 6.25 per cent respectively.

Five of the bulls were never owned or borrowed by the station. Two of these five bulls, W.S.M. and V.N.F., were bred to some of the foundation cows at the time the cows were purchased.



a. 2 descendants in the herd as of 1-1-'60

Figure 1. Longevity of cow families in the W.T.E.S. herd including all female descendants born prior to 1952.

TABLE 2

NAMES, AGES AND LENGTH OF SERVICE OF THE BULLS USED IN THE W.T.E.S. FROM 1928 TO 1952

Name	Code Name	Years Of Age When First Used	Years Used In Herd
Wilkes Sultan Majesty	W.S.M.	2	°
Virginia's Nunthrope Fox	V.N.F.	2	°
Landseer Noble Cruiser	L.N.C.	1	1
Fairy Lad's Helena Prince	F.L.H.P.	3	1
U.T. Fauvic Duchess Sultan	U.T.F.D.S.	4	2
Poet's U.T. Sultan	P.U.T.S.	2	1
Duchess U.T. Sultan	D.U.T.S.	2	1
Golden Glow's Fauvic Prince	G.G.F.P.	9	1
Tiddledywink Flying Fox	T.F.F.	7	1
Fauvic Theatre Cup Prince	F.T.C.P.	12	2
Riverdale Torono	R.T.	2	8
Freda's Estella Volunteer	F.E.V.	2	2
Estella Signal Bravo	E.S.B.	4	1
Sybil Oregon Baronet	S.O.B.	5	2
U.T. Baron St. Nick	U.T.B.S.N.	2	3
U.T. Sybil Successor	U.T.S.S.	2	3
Right Royal Raleigh Lad	R.R.R.L.	5	A.I.
Ena Noble Designer	E.N.D.	6	A.I.
Golden Volunteer Signal	G.V.S.	6	A.I.
Pansy Signal Observer	P.S.O.	10	2

° Bred to foundation cows

The other three, R.R.R.L., E.N.D. and G.V.S., were used in artificial breeding. The fifteen bulls that were either owned or borrowed by the station were used for an average of 2.1 years with only one bull, R.T., being used for more than three years.

Age of bulls. Of the 20 bulls that were used in the herd, only one bull was over 10 years of age. The ages of the bulls were determined from their date of birth to the birth of their first daughter in the West Tennessee Experiment Station herd. The average age of the bulls at the time of their use in the West Tennessee Experiment Station herd was 4.4 years of age. This includes the two bulls that were bred to foundation cows and the three that were used in artificial breeding. The average age of the bulls that were owned or borrowed by the station was 4.5 years.

Number of calves sired. During this 24 year period there were 369 parturitions, which included four abortions. Of the 365 normal births shown in Table 3, 173 were males and 192 were females. Birth weights were available for only 306 of the calves born. The average birth weight for 145 male calves was 54 pounds as compared to 53 pounds for 161 female calves.

Calf losses. The policy at the station has been to dispose of the male calves as soon as possible after birth with most of the female calves being given the opportunity to enter the milking herd. For that reason, calf losses in this report werelimited to females only.

TABLE 3

NUMBER OF CALVES BY SEXES SIRED EACH YEAR BY THE BULLS USED IN THE W.T.E.S. HERD

Years	Males	Females	Total Calves
1928	0	4	4
1929	2	4	6
1930	7	2	9
1931	8	8	16
1932	4	7	11
1933	7	4	11
1934	5	10	15
1935	6	8	14
1936	10	7	17
1937	4	11	15
1938	8	10	18
1939	15	5	20
1940	12	11	23
1941	8	7	15
1942	10	13	23
1943	7	13	20
1944	8	8	16
1945	7	10	17
1946	11	7	18
1947	6	7	13
1948	7	10	17
1949	8	5	13
1950	8	13	21
1951	5	8	13
Total	173	192	365°

° Does not include 4 abortions

All but 11 of the 192 female calves were given the opportunity to remain in the herd until they were at least one year of age. Seven were disposed of at birth and four were sold during the first month. This left 181 female calves of which 30 or 16.57 per cent died before one year of age. Of the 30 calf losses, as shown in Table 4, eight were born dead, seven died from unknown causes and four each died from poison and miscellaneous factors including calving difficulties, blackleg and accidents. Of the eight born dead, four were premature twins. Most of the calves that died prior to one year of age died within the first month after birth.

Number of calves that lived to be over a year of age. Of the 151 calves that lived to be over a year of age, 22 of them were inbred. The inbreeding coefficients ranged from 0.39 per cent to a high of 25.00 per cent with an average inbreeding coefficient of 4.09 per cent for the 22 inbred calves.

The number of offspring that produced a calf in the herd is shown in Table 5. Of the 151 calves that lived to be over a year of age, only 114 of them ever calved. Of the 37 that did not calve, 16 were sold for dairy purposes, 15 sold for slaughter, four sold as non-breeders, one killed by lightening and one died from unknown causes. Daughters of two bulls, V.N.F. and D.U.T.S., never calved. The overall average age at first calving was 27 months ranging from a low of 21 months to a high of 55 months. The average age at first calving by

TABLE 4

CAUSES OF FEMALE CALF LOSSES FROM BIRTH TO ONE YEAR OF AGE IN THE W.T.E.S. HERD

Causes	Number
Born Dead°	8
Scours	1
Pneumonia	2
Poison	4
Weak At Birth	2
Deformities	2
Miscellaneous°°	4
Unknown	7
Total	30

°Includes four premature twins
°°Includes calving difficulties, accidents, etc.

TABLE 5

NUMBER OF OFFSPRING OVER ONE YEAR OF AGE AND THE NUMBER AND AVERAGE AGE AT FIRST CALVING OF THE DAUGHTERS OF BULLS USED IN THE W.T.E.S. HERD

Bull	Number Over 1 Yr. Of Age	Daughters That Calved	
		Number	Average Age In Months
W.S.M.	3	3	25
V.N.F.	1	none	
L.N.C.	1	1	25
F.L.H.P.	1	1	28
U.T.F.D.S.	9	9	25
P.U.T.S.	1	1	23
D.U.T.S.	1	none	
G.G.F.P.	7	5	24
T.F.F.	2	2	26
F.T.C.P.	8	5	25
R.T.	15	13	25
F.E.V.	13	10	25
E.S.B.	8	6	27
S.O.B.	14	12	28
U.T.B.S.N.	26	15	26
U.T.S.S.	17	12	35
R.R.R.L.	1	1	29
E.N.D.	2	2	37
G.V.S.	1	1	25
P.S.O.	20	15	26
Total	151	114	

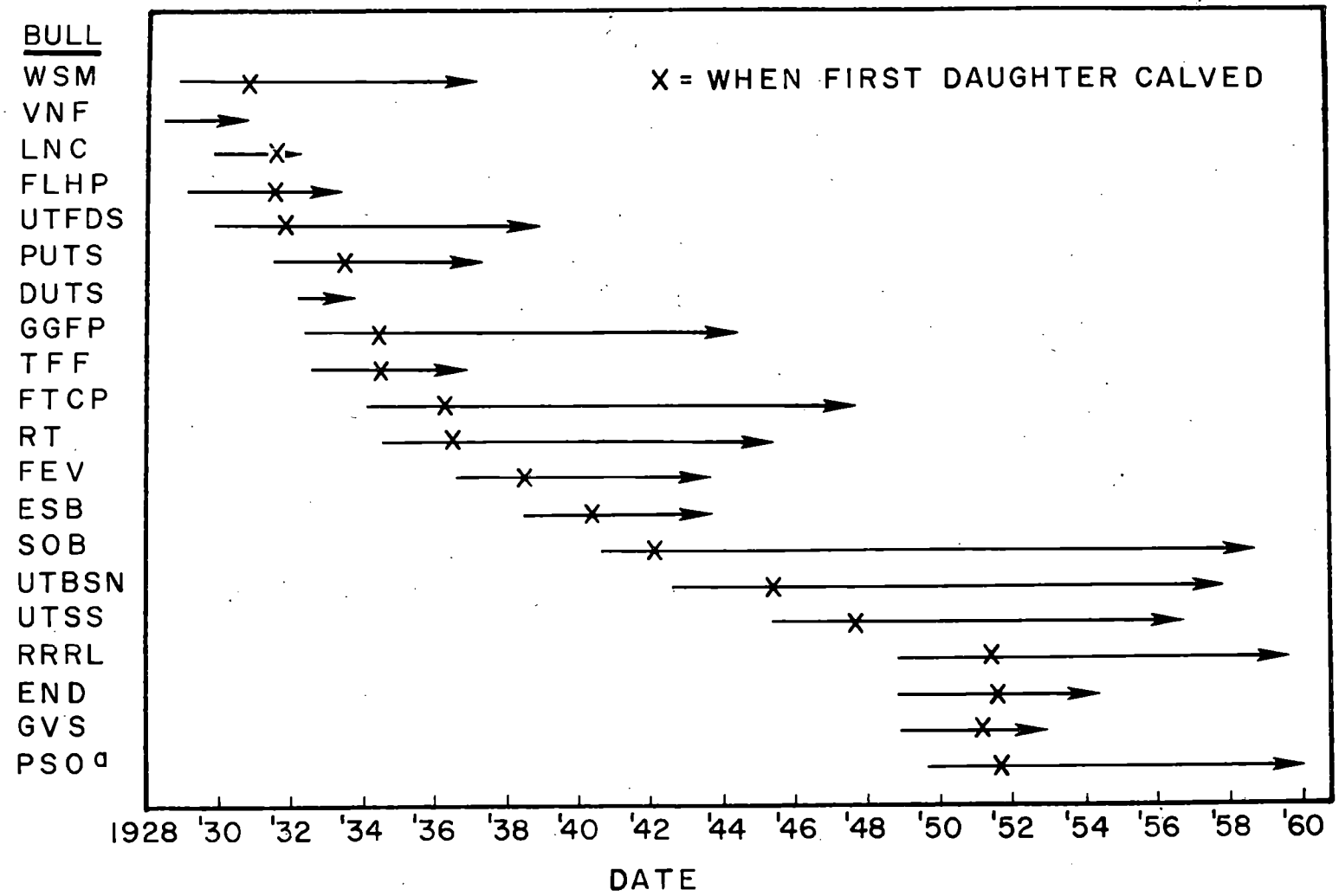
sire groups ranged from 23 months for the daughters of P.U.T.S. to a high of 37 months for the two daughters of E.N.D.

Figure 2 shows the length of time that daughters of these bulls remained in the herd. Ten of the bulls had daughters in the herd for at least eight years with S.O.B. having daughters in the herd for more than 18 years.

As of January 1, 1960, these 114 cows had a total of 445 calvings for an average of 3.9 calvings per cow with an average of 2.9 complete lactations. The length of gestation was available for only 420 of the calvings. Of these 420 gestations, 197 were of male births with an average gestation of 280.1 days as compared to an average gestation of 279.9 days for 223 female births.

Daughter-Dam comparisons. Table 6 shows the daughter-dam comparisons for the bulls used by the West Tennessee Experiment Station. Three bulls, V.N.F., L.N.C. and D.U.T.S., did not have any daughter-dam comparisons and were omitted from Table 6. When all of the lactation records were used, including the ones made while some of the cows were on an all roughage ration, seven of the bulls increased production of their daughters over their dams. One bull, U.T.F.D.S., decreased production when all records were used but increased production when only the records that were made while the cows were receiving normal rations were used.

Eight bulls had daughter-dam comparisons available by using only the records made while the cows were receiving normal rations.



a. 2 Daughters in Herd, 1-1-'60

Figure 2. Length of time that daughters of the bulls used in the W.T.E.S. herd remained in the herd.

TABLE 6

DAUGHTER-DAM COMPARISONS FOR ALL BULLS WITH DAUGHTERS THAT COMPLETED LACTATIONS IN THE W.T.E.S. HERD

Bull	No. Of Pairs	Daughters			Dams			No. Daus. Above Dams		Overall Av. + Or - In Milk Production
		Number Of Lactations	Average Lbs. Milk	Fat	Number Of Lactations	Average Lbs. Milk	Fat	In Milk	In Fat	
W.S.M.	1	4	5,555	343	3	5,480	250	1	1	+
F.L.H.P.	1	1	6,789	347	4	8,482	392	0	0	-
U.T.F.D.S.	4	9	6,788	386	14	7,006	338	1	2	-
U.T.F.D.S.°	2	3	7,365	372	6	6,981	321	1	2	+
P.U.T.S.	1	1	6,769	361	1	6,789	347	0	1	-
G.G.F.P.	4	15	6,557	376	15	5,959	324	2	2	+
G.G.F.P.°	3	5	8,031	462	6	6,263	337	3	3	+
T.F.F.	2	2	8,357	485	7	8,546	409	1	1	-
F.T.C.P.	3	19	6,627	337	13	6,485	334	2	1	+
F.T.C.P.°	2	5	7,284	411	8	7,024	351	1	2	+
R.T.	9	44	6,913	347	40	6,170	354	6	5	+
R.T.°	5	10	8,471	426	10	7,146	410	3	2	+
F.E.V.	4	7	5,482	291	20	6,794	375	0	0	-
E.S.B.	3	7	5,567	308	19	6,849	353	0	0	-
S.O.B.	8	54	7,909	397	44	6,723	346	7	8	+
S.O.B.°	6	38	8,625	422	12	7,739	414	3	2	+
U.T.B.S.N.	11	52	7,123	346	73	7,803	390	2	2	-
U.T.B.S.N.°	9	50	7,329	354	46	8,670	426	3	2	-
U.T.S.S.	10	32	6,435	303	74	7,688	377	2	5	-
U.T.S.S.°	10	32	6,435	303	61	8,037	390	2	0	-
R.R.R.L.	1	5	8,324	403	7	8,340	426	0	0	-
E.N.D.	1	2	5,972	272	10	7,526	345	0	0	-
G.V.S.	1	1	7,511	393	4	6,719	327	1	1	+
P.S.O.	14	44	7,870	393	81	7,504	369	8	10	+
P.S.O.°	14	44	7,870	393	76	7,704	373	8	10	+

° Normal Records

Three of these bulls, G.G.F.P., F.T.C.P. and P.S.O., were proved and five were unproved when they were used by the West Tennessee Experiment Station. All three of the proved bulls and three of the unproved bulls that were selected on the basis of their pedigree increased production of their daughters over their dams. The daughters of the other two unproved bulls produced less than their dams.

The first bull to increase production of his daughters over their dams was U.T.F.D.S. This increase was on normal records only where he had two daughters that completed normal records. One daughter increased production and the other one lowered production, but the overall average was an increase. U.T.F.D.S. was approximately four years old in 1929 when his first daughter was born at the West Tennessee Experiment Station. Thus, he was selected on the basis of his pedigree since he had no other daughters in production when he was used.

A proved bull, G.G.F.P., sired seven daughters and had three daughter-dam pairs by using only records made while the cows were on normal rations. He was the first sire to be used in the herd that was selected on the performance of his daughters. All three of his daughters in the West Tennessee Experiment Station herd increased production with the overall increase being approximately 1800 pounds of milk.

Another proved bull, F.T.C.P., sired eight daughters and had two daughter-dam pairs with normal records. One daughter increased production and the other daughter decreased production. The overall average was an increase of 260 pounds of milk.

The unproved bull, R.T., sired 15 daughters and had five daughter-dam pairs available with normal records. Three of the five daughters increased production and two lowered it. The overall increase was approximately 1300 pounds of milk. This bull was selected only on the basis of his pedigree.

An unproved bull, S.O.B., sired 14 daughters and had six daughter-dam pairs with normal records. Three of his daughters increased production and three lowered it. The overall average was an increase of 900 pounds of milk. He was also selected on his pedigree.

The unproved bull, U.T.B.S.N., sired 26 daughters with nine daughter-dam pairs having normal records. Only three of his daughters increased production and six decreased it with an average overall decrease in production.

Following U.T.B.S.N. was another unproved bull, U.T.S.S., who sired 17 daughters with ten daughter-dam pairs with normal records. Two of his daughters increased production and eight decreased it with an average overall decrease in production.

Another old bull, P.S.O., was the last proven bull to be used in the herd prior to 1952. He sired 20 daughters and had 14 daughter-dam pairs. Eight daughters increased production and six decreased production with an average overall increase in production.

Production of the daughters of the bulls. Figure 3 shows the average production per lactation for the daughters that completed

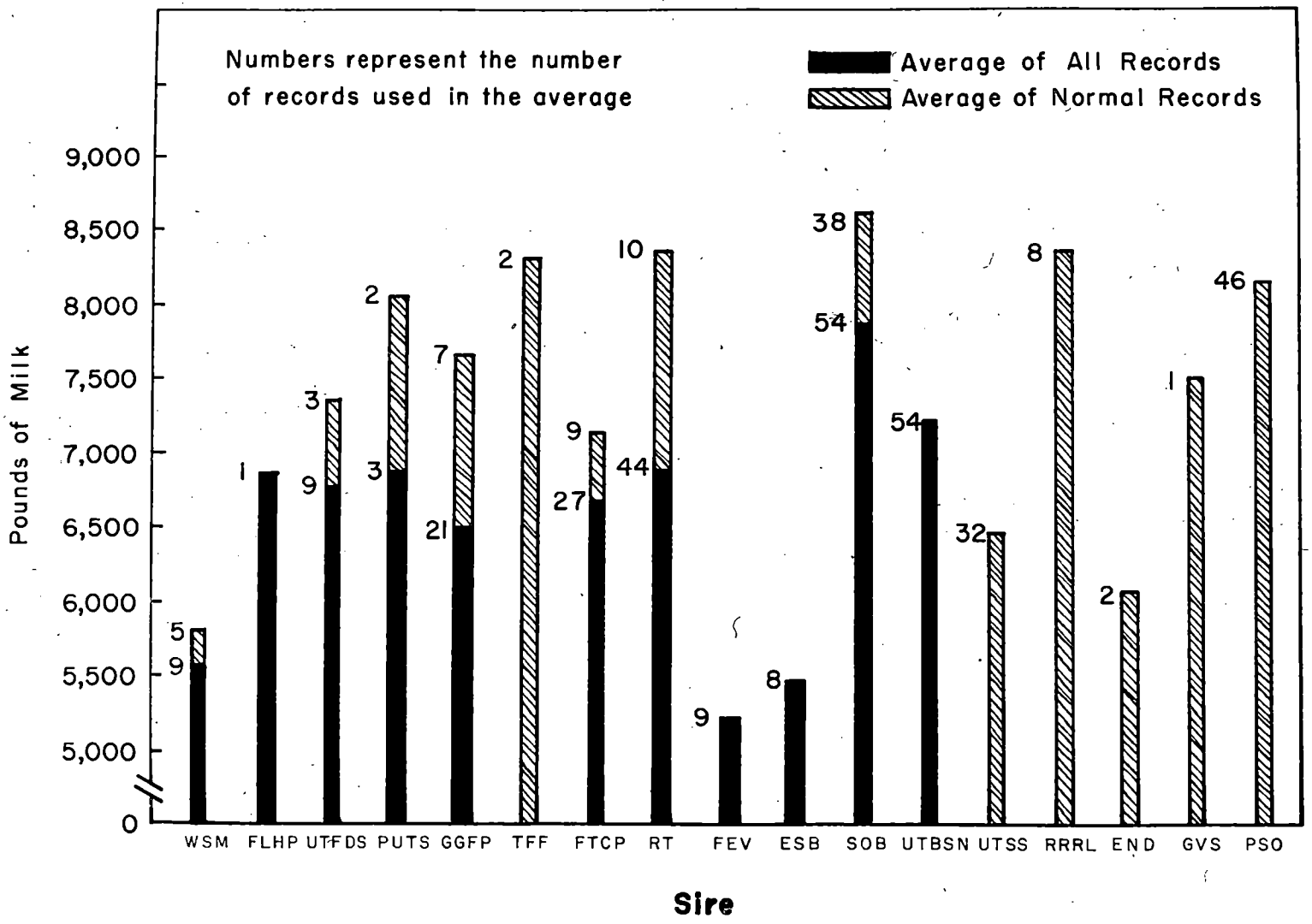


Figure 3. Average milk production of the daughters of 17 sires in the W.T.E.S. herd.

a lactation in the herd. Seventeen sires had daughters that completed lactations. The records made while the cows were receiving normal rations were separated from the average of all records which included some records made while the cows were on an all roughage ration. Figure 3 shows that the records made while the cows were receiving grain were higher than the average of all records. Using the average production of all lactations, the range in production was from 5200 pounds of milk for the daughters of F.E.V. to a high of 7850 pounds of milk for the daughters of S.O.B. The production ranged from a low of 5800 pounds of milk for the daughters of W.S.M. to a high of 8600 pounds of milk for the daughters of S.O.B. when only the average of the normal records was used. Table 6 shows that none of the daughters of F.E.V. increased production over their dams and all of the daughters of S.O.B. increased production when the average of all records was used and three daughters increased production when the average of only the normal records was used.

Table 7 shows the total number of days that these daughters of the 17 sires remained in the herd. The daughters are grouped by sires and the length of time that each daughter was in the herd extends from her second birthday to her last dry date. It may be observed that the highest average production per lactation does not necessarily mean the highest average daily production. Cows with long lactations and long calving intervals had higher lactation totals and averages but produced less total milk and had a lower daily production than cows

TABLE 7

AVERAGE DAILY PRODUCTION AND LENGTH OF TIME THAT THE DAUGHTERS OF 17 SIRES WERE IN THE W.T.E.S. HERD FROM 2 YRS. OF AGE TO THEIR LAST DRY DATE

Bull	No. Daus.	Days In Herd	Lactations	Total Actual Milk	Av. Milk Per Day (lbs.)	Av. Milk Per Lactation (lbs.)
W.S.M.	2	3,248	10	51,835	16.0	5,184
F.L.H.P.	1	799	1	9,328	11.7	9,328
U.T.F.D.S.	4	3.683	10	58,440	15.9	5,844
P.U.T.S.	1	1,206	3	18,715	15.5	6,238
G.G.F.P.	5	8,342	21	132,426	15.9	6,306
T.F.F.	2	1,076	3	17,724	16.5	5,908
F.T.C.P.	5	10,272	27	169,993	16.5	6,296
R.T.	9	18,664	48	318,164	17.0	6,628
F.E.V.	5	3,293	11	48,032	14.6	4,367
E.S.B.	4	3,989	9	38,549	9.7	4,283
S.O.B.	8	24,215	58	468,249	19.3	8,073
U.T.B.S.N.	11	25,940	61	431,968	16.7	7,081
U.T.S.S.	10	17,286	37	233,542	13.5	6,312
R.R.R.L.	1	3,153	8	66,027	20.9	8,253
E.N.D.	1	1,003	2	10,759	10.7	5,380
G.V.S.	1	356	1	5,443	15.3	5,443
P.S.O.	14	18,179	46	353,803	19.5	7,691

with shorter calving intervals. The daughter of F.L.H.P., as shown in Table 7, had a lactation average of 9328 pounds of milk as compared to 8253 pounds of milk for the daughter of R.R.R.L. Based on lactation averages, F.L.H.P. appeared to be the better sire but the average production per day from two years of age to the cow's last dry date was only 11.7 pounds of milk for the daughter of F.L.H.P. as compared to 20.9 pounds of milk for the daughter of R.R.R.L. The daughter of F.L.H.P. had only one long lactation while the daughter of R.R.R.L. had shorter calving intervals resulting in eight lactations.

Age and reason for disposal of daughters. Most of these animals, as shown in Table 8, were two, three and four years of age at the time of disposal. Approximately 56% of the cows were four years of age or younger at the time of their disposal. One cow was sold at 17 years of age because of old age. The average age at the time of disposal for the 149 cows (two are still in the herd) was 5.1 years.

Table 8 shows that the greatest cause for disposal of the cows after they were one year of age was being sold for slaughter. Most of the animals from the West Tennessee Experiment Station herd that were disposed of for slaughter were sold primarily because of low production. The next main cause was selling animals for dairy purposes, followed by animals disposed of because of breeding failures.

TABLE 8

AGE AND REASON FOR DISPOSAL OF THE DAUGHTERS BORN IN THE W.T.E.S. THAT LIVED TO BE OVER 1 YR. OF AGE

Age In Years	No. Daus.	Reason	No. Daus.
1	6	Sold for Dairy Purposes	48
2	31	Udder Trouble°	4
3	28	Slaughter	67
4	19	Old Age	2
5	11	Non Breeder	9
6	7	Bloat	3
7	14	Hemorrhagic Septicemia	1
8	9	Broken Bones	4
9	9	Brucellosis	4
10	4	Killed By Lightening	1
11	3	Milk Fever	1
12	1	T. B. Reactor	3
13	4	Unknown	2
14	0	Total	149°°
15	1		
16	1		
17	1		
	149°°		

° Includes mastitis and garget
°° Two cows are still in herd

DISCUSSION

The registered purebred Jersey herd at the West Tennessee Experiment Station was started in 1928 with the purchase of five cows from Mr. Hendrix. Four of these cows were not registered until after they were purchased by the West Tennessee Experiment Station, which accounts for the U.T. being in their names. The number of parturition and lactation totals recorded were only for the records made at the West Tennessee Experiment Station. No records were available prior to the purchase of the cows.

Since no animals that were born after 1951 were included in this study, it was not possible to determine how long all of the cow families remained in the herd. All but three cow families had disappeared by the end of 1951. As of January 1, 1952, there were 47 descendants in the herd representing the three cow families. Neither of these three cow families had been selected as foundation cows. The cows that were selected to be the foundation cows did not prove to be satisfactory cows and their descendants had disappeared by 1946. The cows that had been selected only for additional milk production responded better to the treatment and management at the West Tennessee Experiment Station and were the main foundation cows for the herd.

The results of the bulls used in this herd substantiates the report by Fohrman (16) in that production proved sires represent the best way to build up a dairy herd. There was a total of eight bulls used in the herd that had daughter-dam comparisons by using only

normal records. Of these eight bulls three were proved and five were not proved before being used in the herd. By proved it is meant that some production information was available on the progeny. As pointed our previously the term proved sire was not used extensively until 1936. All three of the proved bulls increased production of their daughters over their dams. Three of the bulls that were selected on the basis of their pedigree increased production and two decreased production. Although the unproved bulls were sired by good sires and out of good dams, this did not mean that they would sire high producing daughters. F.E.V. was sired by an imported bull of a very popular blood line and out of Xenia's Miss Freda, a cow that produced 800 pounds of butterfat in a lactation and was awarded the medal of merit. The daughters of this bull, F.E.V., produced extremely low and all decreased production below the average of their dams. It is better to sample a young bull and see how his daughters will produce rather than breed all of the herd to him and hope his pedigree value is accurate.

In Table 6 the daughters of U.T.F.D.S. had a higher butterfat average when all records were considered than when only the normal records were used. The cause for this was that one daughter-dam pair did not have normal records to compare and were omitted. This daughter had an average of over five hundred pounds of butterfat per lactation.

A dairyman must be very careful when studying production records to be sure all records are based on a similar measure. Too many

people give all the weight to lactation totals, disregarding how long the lactation was and how long the cow was dry. Arnold and Becker (5) reported that more emphasis should be placed on the average daily milk yield from the time the cow was two years old until her last dry date. Cows that have extra long lactations do not produce as much during the latter part of their lactation as they would if it was the first of a new lactation. Cows with shorter calving intervals produce more calves to be raised for replacements or sold and also tend to have a higher daily average milk production for their lifetime than cows with long calving intervals.

Without good records few dairymen know what percentage of their animals were disposed of each year and for what reason. If the tenure of cows in the herd could be increased, the replacement rate would be lower and greater effort could be used to cull the present herd for production and to select the replacements from the better producing cows and cow families. During this 24 year period only a very few cows were disposed of because of brucellosis or tuberculosis.

One of the main expenses to the dairyman is the raising or purchasing of herd replacements. Few dairymen stop to consider what percentage of their calf crop they raise or sell. By keeping good records and studying these records, it may be possible to greatly reduce the calf losses in a specified herd. This would be especially true if most of the losses resulted from deficiencies in management or disease.

SUMMARY AND CONCLUSIONS

A study was made of the dairy records kept at the West Tennessee Experiment Station from 1928 to 1952. The herd was under the supervision of the same person during this 24 year period. This tended to keep management practices relatively uniform. Also enviromental factors were reduced by using this long period of time.

In 1928 the purebred Jersey herd was established at the West Tennessee Experiment Station by the purchase of five cows. During the remainder of 1928, 1930 and 1931, seven other cows were purchased. No previous production information was available on these twelve cows which served as the foundation herd. No outside female animals were brought into the herd from 1931 to 1952.

The average age of the foundation cows when purchased was 4.4 years. The twelve cows had a total of 54 calvings for an average of 4.5 calvings per cow at the West Tennessee Experiment Station. Six of the twelve cow families had disappeared by the end of the eighth year with five disappearing after the F_1 generation. These twelve cows stayed in the herd for an average of 5.3 years. The main cause for disposal of the foundation cows was mastitis.

From 1928 to 1952 there were daughters in the herd representing 20 different bulls. Five of these bulls were either bred to foundation cows when the cows were purchased or were used in artificial breeding and were never owned or borrowed by the West Tennessee Experiment Station. The fifteen bulls that were either owned or

borrowed by the station were used for an average of 2.1 years. Services to these 20 bulls resulted in a total of 369 parturitions, including four abortions. Of the 365 normal calf births, 173 were males and 192 were females.

Most of the male calves were disposed of at birth and all of the females except 11 were given the opportunity to stay in the herd. Of the 181 female calves that were given the opportunity to stay in the herd, 30 or 16.57 per cent died prior to one year of age. Only 114 of the 151 that lived to be over a year old ever calved. The average age at first calving for the 114 cows that did calve was 27 months. These 114 cows had a total of 445 parturitions with 330 completed lactations for an average of 2.9 completed lactations per cow.

Eight of the bulls used had daughter-dam comparisons available by using only normal lactation records. Three of these bulls were proved and five were not proved when used in the West Tennessee Experiment Station herd. All three of the proved bulls increased production whereas only three of the unproved bulls increased production of daughters over dams.

Most of the cows were two, three and four years of age at the time of disposal. Approximately 56% of the cows were four years of age or younger at the time of their disposal. The average age at the time of disposal for the 149 cows (two are still in the herd) was 5.1 years.

Most of these cows were sold for slaughter primarily because of low production. The next main cause for disposal was those that were sold for dairy purposes followed by breeding failures.

From this study, it may stated that a person starting a dairy herd in Tennessee can expect to lose about half of his foundation cow families in eight to ten years. The cows can be expected to stay in the herd until they are about five years of age. If he plans to increase his herd by raising replacements, he would definitely need to start a good calf raising program.

The best way to improve the herd is by using good proved sires. These sires give an indication of their transmitting ability by the performance of their daughters.

Breeding, feeding and management are interdependent factors in building a good dairy herd. Well bred cows without proper feeding and management will not produce to their maximum inherited ability.

REFERENCES

REFERENCES

(1) Anonymous. Age and Milking Frequency Conversion Factors. American Jersey Cattle Club. 1952.

(2) Anonymous. Report of the Dairy Husbandry Research Advisory Group on the D.H.I.A. and Sire Proving Work. Dairy Husbandry Research Branch, A.R.S., U.S.D.A. February 15 & 16, 1954.

(3) Arnold, P. T. Dix and Becker, R. B. Building a Dairy Herd. Fla. Agr. Expt. Sta. Bull., 576. 1956.

(4) Arnold, P. T. Dix and Becker, R. B. Dairy Calves-Their Development and Survival. Fla. Agr. Expt. Sta. Bull., 529. 1953.

(5) Arnold, P. T. Dix and Becker, R. B. "Don't Overlook the Distaff Side." Hoard's Dairyman, 104:296. 1959.

(6) Arnold, P. T. Dix, Becker, R. B. and Spurlock, A. H. Dairy Cattle and Their Care. Fla. Agr. Expt. Sta. Bull., 599. 1958.

(7) Beam, A. L., McLearen, C. S. and Borland, A. A. Increasing Production In Institutional Herds. J. Dairy Sci., 22:469. 1939.

(8) Becker, R. B. Permanent Records in the Station Herd. J. Dairy Sci., 18:499. 1935.

(9) Becker, R. B. and Arnold, P. T. Dix. Average Useful Life Span and Cause of Losses of Dairy Bulls. J. Dairy Sci., 23:548. 1940.

(10) Becker, R. B., Arnold, P. T. Dix and Spurlock, A. H. Productive Life Span of Dairy Cattle. Fla. Agr. Expt. Sta. Bull., 540. 1954.

(11) Berry, J. C. and Lush, J. L. High Records Contrasted With Unselected Records and With Average Records as a Basis for Selecting Cows. J. Dairy Sci., 22:607. 1939.

(12) Cannon, C. Y. and Hansen, E. N. Expectation of Life in Dairy Cows. J. Dairy Sci., 22:1025. 1939.

(13) Copeland, Lynn. A Study of Factors Concerning Herd Management and Herd Production. J. Dairy Sci., 22:229. 1939.

(14) Copeland, Lynn. The Use of Records in Evaluating the Inheritance of Cows and in the Proving of Bulls. J. Dairy Sci., 21:651. 1938.

(15) Davis, H. P. Calf Losses From Diseases. Nebraska Agr. Expt. Sta. Research Bull., 41. 1952.

(16) Fohrman, M. H. Reminiscences On Breeding Dairy Cattle. J. Dairy Sci., 41:1465. 1958.

(17) Gilmore, L. O. Dairy Cattle Breeding. J. B. Lippincott Co., Chicago, Ill. 1952.

(18) Hazelwood, B. P. All Year Pasturing With and Without Concentrates for Dairy Cattle. University of Tenn. Agr. Expt. Sta. Circular, 58. 1936.

(19) Hodgson, R. E. Keeping Production Records on Dairy Farms is the Key to Greater Efficiency and Profits. J. Dairy Sci., 40:200. 1957.

(20) Hoglund, C. R. Making the Most of Dairy Farm Records. J. Dairy Sci., 39:1332. 1956.

(21) Horwood, R. E. Effective Use of Herd Records. J. Dairy Sci., 29:476. 1946.

(22) Hutchison, D. A., Dunbar, R. S. Jr. and Henderson, H. O. Reproduction in the West Virginia University Dairy Herds. West Virginia Agr. Expt. Sta. Bull, 412T. 1958.

(23) Johnson, R. E., Jungherr, E. L. and Plastridge, W. N. Calf Losses in a Self Contained Herd Over a Period of Seventeen Years. J. Dairy Sci., 31:669. 1948.

(24) Lassiter, C. A. and Seath, D. M. Dairy Calf Losses in the Agricultural Experiment Station Herd. Kentucky Agr. Expt. Sta. Bull., 622. 1955.

(25) Lush, J. L. The Number of Daughters Necessary to Prove a Sire. J. Dairy Sci., 14:209. 1931.

(26) Lush, J. L. and Lacy, M. D. How Old Are Your Bulls and Cows and What Difference Does It Make. Iowa Agr. Expt. Sta. Bull., 290. 1932.

(27) Mead, S. W. A Diagrammatic Method of Presenting the History of Reproduction in a Dairy Herd. J. Dairy Sci., 21:283. 1938.

(28) Ormiston, E. E. Calf Losses in a Dairy Herd Consisting of Five Breeds, University of Illinois. J. Dairy Sci., 32:712. 1949.

(29) Plum, M. and Lush, J. L. Freshening Age of Purebred Cows in Iowa Testing Associations. J. Dairy Sci., 17:625. 1934.

(30) Putnam, D. N., Bowling, G. A. and Conklin, C. T. The Use of First Records Versus the Average of all Records in Dam-Daughter Comparisons When Proving Sires. J. Dairy Sci., 26:967. 1943.

(31) Ragesdale, A. C., Elting, E. C. and Brody, S. Growth and Development. Missouri Agr. Expt. Sta. Research Bull., 96. 1926.

(32) Rice, V. A., Andrews, F. N., Warwick, E. J. and Legates, J. E. Breeding and Improvement of Farm Animals. 5th Ed. McGraw-Hill Book Co., Inc. 1957.

(33) Voelker, H. H. Use of Extended Incomplete Lactation Records. J. Dairy Sci., 40:631. 1957.

(34) Weaver, E., Horwood, R. E. and Smiley, E. S. Losses of Calves in Dairy Herds. The Quarterly Bulletin-Michigan State College, 32:42. 1949.

(35) Wing, H. H. The Cornell Dairy Herd 1889 to 1928. Cornell Bull., 576. 1933.

(36) Wing, J. M. and Wilcox, C. J. Inbreeding-Friend or Foe. Hoard's Dairyman, 104:1000. 1959.