May 21, 1960

To the Graduate Council:

I am submitting herewith a thesis written by David Winslow Culver entitled "The Dairy Cattle Replacement Markets of Tennessee and Florida." 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 Agricultural Economics.

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THE DAIRY CATTLE REPLACEMENT MARKETS OF TENNESSEE AND FLORIDA

A Thesis

Presented to

the Graduate Council of

The University of Tennessee

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

---

by

David Winslow Culver

June 1960

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CHAPTER I

INTRODUCTION

Traditionally, dairy farmers have raised most of the animals needed for herd replacements. However, the dairy industry is undergoing many changes. Milk production is being increasingly concentrated on commercial dairy farms. As milk production becomes more specialized, it is likely that many more dairy farmers will consider the possibility of buying dairy herd replacements rather than raising their own. This will be most likely to occur in Grade A production areas.

Several specific factors have appeared which may influence this type of change. One of these factors is increasing knowledge of the economies of specialization. Where dairying was once typically a small operation in a general farming program, it is now generally the principal enterprise and often the only enterprise on farms where milk is produced. Specialized dairy production operations or "milk factories" are a relatively recent development where an extremely high proportion of the factor inputs, including replacements, are purchased. This development may denote a real trend, although it has not yet become a major influence in most parts of the country. A second factor leading toward purchase of replacements is the rapid rise in capital investment caused by advancing technology. A third factor, which is closely related to the second, is the rapid rise in land prices near urban centers where dairy farms have traditionally been located. A fourth factor has probably been the changing labor situation. Although little factual evidence is available, dairy farmers who have departed from traditional dependence on the farm

family as the primary labor source have apparently had poorer than usual success in raising calves. The reason usually given for this is that calf raising requires considerable attention to detail, and apparently the hired laborer is not as likely as is the family worker to provide this attention.

Purchase of a large proportion of all replacements has already become an established practice for some dairy farmers in Tennessee and other southern states, particularly Florida. While most of the dairy cattle needed for replacements in Tennessee are produced locally, many of those needed in Florida are imported from other states. A large part of the dairy cattle going to Florida in recent years came from Tennessee. In 1958, Florida dairy cattle imports from Tennessee amounted to 6,629 head,[1] which was over one-sixth of the total and was a larger number than from any other state. Thus, the Florida dairy cattle market is becoming an important source of agricultural income in Tennessee. The sale of dairy cattle to commercial dairy farmers within the state has probably been an important source of income to many Tennessee farmers for several years, but little information is available about the proportions of replacements which commercial dairy farmers raise or buy, and no detailed information about characteristics of purchased replacements such as age, breed, price or source is available.

A. THE PROBLEM

The chronic, low farm incomes in Tennessee are an important problem

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[1]Florida Livestock Board, "Imports of Dairy Cattle" (mimeographed).

deserving continued emphasis in economic research. One direct approach to this problem is to seek ways in which markets can be expanded for products presently being produced on Tennessee farms. Dairy cattle, specifically dairy heifers, would be such a product. The primary market for dairy heifers would presumably be as replacements for commercial dairy herds. Dairy replacement markets in Tennessee and Florida may provide the opportunity for a major expansion of dairy cattle production in Tennessee. Information is needed relative to the present and potential markets for dairy replacements in these two states.

As an approach to this problem, four general hypotheses were stated as follows:

Hypothesis I: that sizable markets for replacement heifers presently exist among the Grade A dairy farmers in the two areas.

Hypothesis II: that there is a large potential market for replacement heifers among the Grade A dairy farmers in the two areas.

Hypothesis III: that as dairy farms become larger and more specialized they tend to buy a larger proportion of their replacements.

Hypothesis IV: that the sale of Tennessee replacement heifers to the Florida replacement market can be expanded by auction sales or other organized sales procedures.

This study is an attempt to evaluate these basic hypotheses and to provide additional information about these markets. The specific objectives of

this study are to answer the following questions about the Grade A milk production areas in Tennessee and Florida:

1. What is the present total market for all dairy replacements?
2. What are the breeds and ages of these replacements?
3. What are the present sources of replacements by breed and age?
4. What are the market trends with respect to total numbers, breed and age of replacements?
5. Are present marketing organizations and practices satisfactory for present and future needs?

Any information, which is accumulated, analyzed and interpreted, that aids in answering these questions will further the objectives of this study.

B. DELIMITATIONS

The study is concerned with information about the dairy cattle replacement market in two major areas, Tennessee and Florida. The Tennessee part of the study includes the production areas of the five milk markets in the state which are regulated by a Federal Milk Marketing Order. The production areas are referred to subsequently as milksheds and include all farmers selling milk in the five milk markets. The orders are located in the Knoxville, Nashville, Chattanooga, Appalachian (at Bristol), and Memphis milk markets and include about 90 per cent of the Grade A milk production in the state. All of the milksheds, except the Knoxville milkshed, include some milk production in states adjacent to Tennessee. These bordering states are Virginia, Kentucky, Mississippi, Alabama, and Georgia.

Florida data are based on dairy farms listed by the Florida Milk

Commission as being Grade A dairy farms located in the state of Florida. Farms producing cream or milk for purposes other than Grade A use were not included in data for either state. The study is concerned only with the size, characteristics, and trends of the market for dairy cows and heifers as replacements. No consideration was given to bulls, calves, or culled dairy cows sold for slaughter except as they affected herd replacements.

C. IMPORTANCE OF THE STUDY

Dairy farming has been an important agricultural enterprise in Tennessee for many years. In 1958, total cash receipts to Tennessee farmers from the sale of milk was $71,104,000. The comparable figure for Florida was $69,901,000 which indicates that dairy farming is also an important industry for that state.[2] United States Department of Agriculture figures show 628,000 and 234,000 cows and heifers over two years old were kept for milk as of January, 1959, in Tennessee and Florida, respectively.[3] The much smaller number of cows in Florida produced almost as much in total cash receipts as the larger number in Tennessee for two reasons: (1) milk prices were generally higher in Florida, and (2) nearly all Florida cows were in Grade A production while those in Tennessee were in Grade A, ungraded, and non-sale family production. The same source shows that, out of the cows and heifers kept for milk, 153,000

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[2]U. S. Department of Agriculture, Dairy Statistics, Supplement for 1958, Statistical Bulletin No. 218 (Washington: Government Printing Office, 1959), p. 104.

[3]Ibid., p. 19.

in Tennessee and 64,000 in Florida were eliminated in 1958 by culling, death, or farm slaughter.[4] By accepting these figures as a first approximation of the market for replacements and using a price estimate of $200 per head, the resulting estimate of the annual value of the replacement market would be over 30 million dollars for Tennessee and over 12 million dollars for Florida. At present, it is probable that a high percentage of the market in Tennessee is supplied by the dairy farmers themselves, but for various reasons Florida dairy farmers do not normally raise the major part of their replacements. While current replacement production practices are being reconsidered, it is important that information be available to aid dairymen in their decision making.

D. DEFINITION OF TERMS

Terms used in this study have the usual interpretation found in published agricultural material, except those discussed in this section. Where two or more terms are closely related, they are discussed together.

Federal Order. "A federal order is a form of milk marketing regulation issued by the Secretary of Agriculture under the terms of the Agricultural Marketing Agreement Act of 1937."[5] One of the functions of a federal order is to set minimum prices paid to dairy farmers for their milk.

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[4] Ibid.

[5] Max K. Hinds and William F. Johnstone, Dairy Economics Handbook, U. S. Department of Agriculture, Federal Extension Service Agriculture Handbook No. 138 (Washington: Government Printing Office, 1958), p. 43.

Florida Milk Commission. The Florida Milk Commission is a state agency with regulatory powers over various aspects of the dairy industry. Part of the dairy industry in Florida (the Miami market) is also regulated by a federal order.

Milk market and milkshed. A milk market as defined by the United States Department of Agriculture consists of two parts, a production area and a consuming area. The production area is known as a milkshed and includes the area where the producers are located who supply the milk used in the milk market. A consuming area is known as a marketing area and pertains to the area where milk is sold by distributors in the milk market.[6]

Dairy farm, dairy farmer, and dairying. These terms refer to the production of Grade A milk within one of the milksheds or production areas included in the study. This specific use of the terms does not include the production of manufacturing milk which is used for dairy products such as butter, cheese and evaporated milk.

Grade A milk. Grade A milk is the milk normally used as fluid milk. It is milk which is qualified by city or state health regulations for use as fresh whole milk and related products such as skim milk, buttermilk, and flavored milk. It is synonymous with the term market milk, but was chosen for use in this study since it is a more commonly used term.

Replacements and dairy cattle replacements. These terms are used

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[6]Ibid.

synonymously to mean cows or bred heifers which are or will be placed in the herd of a dairy farmer to produce Grade A milk. Unless otherwise indicated, cows or heifers added to increase the size of herd are included as well as those used to replace cows being taken out of the herd.

Commercial Herd. In this study, commercial herd will mean a dairy herd producing Grade A milk. It is a herd kept for the purpose of producing products for the customer market, in contrast to a breeding herd which is kept to produce animals for sale as replacements for commercial herds.

E. REVIEW OF RELATED STUDIES

A study was made in 1942 by the Maryland Agricultural Experiment Station to determine the number of replacements needed and whether it was more desirable for the dairy farmer to raise or purchase them.[7] Data for the decade 1932 to 1941 were obtained by a personal interview survey of 200 farmers in the four leading dairy counties of the state. The investigators found that 88 per cent of the farmers preferred to raise their own replacements and that the cost of raising heifers from birth to calving varied from $74 to $100 during this period.

A study published in 1956 by the New Hampshire Agricultural Experiment Station was directed toward developing information upon which to base

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[7]Arthur M. Ahalt and A. B. Hamilton, Cost and Advisability of Raising Dairy Heifers, Maryland Agricultural Experiment Station, Bulletin No. A17, 1942.

the decision of whether to buy or raise dairy herd replacements.[8] This report showed that on typical New England dairy farms net farm income could be increased considerably by shifting to the purchase of replacements rather than raising them.

A study was made by Greene, Warrington, and Brooke of the costs and returns in 1958 for 34 Grade A dairy farms in Central Florida.[9] These investigators found the average herd size for dairy farms in that area to be 157 cows per farm with a replacement rate of 24 per cent per year. They also found that the average price paid for all purchased replacements was $252 per head.

A study of the costs of producing and marketing fluid milk on 100 dairy farms in the Memphis milkshed was reported in 1950 by the Tennessee Agricultural Experiment Station.[10] The report showed an average cost of $173 per head for all purchased replacements and an average herd life of 3.9 years per cow. The report also showed that about 60 per cent of all replacements were purchased cows.

Another study including 135 dairy farmers published in 1950 by the Tennessee Agricultural Experiment Station showed the costs of producing

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[8] G. E. Frick and W. F. Henry, Adjustments in Obtaining Dairy Herd Replacements, University of New Hampshire Experiment Station, Bulletin 430, August, 1956.

[9] R. E. L. Greene, John Warrington, and D. L. Brooke, Summary of Costs and Returns for Wholesale Dairy Farms, Central Florida, 1958, Florida Agricultural Experiment Station, Report 60-2 (mimeographed), October, 1959.

[10] M. L. Downen, Seasonal Costs of Producing and Marketing Fluid Milk in the Memphis, Tennessee, Milkshed, 1948-49, Tennessee Agricultural Experiment Station, Rural Research Series, Monograph No. 252, 1950.

and marketing fluid milk in the Knoxville milkshed.[11] This study showed the cost of purchased replacements to be $165 per head for heifers and $178 per head for cows. This report also showed an average herd life per cow of 3.6 years.

A study published in 1951 by the Tennessee Agricultural Experiment Station reported the costs of producing and marketing fluid milk in the Chattanooga milkshed.[12] This report showed 30 per cent of all replacements as cows and 70 per cent as raised and purchased heifers, with an average herd life of 3.4 years per cow.

F. PROCEDURE FOR THE STUDY

In order to provide useful information for analysis of the problem, data relating to numbers of dairy cattle replacements were obtained by a survey of dairy farmers in the major milksheds in Tennessee and throughout Florida. Information obtained in the survey was for the calendar year of 1958, and the data were collected in the summer of 1959.

Survey procedure for Tennessee. Data were obtained from 443 dairy farmers selected by random sampling procedures. The production areas sampled were the five major milksheds in Tennessee, and the samples were

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[11] M. B. Badenhop, Seasonal Costs of Producing and Marketing Fluid Milk in the Knoxville, Tennessee, Milkshed, August 1948-July 1949, Tennessee Agricultural Experiment Station, Rural Research Series, Monograph No. 260, 1950.

[12] M. L. Downen, Seasonal Costs of Producing and Marketing Fluid Milk in the Milkshed of Chattanooga, Tennessee, 1949-50, Tennessee Agricultural Experiment Station, Rural Research Series, Monograph No. 263, 1951.

drawn from lists of producers provided by the Milk Market Administrators in all except the Memphis milkshed. The sample for the Memphis milkshed was drawn from a list prepared by the Memphis Department of Health and Sanitation. There were 4,713 dairy farmers in the five milksheds in June, 1959. The sample for each milkshed was 9 or 10 per cent of the total number of dairy farms in the milkshed. Questionnaires were mailed to the selected dairy farmers in the five milksheds. By using two follow-up requests, total response with the mailed questionnaires reached approximately 70 per cent. The information was obtained from non-respondents by personal interview.

Survey procedure for Florida. Collection of data from farmers in Florida was done by the same general procedure except that the list of all Grade A dairy farmers was obtained from the Florida Milk Commission. Out of a total of approximately 835 commercial dairy farmers in Florida, a sample of 170, or approximately 20 per cent of all farms was included in the survey.

G. DAIRY FARMING IN TENNESSEE

The dairy farms of all major market areas of Tennessee are typified by the family farm in which dairying is the major enterprise. In the eastern and central parts of the state, dairying is combined on many farms with tobacco and, to a lesser extent, with poultry or other livestock enterprises. In the western part of the state, the most frequent enterprise combinations include cotton, other field crops, or livestock enterprises. Jersey cattle have been the predominant dairy breed in the state

for many years, although the number of Holstein cattle has increased rapidly in recent years, particularly in the eastern part of the state. Guernseys have been used widely for many years and Ayrshires and Brown Swiss are found to a lesser extent. The majority of dairy farmers have traditionally raised most or all of their replacements, although a considerable number of Holsteins have been imported from northern states and Canada in recent years. Jersey cattle have commonly been exported to other states for use in both commercial and breeding herds. Tennessee has a good climate for raising dairy cattle and is well located geographically to supply needs for dairy cattle replacements in Florida as well as Tennessee, but additional information is needed about both area markets to aid in rational planning.

H. DAIRY FARMING IN FLORIDA

There are wide variations in size and type of the dairy farms in Florida. In the western part of the state, family farms, rather similar to those in Tennessee, are more typical, although the herds are often larger than are usually found in Tennessee. In northern and most of central Florida, there is extremely wide variation in size and characteristics of dairy farms. Dairy farming in the Miami area and surrounding areas is typified by the large corporate farm. Many of the dairy farms in the state are specialized operations producing only fluid milk for sale, with the addition of the sale of cattle and calves incidental to herd maintenance. Jersey, Guernsey and Holstein cattle are widely used; Brown Swiss and Ayrshire cattle are found less frequently. The hot, humid climate causes a rather high calf mortality rate because of insects, animal

parasites, and diseases. Florida has been importing large numbers of dairy cattle in recent years because: (1) dairy production has been increasing rapidly in the state and (2) only a small proportion of the dairy calves are kept for replacements.

I. ORGANIZATION OF THE STUDY

Chapter II presents information on the dairy replacements utilized in the five Tennessee milksheds. The survey data are presented relative to the number, breed, and age of replacements. The replacement rate is determined and an estimate of the total replacements per milkshed is made.

Chapter III presents similar information shown by the survey results in Florida. The number of replacements and the replacement rate are considered for the following four groups: (1) small, (2) medium, (3) large, and (4) very large.

Chapter IV presents information relative to the sources of replacements for both areas. The study material is presented in four sections as follows: (1) sources of purchased cows and heifers, (2) the disposition of heifer calves, (3) prices paid for purchased heifers, and (4) data on the annual heifer sales of the artificial breeders associations in Tennessee.

Chapter V includes some financial implications of the dairy replacement markets to Tennessee farmers. The importance of these markets is considered both on the basis of the present market and also in the light of possible future adjustments.

A summary of the study and the writer's conclusions make up Chapter VI.

CHAPTER II

DAIRY REPLACEMENTS IN TENNESSEE

In this chapter an examination is made of the sample data relating to the size of dairy herds and number and type of replacements in the five major Tennessee milksheds. The primary intent of this chapter is to interpret the sample data in order to estimate the total number of replacements used and to determine the characteristics of these replacements.

Of the 4,713 dairy farmers in the five Tennessee milksheds at the time the study was made, 443 were included in the sample. The sample for each milkshed was checked for representativeness by comparing the average pounds of base delivery milk of farms in the sample with the average of all farms in the milkshed. The sample in each milkshed was within 2 per cent of the average for the milkshed. The number of farms included in the sample and the percentage of all farms are shown in Table I.

A. NUMBER OF COWS ON DAIRY FARMS

In the study of five Tennessee milksheds, information was obtained on the number of cows per farm for all of the 443 farms included in the sample. The data obtained for these farms show the number of cows on January 1, 1958, and January 1, 1959. The average of these was taken as the 1958 average per farm. The number of cows per farm for each of the five milksheds is shown in Table II.

The average for all five milksheds was 33 cows per farm in 1958. The Memphis milkshed had the largest herds with an average of 36 cows

TABLE I

SAMPLE NUMBER AND PER CENT, GRADE A DAIRY FARMS,
FIVE TENNESSEE MILKSHEDS, 1958

Milkshed	Total Farms	Sample	Sample
	Number	Number	Per Cent
Knoxville	944	87	9.2
Nashville	1,387	125	9.0
Chattanooga	742	72	9.7
Appalachian	680	67	9.9
Memphis	960	92	9.6
Five Milksheds	4,713	443	9.4

TABLE II

NUMBER OF COWS PER FARM, 443 GRADE A DAIRY FARMS,
FIVE TENNESSEE MILKSHEDS, 1958

Milkshed	Cows Per Farm		
	January 1, 1958	January 1, 1959	1958 Average
	Number	Number	Number
Knoxville	28.6	29.5	29.0
Nashville	33.6	34.1	33.9
Chattanooga	33.5	35.8	34.7
Appalachian	31.0	32.9	32.0
Memphis	35.5	37.0	36.3
Five Milksheds	32.6	33.9	33.2

while the lowest average, the Knoxville milkshed, had an average herd size of 29 cows. The Chattanooga milkshed reported 35 cows per farm and the Nashville and Appalachian milksheds reported 34 and 32 cows per farm, respectively.

There are no studies showing size of herd which are available for comparison. In order to relate the dairy farms in this study to available data for dairy farming industry in Tennessee, the size of herd for sampled farms in this study is compared with the size of herd for all dairy farms[1] (Census of Agriculture definition) in the state and for farms in the Tennessee Dairy Herd Improvement Association.[2] The size of herd for each group is as follows:

	Cows Per Herd
All Dairy Farms (Census of Agriculture definition), 1954	14.9
443 Farms in Five Milksheds, 1958	33.2
283 Farms, Tennessee Dairy Herd Improvement Association, 1958-59	39.2

The average number of cows per herd for all dairy farms in Tennessee in 1954 was considerably lower than for the farms included in this study or for farms in the Dairy Herd Improvement Association. A large part of the dairy farms reported by the 1954 Census were not Grade A dairy farms and would not be expected to be as large as the Grade A dairy farms. The

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[1]Southern Cooperative Series Bulletin No. 46, The Position of Dairying in the South, Tennessee Agricultural Experiment Station, Knoxville, 1956.

[2]Tennessee Agricultural Extension Service, Dairy Extension Office, "State Dairy Herd Improvement Association Summary 1958-59" (mimeographed).

farms in the Dairy Herd Improvement Association were clearly larger than the average of the five milksheds, but they would be expected to be somewhat larger considering the additional investment represented by the Dairy Herd Improvement Association service.

With the average number of cows per farm established, the total number of cows in each milkshed can be estimated from the number of farms per milkshed. The average number of farms per milkshed for 1958, taken as the average of the number January 1, 1958, and the number January 1, 1959, is shown in Table III. The Nashville milkshed included the largest number of farms with 1,455 and the Memphis milkshed had the next largest number, 1,057 farms. The other milksheds--Knoxville, Chattanooga, and Appalachian--had 992, 783, and 711, respectively.

Estimates of the total number of cows for each milkshed were made by multiplying the number of cows per farm by the number of farms according to the data in Table II, page 16, and Table III. The estimates made by this method are shown in Table IV. The total number of cows per milkshed varied from 22,752 in the Appalachian milkshed to 49,325 in the Nashville milkshed. The total for the five Tennessee milksheds was 166,384 cows.

B. REPLACEMENT RATE AND TOTAL NUMBER OF REPLACEMENTS

Detailed information on the number and types of replacements used was obtained from 351 dairy farmers in the five milksheds. Since this group did not include a number of the farms in the total sample, the representatives of the smaller sample was also checked. This check was made, as for the total sample, by comparisons of the average base delivery

TABLE III

NUMBER OF GRADE A DAIRY FARMS, FIVE TENNESSEE MILKSHEDS, 1958

Milkshed	January, 1958	January, 1959	1958 Average
Knoxville	1,020	963	992
Nashville	1,486	1,423	1,455
Chattanooga	804	761	783
Appalachian	666	755	711
Memphis	1,084	1,030	1,057
Five Milksheds	5,060	4,932	4,996

TABLE IV

ESTIMATED TOTAL NUMBER OF COWS ON GRADE A DAIRY FARMS,
FIVE TENNESSEE MILKSHEDS, 1958

Milkshed	Cows on Farms		
	All Farms	Cows Per Farm	Total Cows
	Number	Number	Number
Knoxville	992	29.0	28,768
Nashville	1,455	33.9	49,325
Chattanooga	783	34.7	27,170
Appalachian	711	32.0	22,752
Memphis	1,057	36.3	38,369
Five Milksheds	4,996	33.3	166,384

milk per farm for the sample with the average for all farms in each milkshed. The average base production size for the sample was within three per cent of the average for all farms in each milkshed. The number and per cent of farms providing information on replacements were as follows:

	Number	Per Cent
Knoxville	74	7.8
Nashville	103	7.4
Chattanooga	52	7.0
Appalachian	53	7.8
Memphis	69	7.2
Five Milksheds	351	7.4

Replacement rate. The replacement rate was calculated as the percentage of cows in the herd which were replaced during the year by using the number of cows eliminated and the average number in the herd during the year. The number eliminated is used, rather than the number added, because it more correctly represents the turnover of cows in the herd. Using the number eliminated correctly estimates the total replacement volume where the total number of cows does not change. It underestimates total replacements where the total number of cows increases and overestimates replacements with a decreasing total number of cows. Comparison of the number of cows added, as shown by Table V, with the number eliminated indicates that herds are getting larger. This, however, does not mean that the total number of cows is increasing. Reference to Table III, page 19, shows that the number of farms declined during 1958 in four out of the five milksheds.

TABLE V

DAIRY HERD REPLACEMENT RATE, 351 GRADE A DAIRY FARMS,
FIVE TENNESSEE MILKSHEDS, 1958

Milkshed	Herd Size	Cows Eliminated	Cows Added	Replacement Rate	Herd Life Per Cow
	Number	Number	Number	Per Cent	Years
Knoxville	29.9	5.6	7.3	18.8	5.3
Nashville	33.0	6.3	8.2	19.0	5.3
Chattanooga	35.9	6.1	8.9	17.1	5.8
Appalachian	33.0	6.1	8.4	18.5	5.4
Memphis	40.0	10.8	12.5	27.1	3.7
Five Milksheds	34.2	7.0	9.0	20.4	4.9

The replacement rates for all milksheds, except the Memphis milkshed, were within a narrow range of 17 per cent for Chattanooga to 19 per cent for Nashville. The replacement rate for Memphis was 27 per cent. This gives an average replacement rate for the five milksheds of slightly more than 20 per cent. The average herd life per cow was determined from the replacement rate. Since the replacement rate is the per cent of all cows in the herd which are replaced in one year, the average herd life per cow was determined as the number of years in which all replacements used equals the number of cows in the herd. The replacement rate for the five milksheds, just over 20 per cent, gives an average herd life per cow of 4.9 years.

Total number of replacements. The total number of replacements was estimated by multiplying the total number of cows times the replacement rate for each milkshed. The estimate of total replacements utilized by all dairy farms in the five milksheds was 34,033. The total number of replacements per milkshed varied considerably due to differences in the replacement rate and the total number of cows. The Memphis milkshed, with 10,398, used the largest number of replacements, due in part to a high replacement rate. The Nashville milkshed, with more total cows, used 9,115 replacements. The other three milksheds, having a smaller number of cows, used considerably fewer replacements with 5,408 for the Knoxville milkshed, 4,646 for the Chattanooga milkshed, and 4,209 for the Appalachian milkshed. The estimated number of total replacements is shown in Table VI by milkshed.

TABLE VI

ESTIMATED TOTAL DAIRY CATTLE REPLACEMENTS ON GRADE A DAIRY FARMS, FIVE TENNESSEE MILKSHEDS, 1958

Milkshed	Total Cows	Replacement Rate	Total Replacement
	Number	Per Cent	Number
Knoxville	28,768	18.8	5,408
Nashville	49,325	19.0	9,372
Chattanooga	27,170	17.1	4,646
Appalachian	22,752	18.5	4,209
Memphis	38,369	27.1	10,398
Five Milksheds	166,382	20.4	34,033

C. CHARACTERISTICS OF REPLACEMENTS

Replacements in the Tennessee milksheds were classified in four ways: (1) by breed, (2) whether purchased or raised, (3) by age, and (4) sources of purchased replacements. The first three of these classifications are examined in this chapter. Discussion of the fourth classification, sources of purchased replacements, is included in Chapter IV.

Classification by age and whether raised or purchased. Replacements were grouped under three major headings in the study: (1) heifers raised, (2) heifers purchased, and (3) cows purchased. Table VII shows that for the five milksheds 60 per cent of the animals added were heifers that were raised by the dairy farmers and added to their own herds. The average per cent raised by milkshed ranged from 48 per cent in the Memphis milkshed to 73 per cent in the Chattanooga milkshed. The Memphis milkshed was the only one of the five Tennessee milksheds where less than one-half of all replacements were raised rather than purchased.

TABLE VII

HEIFERS RAISED, HEIFERS PURCHASED, AND COWS PURCHASED AS A PERCENTAGE OF TOTAL REPLACEMENTS, 351 GRADE A DAIRY FARMS, FIVE TENNESSEE MILKSHEDS, 1958

Description	Knox-ville	Nash-ville	Chatta-nooga	Appa-lachian	Mem-phis	Five Milksheds
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Heifers raised	65.3	65.1	72.7	54.5	47.7	60.0
Heifers purchased	12.1	10.9	12.1	26.6	13.2	14.1
Cows purchased	22.6	24.0	15.2	18.9	39.1	25.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

Nearly two-thirds of all purchased replacements in the five milksheds were cows. Purchased cows accounted for 26 per cent of all replacements, while purchased heifers accounted for only 14 per cent in the five milksheds. More cows than heifers were purchased in all milksheds except the Appalachian milkshed, where 27 per cent of the replacements were purchased heifers and 20 per cent were purchased cows. The large proportion of cows relative to heifers purchased as replacements can be explained in part by reference to Table III, page 19, which indicates a definite decline in the number of dairy farms. As some dairy farmers quit, many of the cows in their herds move into the replacement market. Heifers raised and heifers purchased combined accounted for 74 per cent of all replacements for the five milksheds.

Breed of animals added. Animals added to sampled herds were also classified on the basis of breed. No differentiation was made between registered and grade animals. All the animals were listed as one of the six following breed categories: (1) Ayrshire, (2) Brown Swiss, (3) Guernsey, (4) Holstein, (5) Jersey, and (6) mixed and other.

Table VIII shows that more than twice as many Holsteins were added to herds as any other breed. Holstein cattle accounted for about 46 per cent and Jersey cattle about 20 per cent of all replacements for sampled herds in Tennessee milksheds. Guernsey cattle accounted for about 13 per cent and cattle of mixed breeding accounted for about 20 per cent of all cattle added during the year. Table VIII also shows that Holsteins made up 72 per cent of all purchased heifers but only 43 per cent of heifers raised by dairy farmers and added to their own herds and 37 per cent of

TABLE VIII

BREED OF REPLACEMENTS, 351 GRADE A DAIRY FARMS, FIVE TENNESSEE MILKSHEDS, 1958

Breed	Heifers Raised	Heifers Purchased	Cows Purchased	All Replacements
	Per Cent	Per Cent	Per Cent	Per Cent
Ayrshire	0.7	0.7	0.4	0.6
Brown Swiss	1.4	1.1	0.9	1.2
Guernsey	15.1	11.7	8.0	12.8
Holstein	43.1	71.6	36.9	45.5
Jersey	24.3	6.3	18.4	20.2
Mixed and other	15.4	8.5	35.5	19.7
Total	100.0	100.0	100.0	100.0

all cows purchased and added to herds during the year. This would indicate that the number of Holstein cattle was increasing relative to other breeds. The percentages for Jersey cattle were 24 per cent for heifers raised and added to herds, 6 per cent for purchased heifers, and 18 per cent for purchased cows. This indicates that the market for Jersey heifers in the five Tennessee Milksheds was very weak in 1958 when compared to the market for Holstein heifers.

CHAPTER III

DAIRY REPLACEMENTS IN FLORIDA

In this chapter information is presented relative to size of herds, replacement rate, and characteristics of sampled dairy herds in Florida. The sampled farms were selected from a list of all Florida Grade A dairy farms provided by the Florida Milk Commission. All dairy farms owned by governmental or institutional organizations were eliminated leaving a total of 835 commercial dairy farms in the state. Questionnaires were mailed to all commercial dairy farmers. The total number returned was approximately the 20 per cent needed, but many of those returned were not completed with the information requested. The personal interview method was used to obtain the information needed to complete the questionnaires for 40 farms which were selected by stratified random sampling using the size of herd stratification of farms shown in Table IX. Questionnaires were mailed a second time to all non-respondents. These procedures provided the desired information for 170 farms.

Information was also secured from the Florida Milk Commission showing the number of cows per herd for all Grade A Florida dairy farms. The dairy farms were divided into nine categories according to number of cows per herd, and the sample was tested for representativeness by use of the chi-square single classification test. If the number of farms falling into each category in the sample had been in the exact ratio which was expected, the calculated value for chi-square would have equaled zero. Thus, the calculated value for chi-square and confidence in the representativeness of the sample are inversely related. In testing the

TABLE IX

SAMPLE PERCENTAGE AND WEIGHT BY SIZE OF HERD, COMMERCIAL GRADE A DAIRY FARMS, FLORIDA, 1958

Cows Per Herd	All Farms	Sample Number	Sample Per Cent	Weight
Small				
0- 49	170	34	20.00	5.00
50- 99	216	41	18.98	5.27
100-149	122	30	24.59	4.07
150-199	85	15	17.64	5.67
Total	593	120	20.24	-
Medium				
200-249	51	12	23.52	4.25
250-299	33	6	18.18	5.50
300-399	46	7	15.21	6.57
Total	130	25	19.23	-
Large				
400-499	38	8	21.05	4.75
500-999	60	11	18.33	5.45
Total	98	19	19.39	-
Very Large				
1,000-3,999	a	a	a	a
4,000 and more	a	a	a	a
Total	14	6	42.86	-
All Farms	835	170	20.35	-

[a]Data are not shown because of the small number of farms included.

sample of Florida dairy farms, the calculated value of chi-square was 2.772 with a 95 per cent limit of 15.51 which gives an expectation that the sample is highly representative. The calculations used in determining the value of chi-square are shown in Table XXI, page .

A. SIZE OF HERD AND NUMBER OF REPLACEMENTS

Although the sample was considered to be quite representative of all Grade A dairy farms in Florida, there is some variation in the sample percentage among the various size groups. Since the variation in sample per cent is greatest among the larger farms, there would be a noticeable effect on calculated averages or projected totals for all dairy farms. In order to refine these estimates, data were weighted according to sample per cent for various size groups as shown in Table IX. All averages which represent the arithmetic mean and relate to herd size or number of animals added or eliminated per herd were weighted as indicated. This weighting assumes that all dairy herds in a particular size group have the same characteristics on a group basis as the sampled herds. Under this assumption, application of the assigned weights gives the market totals for each group.

Size of herd. There was extreme variation in size of herd among sampled farms. The range of herd size included two with less than 20 cows per herd and 6 in the category of 1,000 or more. In order to give a more complete picture of average or central tendency values, three forms of measurement were utilized. Size of herd is shown as the mean, median, and mode for January 1, 1959, for all sampled herds as follows:

	Number of Cows Per Herd
Weighted Mean	205.4
Median	123
Mode	50-99

The relationships of these different measures of central tendency indicate a skewed distribution rather than a normal distribution. The distribution of sampled dairy farms is shown for various size groups in Figure 1.

The weighted average was calculated for four general size groups by summarizing data from the eleven groups used in weighting the sample. The average size of herd in 1958 for the four groups is shown in Table X. In the four size groups, as arbitrarily chosen, the weighted average size varied from 84 cows per farm for farms with less than 200 cows to a weighted average of 1,962 cows per farm for farms with 1,000 or more cows. The weighted average size of herd for all farms was 194 cows per farm.

TABLE X

AVERAGE NUMBER OF COWS, NUMBER ELIMINATED, AND REPLACEMENT RATE, 170 GRADE A DAIRY FARMS, FLORIDA, 1958

Size of Herd	Cows in Herd	Eliminated	Replacement Rate	Time in Herd Per Cow
	Number	Number	Per Cent	Years
Small	84	20	24.0	4.2
Medium	265	61	23.0	4.3
Large	553	176	31.7	3.1
Very Large	1,962	546	27.8	3.6
All Farms	194	54	27.6	3.6

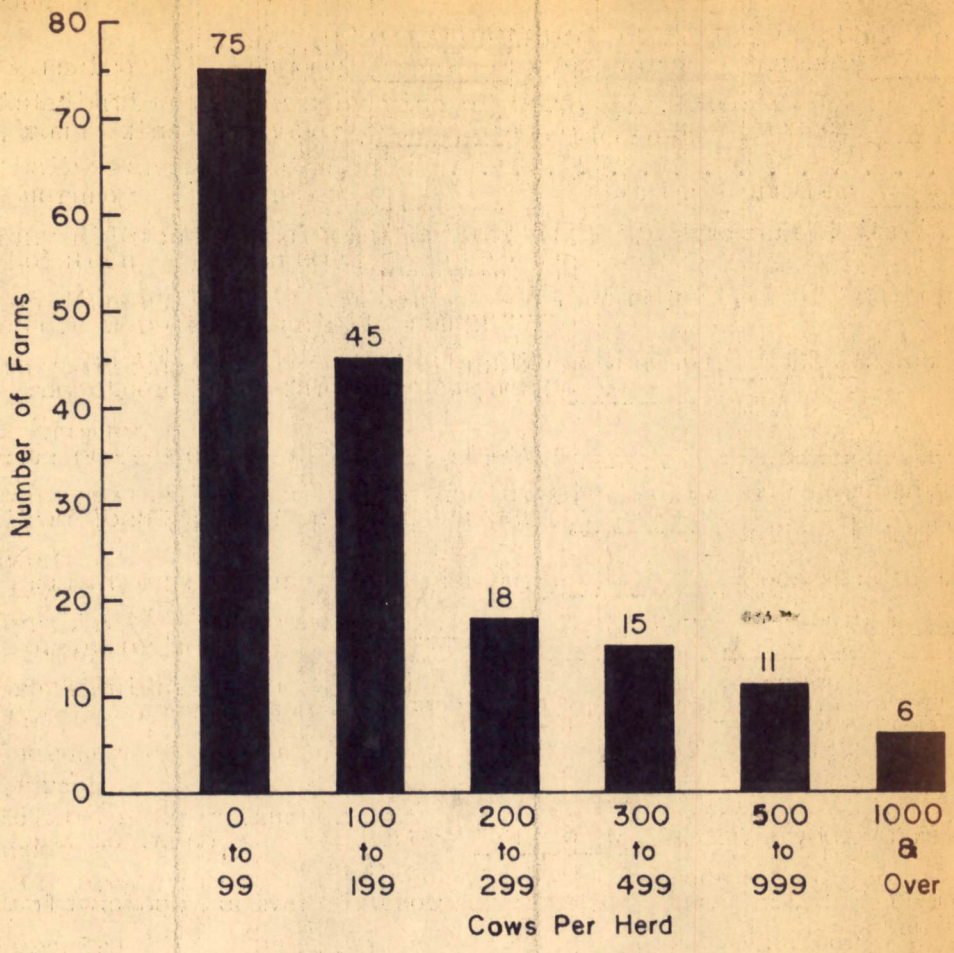


Figure 1. Distribution of farms by size of herd, 170 Grade A dairy farms, Florida, 1958.

Data reported by Greene, Warrington, and Brooke show the average size of herd to be 157 cows per herd for Central Florida and 231 cows per herd for Northeast Florida.[1]

Replacement rate. Information on replacements was obtained from all of the 170 farms included in this study. The replacement rate and corresponding herd life per cow are shown in Table X, page 32. The replacement rates for small and medium size groups were 24 and 23 per cent, respectively. The replacement rates for the larger groups were distinctly greater - 32 per cent for the large group and 28 per cent for the very large group. The replacement rate for all farms was 28 per cent in contrast to the 24 per cent reported by Greene, Warrington, and Brooke in Central Florida.[2] The estimated replacement rate of 28 per cent indicates that the average herd life per cow was 3.6 years.

Total number of replacements. An estimate of the total number of replacements used on the 835 commercial dairy farms can be made from the data on number of cows eliminated during the year. The estimated total number of replacements is shown in Table XI.

In estimating total replacements the number of cows eliminated is used as in the Tennessee survey. This probably underestimates the total Florida demand for dairy cattle in 1958 since the number of milk cows on

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[1]R. E. L. Greene, John Warrington, and D. L. Brooke, Summary of Costs and Returns for Wholesale Dairy Farms, Central Florida, 1958, Florida Agricultural Experiment Station, Report 60-2 (mimeographed), 1959.

[2]Ibid.

Florida farms increased each year during the period 1949-58.[3] However, since the rate of increase or decrease in total number of cows for any given area is subject to wide variation, the number of eliminations is used to give a more reliable first approximation.

TABLE XI

ESTIMATED TOTAL NUMBER OF DAIRY CATTLE REPLACEMENTS USED ON COMMERCIAL GRADE A DAIRY FARMS, FLORIDA, 1958

Size Group	Dairy Farms	Replacements Per Farm	Total Replacements
Small	594	20	11,888
Medium	130	61	7,920
Large	98	176	17,223
Very Large	14	553	7,193
All Farms	835	53	44,224

The estimated number of total replacements for 1958 was 44,224. The number of dairy cattle imported in 1958, reported as 35,138, appears to have been about four-fifths of all replacements. However, imports probably represented a somewhat smaller proportion of the total for two reasons: (1) imports probably included some bulls and calves not used as replacements in the sense used here, and (2) the estimate of total replacements does not include replacements for herds owned by institutions, and it does not allow for any increase in the total number of cows.

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[3] U. S. Department of Agriculture, Dairy Statistics, Statistical Bulletin No. 218 (Washington: Government Printing Office, 1957), p. 159, and 1958 Supplement (1959), p. 20.

Of the total, the 112 large and very large farms were estimated to have utilized 24,416, or somewhat more than one-half of all replacements used on Florida commercial dairy farms in 1958. This represents an average of 218 replacements per farm per year for the 112 farms. This suggests that these 112 farms have a large enough volume of annual replacement purchases to be interested in individual contracts for supply of these replacements. It may also suggest that individual farmers or groups of farmers in other areas, including Tennessee, would be able to secure among this group of Florida dairy farmers a market for large numbers of replacement cattle.

The 723 farms in the two smaller groups were estimated to have used 19,808 replacements or about 16 per farm per year. These smaller Florida dairy farmers can probably be expected to make most of their replacement purchases through organized markets or cattle dealers.

B. CHARACTERISTICS OF REPLACEMENTS

Three characteristics of animals added to herds are considered in this chapter: (1) breed, (2) as heifers or cows, and (3) whether purchased or raised. Data for discussion of these characteristics are also summarized for four size groups, as in the previous discussion.

Classification as cows or as heifers raised or purchased. Animals added to herds are shown in Table XII as heifers raised, heifers purchased, and cows purchased. Nearly one-half, 47 per cent, of all animals added to herds were purchased heifers. Heifers raised accounted for 29 per cent of all replacements, and purchased cows accounted for 24 per cent. The

percentage of the total represented by heifers raised decreased as the size of farm increased.

TABLE XII

HEIFERS RAISED, HEIFERS PURCHASED, AND COWS PURCHASED AS A PERCENTAGE OF ALL REPLACEMENTS, 170 GRADE A DAIRY FARMS, FLORIDA, 1958

Description	Small	Medium	Large	Very Large	All Farms
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Heifers Raised	52.3	33.7	21.8	17.7	28.9
Heifers Purchased	35.8	53.0	76.9	20.8	46.9
Cows Purchased	11.9	13.3	1.3	61.5	24.2
Total	100.0	100.0	100.0	100.0	100.0

Heifers raised accounted for 52 per cent of all replacements for small farms but only 18 per cent for very large farms. This would tend to support the previously stated hypothesis that increasing specialization and volume of investment can be expected to result in fewer replacements raised and more purchased. The differences observed in per cent of replacements raised are probably due to several factors. Among these factors affecting per cent of replacements raised, the following would probably be important: (1) specialization of labor and facilities, (2) capital rationing among small operators, and (3) lack of satisfactory purchasing opportunities on the part of small operators. Among the replacements purchased, heifers greatly exceeded cows except in the very large group where about three-fourths of the animals purchased were cows.

The reason for the low use of heifers by very large farms is probably an effort to avoid the problems associated with starting animals on the first lactation.

Breed of replacements. All reported replacements in the 170 sampled herds were classified on the basis of the following breeds: (1) Ayrshire, (2) Brown Swiss, (3) Guernsey, (4) Holstein, (5) Jersey, and (6) mixed and other. No differentiation was made between registered and grade animals. The percentage of total replacements accounted for by each breed is shown in Table XIII.

The Jersey breed accounted for 40 per cent of all additions and the Holstein and Guernsey breeds accounted for 27 and 18 per cent, respectively. Mixed and other breeds were 13 per cent of all additions, while Ayrshire and Brown Swiss together accounted for less than 3 per cent. Heifers raised were rather evenly distributed among breeds as follows: Holstein, 27 per cent; Guernsey, 25 per cent; Jersey, 24 per cent; and mixed and other, 20 per cent. The Holstein and Jersey breeds accounted for most of the purchased heifers with 38 per cent and 33 per cent, respectively. The Jersey breed accounted for 71 per cent of all purchased cows. It was noticeable that a large part of the Jersey cattle were cows, while most of the Holstein and Guernsey cattle were heifers. All replacements are shown in Figure 2 as the per cent represented by heifers raised, heifers purchased, and cows purchased.

TABLE XIII

BREED OF REPLACEMENTS, 170 GRADE A DAIRY FARMS, FLORIDA, 1958

Breed	Heifers Raised	Heifers Purchased	Cows Purchased	All Additions
	Per Cent	Per Cent	Per Cent	Per Cent
Ayrshire	3.1	1.3	0.3	1.6
Brown Swiss	1.5	1.2	0.1	1.0
Guernsey	24.6	19.9	7.7	18.3
Holstein	27.2	37.2	4.8	26.5
Jersey	23.9	33.3	71.2	39.7
Mixed and others	19.7	7.1	15.9	12.9
Total	100.0	100.0	100.0	100.0

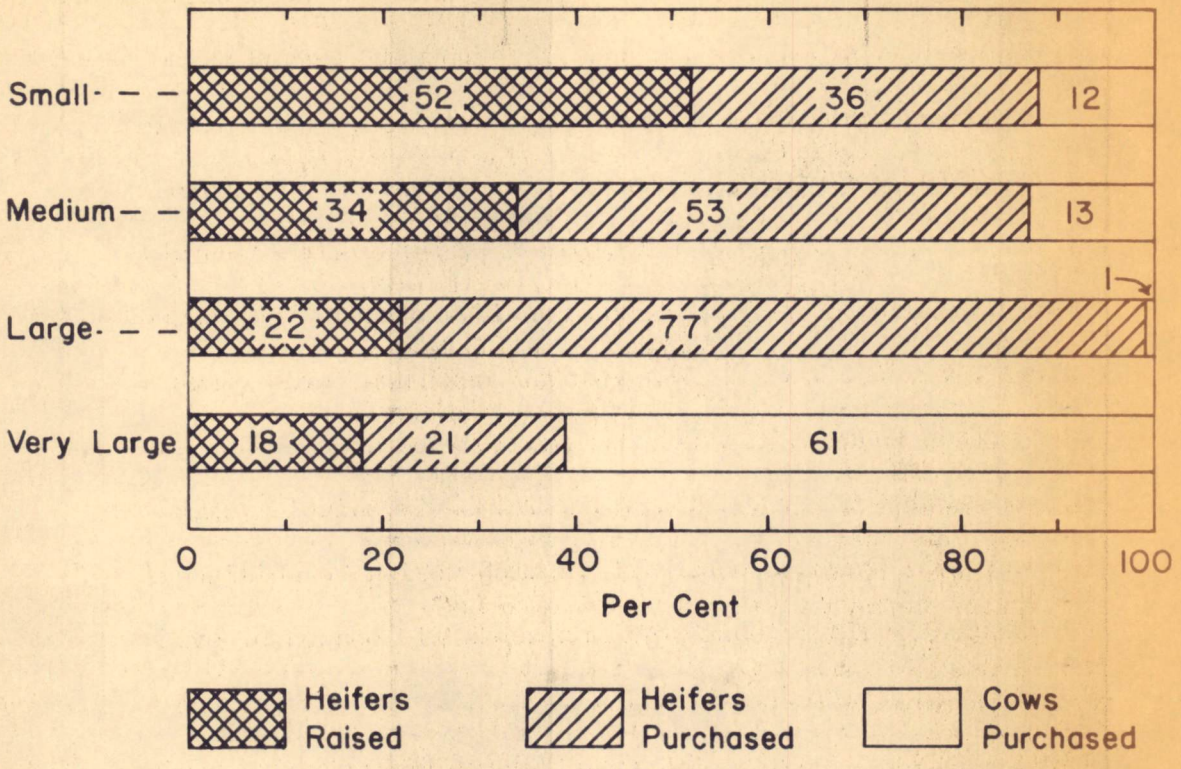


Figure 2. Heifers raised, heifers purchased and cows purchased as a percentage of total replacements by size of herd, 170 Grade A dairy farms, Florida, 1958.

CHAPTER IV

SOURCES OF PURCHASED REPLACEMENTS AND FACTORS AFFECTING THESE SOURCES

The purpose of this chapter is to present and evaluate certain factors relative to sources of replacements for sampled dairy farms in the Tennessee and Florida surveys. Four specific factors are considered: (1) sources of purchased replacements, (2) the use of heifer calves, (3) prices paid for purchased heifers, and (4) heifer sales of the Tennessee artificial breeding associations.

A. SOURCES OF PURCHASED COWS AND HEIFERS

Information was obtained in both the Tennessee and Florida surveys showing the type of market source for all purchased replacements. Four categories were used as follows: (1) other local farmers, (2) local auction sales, (3) local cattle dealers, and (4) other sources.

Sources reported in Tennessee milksheds. On the basis of sampled farms in Tennessee milksheds, the most important source was local farmers which accounted for 46 per cent of the total. Farmers purchased 17 per cent of their replacements through auction sales and 14 per cent from cattle dealers, while 24 per cent of all replacements came from various other sources. The relative importance of each source is shown by milkshed in Table XIV. Local farmers were the most important source of replacements in each of the Tennessee milksheds. They provided 84 per cent of all replacements in the Chattanooga milkshed and 60 per cent in the Knoxville milkshed. Auction sales were an important source in the Memphis

milkshed, providing 29 per cent of all replacements; but they accounted for only 14 per cent for the Knoxville milkshed and less than 10 per cent for each of the three other milksheds. Cattle dealers were the source of 20 per cent and 19 per cent of all replacements in the Nashville and Memphis milksheds respectively, but they provided less than 8 per cent in each of the three other milksheds. Various other sources accounted for 20 to 44 per cent of all replacements except in the Chattanooga milkshed where they accounted for less than 1 per cent.

TABLE XIV

SOURCES OF PURCHASED REPLACEMENTS, 351 GRADE A DAIRY FARMS, FIVE TENNESSEE MILKSHEDS, 1958

Source	Knox-ville	Nash-ville	Chatta-nooga	Appa-lachian	Mem-phis	All Farms
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Local Farmers	60.0	42.1	83.7	44.3	32.2	45.7
Auction Sales	13.7	9.7	7.8	5.2	29.3	16.5
Cattle Dealers	2.9	20.3	7.8	6.8	18.5	13.8
Other Sources	23.4	27.9	0.7	43.7	20.0	24.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

The relative importance of the different sources for purchased heifers tended to be opposite to what it was for purchased cows. Figure 3 shows the percentage of purchased heifers and the percentage of purchased cows accounted for by each source. The major part of the cows purchased were from local sources with 53 per cent from local farmers and 21 per cent

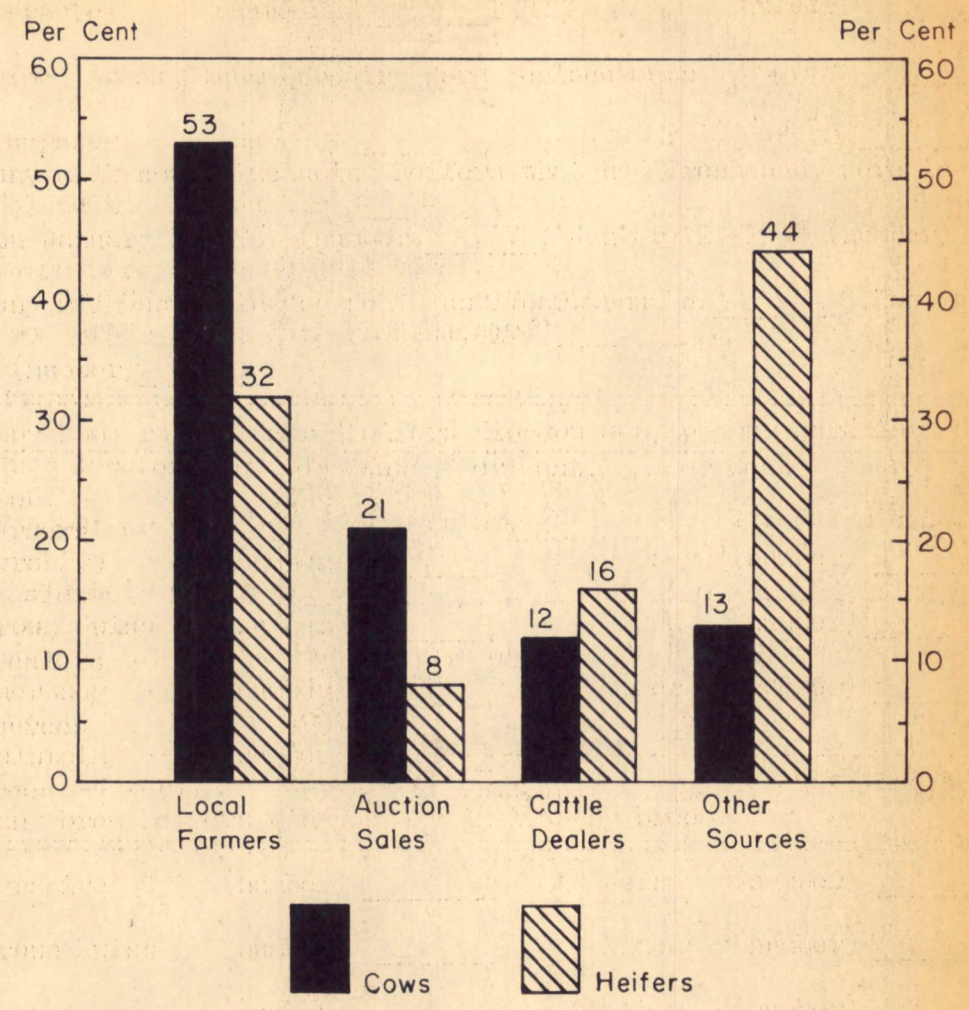


Figure 3. Sources of purchased heifers and cows, 351 Grade A dairy farms, five Tennessee milksheds, 1958.

from local auction sales. A large part of the cows coming from local sources is probably the result of the decline in the number of dairy farms. Many of the heifers, on the other hand, appear to have come from other states or production areas. Cattle dealers provided 16 per cent of all purchased heifers while 44 per cent came from other sources. The other sources were generally specified as northern states. This appears to be closely related to the fact that 72 per cent of all purchased heifers were Holstein as shown in Table VIII, page 27.

Sources of replacements in Florida. On the basis of sampled dairy farms, local farmers appear to have been a very minor source of dairy replacements for Florida dairy farmers. Local farmers provided only 7 per cent of purchased dairy replacements in Florida compared to 46 per cent for Tennessee milksheds. Local auction sales accounted for only 5 per cent of Florida dairy replacements, while local cattle dealers accounted for 25 per cent and various other sources accounted for the remaining 63 per cent.

The relative importance of each source is shown in Table XV for small, medium, large and very large farms. Purchases from local farmers represented 15 per cent of all replacements purchased by farms in the small or medium groups, but only 8 per cent for large farms. None of the very large farms in the sample reported any purchases from local farmers. Auction sales were the least important of the four types of sources for all size groups except the very large group where they accounted for 7 per cent of all purchases. All groups reported cattle dealers as the second most important source of dairy cattle purchases,

accounting for a range from 15 per cent for the very large group to 35 per cent for the medium group. In all size groups, more than one-half of all purchased replacements came from various sources other than local farmers, auction sales, and cattle dealers.

TABLE XV

SOURCES OF PURCHASED REPLACEMENTS, 170 GRADE A DAIRY FARMS, FLORIDA, 1958

Source	Small	Medium	Large	Very Large	All Farms
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Local Farmers	14.9	14.6	7.7	-	6.9
Auction Sales	13.2	0.4	1.0	7.0	4.8
Cattle Dealers	20.1	34.5	33.2	15.1	24.9
Other Sources	51.8	50.5	58.1	77.9	63.4
Total	100.0	100.0	100.0	100.0	100.0

The dairy replacements reported as purchased from local cattle dealers and various other sources were generally reported as coming from outside of Florida. Most of the cattle purchased through local auction sales probably had been recently imported from other states or Canada, but dairy farmers were usually not aware of the prior source of the cattle they purchased through these auctions. If we assume that all replacements reportedly purchased from auction sales, cattle dealers, and other sources came, upon purchase or immediately prior to purchase from states or areas outside of Florida, then the number of here replacements imported into Florida equals 93 per cent of all purchased replacements. Applying the

estimate, presented in Table XII, page 37, that 71 per cent of all replacements were purchased, then 93 per cent of that amount or 66 per cent of all replacements can be estimated to have come from outside of Florida.

The relative importance of different sources was generally similar for purchased heifers and purchased cows, except in the case of cattle dealers which accounted for 35 per cent of all purchased heifers but only 10 per cent of all purchased cows. Figure 4 shows, also, that local farmers accounted for 7 per cent of all purchases of both cows and heifers, and auction sales were the source of 10 per cent and 2 per cent of purchased cows and heifers, respectively. More than one-half of all purchases of both cows and heifers were from various other sources with 78 and 56 per cent for cows and heifers, respectively. The conclusion should not be drawn that cattle dealers were connected only with those purchases reported under that source, since farmers reporting purchases from the other sources category generally indicated that these purchases were made with the help of a cattle dealer or broker. Cattle dealers are also very likely responsible for bringing most of the dairy replacements to the local auction markets. No detailed information is available as to the importance of cattle dealers in the overall market structure for dairy replacements.

B. USE OF HEIFER CALVES

Information on the disposition of heifer calves was obtained in both the Tennessee and Florida surveys. The methods of disposition were divided into four groups as follows: (1) kept to raise, (2) sold as baby calves, (3) sold for veal, and (4) died. This information was secured

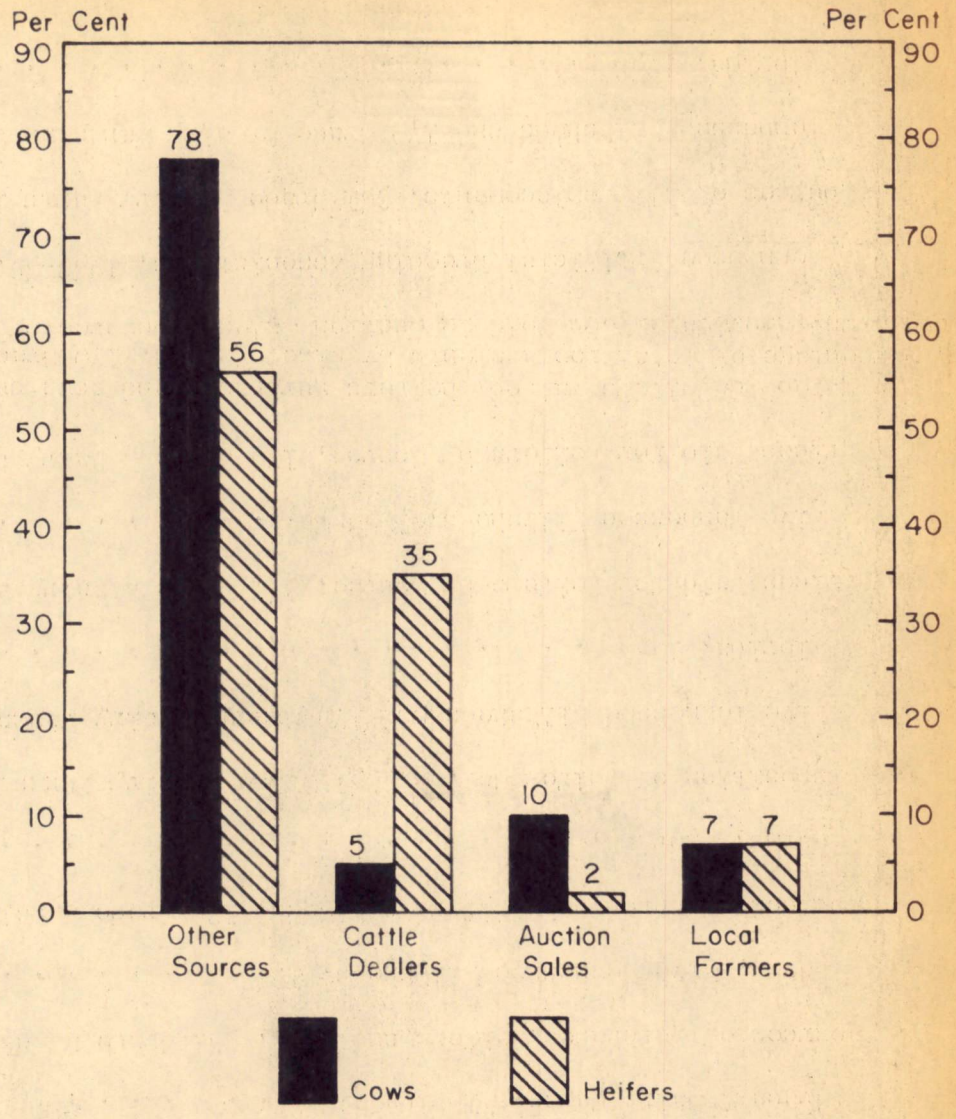


Figure 4. Sources of purchased heifers and cows, 170 Grade A dairy farms, Florida, 1958.

for all dairy heifer calves born on 351 Grade A dairy farms in Tennessee milksheds and 170 Grade A dairy farms in Florida.

Disposition of heifer calves in Tennessee milksheds. Fifty-nine per cent of all heifer calves were kept to be raised on sampled farms in Tennessee milksheds, as shown in Table XVI. All milksheds reported keeping more than one-half of all heifer calves to be raised with the lowest percentages being 53 and 54 per cent for the Memphis and Knoxville milksheds, respectively. The Nashville and Appalachian milksheds reported 64 per cent and the Chattanooga milkshed 63 per cent of all heifer calves as kept to be raised. The majority of the remaining calves were reported sold as baby calves. All sampled farms reported an average of 28 per cent disposed of in this way. Less than 3 per cent of the calves in all five milksheds were sold for veal, while an average of slightly more than 10 per cent were reported to have died.

TABLE XVI

DISPOSITION OF HEIFER CALVES, 351 GRADE A DAIRY FARMS, FIVE TENNESSEE MILKSHEDS, 1958

Disposition	Knox-ville	Nash-ville	Chatta-nooga	Appa-lachian	Mem-phis	All Farms
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Kept to Raise	54.3	63.7	62.6	63.6	52.5	59.2
Sold as Baby Calves	33.7	20.6	26.5	23.6	34.7	27.7
Sold for Veal	2.7	5.0	0.7	4.1	0.7	2.7
Died	9.3	10.7	10.2	8.7	12.1	10.4
Total	100.0	100.0	100.0	100.0	100.0	100.0

The sum of the calves which died and those sold for veal obviously were eliminated as possible future replacements, but all of those kept to be raised or sold as baby calves may possibly have been available as future replacements. It was assumed that all heifer calves kept to be raised were kept to provide replacements in the same herd or to be sold to other dairy farmers as replacements. The heifer calves reported sold as baby calves could have been raised for the replacement market or they could have entered the beef market. This choice probably depended on qualities of the individual animals and the relative price of the two markets.

From an analysis of the records on a large number of dairy cattle, Frick and Henry concluded that with good management and a normal sex ratio of calves 335 replacements can be raised annually with 1,000 cows. This figure included allowances for mortality and sterility. Since 59 per cent of all heifer calves were kept to be raised, about twenty heifers probably were raised to calving time for each 100 cows in these milksheds. This is the same as the 1958 replacement rate which suggests that these dairy farmers as a group raised the same number of replacements as they used. Thus, where replacements were brought into the milkshed from other areas or from local farmers which were not part of the milkshed, a comparable number of cattle apparently was exported to other areas for replacements.

Disposition of heifer calves in Florida. For the surveyed Florida dairy farms, only 34 per cent of all heifer calves were kept to be raised, while 62 per cent were sold as baby calves. Less than one per cent of all heifer calves were reported as sold for veal, and only 4 per cent

were reported to have died. The low rate of calf mortality indicated is probably due to failure to report part of the calves which had died, since many Florida farmers indicated that they had no record of calves which were born dead or had died within a few days of birth. The disposition of heifer calves by size of herd is shown in Table XVII. Farms in the small and medium size groups reported keeping 47 and 44 per cent, respectively, of all heifers to be raised, while large and very large farms reported keeping 24 and 27 per cent, respectively. The large and very large farms both sold 72 per cent of their heifer calves as baby calves and the small and medium size farms sold 47 and 50 per cent, respectively, as baby calves.

TABLE XVII

DISPOSITION OF HEIFER CALVES BY SIZE OF HERD,
170 GRADE A DAIRY FARMS, FLORIDA, 1958

Disposition	Small	Medium	Large	Very Large	All Farms
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Kept to Raise	47.3	43.7	23.9	27.3	33.7
Sold as Baby Calves	44.6	49.5	71.7	71.7	61.7
Sold for Veal	2.5	1.7	-	-	0.9
Died	5.6	5.1	4.4	1.0	3.7
Total	100.0	100.0	100.0	100.0	100.0

Since Florida dairy farmers kept only 34 per cent of their heifer calves and part of these will be eliminated by death or sterility as suggested by Frick and Henry, they probably were producing only eleven

or twelve replacement heifers per year for each 100 cows. This is far below the number needed for replacement purposes considering that the 1958 replacement rate was 28 per cent per year, as shown in Table X, page 32.

Comparison of the disposition of heifer calves in Tennessee milksheds and in Florida. A comparison of the data on disposition of heifer calves gives an illustration of the differences in replacement practices between the Grade A dairy farmers in Tennessee milksheds and in Florida. Omitting the calves reported to have died and the relatively small proportion sold for veal, the use of heifer calves was quite different for the Tennessee and Florida surveys. The percentage of all heifer calves kept to be raised and those sold as baby calves are compared for Tennessee and Florida in Figure 5. Farmers in the Tennessee survey kept 59 per cent

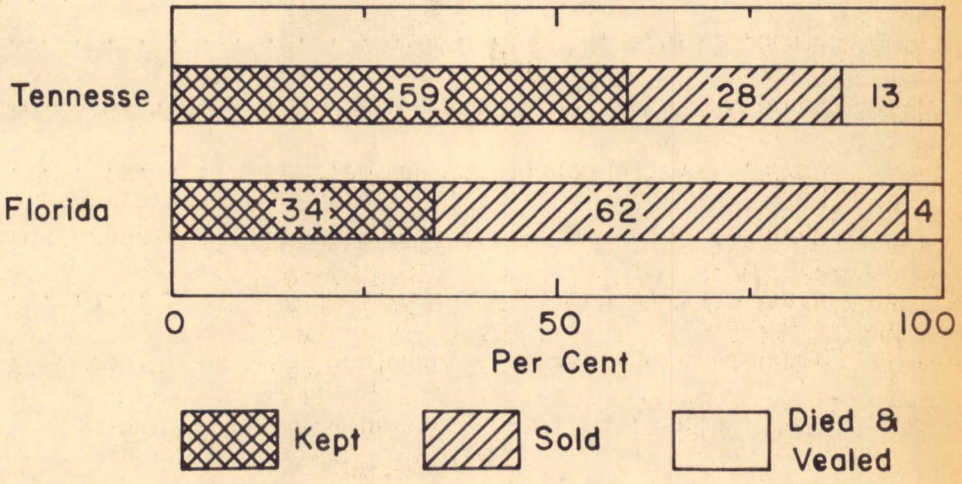


Figure 5. Disposition of heifer calves, 351 Grade A dairy farms in five Tennessee milksheds and 170 Grade A dairy farms in Florida, 1958.

of all heifer calves to be raised and sold 28 per cent as baby calves, while the Florida survey shows nearly the exact opposite with 34 per cent kept to be raised and 62 per cent sold as baby calves.

C. PRICES PAID FOR PURCHASED HEIFERS

Information on the prices paid for purchased heifers was obtained in both the Tennessee and Florida surveys. Prices were obtained according to source but were not differentiated by breed.

Prices paid in Tennessee milksheds. The average price for all purchased heifers was $255 for sampled farms in the Tennessee milksheds. The prices for heifers purchased from each source are shown in Figure 6. The prices for each source varied from $182 for those from auction sales to $290 for those from the other sources category. Purchases from local cattle dealers averaged $255, and those from local farmers averaged $245 per heifer. Breed differences probably accounted for most of the price variation. The replacements purchased from local farmers or at auction sales appeared to be primarily Jersey or Guernsey cattle. The distinctly lower price for purchases at auction sales suggests that the quality of these replacements was probably comparatively low. The replacements purchased from various other sources were generally reported as being Holsteins imported from northern states. Since a large proportion of this group was imported from a considerable distance, the quality and perhaps the proportion of registered animals were probably higher than for replacements purchased from local sources.

There was also rather wide variation in average prices paid

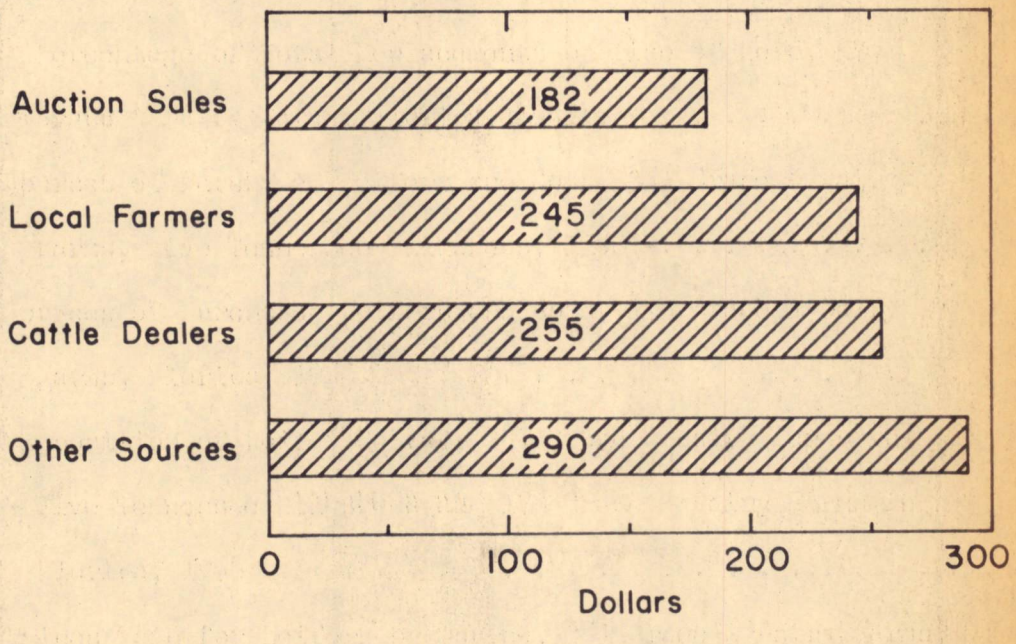


Figure 6. Prices paid for heifers by source, 351 Grade A dairy farms, five Tennessee milksheds, 1958.

between the five milksheds in Tennessee. The average prices paid from all sources for each milkshed is as follows:

	Average Price
Knoxville	$266
Nashville	247
Chattanooga	227
Appalachian	280
Memphis	246

Although the breed of animals purchased was probably related to the differences in price, the data do not show any clear evidence to support such an hypothesis.

Prices paid by Florida dairy farmers. The average price paid for all purchased heifers was $276 for sampled farms in Florida. The prices are shown in Figure 7 for heifers purchased from each source. The prices paid varied considerably between sources with a range from $203 for purchases from local farmers to $310 for purchases from cattle dealers. Purchases from auction sales averaged $216, and those from other sources averaged $265 per heifer. Breed differences appear to have accounted for a large part of the price variation. Replacements purchased from local farmers and at auction sales appear to have been primarily Jersey or Guernsey cattle which partially accounts for the lower average prices reported for these sources. The reason is not apparent for the distinctly higher average prices reported for purchases from cattle dealers.

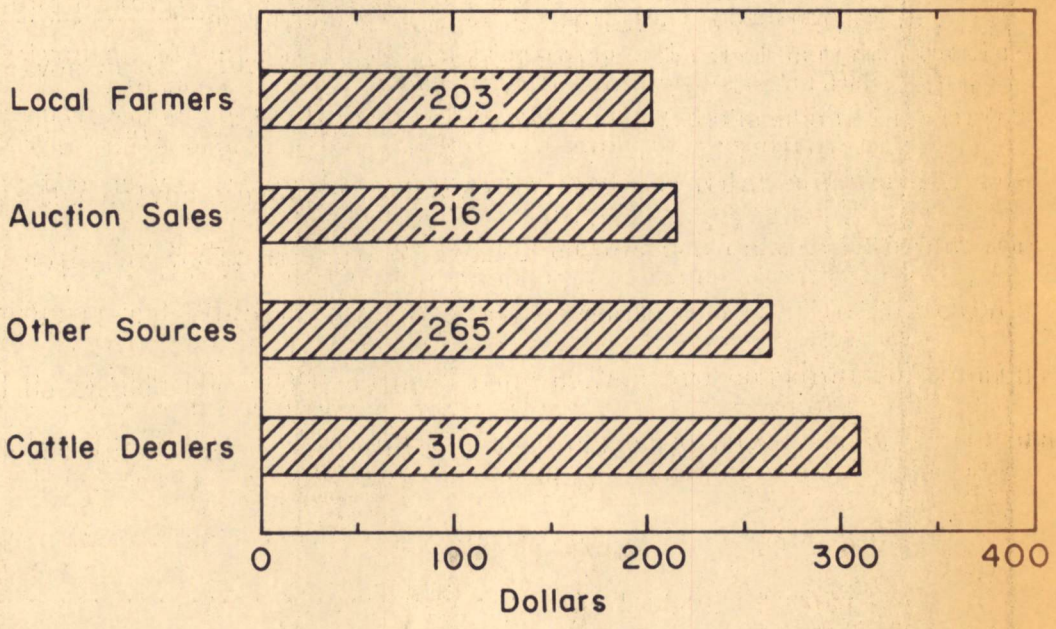


Figure 7. Prices paid for heifers by source, 170 Grade A dairy farms, Florida, 1958.

Comparison of prices paid in Tennessee and Florida. The data obtained on prices paid for heifers are shown for the Tennessee and Florida surveys for comparison in Table XVIII. The average price paid for all purchased heifers was only $21 less in Tennessee than in Florida, being $255 for Tennessee compared to $276 for Florida, although the average prices for the different sources showed considerable variation. Prices were higher in Tennessee for purchases from local farmers and other sources than in Florida, while the Florida price was higher for heifers purchased at auction sales or from cattle dealers.

TABLE XVIII

PRICES PAID BY GRADE A DAIRY FARMERS FOR PURCHASED HEIFERS, FIVE TENNESSEE MILKSHEDS AND FLORIDA, 1958

Source	Purchase Price	
	Tennessee	Florida
Local Farmers	$245	$203
Auction Sales	182	216
Cattle Dealers	255	310
Other Sources	290	265
Average	255	276

The conclusion should not be drawn that actual heifer price levels were as nearly even in the two areas as these averages indicate. Reference to Table VIII, page 27 and Table XIII, page 39 shows that for the Tennessee group, 72 per cent of all purchased heifers were Holstein, compared to 18 per cent for Guernsey and Jersey breeds combined, while for Florida only

37 per cent were Holstein and 53 per cent were Guernsey and Jersey. Since Holstein cattle, being much larger, usually sell at a considerably higher price per animal than do Guernsey or Jersey cattle, the proportion of the three breeds is important in evaluating the available price averages.

D. ARTIFICIAL BREEDERS' HEIFER SALES

One relatively new source of replacements in Tennessee are the heifer sales being sponsored by the three artificial breeders associations in the state. Including the sales held in 1959, there have been five annual sales sponsored by the East Tennessee Artificial Breeders Association at Knoxville, four sponsored by the West Tennessee Artificial Breeders Association at Yorkville, and one by the Tennessee Artificial Breeding Association at Nashville. In order to evaluate these sales, available data were secured showing (1) the number of heifers sold, (2) the areas where they were produced, (3) breed, (4) prices paid, and (5) destination of the heifers from the sale. All the desired information was obtained for the 1957, 1958, and 1959 annual sales sponsored by the East Tennessee and West Tennessee Associations. Data were obtained for the Tennessee Association on number of heifers, areas where they were produced, and sale prices for the 1959 sale; but the destination of heifers from the sale was not available.

Number of heifers sold. The East Tennessee sales were considerably larger than those sponsored by the other two associations. The average number sold in the 1957, 1958, and 1959 sales at Knoxville was 91 heifers

per sale, while the average number sold at the West Tennessee sale was only 44 for the same three-year period. At the 1959 sale at Nashville 49 heifers were sold.

Areas producing heifers for association sales. The counties where these heifers were produced for the three years are shown in Figure 8. The production of heifers sold in the East Tennessee sale were distributed throughout most of area served by the association. The six counties which produced the largest number of heifers for the three sales are as follows:

County	Number of heifers
Greene	77
Bradley	27
Sullivan	25
Knox	23
Blount	21
Roane	20

The heifers sold at the West Tennessee sales came primarily from the two counties nearest the association headquarters. Gibson and Dyer Counties accounted for 58 heifers each out of a total of 133 sold in the three sales. Five other nearby counties provided the remaining 17 heifers. No reasons are available for the extreme concentration of production of these heifers.

Production of heifers was widely scattered for the 1959 sale sponsored by the Tennessee Association at Nashville. The 49 heifers came from 16 different counties with no more than eight from any county.

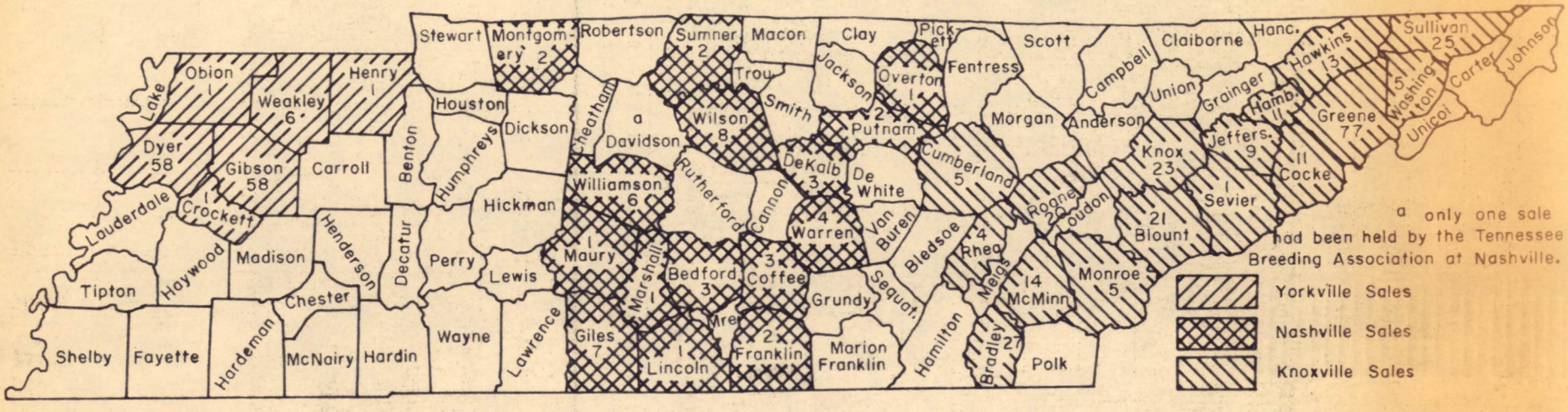


Figure 8. Sources of heifers sold in auction sales sponsored by Tennessee Artificial Breeding Associations, 1957-59.

Heifers in this sale apparently came from areas where artificial breeding is widely used.

Breed of heifers sold. Jersey heifers accounted for 55 per cent of all heifers sold at these auction sales. Nearly all the remainder were Holstein and Guernsey. A few Brown Swiss heifers were sold at the Knoxville and Nashville sales, and a small number with mixed breeding were included in the Knoxville sales. The number of animals of each breed sold during the three years is shown by sale location in Table XIX.

TABLE XIX

NUMBER OF HEIFERS SOLD IN AUCTION SALES SPONSORED BY ARTIFICIAL BREEDING ASSOCIATIONS IN TENNESSEE, 1957-59

Location	Breed				
	Brown Swiss	Guernsey	Holstein	Jersey	Mixed
	Number	Number	Number	Number	Number
Knoxville	2	54	73	127	17
Yorkville	-	-	38	95	-
Nashville	7	6	7	29	-
Total	9	60	118	251	17

Sale prices. The average price for heifers of all breeds varied considerably during the three-year period, although the price for Jersey heifers was relatively stable. The average prices for heifers are presented for all breeds and for the three major breeds in each of the three years in Table XX. The average price for Jersey heifers was $237 in 1958

and varied downward to $221 in 1957 and $219 in 1959. Holstein heifers sold at considerably higher prices than did Jerseys, averaging about $100 per heifer more during the three years. The average price for Guernsey heifers was also slightly higher than the Jersey average.

Although larger cattle are expected to sell at a higher price than the smaller breeds, the large premium paid for Holstein heifers points up the strong demand for Holsteins relative to other breeds in Tennessee. The 1958 average Jersey sale price of $237 suggests, when compared with the average of $276 paid by Florida dairy farmers, that the Jersey heifers in these sales would move readily into the Florida replacement market.

TABLE XX

AVERAGE SALE PRICE FOR HEIFERS IN AUCTION SALES SPONSORED BY ARTIFICIAL BREEDING ASSOCIATIONS IN TENNESSEE, 1957-59

Breed	Average Sale Price		
	1957	1958	1959
Jersey	$221	$237	$219
Guernsey	228	293	229
Holstein	286	397	319
All Breeds	236	283	252

Destination of heifers from sales. A limited amount of information was available on the destination of heifers following the sales. Most of the heifers sold were purchased by dairy farmers in the Tennessee counties served by the associations. In these cases the auction markets performed

as marketing media serving buyers who were in the same general area as the sellers.

Part of the Jersey and Guernsey heifers were known to have been moved to other southern states. Records of the sales at Knoxville indicate that numbers moved to other states were as follows:

1957 Sale --- Georgia 10

1958 Sale --- Virginia 3

1959 Sale --- Georgia 10, Florida 19

Of those sold at the Yorkville sale, the records show 7 heifers going to Texas and 1 to Mississippi in 1957, 1 to Missouri in 1958, and 2 to Missouri in 1959. Actually, these figures probably do not represent all heifers leaving Tennessee since cattle buyers who purchased part of the Jerseys and Guernseys at these sales may have transported their purchases to other states for resale. The destination of heifers sold at the 1959 Nashville sale was not available.

In considering the source and disposition of these heifers, it appears that there may be considerable opportunity for expanding sales of this type. Since artificial breeding is widely available in Tennessee, any farmer in the area serviced by the breeding associations has an opportunity to produce heifers for these sales. At the same time, demand for replacement heifers, as reported in this study, appears to be adequate to allow major expansion. Sale prices over the three-year period reported would suggest that Holstein heifers might be desired more by the buyers at these sales. This is supported by data on heifer purchases, presented in Chapter II, showing Holsteins to be 72 per cent of all heifers purchased in the five major Tennessee milksheds. However, despite the greater

recent demand for Holsteins in Tennessee, the large proportion of Jersey and Guernsey cattle cannot be changed to produce primarily Holsteins except over a long period of time. Recent movement of several Jersey and Guernsey cattle from these auction sales to Florida and other states and the clear differential in price levels suggest that a large number of these breeds could be sold at satisfactory prices for the Florida replacement market. There appear to have been two major reasons why only a small number of heifers from these sales have gone to Florida: (1) dairy farmers in Florida have not been aware of the sales, and (2) the number sold has been rather small in most sales.

CHAPTER V

GROSS RETURNS TO TENNESSEE FARMERS FROM THE TENNESSEE AND FLORIDA DAIRY CATTLE REPLACEMENT MARKETS

The object of this chapter is to utilize the information presented in Chapters II through IV to estimate the present and potential returns to Tennessee farmers from the sale of dairy cattle in the replacement markets which have been described. Since this chapter is concerned with returns from the annual production and sale of replacements, all replacements are considered as heifers. Various assumptions, based on data which were previously discussed, are used in determining the prices and total number of heifers.

A. PRESENT AND POTENTIAL GROSS RETURNS TO TENNESSEE FARMERS FROM HEIFER SALES IN TENNESSEE MILKSHEDS

A large proportion of the replacement heifers purchased by Grade A dairy farmers was directly or indirectly from farmers in Tennessee or adjacent areas. Total returns from these heifer sales were estimated for four different assumptions of the total market number. The basis for estimating the market number is given for each assumption as follows:

1. The total of heifers purchased from local farmers, local auction sales, and local cattle dealers.
2. All purchased heifers
3. All purchased replacements
4. All replacements

The 1958 overall average price for heifers purchased in all five milksheds was used for these assumptions.

First assumption. The first assumption was that Tennessee farmers furnished all of the heifers previously shown as purchased from local farmers, local auction sales, and local cattle dealers in 1958. Since these sources are all local, this assumption appears to approximate the present market share of farmers in Tennessee or in adjacent areas where part of the various milksheds lie outside the state. The estimated returns to farmers in or near these milksheds are as follows:

Total Market	Price	Total Value
2,687	$255	$685,185

This number would appear to include approximately 56 per cent of all purchased heifers. It probably includes practically all Jersey and Guernsey heifers and about 40 per cent of all purchased Holstein heifers.

Second assumption. The second assumption was that Tennessee farmers produced and sold all the heifers that were purchased in the five milksheds. This assumption would probably require a major change in the breed distribution of heifers produced in the state if Grade A dairy farmers continue to buy Holstein heifers as more than 70 per cent of all purchased heifers. The market total and value would be as follows:

Total Market	Price	Total Value
4,799	$255	$1,223,745

Third assumption. The third assumption was that Tennessee farmers produced and sold all replacements purchased by Grade A dairy farmers in the five milksheds. This assumption includes a much larger market total than the second assumption since almost twice as many cows as heifers

were purchased in 1958. The market total and value using this assumption are as follows:

Total Market	Price	Total Value
13,613	$255	$3,471,315

More than 85 per cent of all cows used as replacements were estimated to have come from local sources in 1958, so there would be little change in production areas from the second assumption. The major production adjustment would probably be the large increase in number of Holstein heifers.

Fourth assumption. The fourth assumption was that Tennessee farmers produce all the replacements needed by Grade A dairy farmers in the five milksheds. In addition to the production changes required for this assumption, an important change in replacement practices would be necessary, since 60 per cent of all replacements in these milksheds are currently raised by the dairy farmers themselves. The total market number and value for this assumption is as follows:

Total Market	Price	Total Value
34,033	$255	$8,678,415

The major changes in replacement practices required for the fourth assumption are not likely for some time; but if the trend toward a smaller number and larger size of dairy farms continues, replacement practices may change in this direction. The data on farm size and per cent of replacements raised seem to suggest that they are inversely associated among the farms studied.

B. PRESENT AND POTENTIAL GROSS RETURNS TO TENNESSEE FARMERS FROM HEIFER SALES IN FLORIDA

In developing the market possibilities for replacement heifers in Florida, the total number of heifers was determined from four different assumptions as follows:

1. 1958 dairy cattle imports from Tennessee as shown by the Florida Livestock Board
2. All purchased Jersey and Guernsey heifers
3. All purchased heifers
4. All replacements

The price used in the first, third, and fourth assumptions was the average price for replacement heifers paid by dairy farmers in Tennessee milksheds. The price used in the second assumption was the average price for Jerseys in the 1958 heifer sales of the artificial breeding associations in Tennessee.

First assumption. The first assumption is that the market for replacement heifers which is available to Tennessee farmers equals the 1958 imports from Tennessee as reported by the Florida Livestock Board.[1] This figure includes bulls and calves, so it appears to overestimate the number used as herd replacements. The error is probably small, however, for two reasons: (1) the number of bulls imported by Florida dairymen was probably small due to the widespread use of artificial insemination, and (2) since Florida dairymen raise relatively few dairy calves, the

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[1]Florida Livestock Board, "Imports of Dairy Cattle" (mimeographed).

number of calves imported was probably very low. The total market value using this assumption is as follows:

Total Market	Price	Total Value
6,629	$255	$1,690,395

This estimate of total market number and value assumes that all cattle imported into Florida from Tennessee came directly or indirectly from Tennessee farmers. No information is available to check the accuracy of the data. The price used in this assumption may be an overestimation, since it is based on the large proportion of Holsteins purchased by Tennessee farmers while the cattle going to Florida probably included a high proportion of Jerseys.

Second assumption. The second assumption is that Tennessee farmers provide all the Jersey and Guernsey heifers purchased in 1958 by Florida dairy farmers. A large proportion of the heifers purchased in Florida were of the Jersey and Guernsey breeds while most of the heifers purchased in Tennessee were Holstein. This suggests that a major market for Tennessee Jersey and Guernsey heifers may have been the Florida market. If Tennessee farmers had provided all the Jersey and Guernsey replacement heifers, the estimated gross returns to Tennessee farmers would be as follows:

Total Market	Price	Total Value
11,034	$237	$2,615,058

Third assumption. The third assumption is that all the replacement heifers purchased in Florida were supplied by Tennessee farmers.

With the present number and distribution of dairy cattle, this possibility does not appear likely in the near future, since the small number of Holsteins available probably does not allow very many to be exported. However, if this possibility were developed, perhaps by increases in breeding stock or by purchase of young calves, the estimated gross returns to Tennessee farmers would be as follows:

Total Market	Price	Total Value
20,741	$255	$5,288,955

Fourth assumption. The fourth assumption is that Tennessee farmers supply all the replacements needed by Florida dairy farmers. Although this possibility does not appear to be very likely to occur, its inclusion gives a useful picture of the total market. The estimated total market and value would be as follows:

Total Market	Price	Total Value
44,224	$255	$11,277,120

C. COMPARISON OF TENNESSEE AND FLORIDA REPLACEMENT MARKETS

On the basis of total market estimates, the Florida market for dairy replacements is clearly larger than the market in the five Tennessee milksheds. The number of cows, per cent replacement rate, total replacements, and purchased replacements for the two areas are as follows:

	Total Cows	Replacement Rate	Total Replacements	Purchased Replacements
Tennessee	166,384	20.4 per cent	34,033	13,613
Florida	161,990	27.6 per cent	44,224	31,443

The number of cows was nearly the same for the two areas, but a higher replacement rate in Florida resulted in a considerably larger number of replacements used than in the five Tennessee milksheds. If the total number of cows in Florida increased during that time, then total replacements were actually greater than the figure given. This probably was the case, since herd size increased while the number of dairy farms appears to have remained about the same. Total number of cows in the Tennessee milksheds probably stayed about constant, since herd size increased nearly proportionally to the decrease in number of farms.

The sources of replacements in 1958 were quite different for the two areas; however, purchases from Tennessee farmers were an important source for both. In Figure 9 the sources of replacements for the two areas are compared on the basis of three groups: (1) raised, (2) purchased from Tennessee farmers, and (3) all other sources. For the Tennessee milksheds 60 per cent of all replacements were raised, while 30 per cent were purchased from other Tennessee farmers, and 10 per cent came from all other sources. The Florida dairy farmers raised only 29 per cent of all their replacements while 15 per cent were purchased from Tennessee farmers and 56 per cent came from all other sources.

The total value of all purchases from Tennessee farmers, including both cows and heifers, was nearly two-thirds as much for Florida dairymen as for the dairymen in the Tennessee milksheds. The total number purchased and the estimated value are as follows:

	Total Number	Price	Total Value
Tennessee	10,346	$255	$2,638,230
Florida	6,629	$255	$1,690,395

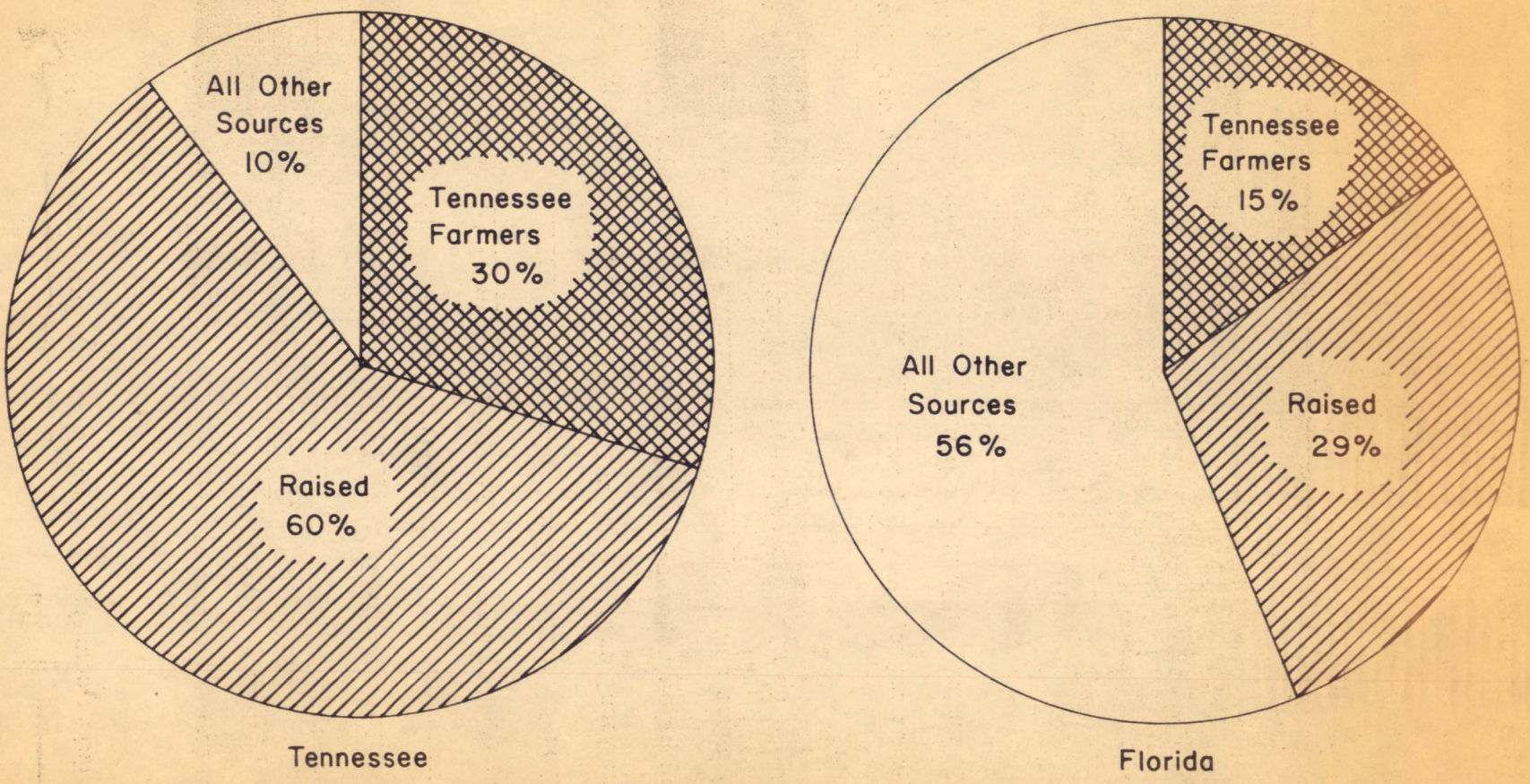


Figure 9. Sources of all replacements, 351 Grade A dairy farms in five Tennessee milksheds and 170 Grade A dairy farms in Florida, 1958.

Some of the cows included in these figures would be those sold by Tennessee dairy farmers who are going out of business, so the amount should not be considered as equal to annual income to farmers.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The problem of providing satisfactory herd replacements in adequate numbers is a major consideration among dairy farmers. In some areas, the purchase of replacements has provided most of those needed, while in other areas the general practice has been to raise most replacements and purchase the remainder. Many of these dairy cattle replacements for Tennessee and Florida have been purchased in Tennessee. Little is known, however, about the size or importance of these dairy cattle replacement markets to Tennessee farmers.

The purposes of this study were: (1) to describe the dairy cattle replacement markets of Tennessee and Florida and (2) to estimate the size of these markets and their present and potential importance to Tennessee farmers. The study included a total of 443 Grade A dairy farms in five Tennessee milksheds and 170 Grade A dairy farms in Florida. These farms, selected by random sampling procedures, comprised a 9.4 per cent sample of the farms in five Tennessee milksheds and a 20.0 per cent sample of the farms in Florida. Information about the selected farms was obtained by a combination of mail questionnaires and personal interview.

The average herd size for the 443 farms in five Tennessee milksheds was thirty-three cows per farm. There were no major differences in average size of herd between the five milksheds; the smallest average size of herd was twenty-nine cows per farm in the Knoxville milkshed, and the largest was thirty-six cows per farm in the Memphis milkshed.

There was a great deal of variation in herd size among the 170

sample farms in Florida. The average size of herd was 194 cows per farm while the median size was 123 cows per farm which indicates a skewed distribution in herd size. The 120 small farms, with less than 200 cows each, had an average of 84 cows per farm. The six very large farms, with 1,000 or more cows each, had an average of 1,962 cows per farm.

Detailed information on replacements was obtained for 321 farms in the five Tennessee milksheds and 170 farms in Florida. Replacement rates in Tennessee milksheds were in the narrow range of 17 to 19 per cent except for the Memphis milkshed which was 27 per cent. This gave an average replacement rate of about 20 per cent for the five milksheds and provided the basis for estimating the total number of replacements for all farms in 1958. This total was 34,033 for the five milksheds. Of this total number, the Memphis milkshed utilized more than 10 thousand, and the Nashville milkshed utilized more than 9 thousand.

The average replacement rate for Florida dairy farms was 28 per cent, and the estimated total number of replacements utilized by all farms was more than 44 thousand in 1958. The replacement rates for small and medium groups were 24 and 23 per cent respectively while the large and very large groups had 32 and 28 per cent. This suggests that large farms tend to have a higher replacement rate than smaller farms.

In the Tennessee milksheds, 60 per cent of all replacements were raised. More than one-half of all replacements were raised in all the milksheds except the Memphis milkshed where 48 per cent were raised. Twenty-six per cent of all replacements were purchased as cows and only 14 per cent were heifers. The large proportion of cows relative to

heifers purchased as replacements appears to have been related to the fact that a large number of dairy farmers dropped out of the market in four of the five milksheds, thereby releasing a large number of cows into the replacement market. Forty-six per cent of all replacements were Holstein while only 20 per cent were Jersey, and 13 per cent were Guernsey. Holstein heifers accounted for 72 per cent of all purchased heifers and 43 per cent of all heifers raised for replacements. The large proportion of young Holstein cattle being added suggests that Holsteins are increasing relative to other breeds in the Tennessee milksheds.

Almost one-half, 47 per cent, of all replacements on Florida dairy farms were purchased heifers, and only 29 per cent were raised. The proportion of all replacements accounted for by raised heifers varied inversely with farm size which supports the hypothesis that increasing specialization and volume of investment leads to the purchase of a larger proportion of all replacements. The Jersey breed accounted for 40 per cent of all replacements, including 71 per cent of all purchased cows. The Holstein and Guernsey breeds accounted for 27 and 18 per cent respectively of all replacements. Holsteins and Jerseys accounted for 37 and 33 per cent respectively of all purchased heifers.

Most of the replacements purchased in the Tennessee milksheds were from local sources with 46 per cent from local farmers. Local auction sales were an important source in the Memphis milkshed but only a minor source in the other milksheds. Cattle dealers provided 20 per cent and 19 per cent of all replacements in the Nashville and Memphis milksheds respectively, but only a very small proportion in the other Tennessee milksheds. A large proportion, 44 per cent, of all purchased heifers

came from other sources; most of these appear to have been Holstein heifers brought in from northern states and Canada. This is closely related to the fact that 72 per cent of all purchased heifers in the Tennessee milksheds were Holstein.

Only 37 per cent of all replacements used by Florida dairy farmers were from the local sources including local farmers, auction sales, and cattle dealers. The remainder, almost two-thirds of all purchased replacements, were purchased from various other sources. Most of the cattle reported as purchased from other sources, cattle dealers, and auction sales probably came directly or indirectly from other states or Canada; so the small proportion, only 7 per cent of purchased replacements, that was purchased from local farmers was considered to have been produced locally.

Fifty-nine per cent of all heifer calves were kept to be raised in the Tennessee milksheds. Ten per cent were reported to have died, and nearly all of the remainder were sold as baby calves. This indicates that, as a group, the dairy farmers in these milksheds were keeping approximately the number of heifer calves that would be needed to provide all replacements. Those sold as baby calves were probably grown for replacements or used for other purposes according to relative prices. Florida dairy farmers, however, kept only 34 per cent of their heifer calves and sold 62 per cent. The proportion kept to be raised is clearly too small to supply needed replacements. Most of those sold as baby calves appeared to be going to beef markets rather than being raised for replacement purposes. The large number of calves being sold by these dairy farmers provides a very large potential source of calves to be

raised for replacement purposes.

The average price for all purchased heifers was $255 for sampled farms in the Tennessee milksheds. Prices were lowest for purchases from auction sales and highest for purchases from "other sources." Prices paid for purchased heifers by the Florida dairy farmers averaged $276. The highest prices were for purchases from cattle dealers with those from "other sources" being nearly as high. The differences in prices paid among the four sources appeared to be related to the proportion of Holstein heifers included for both Tennessee and Florida. The average price difference between Tennessee and Florida would probably have been much greater except for the fact that a much larger proportion of the purchased heifers were Holstein in the Tennessee milksheds than in Florida.

The annual heifer sales sponsored by the three artificial breeding associations in Tennessee were summarized for 1957-59. Most of the bred heifers sold at these sales were purchased by Tennessee dairy farmers; however, some of them went to various other states including Florida, Georgia, and Texas. Average prices for these sales for Jersey heifers were $221, $237, and $219 for the years 1957, 1958, and 1959 respectively. These prices, when compared to Florida average prices, suggest that many more heifers might have moved into Florida markets from these sales if a larger number had been available.

Although replacement practices were quite different for dairy farmers in Florida than for those in Tennessee milksheds, purchases from Tennessee farmers were an important source of replacements for both areas. Sales of dairy replacements by Tennessee farmers appear to have had a value of about two and one-half and one and one-half million dollars in

the Tennessee milksheds and Florida respectively.

The higher replacement rates and the likelihood of an increasing number of cows makes the potential sale of replacements in Florida quite large. Information on replacement practices and recent dairy cattle imports indicate that the major part of replacement needs are being filled by purchases from several states and Canada. The large demand in Florida for Jersey and Guernsey cattle has allowed large numbers of these cattle to move from Tennessee to Florida at a time when the demand in Tennessee was stronger for Holsteins.

Tennessee's locational advantage and adaptability to cattle production may allow more of the replacement needs in both Tennessee and Florida to be filled by Tennessee farmers. Additional information is needed on the importance of location differences for dairy replacements and the relative economy of various replacement practices in order to more accurately chart the future course of the production of dairy cattle replacements.

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APPENDIXES

APPENDIX A

TABLE XXI

CHI-SQUARE TEST FOR REPRESENTATIVENESS, SELECTED SAMPLE, GRADE A DAIRY FARMS, FLORIDA, 1958

Category	Frequency		f-F	$(f-F)^2/F$
	Observed	Theoretical		
0- 49	34	34.61	- .61	.011
50- 99	41	43.98	-2.98	.202
100-149	30	24.84	5.16	1.072
150-199	15	17.30	-2.30	.306
200-249	12	10.38	1.62	.253
250-299	6	6.72	- .72	.077
300-399	7	9.36	-2.36	.595
400-499	8	7.74	.26	.009
500 and over	17	15.07	1.93	.247
Total	170	170.00	-	2.772[a]

[a]The 95 per cent limit was 15.51.

TABLE XXII

SOURCES OF PURCHASED HEIFERS, 351 GRADE A DAIRY FARMS, FIVE TENNESSEE MILKSHEDS, 1958

	Knoxville	Nashville	Chattanooga	Appalachian	Memphis	Five Milksheds
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Local Farmers	35.9	29.2	62.4	29.7	20.2	32.2
Auction Sales	4.7	6.7	17.9	3.4	9.6	7.7
Cattle Dealers	7.8	40.5	17.9	4.2	14.0	16.3
Other Sources	51.6	23.6	1.8	62.7	56.2	43.8
All Sources	100.0	100.0	100.0	100.0	100.0	100.0

TABLE XXIII

SOURCES OF PURCHASED COWS, 351 GRADE A DAIRY FARMS,
FIVE TENNESSEE MILKSHEDS, 1958

	Knoxville	Nashville	Chattanooga	Appalachian	Memphis	Five Milksheds
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Local Farmers	73.9	47.8	100.0	67.6	36.4	53.2
Auction Sales	18.9	10.9	-	8.1	36.0	21.4
Cattle Dealers	-	11.4	-	10.8	19.9	12.3
Other Sources	7.2	29.9	-	13.5	7.7	13.1
All Sources	100.0	100.0	100.0	100.0	100.0	100.0

TABLE XXIV

SOURCES OF PURCHASED HEIFERS, 170 GRADE A DAIRY FARMS, FLORIDA, 1958

	Small	Medium	Large	Very Large	All Farms
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Local Farmers	11.1	4.5	7.8	-	6.8
Auction Sales	11.0	0.5	1.0	-	2.4
Cattle Dealers	24.1	36.1	32.0	59.7	35.2
Other Sources	53.8	58.9	59.2	40.3	55.6
All Sources	100.0	100.0	100.0	100.0	100.0

TABLE XXV

SOURCES OF PURCHASED COWS, 170 GRADE A DAIRY FARMS, FLORIDA, 1958

	Small	Medium	Large	Very Large	All Farms
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Local Farmers	26.4	54.7	1.6	-	7.1
Auction Sales	20.1	-	-	9.3	9.6
Cattle Dealers	7.9	28.5	98.4	-	4.9
Other Sources	45.6	16.8	-	90.7	78.4
All Sources	100.0	100.0	100.0	100.0	100.0

APPENDIX C

DEPARTMENT OF AGRICULTURAL ECONOMICS
UNIVERSITY OF TENNESSEE

Code No._____

Study of Dairy Herd Replacements

I. How many milk cows, including heifers that had freshened, were in your herd on January 1, 1959 (number)_____, January 1, 1958 (number)_____.

II. How many milk cows did you sell last year? (number)_____ How many died? (number)_____

III. How many home raised dairy heifers did you add to your herd in 1958 by breed?

Ayrshire	(number) _____	Jersey	(number) _____
Brown Swiss	(number) _____	Mixed	(number) _____
Guernsey	(number) _____	Other	(number) _____
Holstein	(number) _____		

IV. How many bred heifers did you buy in 1958 by breed?

Ayrshire	(number) _____	Jersey	(number) _____
Brown Swiss	(number) _____	Mixed	(number) _____
Guernsey	(number) _____	Other	(number) _____
Holstein	(number) _____		

Where were these bred heifers bought:		Average prices paid:
From other local farmers	(number) _____	$_____
At local auction sales	(number) _____	$_____
From local cattle dealers	(number) _____	$_____
From other sources	(number) _____	$_____

(Please indicate area for other sources)_____

_____

V. How many dairy cows and heifers that had freshened did you buy in 1958 by breed?

Ayrshire (number) _____ Jersey (number)_____

Brown Swiss (number) _____ Mixed (number)_____

Guernsey (number) _____ Other (number)_____

Holstein (number) _____

Where were these animals bought:

From other local farmers (number) _____

At local auction sales (number) _____

From local cattle dealers (number) _____

From other sources (number) _____ (Please indicate area for other sources)_____

VI. What did you do with the dairy-type heifer calves born on your farm last year:

Kept to raise (Number) _____ Sold for veal (number) ____

Sold as baby calves (Number) _____ Died (number) ____