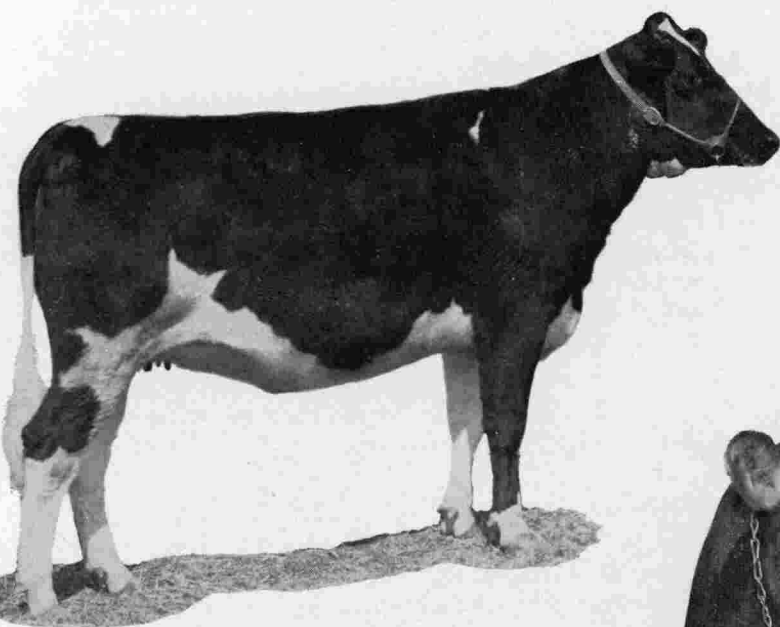


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the Dairy Cattle Replacement Markets of Tennessee and Florida

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SUMMARY

- A study was made of the dairy cattle replacements on 443 Grade A dairy farms in five Tennessee milksheds and 170 Grade A dairy farms in Florida. 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 average size of herd for the farms in Tennessee milksheds was 33 cows per farm. The average size of herd in Florida was 194 cows per farm.

- The average replacement rate for the five Tennessee milksheds was 20 percent, and the total number of replacements was 34,033 for the five milksheds. The average replacement rate for Florida dairy farms was 28 percent, and the estimated total number of replacements was 44,224 in 1958.

- In the Tennessee milksheds, 60 percent of all replacements were raised by the dairy farmers and added to their own herds while 26 percent of all replacements were purchased cows and only 14 percent were purchased heifers. Holsteins accounted for 46 percent of all replacements in the Tennessee milksheds; 20 percent were Jersey, and 13 percent were Guernsey. Nearly one-half, 47 percent, of all replacements on Florida dairy farms were purchased heifers, and only 29 percent were raised by the dairy farmers and added to their own herds. The Jersey breed accounted for 40 percent of all replacements while the Holstein and Guernsey breeds accounted for 27 and 18 percent, respectively.

- Most of the replacements purchased in the Tennessee milksheds were from local sources: 46 percent from local farmers, 17 percent from local auction sales, and 14 percent from local cattle dealers. Twenty-four percent of all purchased replacements came from other sources. Only 37 percent of all replacements used by Florida dairy farmers were from local farmers, local auction sales, and local cattle dealers. The remainder, almost two-thirds of all purchased replacements, were bought from various other sources. The average price paid for all purchased heifers was \$255 in Tennessee and \$276 in Florida.

- Fifty-nine percent of all heifer calves were kept to be raised in the Tennessee milksheds. Ten percent were reported to have died, and nearly all of the remainder were sold as baby calves. Florida dairy farmers, however, kept only 34 percent of their heifer calves and sold 62 percent.

- The annual heifer sales sponsored by the three artificial breeding associations in Tennessee were summarized for 1957-59. Most bred heifers sold at these sales were bought 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.

- In 1958 Tennessee farmers sold dairy replacements valued at about \$2½ million in Tennessee and around \$1½ million in Florida. 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. Whether dairy cattle replacements can be raised profitably with a particular farm situation must be determined according to principles of good farm management. Additional information is also needed relative to the cost of producing dairy heifers in Tennessee.

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The Dairy Cattle Replacement Markets Of Tennessee and Florida

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INTRODUCTION

Traditionally, dairy farmers have raised most of the animals which they needed for herd replacements. However, the dairy industry is undergoing many changes. Milk production is being increasingly concentrated and specialized on commercial dairy farms. In some areas specialization has resulted in many dairy farmers buying herd replacements rather than raising their own. If this occurs in Tennessee, it will most likely be in Grade A production areas.

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 This was over one-sixth of the total and was a larger number than was imported from any other state.

The Florida dairy cattle market has become an important source of agricultural income in Tennessee, and dairy replacement markets in Tennessee and Florida may provide the opportunity for a major expansion of dairy cattle production in Tennessee. However, information is needed relative to the present and potential markets for dairy replacements in these two states.

Scope and Importance of the Study

The Tennessee part of the study includes dairy farmers who produce milk for the five milk markets in the state which are regulated by a Federal Milk Marketing Order: Knoxville, Nash-

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

ville, Chattanooga, Appalachian (Bristol), and Memphis. The areas where producers are located who supply the markets with fluid milk are referred to subsequently as milksheds. All of the milksheds, except the Knoxville milkshed, include some milk production in one or more states other than 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.

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 \$69,901,000.² United States Department of Agriculture figures show 628,000 and 234,000 cows and heifers over 2 years old were kept for milk as of January, 1959, in Tennessee and Florida, respectively.

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 production in Florida was for Grade A use, while production in Tennessee included Grade A, ungraded, and family use.

The same source shows that, out of the cows and heifers kept for milk, 153,000 in Tennessee and 64,000 in Florida were eliminated in 1958 by culling, death, or farm slaughter.³ 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 for Tennessee and over \$12 million in Florida. At present, it is probable that a high percentage of the dairy cattle replacements in Tennessee are supplied by the dairy farmers themselves. However, for various reasons, Florida dairy farmers do not normally raise the major part of their replacements.

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.

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. Data were collected in the summer of 1959 for the calendar year of 1958.

Survey procedure for Tennessee. Data were obtained from 443 dairy farmers selected by random sampling. The production areas sampled were the five major milksheds in Tennessee, and the samples were 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 between 9 and 10 percent 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 mailed requests, total response with the mailed questionnaires reached approximately 70 percent. The information from non-respondents was obtained by personal interviews.

The sample for each milkshed was checked for representativeness by comparing the average pounds of base milk of farms in the sample with the average of all farms in the milkshed. The sample for each milkshed was within 2 percent of the average for the milkshed. The data obtained for the sampled farms included the number of cows on January 1, 1958 and January 1, 1959. The average of these was taken as the average number of cows per farm in 1958. With the average number of cows per farm established, the total number of cows was estimated from the total number of farms in each milkshed. The average number of farms per milkshed for 1958 was taken as the average of the number January 1, 1958 and the number January 1, 1959.

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 about 835 commercial dairy farmers in Florida, a sample of 170, or about 20 percent of all farms, was included in the survey.

Dairy Farming in Tennessee and Florida

The dairy farms of all major market areas of Tennessee are typified by the family farm on 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 livestock or poultry 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. Although dairy farmers have generally raised most of their replacements, 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. Tennessee has a favorable climate for raising dairy cattle and is well located geographically to supply needs for dairy cattle replacements in Florida as well as Tennessee.

In the western part of Florida, 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 are extremely wide variations in size and characteristics of dairy farms. Dairy farming in the Miami and surrounding areas is typified by the large corporate farm. Many of the dairy farms in the state are specialized operations producing fluid milk for sale. Jersey, Guernsey, and Holstein cattle are widely used; Brown Swiss and Ayrshire cattle are found less frequently. Average production for all milk cows in Florida was 5,220 pounds of milk per cow in 1958.⁴ The fact that the production level in Florida was higher than for surrounding states may have been due primarily to feeding practices, since Florida dairy farmers are reported to feed a higher ratio of concentrates to milk than do dairy farmers in other southeastern states.⁵

4. *Ibid.*, p. 3.

5. P. T. Dix Arnold, R. B. Becker, and A. H. Spurlock, *Dairy Cattle and Their Care*, Florida Agricultural Experiment Station Bulletin 599, August, 1958.

DAIRY REPLACEMENTS IN TENNESSEE

Replacement Rate

The replacement rate was calculated as the percentage of cows in the herd which was replaced during the year, using the number of cows eliminated and the average number in the herd during the year.⁶ Comparison of the number of cows added with the number eliminated indicates that herds are getting larger. This, however, does not mean that the total number of cows is increasing. The number of farms declined during 1958 in four out of the five milksheds; thus the total number of cows in the five milksheds appears to have remained about the same during the year.

Table 1 shows that the replacement rates for all milksheds, except the Memphis milkshed, were within a narrow range of 17 percent for Chattanooga to 19 percent for Nashville. The replacement rate for Memphis was 27 percent. This gives an average replacement rate for the five milksheds of slightly more than 20 percent or an average herd life per cow of 4.9 years.

Table 1.—*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		Percent	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
Total	34.2	7.0	9.0	20.4	4.9

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.⁷ The estimate of total replacements utilized by all dairy farms in the five milksheds was 34,033. The total number of replacements used per milkshed varied from 10,398 in the

6. 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 where the total number of cows decreases.

7. Data used in developing this estimate of the total number of cows are shown in Appendix A, Tables 1-4.

Memphis milkshed to 4,209 in the Appalachian milkshed due to differences in the replacement rate and the total number of cows. The estimated number of all replacements is shown by milkshed in Table 2.

Table 2.—Estimated Total Dairy Cattle Replacements on Grade A Dairy Farms, Five Tennessee Milksheds, 1958.

Milkshed	All cows	Replacement rate	All replacements
	Number	Percent	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
Total	166,384	20.4	34,033

Description of Replacements

All replacements were grouped under three headings: 1) heifers raised, 2) heifers purchased, and 3) cows purchased. Table 3 shows that in the five milksheds 60 percent of the animals added were heifers that were raised by the dairy farmers and added to their own herds. The average percent raised by milkshed ranged from 48 percent in the Memphis milkshed to 73 percent in the Chattanooga milkshed.

Purchased cows accounted for 26 percent of all replacements, while purchased heifers accounted for only 14 percent in the five milksheds. The large proportion of cows relative to heifers purchased as replacements can be explained in part by the decline in the number of dairy farms. As some dairy farmers quit, many of the cows in their herds move into the replacement market.

Table 3.—Heifers Raised, Heifers Purchased, and Cows Purchased as a Percentage of Total Replacements, 351 Grade A Dairy Farms, Five Tennessee Milksheds, 1958.

Description	Knoxville	Nashville	Chattanooga	Appalachian	Memphis	Five milksheds
	Percent					
Heifers raised	65.3	63.1	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

Breed of replacements. Animals added to herds were also classified on the basis of breed. 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. No differentiation was made between registered and grade animals.

Table 4 shows that Holstein cattle accounted for 46 percent and Jersey cattle 20 percent of all replacements in the Tennessee milksheds. Guernsey cattle accounted for 13 percent and cattle of mixed breeding accounted for 20 percent of all replacements during the year. Table 4 also shows that Holsteins made up 72 percent of all purchased heifers, but only 43 percent of heifers raised by dairy farmers and added to their own herds and 37 percent of all cows purchased and added to herds during the year. This suggests that the number of Holstein cattle was increasing relative to other breeds. Jersey cattle accounted for 24 percent of all heifers raised and added to herds, 6 percent of all purchased heifers, and 18 percent of the purchased cows. This indicates that the market for Jersey heifers in the five Tennessee milksheds was very weak in 1958 in comparison with the market for Holstein heifers.

Table 4.—Breed of Replacements, 351 Grade A Dairy Farms, Five Tennessee Milksheds, 1958.

Breed	Heifers raised	Heifers purchased	Cows purchased	All replacements
	Percent			
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	71.7	36.8	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

DAIRY REPLACEMENTS IN FLORIDA

Although the sample was considered to be representative of all Grade A dairy farms in Florida, there was some variation of the sample percentage among the various size groups. Since the variation in sample percentage was greatest among the groups of larger farms, these groups would have a noticeable effect on calculated averages or projected totals for all dairy farms. In order to refine these estimates, sample data were expanded by use of the expansion ratios shown in Appendix C, Table 1. All averages relating to herd size or number of animals added or eliminated per herd were derived after expanding each group as indicated.

Size of Herd

There was extreme variation in size of herd among sampled farms in Florida. The range of herd size included two with less

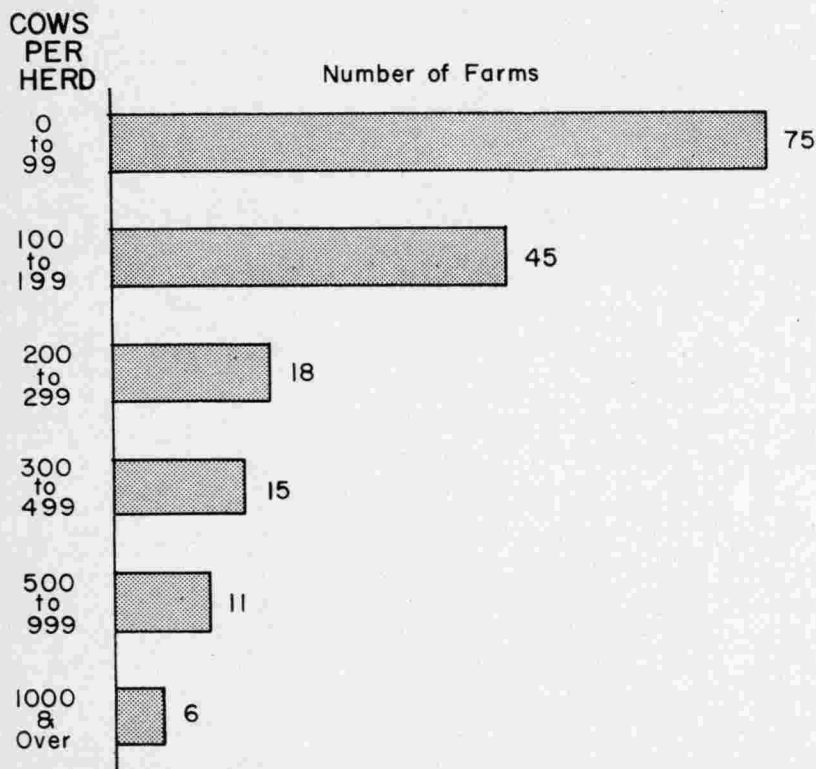


Figure 1. Distribution of farms by size of herd, 170 Grade A dairy farms, Florida, 1958.

than 20 cows per herd and six in the category of 1,000 or more.⁸ The distribution of sampled dairy farms is shown for various size groups in Fig. 1. The average size of herd was summarized for four size groups and is shown in Table 5. The weighted average size of herd for all farms was 194 cows per farm. Data reported by Greene, Warrington, and Brooke show the average size of herd in 1958 to be 157 cows per herd for Central Florida and 231 cows per herd for Northeast Florida.⁹

Table 5.—Average Size of Herd, 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		Percent	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

Replacement Rate and Total Number of Replacements

The replacement rates for small and medium size groups were 24 and 23 percent, respectively, while replacement rates for the larger groups were distinctly greater—32 percent for the large group and 28 percent for the very large group. The replacement rate for all farms was 28 percent. This indicates that the average herd life per cow was 3.6 years.

An estimate of the total number of replacements used on the 835 commercial dairy farms is shown in Table 6. In estimating total replacements, the number of cows eliminated was used as was done in the Tennessee survey.¹⁰

The estimated number of total replacements for 1958 was 44,224. Of the total, the 112 large and very large farms were estimated to have utilized 24,416, or somewhat more than one-

8. Size of herd, shown as the mean and median, for January 1, 1959, for all sampled herds in Florida was as follows: weighted mean—205 cows per farm, median—123 cows per farm. The relationships of these different measures of central tendency suggest a skewed distribution rather than a normal distribution. This skewness is evident in Figure 1.

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), 1959.

10. This probably underestimates the total Florida demand for dairy cattle in 1958 since the number of milk cows on Florida farms increased each year during the period 1949-58 (see footnote 6).

Table 6.—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

half of all replacements used on commercial dairy farms in Florida in 1958. This represents an average of 218 replacements per farm per year for the 112 farms. The 723 farms in the two smaller groups were estimated to have used 19,808 replacements, or about 16 per farm per year.

Description of Replacements

All replacements are shown in Fig. 2 as heifers raised, heifers purchased, and cows purchased. Nearly one-half, 47 percent, of all animals added to herds were purchased heifers. Heifers raised accounted for 29 percent of all replacements and

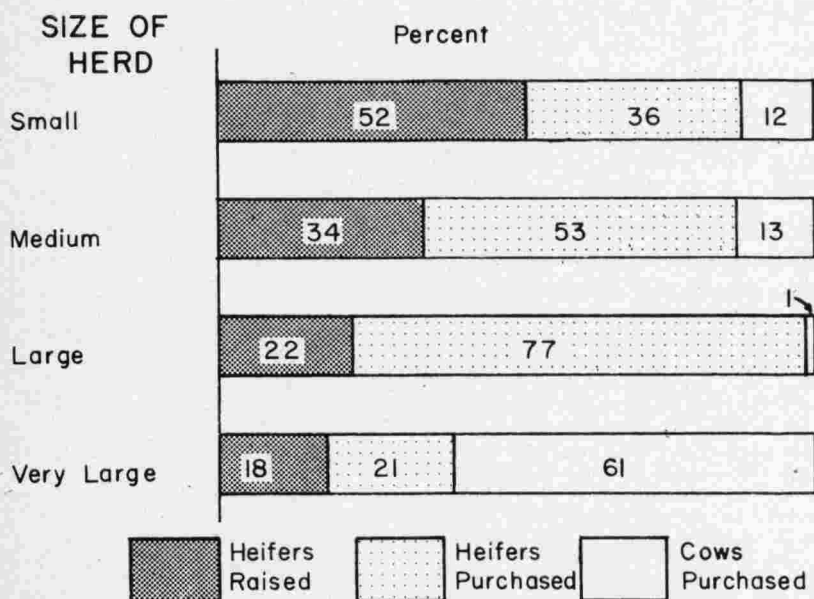


Figure 2. Heifers raised, heifers purchased and cows purchased as a percentage of total replacements, by size of herd, 170 Grade A dairy farms, Florida, 1958.

purchased cows accounted for 24 percent. The percentage of the total represented by heifers raised decreased as the size of farm increased. Heifers raised accounted for 52 percent of all replacements for small farms but only 18 percent for very large farms. Among the replacements purchased, heifers greatly exceeded cows except in the very large group where about three-fourths of the animals purchased were cows.

All reported replacements in the 170 sampled herds were classified on the basis of six breed categories: 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 7.

Table 7.—Breed of Replacements, 170 Grade A Dairy Farms, Florida, 1958.

Breed	Heifers raised	Heifers purchased	Cows purchased	All replacements
	Percent			
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

The Jersey breed accounted for 40 percent of all replacements while Holsteins accounted for 27 percent and Guernseys accounted for 18 percent. Mixed and other breeds were 13 percent of all replacements, while Ayrshire and Brown Swiss together accounted for less than 3 percent. Heifers raised were rather evenly distributed among breeds: Holstein, 27 percent; Guernsey, 25 percent; Jersey, 24 percent; and mixed and other, 20 percent. The Holstein and Jersey breeds accounted for most of the purchased heifers with 37 percent and 33 percent, respectively. The Jersey breed accounted for 71 percent of all purchased cows. It was noticeable that a large part of the Jersey replacements were cows, while most of the Holstein and Guernsey replacements were heifers.

SOURCES OF PURCHASED REPLACEMENTS AND FACTORS AFFECTING THOSE SOURCES

Sources of Purchased Replacements

The type of market source for all purchased replacements was divided into four categories: 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 of replacements was local farmers who accounted for 46 percent of the total. Farmers bought 17 percent of their replacements through auction sales and 14 percent from cattle dealers, while 24 percent of all replacements came from various other sources. The relative importance of each source is shown by milkshed in Table 8. Local farmers provided 84 percent of all replacements in the Chattanooga milkshed and 60 percent in the Knoxville milkshed. Auction sales were an important source in the Memphis milkshed, providing 29 percent of all replacements, but they accounted for only 14 percent for the Knoxville milkshed and less than 10 percent for each of the three other milksheds. Cattle dealers provided 20 percent and 19 percent of all replacements in the Nashville and Memphis milksheds, respectively, but they provided less than 8 percent in each of three other milksheds. Various other sources accounted for 20 to 44 percent of all replacements, except in the Chattanooga milkshed where they accounted for less than 1 percent.

Table 8.—*Sources of Purchased Replacements, 351 Grade A Dairy Farms, Five Tennessee Milksheds, 1958.*

Source	Knox-ville	Nash-ville	Chatta-nooga	Appa-lachian	Memphis	All farms
	Percent					
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

Fig. 3 shows the relative importance of the different sources for purchased heifers tended to be opposite to what it was for purchased cows. The major part of the cows purchased were from local sources, with 53 percent from local farmers and 21 percent

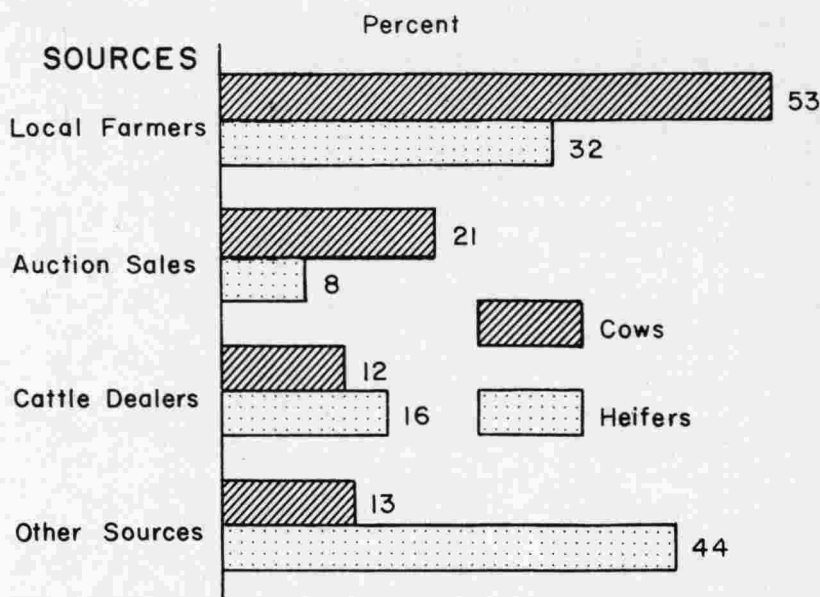


Figure 3. Sources of purchased heifers and cows, 351 Grade A dairy farms, five Tennessee milksheds, 1958.

from local auction sales. The large part of the cows coming from local sources probably resulted from 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 percent of all purchased heifers, while 44 percent came from other sources. The other sources were generally specified as northern states. This appears to be closely related to the fact that 72 percent of all purchased heifers were Holstein.

Sources of replacements in Florida. Local farmers were a very minor source of dairy replacements for Florida dairy farmers. They provided only 7 percent of purchased dairy replacements in Florida, compared to 46 percent for Tennessee milksheds. Local auction sales accounted for only 5 percent of Florida dairy replacements, while local cattle dealers accounted for 25 percent and various other sources accounted for the remaining 63 percent.

The relative importance of each source is shown in Table 9 for small, medium, large, and very large farms. Purchases from local farmers represented 15 percent of all replacements purchased by farms in the small or medium groups, but only 8 percent 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 percent of all purchases. All groups reported cattle dealers as the second most important source of dairy cattle purchases, ranging from 15 percent for the very large group to 35 percent for the medium group. In all size groups, more than one-half of all purchased replacements came from other than local sources.

Table 9.—Sources of Purchased Replacements, 170 Grade A Dairy Farms, Florida, 1958.

Source	Size of Herd				All farms
	Small	Medium	Large	Very large	
			Percent		
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 had been recently imported from other states or Canada, but dairy farmers were usually not aware of the place of origin of the cattle they purchased through these auctions. Since nearly all purchased replacements, except those from local farmers, originated in states other than Florida, the number of herd replacements imported into Florida was about 93 percent of all purchased replacements. Applying the previous estimate that 71 percent of all replacements were purchased, then 93 percent of that amount—or 66 percent 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 who accounted for 35 percent of all purchased heifers but only 10 percent of all purchased cows. Fig. 4 shows that local farmers accounted for 7 percent of all purchases of both cows and heifers and that auction sales were the source of 10 percent and 2 percent of purchased cows and heifers, respectively. More than one-half of all purchases of both cows and heifers were from various other sources. The conclusion should

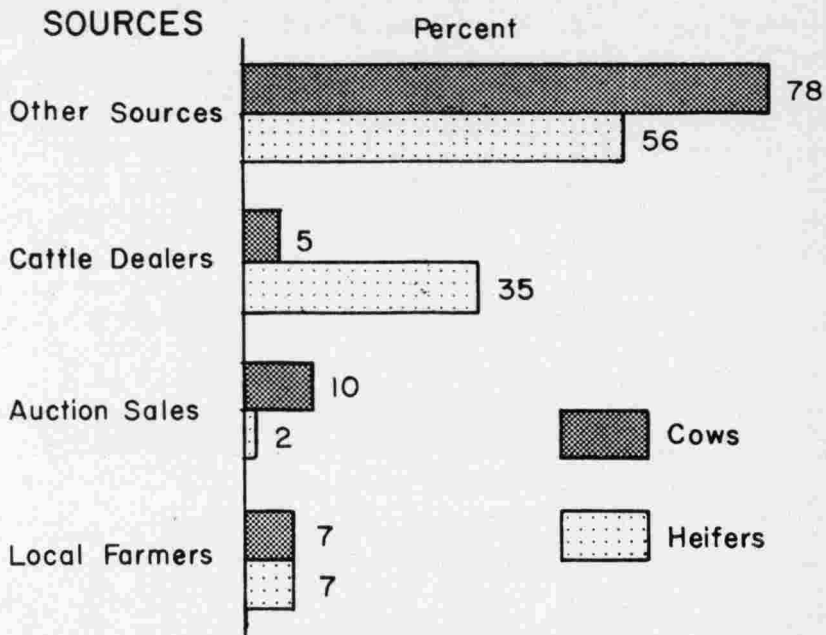


Figure 4. Sources of purchased heifers and cows, 170 Grade A dairy farms, Florida, 1958.

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 over-all dairy replacement market.

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 each source varied from \$182 for those from auction sales to \$290 for those from the other sources category as shown in Fig. 5. 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

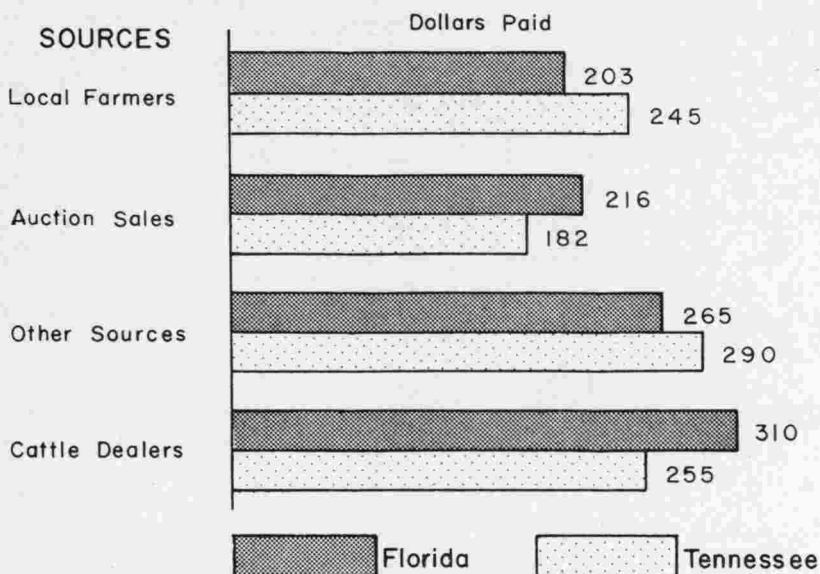


Figure 5. Prices paid for heifers by source, 170 Grade A dairy farms in Florida and 351 Grade A dairy farms in five Tennessee milksheds, 1958.

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 comparatively lower. The replacements purchased from various other sources were generally reported as being Holstein cattle imported from northern states. Also, since a large proportion of these cattle were 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 between the five milksheds in Tennessee. The average prices paid for cattle from all sources by milkshed are as follows:

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

Prices paid by Florida dairy farmers. The average price paid for all purchased heifers was \$276 for sampled farms in Florida. The prices paid varied considerably between sources with a range from \$203 for purchases from local farmers to \$310 for purchases from cattle dealers as shown in Fig. 5. 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 bought from local farmers and at auction sales appear to have been primarily Jersey or Guernsey cattle, which partly accounts for the lower average prices reported for these sources. Since the heifers purchased from local cattle dealers and other sources were primarily from out of state, the higher average prices reported for purchases from cattle dealers were probably due to purchase of a larger proportion of Holstein cattle through local cattle dealers.

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 Tables 4 and 8 shows that for the Tennessee group, 72 percent of all purchased heifers were Holstein, compared to 18 percent for Guernsey and Jersey breeds combined; for Florida only 37 percent were Holstein and 53 percent 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 relative proportions of these breeds is important in evaluating the price averages.

Heifer Calves as Sources of Replacements

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

Disposition of heifer calves in Tennessee milksheds. Fifty-nine percent of all heifer calves were kept to be raised on sampled farms in Tennessee milksheds. Table 10 shows that dairy farmers in all Tennessee milksheds reported keeping more than one-half of their heifer calves to be raised. The majority of the remaining calves were reported sold as baby calves. All sampled farms reported an average of 28 percent disposed of in this way. Less than 3 percent of the calves in all five milksheds were sold for

veal, while an average of slightly more than 10 percent were reported to have died.

Table 10.—Disposition of Heifer Calves, 351 Grade A Dairy Farms, Five Tennessee Milksheds, 1958.

Disposition	Knox- ville	Nash- ville	Chatta- nooga	Appa- lachian	Memphis	All farms
	Percent					
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

All of the calves which died and those sold for veal obviously were eliminated as possible future replacements, but those kept to be raised or sold as baby calves may have been available as future replacements. Since the heifers kept to be raised represent replacements which these dairy farmers were producing, the data in Table 10 provide the basis for estimating the proportion of needed replacements which are produced in the milksheds. 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.¹¹ Since 59 percent of all heifer calves were kept to be raised, about 200 heifers probably were raised to calving time for each 1,000 cows in these milksheds. This is the same as the 1958 replacement rate and suggests that these dairy farmers as a group raised about 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 percent of all heifer calves were kept to be raised, while 62 percent were sold as baby calves. A very small number were reported as sold for veal, and less than 4 percent were reported to have died. The disposition of heifer calves by size of herd is shown in Table 11. Farmers in the small- and medium-size groups reported keeping 47 and 44 percent of all

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

heifers to be raised, while farmers in the large and very large groups reported keeping 24 and 27 percent, respectively. Farmers in the large and very large groups both sold 72 percent of their heifer calves as baby calves, while those with small farms sold 47 percent, and farmers with medium-size farms sold 50 percent.

Table 11.—Disposition of Heifer Calves by Size of Herd, 170 Grade A Dairy Farms, Florida, 1958.

Disposition	Size of herd				All farms
	Small	Medium	Large	Very Large	
			Percent		
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 percent of their heifer calves and part of these will be eliminated by death or sterility as suggested by Frick and Henry,¹² they probably were producing only 11 or 12 replacement heifers per year for each 100 cows. This is clearly less than one-half the number needed for replacement purposes.

Artificial Breeders' Heifer Sales

One relatively new source of replacements in Tennessee is the heifer sales being sponsored by the three artificial breeding 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 for the 1959 sale sponsored by the Tennessee Association at Nashville was available except for the destination of heifers from the sale.

Number of heifers. The East Tennessee sales were considerably larger than those sponsored by the other two associations.

12. *Ibid.*

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 44 for the same 3-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 3 years are shown in Fig. 6. The production of heifers sold in the East Tennessee sale was distributed throughout most of the area served by the association. The six counties which produced the largest number of heifers for the three Knoxville sales are as follows:

<u>Counties</u>	<u>Number of heifers</u>
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. 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 one county.

Breed of heifers. Jersey heifers accounted for 55 percent of all sales at these auctions. 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. Table 12 shows the number of heifers sold during the 3 years by breed for each sale location.

Table 12.—Number of Heifers Sold in Auction Sales Sponsored by Artificial Breeding Associations in Tennessee, 1957-59.

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

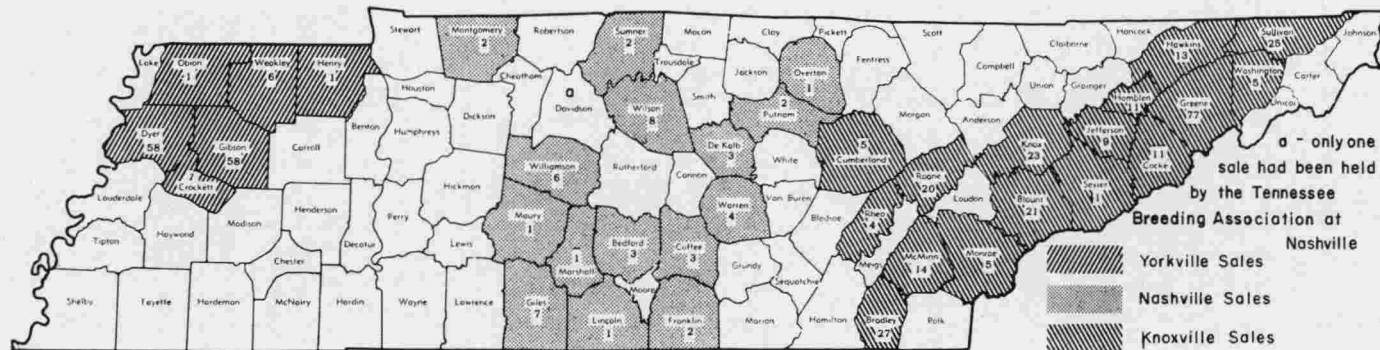


Figure 6. Areas of production of heifers and number per county sold in auction sales sponsored by Tennessee Artificial Breeding Associations, 1957-59.

Sale prices. The average price for heifers of all breeds varied considerably during the 3-year period even though the price for Jersey heifers was relatively stable as shown in Table 13. 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 3 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.

Table 13.—Average Sale Price for Heifers in Auction Sales Sponsored by Artificial Breeding Associations in Tennessee, 1957-59.

Breed	Year		
	1957	1958	1959
		Dollars	
Jersey	221	237	219
Guernsey	228	293	229
Holstein	286	397	319
Average	236	283	252

Destination of heifers from sales. A limited amount of information was available on the destination of heifers following the sales. Most heifers sold were bought by dairy farmers in the Tennessee counties served by the associations; however, records of the sales at Knoxville indicate that some heifers were moved to other southern states each year: 1957 sale—Georgia 10, 1958 sale—Virginia 3, and 1959 sale—Georgia 10 and 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. These figures probably do not represent all heifers leaving Tennessee, since cattle buyers who bought part of the Jerseys and Guernseys at these sales may have resold those heifers in other states. The destination of heifers from 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 3-year period reported would suggest that Holstein heifers are desired more by the buyers at these sales. This is supported by data on heifer purchases presented in the earlier section entitled "Dairy Replacements in Tennessee" which showed Holsteins to be 72 percent of all heifers purchased in the five major Tennessee milksheds. Nevertheless, despite the greater recent demand for Holsteins in Tennessee, the large proportion of Jersey and Guernsey cattle on Tennessee farms can be reduced markedly only 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 of heifers per sale has been rather small.

Estimated Value of the Tennessee and Florida Replacement Markets

The value of replacements in the two markets was determined for: 1) all replacements used, 2) all purchased replacements, and 3) for replacements which came from Tennessee. Fig. 7 shows that a large part of all replacements in both markets came from

Table 14.—Market Value of Dairy Cattle Replacements, 351 Grade A Dairy Farms in Five Tennessee Milksheds and 170 Grade A Dairy Farms in Florida, 1958.

Replacement market	Number of replacements	Average price ³	Market value
Tennessee			
All replacements	34,033	\$255	\$ 8,678,415
All purchased replacements	13,613	255	3,471,315
Purchases from Tennessee farmers	10,346 ¹	227	2,348,542
Florida			
All replacements	44,224	\$276	\$12,205,824
All purchased replacements	31,399	276	8,666,124
Purchases from Tennessee farmers	6,629 ²	276	1,829,604

1. Includes replacements purchased from all local sources: farmers, cattle dealers, and auction sales.
2. Represents all dairy cattle imports from Tennessee in 1958 as reported by the Florida Livestock Board.
3. The price used for Tennessee purchases from Tennessee farmers is the simple average of prices paid for heifers from all local sources: farmers, cattle dealers, and auction sales. Other prices are those paid for all heifers in the market.

Tennessee, even though the proportions of replacements raised and purchased were quite different for Tennessee and Florida. Table 14 shows that the value of all replacements was more than \$8½ million in the Tennessee market and more than \$12 million in the Florida market.

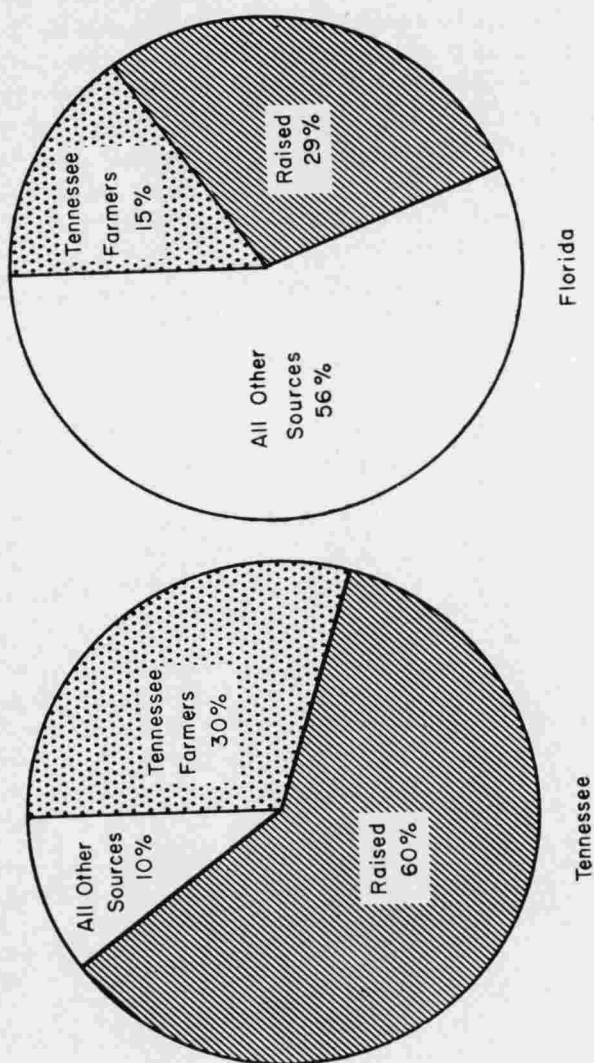


Figure 7. Sources of all replacements, 351 Grade A dairy farms in five Tennessee milksheds and 170 Grade A dairy farms in Florida, 1958.

APPENDIX A

Table 1.—Sample Number and Percent, Grade A Dairy Farms, Five Tennessee Milksheds, June, 1959.

Milkshed	Farms in milkshed	Farms in sample	
	Number	Number	Percent
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
Total	4,713	443	9.4

Table 2.—Number of Cows Per Farm, 443 Grade A Dairy Farms, Five Tennessee Milksheds, 1958.

Milkshed	January 1, 1958	January 1, 1959	1958 Average
		Number of cows	
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
Total	32.6	33.9	33.2

Table 3.—Average Number of Grade A Dairy Farms, Five Tennessee Milksheds, 1958.

Milkshed	January, 1958	January, 1959	1958 Average
		Number of farms	
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
Total	5,060	4,932	4,996

APPENDIX A (continued)

Table 4.—Estimated Total Number of Cows on Grade A Dairy Farms, Five Tennessee Milksheds, 1958.

Milkshed	All farms	Cows per farm	Total
		Number of cows	
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
Total	4,996	33.2	166,384

Table 5.—Sources of Purchased Heifers, 351 Grade A Dairy Farms, Five Tennessee Milksheds, 1958.

	Knox-ville	Nash-ville	Chatta-nooga	Appa-lachian	Memphis	Five milksheds
						Percent
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 6.—Sources of Purchased Cows, 351 Grade A Dairy Farms, Five Tennessee Milksheds, 1958.

	Knox-ville	Nash-ville	Chatta-nooga	Appa-lachian	Memphis	Five milksheds
						Percent
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

APPENDIX A (continued)

Table 7.—Sources of Purchased Heifers, by Size of Farm, 170 Grade A Dairy Farms, Florida, 1958.

	Small	Medium	Large	Very large	All farms
			Percent		
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 8.—Sources of Purchased Cows, By Size of Farm, 170 Grade A Dairy Farms, Florida, 1958.

	Small	Medium	Large	Very large	All farms
			Percent		
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

Table 9.—Heifers Raised, Heifers Purchased, and Cows Purchased as a Percentage of All Replacements, 170 Grade A Dairy Farms, Florida, 1958.

Description	Size of Herd				All farms
	Small	Medium	Large	Very large	
			Percent		
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

APPENDIX B

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. The calculations used in determining the value of chi-square are shown in Table 1. The theoretical frequency was based on data provided by the Florida Milk Commission.

Table 1.—Chi-Square Test for Representativeness,¹ Selected Sample, Grade A Dairy Farms, Florida, 1958.

Category	Frequency		f-F	(f-F)/F
	Observed (f)	Theoretical (F)		
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 ²

1. Wilfrid J. Dixon, and Frank J. Massey, Jr., *Introduction to Statistical Analysis* (Second edition; New York: McGraw-Hill Book Company, 1957), pp. 222-224.

2. The critical value at the 5 percent level was 15.51, so the observed value $\chi^2 = 2.772$ is clearly too small to cause us to reject the hypothesis that the sample is representative of all farms. If the number of farms falling into each category in the sample had been in the exact ratio of the theoretical frequency, 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.

APPENDIX C

Table 1.—Sample Percentage and Weight by Size of Herd, Commercial Grade A Dairy Farms, Florida, 1958.

Cows per herd	All farms	Sample	Sample	Expansion ratio
	Number	Percent		
Small				
Under 50	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	13	5	38.46	2.60
4,000 and more	1	1	100.00	1.00
Total	14	6	42.86	-----
Grand total	835	170	20.35	-----

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