

UNIVERSITY OF TENNESSEE

Upon the request of the Committee on Graduate Study
the under-signed have examined a thesis entitled

The Hairy Industry of Tennessee

presented by Paul Reaver

candidate for the degree of Master of Science

_____, and hereby certify that it
is worthy of acceptance.

W. C. Oliver W. H. Hylle)
Thos. B. Harrison)

Examiners.

THE DAIRY INDUSTRY IN TENNESSEE

by

Paul M. Reaves, B. S. in Agr.

SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF SCIENCE IN AGRICULTURE

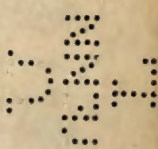
in the

GRADUATE SCHOOL

of the

UNIVERSITY OF TENNESSEE

August, 1928



ACKNOWLEDGEMENT

The author expresses his appreciation to Professor C. Elmer Wylie, Head of the Dairy Department, University of Tennessee, for his helpful advice and guidance in the preparation of this report.

N. L. B. 31 Dec. 1928. 1.00

CONTENTS

	Page
1. Introduction	
2. Natural Conditions in Tennessee for Dairying	1
✓3. History of the Dairy Industry of the State	2
✓4. The Kind of Cattle Used.	4
✓5. The Number of Cattle Used For Dairy Purposes, Their Value, and the Number of Young Cattle Being Grown.	5
6. Dairy Cattle Shipped in and out of the State	11
✓7. The Distribution of Dairy Cattle over the State	13
8. The Distribution of Registered Jersey Breeders over the State	17
9. Milk Production	
a. All cattle of state	19
b. cow testing association cows	23
c. Officially tested Jerseys	23
d. Factors affecting milk production by	25
e. Counties of the state (milk production by)	34
f. Tennessee champion producers	35
g. Total production of the state and its value	39
10. ✓ Manufactured Dairy Products and Manufacturing Plants	41
11. Distribution of Dairy Products	48
12. Results of Work on Controlling Onion Flavor and Odor in Milk	50

	Page
13. Texas Fever and Cattle Tick Eradication Work	53
14. Tuberculosis Eradication Work	54
15. Milk Ordinances and Milk Supply.	
a. State	55
b. Memphis	57
c. Knoxville	62
d. Nashville	71
e. Chattanooga	72
16. Dairy Organizations of Tennessee	74
17. Knox County Milk Producers Association	75
18. Cow Testing Associations--Knox County Cow Testing Association	78
19. Concluding Remarks	80
20. Bibliography.	

FIGURES

	Page
1. Number of Milk Cows in Tennessee, and Value per Head	7
2. Number of Dairy Heifers in Tennessee, (from one to two years old)	9
3. Number of Dairy Heifer Calves in Tennessee	10
4. Average Yearly Number of Dairy Cattle Shipped in and out of State	12
5. Distribution of Dairy Cattle in Tennessee, 1920	13
5a. Distribution of Milk Cows, by Counties, in Tennessee, 1924	14
5b. Number of Milk Cows per Square Mile, by Counties in Tennessee	14
6. Register of Merit Testers in Tennessee	17
7. Number of New Breeders and Inactive Breeders of Registered Jersey Cattle in Tennessee	17
8. Tennessee Registered Jersey Breeders and Owners by Counties	18
9. Daily Production by Months of Tennessee Cows 1926	21
10. Daily Production by Months of Tennessee Cows 1927	22

	Page
11. Yearly Production of Tennessee Cows	24
12. Variation in Milk and Fat Production According to Age in 305 day R. of M. Records for Tennessee Cows	30
13. Variation in Milk and Fat Production According to Age in 365 day R. of M. Records, for Tennessee Cows	30a
14. Variation in Production According to Month of Freshening, for Tennessee Cows	32
15. Comparison of Fat Production of Tennessee Register of Merit Cows and those of the United States; also Variation According to Month of Freshening	33a
16. Average Annual Production per Cow in Tennessee, in Gallons, by Counties, 1920	35
17. Total Production and Total Value of Milk in Tennessee	40
18. Trend of Creamery Butter Production in Tennessee	42
19. Trend of Butter Production in Tennessee	43
20. Trend of Farm Cheese Production in Tennessee	44a
21. Trend of Factory Cheese Production in Tennessee	44b
22. Dairy Manufacturing Plants in Tennessee	45

	Page
23. How Tennessee's Milk is Utilized	46a
24. How Tennessee's Dairy Products are Marketed	47a
25. Value of Dairy Products in Tennessee, 1920	48
26. Value of Dairy Products in Tennessee, by Counties, 1924	49
27. Channels of Knoxville's Fluid Milk Supply From Producer to Consumer, 1925	65

TABLES

	Page
1. Number and Value of Milk Cows	5
2. Number and Value of all Dairy Cattle	6
3. Number of Dairy Cattle According to Age	8
4. Increase or Decrease in Number of Dairy Cattle	8
5. Dairy Cattle Shipped in and out of Tennessee	11
5a. Area, Number of Milk Cows, and Number of Milk Cows per Square Mile, by Counties, in Tennes- see, 1925	14
6. Distribution of Registered Jersey Breeders over the State (by Counties)	17
7. Daily Production by Months of Tennessee Cows	20
8. A Comparison of the Production of All Tennes- see Cows, Cow Testing Association Cows and Register of Merit Jersey cows of Tennessee.	23
9. Variation of Production According to Age in the 305 day classes	27
10. Variation of Production According to Age in the 365 day Class	28
11. Comparison of Records of Immature Cows to Re- cords of Mature Cows	29
12. Production According to Month of Freshening	31

	Page
13. Comparison of Tennessee Register of Merit Jerseys with those of United States as a Whole	33
14. Average Production per Cow, by Counties, in Tennessee.	34
15. List of Tennessee Holstein Champion Producers	35
16. List of Tennessee Jersey Champion Producers	38
17. Total Milk Production and Value in Tennessee	39
18. Annual Creamery Butter Production	41
19. Annual Butter Production	41
20. Trend of Farm Cheese Production	44
21. Trend of American Cheddar Cheese Production	44
22. What Becomes of the Milk Produced in Tennessee?	46
22a. How are Tennessee's Dairy Products Marketed	47
23. Value of Dairy Products in Tennessee, by Counties, 1924	49
24. Results in Removing Onion Flavor and Odor from Milk with Mineral Oil	52
25. Status of Tick Eradication Work	53
26. Status of Tuberculosis Eradication Work	54
27. Milk Used Daily per Capita in Memphis and the Percent that is Pasteurized	60

	Page
28. Average Daily Sales of Dairy Products in Knoxville in 1912	62
29. Amount and Form in Which Sold, of Knoxville's Milk in 1925	62
30. Knoxville's Milk Supply	63
31. Distance of Knoxville's Milk Supply	63
32. Retail Milk, Bacteria Requirement in Knox- ville.	67

THE DAIRY INDUSTRY OF TENNESSEE

Introduction

As we study the history of Agriculture in the United States, we find that land becomes more valuable and there is less acreage per person to be fed from it. As a result, a more intensified form of agriculture must be supplied. We also find that as crops deplete the soil of its plant food, that livestock has been the means of bringing it back to profitable cultivation, and also the means of producing more human food per acre. For years beef cattle were in the foremost, as they could go out and graze on the grasses of the mountains and prairies and produce human food. This method was not yet intensified enough for certain sections, and the number of these sections have been and are increasing rapidly. The people of these sections are turning to the dairy cow to produce the increasing demand for man's most vital food, dairy products. She was found to be several times as efficient as the beef cow, in the production of food, and fit in well with intensive farm practices where small acreages must give the largest possible return. This has been especially true in the sections near large cities.

In Tennessee the conditions have not been different from that in the other parts of the United States. The methods of handling cattle and dairy products have gone through a wide range of changes up to the present day. Our dairy industry is demanding more and more labor, both on the farm and in the plants that handle and manufacture dairy products. The number of cattle needed, as well as the quality, is increasing continually, and the consumption of dairy products is also keeping pace with the strides of progress.

The object of this report is to give a brief history of the dairy industry in Tennessee, including the present status in dairy development, and some reasons for the changes which are taking place.

Natural Conditions in Tennessee for Dairying

In order for any industry to prosper to its fullest extent, it must be situated so that it may be benefitted by its environment. In Tennessee we find many natural conditions suitable for dairying, which we do not find in many parts of America. Climatic conditions do not reach either extreme, therefore we do not have the disadvantage of the extreme heat of the more southern portions, which under all conditions decrease the production; nor on the other hand do we have the extreme low temperatures along with the long winters of the North, which cause those dairymen to go to much expense for buildings. Much cheaper buildings will suffice for Tennessee. The long dormant period calls for much more stored feed for the cattle; also it keeps the animals housed more closely for so long a period that tuberculosis is more prevalent. In Tennessee, less than one half of one percent (.5%) of the cattle react to the tuberculin test. This fact makes a much greater demand for Tennessee cattle.

No sections of this state are now infected with cattle tick, which is a great menace to dairying farther south. We have a rather long pasture season and most

pasture grasses flourish here. The winter feed supply can readily be produced and we are near the cotton seed meal supply. Transportation facilities are good (and as we produce more dairy products than we use, we can send the surplus to the Southern market, to which we are much nearer than the great dairy states.

While we have many natural advantages in Tennessee, we must not lose sight of the fact that our average and total production is far below that of many other states. We have comparatively short, mild winters, yet we cannot go without proper protection; also the long growing season means long pasture season, but during droughts of the summer our cattle are forced to live on very scant rations which must be supplemented more than has been if we are to build up the production of our cattle. Quoting Hugh G. Van Pelt, ⁽²⁹⁾ before an assembly at the East Tennessee Farmers' Convention, at Knoxville, Tennessee: "If August lasted long enough in Tennessee, cows would starve to death."

History of the Dairy Industry in Tennessee (31)

Dairy cattle were introduced into Tennessee when people settled in the state. In 1840, Tennessee ranked

fifth in the United States in number of all cattle. There were 822,851 head in the state at that time. Milk cows were worth about \$15.00 per head and butter sold for ten cents per pound.

The first registered Jerseys brought into Tennessee, came in 1867. In 1878, Tormentor, a famous Jersey bull, was brought to Tennessee. His descendants have made much Jersey history. The Cleburne Jersey Farm at Spring Hill, Tennessee, is the oldest continuous Jersey breeding establishment in the world. Tennessee has more Jerseys than any other state east of the Mississippi River. *and south of the Ohio River* This state also ranks highest in percent of registered dairy cattle that are registered Jerseys.

In the early days the milk was used on the farm, and made into farm butter and farm cheese. From 1850 to 1860 there was being more butter made and less cheese.

During the war period the number of cattle decreased.

In the 1870 census report was given the first record of milk sold. In the decade 1870 to 1880, all phases of the dairy industry grew, and the improved economic conditions throughout the state enhanced the sale of dairy products. The yearly sale was more than twice that of ten years previous. Between 1880 and 1890 there was a great

cityward movement. At this time there arose around the cities the production of milk and its products for the city's consumption. At this period 83.5% of the farms reported dairy cattle.

The first cooperative creamery in Tennessee was organized in 1910 at Winchester, Franklin County.

The first cheese factory was organized in 1916 at Laurel Valley, Johnson County.

From 1910, the dairy industry developed rapidly in all its phases, as is shown later in this report.

The Kind of Dairy Cattle

The majority of the cattle of the state that are used for dairy purposes are grade Jerseys. They range from a small percentage of Jersey blood to extreme high grade animals and a small percentage of purebreds. This is a result of purebred bulls and bulls carrying Jersey blood, to have been more or less uniformly used throughout the state on the cows that were here, including scrubs and those being kept as beef cattle. Only one and seven tenths percent (1.7%) of the cattle used for dairy purposes are purebred, (27) giving a total of 11,347. Of the purebreds, eighty-three percent (83%) are Jerseys; twelve percent (12%) are Hol-

steins; one percent (1%) Guernseys; and the remaining four percent (4%) are Brown Swiss, Ayrshires and Milk-
ing Shorthorns.

Number of Cattle Used for Dairy Purposes

According to the report of January 1, 1928, (tables 1 and 2) there are 651,000 head of cattle used for dairy purposes in Tennessee; 446,000 of which are cows and heifers over two years old in milk; 93,000 are yearling heifers; and 112,000, heifer calves under one year old. This is an increase in milk cows of five percent (5%) over last year, and an increase of forty-six percent (46%) in total value, giving a total value for milk cows of \$25,400,000.00, or an average of \$57.00 per head.

Table 1 Number and Value of Milk Cows (25)

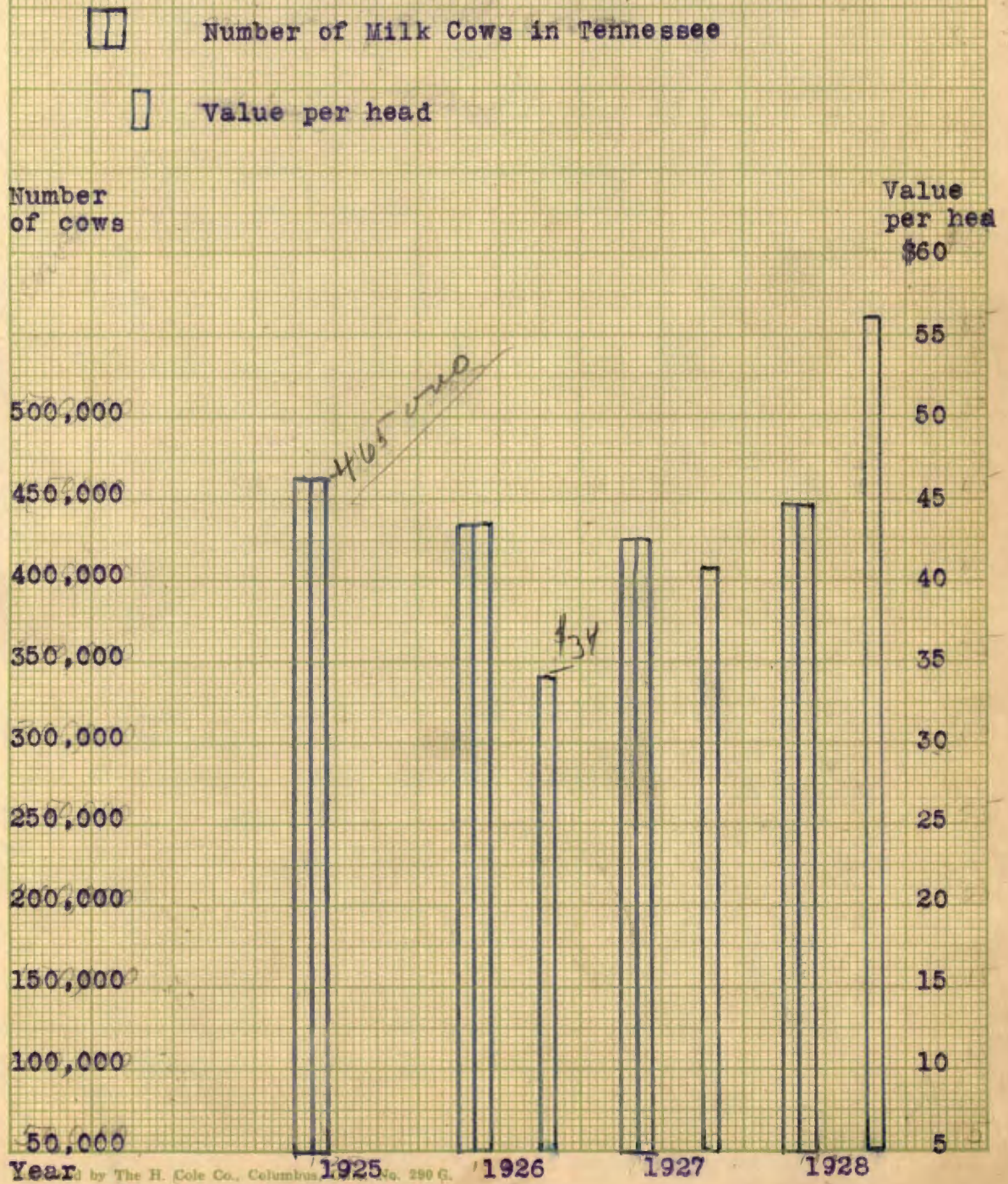
Year	Number	Total Value	Value per Head
1925	462,000	Not available	Not available
1926	434,000	14,756,000	34.00
1927	425,000	17,425,000	40.82
1928	446,000	25,422,000	57.02

The number of dairy cattle in the state ran very uniformly until after 1910 (table 2 and figure 1), when they almost doubled in a decade. Since 1920 there has been a decrease, but in 1927 and 1928 there has been an increase in number.

Table 2 Number and Value of all Dairy Cattle (25)

<u>Year</u>	<u>Number</u>	<u>Total Value</u>	<u>Value per Head</u>
1850	250,456		
1860	249,514		
1870	243,197		
1880	303,900		
1890	345,311		
1900	321,676	8,137,474	25.30
1910	397,104	11,999,755	30.22
1920	669,360	32,630,211	48.75
1925	645,000		
1926	595,000		
1927	606,000		
1928	651,000		

Figure 1.



The 1920 census report shows a total of 669,360 dairy cattle, (tables 3 and 4--figures 2 and 3), divided as shown by tables. There are 8760 bulls. This gives one bull for every 47 cows or for every 57 females over one year of age. For each five cows that are in milk, there are two heifers under one year old and one yearling heifer to replace and increase the milking herds. The reports for the years from 1925 to 1928 show that the number of heifers have decreased, but are on the increase.

Table 3 Number of Dairy Cattle According to Age (25-27)

Year	Milk cows	From 1 yr.-2 yr.	Under 1yr.	bulls	total
1920	415,128	79,595	135,877	8760	669360
1925	462,000	88,000	95,000	*	645000
1926	454,000	74,000	87,000	*	595000
1927	425,000	82,000	92,000	*	606000
1928	446,000	93,000	112,000	*	651000
*--Not Reported					

Table 4 Increase or Decrease---1928 as 100%

Year	Milk cows	From 1 yr.-2 yr.	Under 1yr.	bulls
1925	100.0%	100.0%	100.0%	100.0%
1926	93.9	84.0	91.5	92.2
1927	92.0	93.1	104.2	93.9
1928	96.5	105.6	107.3	100.9

Figure 2.

Number of dairy heifers (from one to two years old)
in Tennessee.

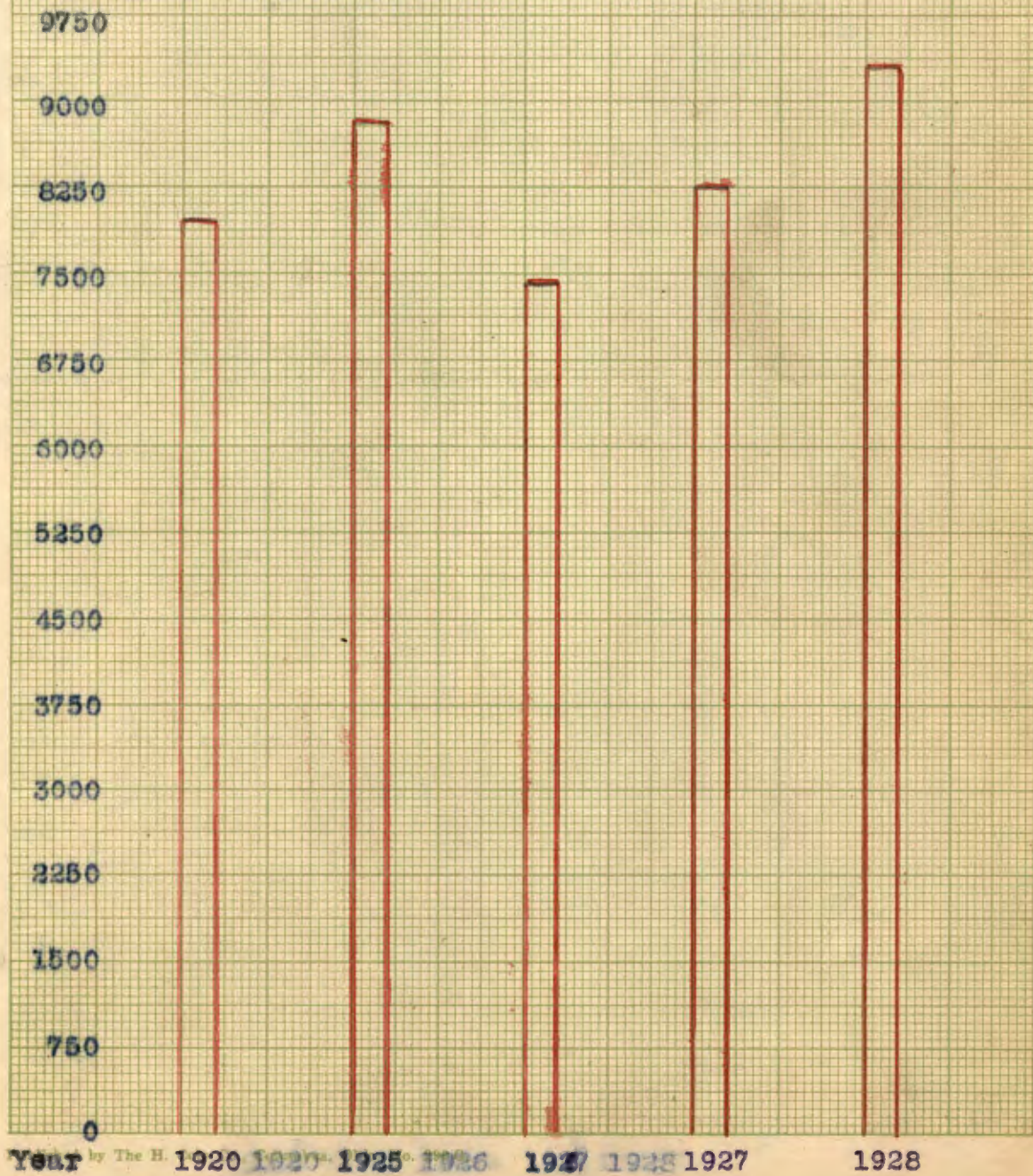


Figure 3.
170,000

160,000

150,000

140,000

130,000

120,000

110,000

100,000

90,000

80,000

70,000

60,000

50,000

40,000

30,000

20,000

10,000

0

Number of Dairy heifer calves
in Tennessee.

Year 1920 1925 1926 1927 1928

Published by The H. W. Sargent Co., Columbus, Ohio

Cattle Shipped in and out of State

The increasing demand for dairy cattle caused by larger consumption of dairy products and to replace the large number of T. B. reactors in the North and East, has caused an exceedingly large demand for Tennessee cattle, which show less than one half of one percent (.5%) reactors. (19)

The number shipped out in 1927 (table 5 and figure 4), was less than the two years previous because our own demand was greater. Those shipped in for the same period increased for the same reason. However they have been but a small percentage of those shipped out.

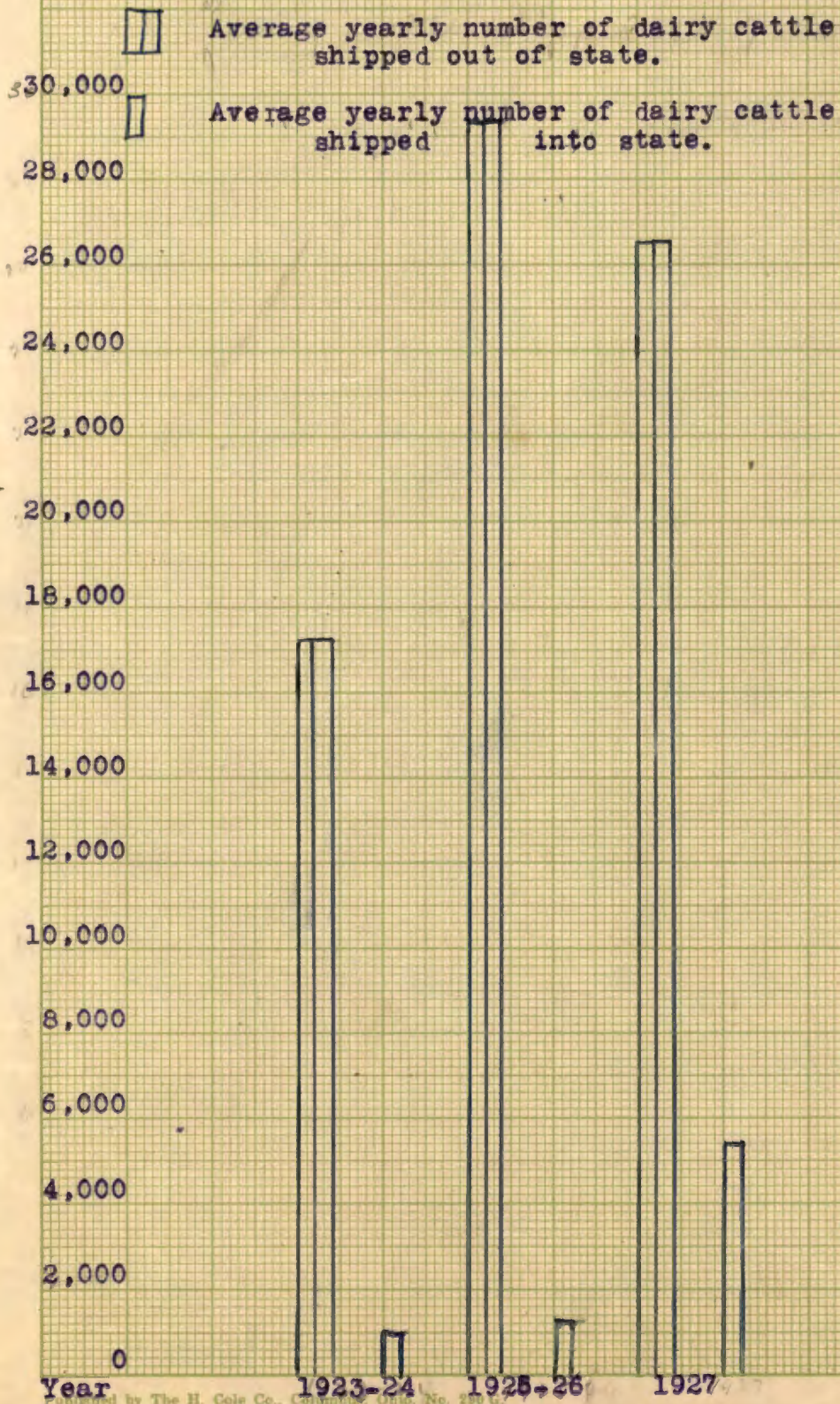
Table 5 Yearly average of Dairy Cattle (Reactor 5)
Shipped in and out of State (19)

Year	Yearly average shipped		Ratio	
	In	Out	Out	In
1923-24	1.046	17.195	100	6
1925-26	1.244	22.300	100	4.2
1927	5.413*	26.450*	100	20.4

Data obtained from office of State Veterinarian, from health certificate for cattle sent out and those brought in. Those that were shipped out to be slaughtered and tested in stock yards of other states, and then used for dairy purposes are not recorded nor included. (19)

*Estimated from first 8 mo. record of year.

Figure 4.



The Distribution of Dairy Cattle Over the State

The distribution of dairy cattle in the state is clearly shown by Figures 5 and 5a and Table 5a, the most being in Shelby County, Davidson County, and surrounding counties; also Hamilton county and Knox county have several. This is due to the fluid milk market of the larger cities, also in and around them are located the bulk of the creameries, ice cream plants and collecting stations. The distribution is fairly even from the northern to the southern boundaries of the state, in each of the three sections, but in the counties where these sections meet, there are very few dairy cattle due to the mountainous area and to the long distance from any of the larger cities or towns. The land is cheap and it is yet profitable to grow the less intensified crop of beef cattle.

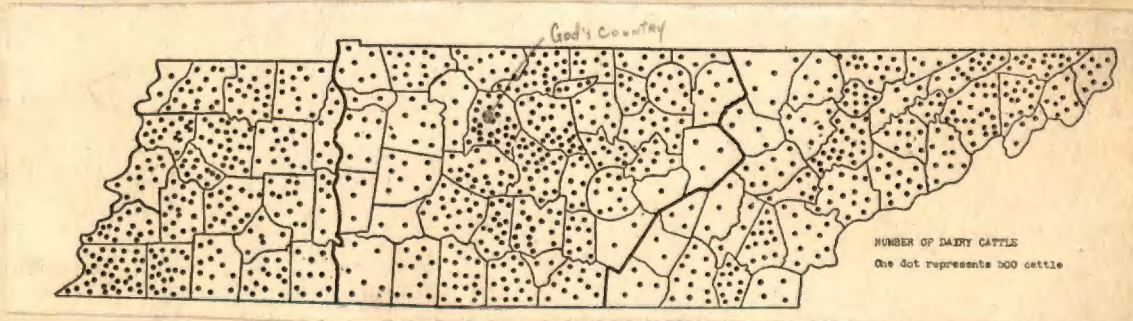
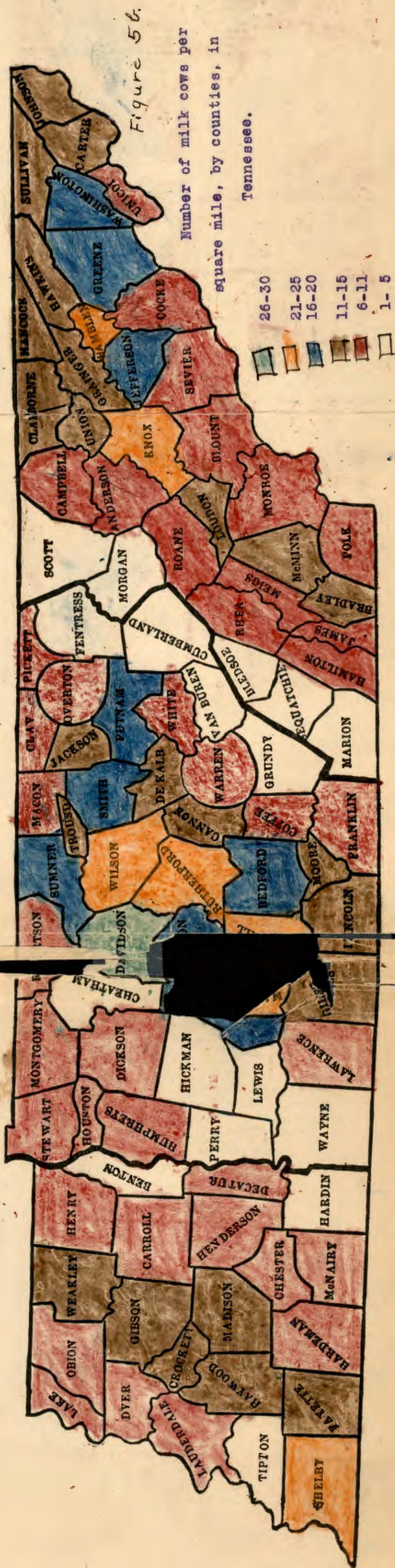


Fig. 5---Showing distribution of dairy cattle in Tennessee in 1920.

Figure 5a and Table 5a show the distribution of milk cows over Tennessee by counties, for the year 1924. This includes all cows that were milked.



Number of milk cows per
square mile, by counties, in
Tennessee.

Table 5a and Figure 5⁶ show the distribution of milk cows, according to area. Davidson County ranks first in number of milk cows per square mile. In that county, there are thirty head per square mile. Over the state, it varies from that to two per square mile. The counties with a large number of cattle, and a large area are not so thickly populated as some with smaller area.

Number of Cows in Tennessee by Counties

Table 5a, showing area, number of milk cows, and number milk cows per square mile by counties, in Tennessee in 1925.

County	Area in Sq. Mi.	Cows per County	Cows per Sq. Mi.
Davidson	511	15,264	30
Marshall	378	9,050	24
Hamblen	158	3,621	23
Rutherford	614	13,901	22
Knox	504	11,365	22
Wilson	613	13,528	22
Shelby	801	16,617	21
Putnam	404	4,352	19
Washington	325	6,465	19
Williamson	586	11,245	19
Greene	613	11,315	18
Jefferson	312	5,507	18
Smith	296	5,270	18
Sumner	558	9,444	17
Bedford	514	8,166	16
Maury	582	9,428	16
Giles	628	8,577	15

Table 5a (Continued)

County	Area in Sq. Mi.	Cows per County	Cows per Sq. Mi.
Hawkins	482	7,580	15
Trousdale	106	1,656	15
Union	235	3,581	15
Crockett	267	3,925	14
Fayette	618	8,870	14
Bradley	336	4,348	13
Cannon	268	3,561	13
Lincoln	587	7,675	13
Meigs	207	1,667	8
Loudon	219	3,103	13
Sullivan	436	8,513	12
Carter	353	4,190	12
Dekalb	311	3,923	12
Gibson	633	8,372	12
Grainger	307	3,667	12
Hancock	228	2,909	12
Haywood	508	6,293	12
McMinn	432	5,501	12
Madison	552	6,506	12
Weakley	580	6,978	12
Claiborne	468	5,217	11
Jackson	301	3,286	11
Johnson	294	3,174	11
Moore	141	1,646	11
Blount	571	5,875	10
Cocke	442	4,336	10
Macon	286	2,948	10
Montgomery	516	5,048	10
Obion	552	5,528	10
Coffee	442	4,239	9
Dyer	500	4,500	9
Hamilton	574	5,350	9
Overton	446	3,941	9
Robertson	455	4,170	9
Sevier	587	5,598	9
Warren	423	3,831	9
White	363	3,240	9
Anderson	342	2,758	8
Carroll	619	4,905	8
Franklin	575	4,327	8

Table 5a (Continued)

County	Area in Sq. Mi.	Cows per County	Cows per Sq. Mi.
Hardeman	697	5,322	8
Henry	626	4,824	8
Lauderdale	456	3,862	8
Lawrence	611	4,869	8
Polk	432	1,988	8
Rhea	365	2,827	8
Roane	380	3,184	8
Chester	313	2,309	7
Clay	254	1,860	7
Decatur	288	2,025	7
Dickson	549	3,694	7
Henderson	536	3,719	7
Monroe	673	4,501	7
Pickett	162	1,245	7
Stewart	449	2,992	7
Campbell	459	3,063	6
Houston	197	1,112	6
Humphreys	451	2,950	6
Lake	122	714	6
McNairy	588	3,875	6
Benton	456	2,242	5
Bledsoe	391	1,931	5
Cheatham	314	1,507	5
Hardin	582	3,046	5
Hickman	570	3,040	5
Tipton	442	6,640	5
Unicoi	201	1,077	5
Sequatchie	264	1,152	4
Marion	504	1,873	4
Cumberland	655	2,092	3
Pentress	486	1,632	3
Grundy	375	1,112	3
Lewis	286	916	3
Morgan	529	1,895	3
Peary	487	1,615	3
Scott	550	1,900	3
Wayne	749	2,450	3
Van Buren	293	676	2

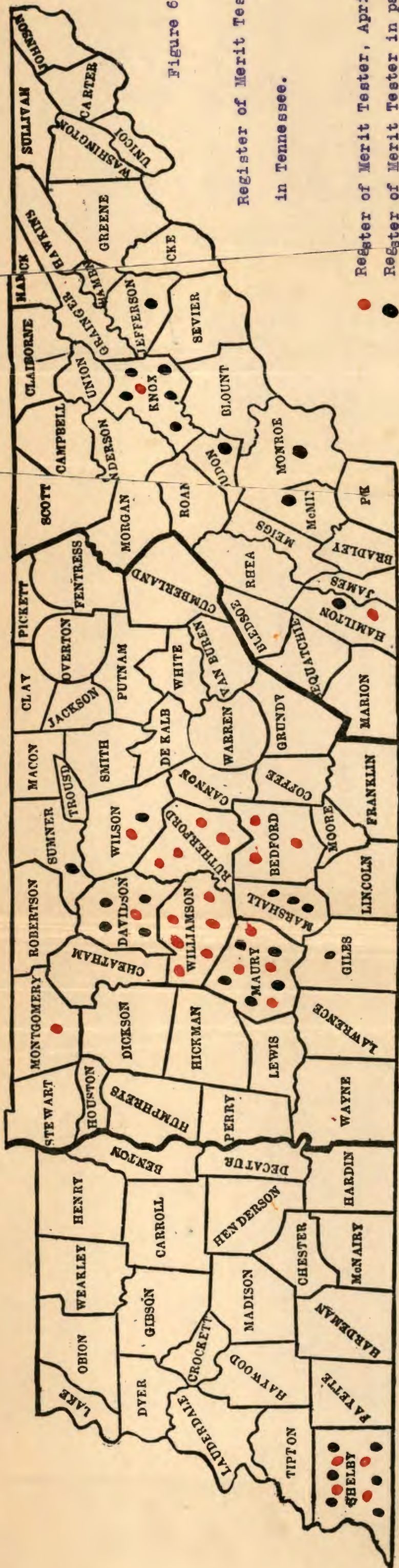


Figure 6.

Register of Merit Testers.
in Tennessee.

● Register of Merit Tester, April, 1928.
● Register of Merit Tester in past.

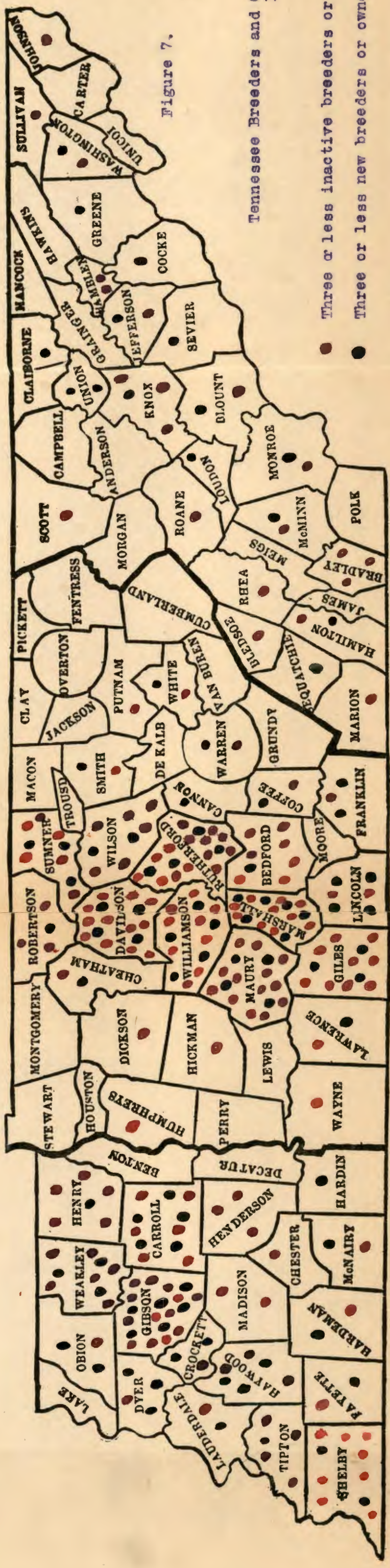


Figure 7.

Tennessee Breeders and Owners
1928

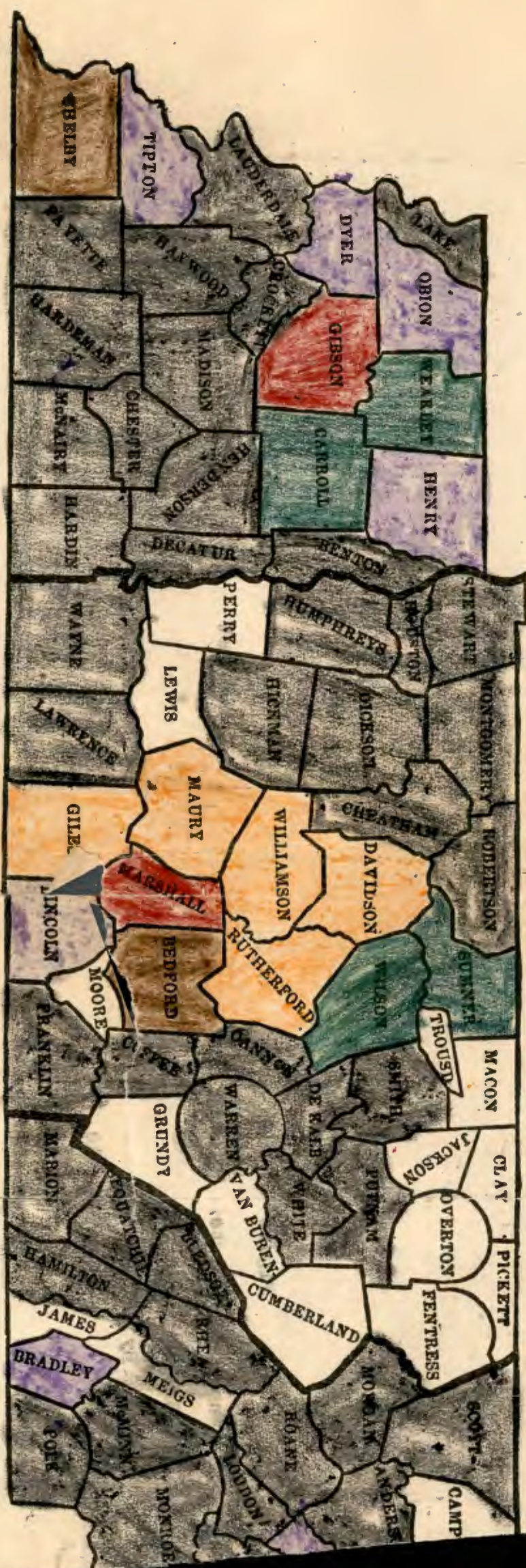
● Three or less inactive breeders or owners.
● Three or less new breeders or owners.

**Distribution of Breeders and Owners
of Registered Jersey Cattle (3)**

There are 79 counties in Tennessee that have some registered Jersey cattle. In these counties there are 3906 breeders and owners of them. The number per county for these counties ranges from 1 to 397. Of these, 235 are new owners and 501 are inactive. There are 26 who are conducting Register of Merit testing and 31 who have in the past. Table 6 and figures 6, 7, and 8 give the distribution by counties.

Table 6. Distribution of Jersey Breeders Over the State, also those that are New, Inactive, Testing or Having Tested Officially.

Rank	County	No. Breed- ers and Owners	Inactive Breeders	New Breeders	R.of M Tester	R.of M. Tester in past
1	Marshall	397	30	18	-	3
2	Gibson	370	39	24	-	-
3	Rutherford	242	41	12	4	-
4	Williamson	241	26	14	6	-
5	Davidson	238	31	12	1	4
6	Giles	225	25	10	-	1
7	Maury	223	36	8	4	5
8	Wilson	191	18	5	1	1
9	Carroll	176	18	14	-	-
10	Weakley	196	19	10	-	-
11	Sumner	151	18	9	-	-
12	Shelby	125	23	7	4	6
13	Bedford	122	19	2	3	-
14	Henry	83	15	4	-	-
15	Lincoln	75	7	13	-	-
16	Dyer	61	3	9	-	-
17	Knox	60	9	4	1	5



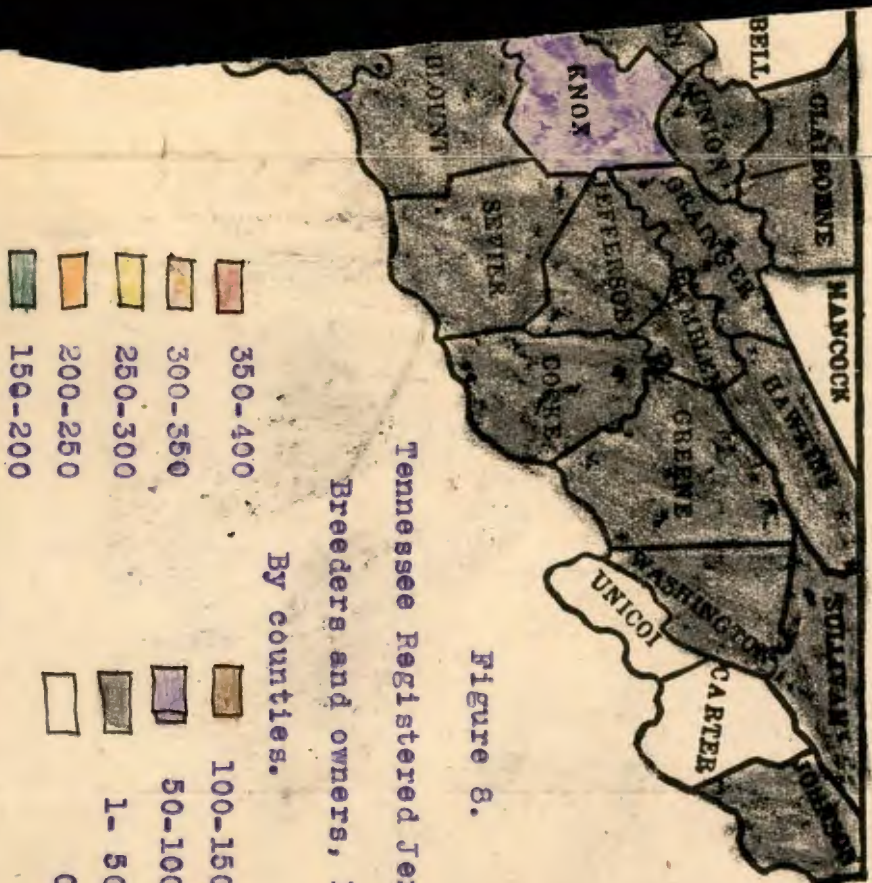


Figure 8.

Rank	County	No. Breed- ers and Owners	Inactive Breeder	New Breeder	R. of M Tester	R. of M. Tester in past
18	Obion	53	4	6	-	-
19	Bradley	53	9	-	-	-
20	Tipton	52	13	2	-	-
21	Haywood	49	8	6	-	-
22	Franklin	34	4	5	-	-
23	Madison	34	5	-	-	-
24	Robertson	33	9	2	-	-
25	Jefferson	27	6	1	-	1
26	Hardeman	27	2	1	-	-
27	Warren	23	3	1	-	-
28	Hamilton	22	3	1	1	1
29	Fayette	21	2	3	-	-
30	Lauderdale	20	4	2	-	-
31	Crockette	19	1	5	-	-
32	McMinn	18	2	3	-	1
33	Coffee	17	1	1	-	-
34	Montgomery	17	-	-	1	-
35	Washington	14	3	2	-	-
36	Henderson	14	8	-	-	-
37	Lawrence	13	2	1	-	-
38	Hamblen	13	6	-	-	-
39	Monroe	13	1	1	-	1
40	Loudon	13	-	1	-	1
41	Chester	11	1	-	-	-
42	White	11	1	1	-	-
43	Putnam	10	4	-	-	-
44	Smith	8	2	1	-	-
45	Blount	8	1	1	-	-
46	Rhea	8	2	-	-	-
47	Roane	8	1	-	-	-
48	McNairy	8	1	2	-	-
49	Bledsoe	7	3	-	-	-
50	Dickson	7	2	-	-	-
51	Hickman	7	2	-	-	-
52	Sullivan	6	3	-	-	-
53	Cannon	6	-	1	-	-
54	Dekalb	6	-	-	-	-
55	Greene	6	-	2	-	-

Rank	County	No. Breed- ers and Owners	Inactive Breeder	New Breeder	R. of M Tester	R. of M. Tester in past
55	Morgan	6	-	-	-	-
56	Union	5	-	2	-	-
57	Cheatham	5	2	1	-	-
58	Anderson	5	-	-	-	-
59	Hawkins	4	-	-	-	-
60	Marion	4	1	-	-	-
61	Humphrey	4	1	-	-	-
62	Sequatchie	2	-	1	-	-
63	Sevier	2	-	1	-	-
64	Benton	2	-	-	-	-
65	Cooke	2	-	-	-	-
66	Decatur	2	-	-	-	-
67	Grainger	2	-	-	-	-
68	Houston	2	-	-	-	-
69	Lake	2	-	-	-	-
70	Polk	2	-	-	-	-
71	Scott	2	1	-	-	-
72	Stewart	1	-	-	-	-
73	Wayne	1	1	-	-	-
74	Claiborne	1	-	1	-	-
75	Cooke	1	-	1	-	-
76	Hardin	1	-	1	-	-
77	Johnson	1	1	-	-	-
78	Pickett	1	-	-	-	-
79		3906	501	235	26	31

Milk Production

The 1920 estimated report for the average production of all milk cows in Tennessee is 2494⁽²⁷⁾ pounds of milk and 99 pounds of butter fat. The 1925 estimated production is⁽¹⁶⁾ about 2800 pounds of milk and 126 pounds of butter fat.

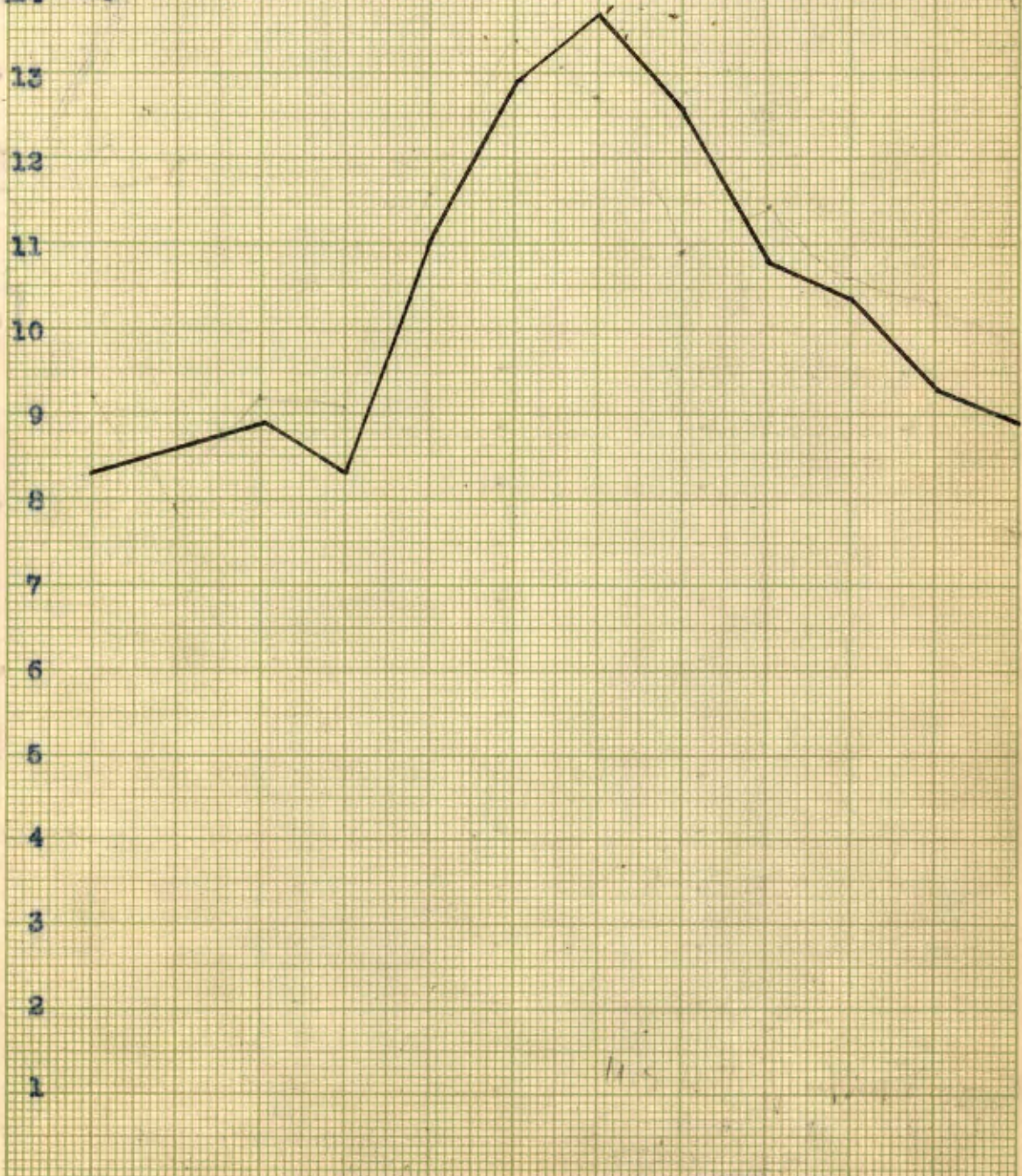
Table 7 and figures 9 and 10 show the trend of daily milk production for Tennessee cows from July 1925 to February 1928, and the total average production for the year.

Table 7-The Average Daily and Yearly Production by
Months and Years in Pounds for 1925, (25)
1926, 1927, 1928.

Month	1925	1926	1927	1928
January		8.3	8.3	8.3
February		8.6	8.9	9.7
March		8.9	9.2	
April		8.3	10.1	
May		11.0	11.9	
June		12.9	13.3	
July	11.1	13.7	13.7	
August	10.8	12.4	12.4	
September	9.6	10.8	12.7	
October	9.5	10.4	8.8	
November	7.7	9.5	10.7	
December	8.2	8.9	8.5	
Daily Average	9.8	10.3	10.6	
Yearly Average	3705	3828		

Figure 9.

Daily production by months of Tennessee cows. 1926

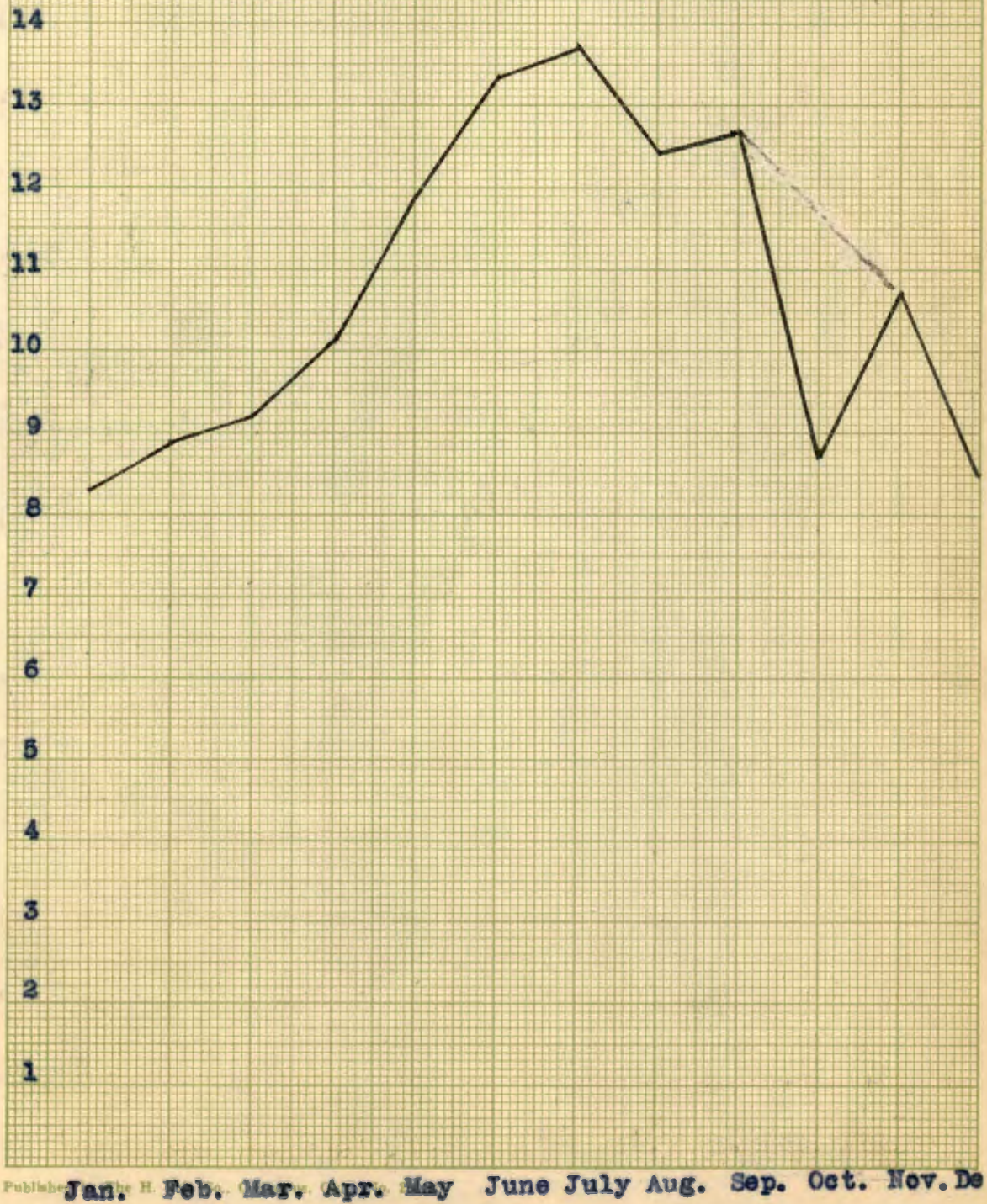
Pounds of milk
per day

Published by The H. Cole Co., Columbus, Ohio, No. 290 G.

Jan. Feb. Mar. Apr. May June July Aug. Sep. Oct. Nov. Dec

Figure 10.

Daily production by months of Tennessee cows, 1927.
Pounds of milk
per day.



Cow Testing Association records of Tennessee average about 4500⁽¹⁶⁾ pounds of milk and 218 pounds of butter fat. Up to 1925 there were 561 Register of Merit Jerseys in Tennessee and their averaged production calculated by averaging the age average, given in a table in Selecting Dairy Cattle--The Breeds, by C. E. Wylie,⁽³²⁾ gave 8,308 pounds of milk and 465 pounds of butter fat.

Up to 1928 there are 815 Register of Merit Jerseys in Tennessee. (30)

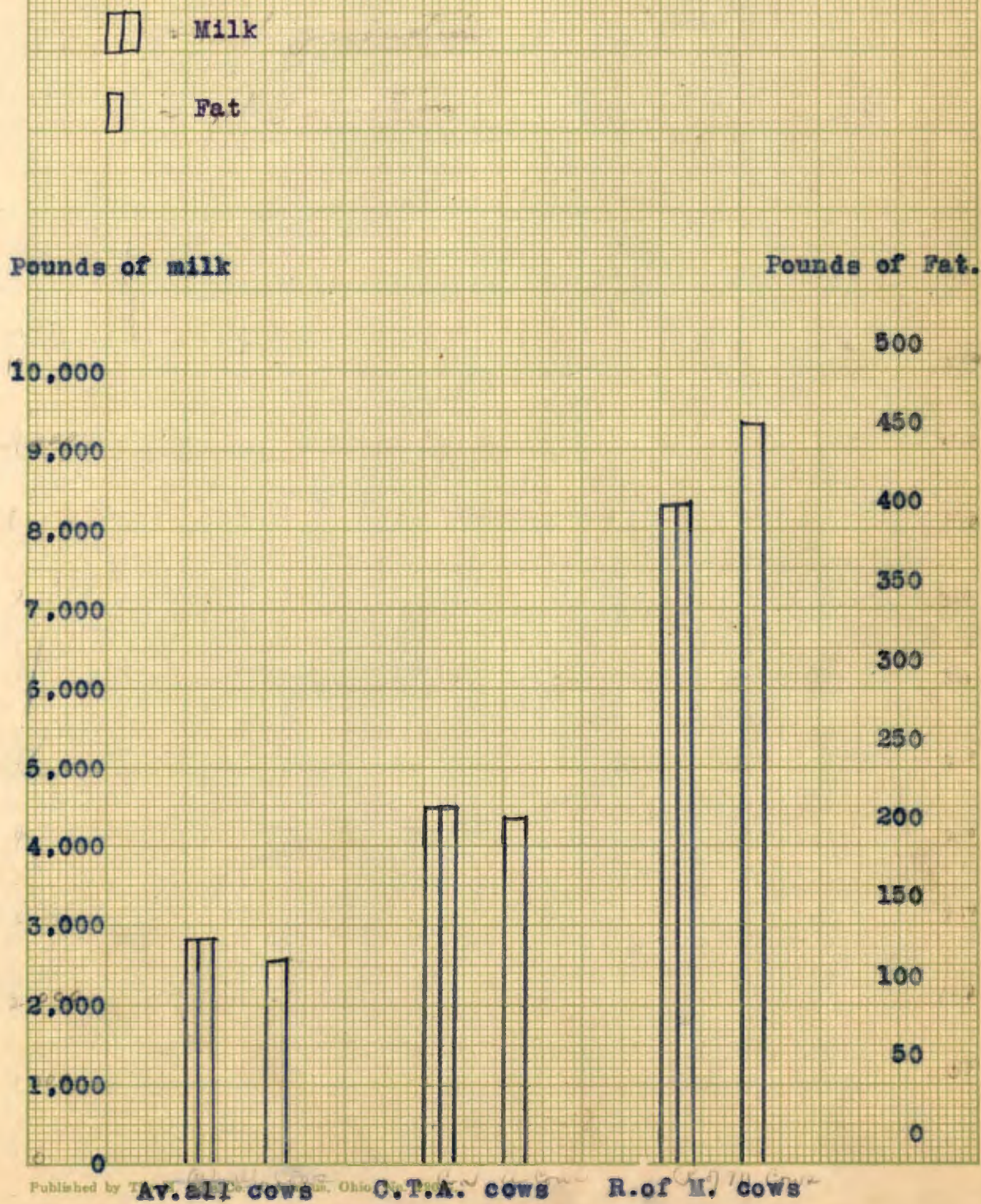
Table 8 A Comparison of the Production of all Tennessee Cows (1925), Cow Testing Association Cows (all) (32-16-21) and Officially Tested Jersey Cows (up to 1925).

Average all cows		Average C.T.A. cows	R. of M. Jerseys
Milk	# 2800	4500	8,308
Fat	# 126	218	465

Tables 15 and 16 show the class leaders of Holsteins and Jerseys, giving their owners, age, production, and length of test. (2-15)

Figure 11.

Yearly production of Tennessee Cows.



Factors Affecting Milk Production in Tennessee

In the past several years, students in Dairying at the University of Tennessee have attempted to find various factors that affect milk production, and especially in Tennessee. They have also compared the production of this state to that of the United States as a whole, under similar conditions.

(30)
Warner worked on the variation with age. He used 194 Register of Merit records of Jersey cows in Tennessee, with records of 305 days or less and 620 Register of Merit records of Jersey cows in Tennessee with records of 306 to 365 days in length. He found the average age of maturity to be six years. The variation with age, as he found it, did not conform to that of Eckles, probably due to the fact that he used the age of maturity as six years.

The results of his findings are tabulated in tables 9, 10, and 11, and are shown graphically in Figures 12 and 13. Warner compared the yearly production when freshening in the different months of the year. He found the highest production when freshening in January, the second highest in April, and the lowest when freshening in May. The results are tabulated in table 12 and are shown in figure 14.

The above averages were compared with the average of all Register of Merit cows in the United States. They showed a lower production for Tennessee cows, even though they were older. This comparison is given in table 13 and figure 15.

(6)
Burdette worked on the distribution and production of dairy cattle. He found that Tennessee ranks thirty-sixth among all states in the United States for the average production per cow. Tennessee ranked twenty-eighth in the United States for the highest butter fat record.

In working on the annual production per cow, by counties, he found that Robertson stood highest with 399 gallons, and Sequatchie lowest with 165 gallons. These results are shown in table 14 and figure 16.

(8)
Collins found that the highest production for the Tennessee Jerseys was in May and the lowest in December, there being a fairly regular increase until May and a corresponding decrease afterwards.

Table 9 Variation in Production According to Age
in 305-day Class. ⁽³⁰⁾ Figures compiled from records of
814 Register of Merit Cows in Tennessee (305 days or
less).

Age of Cow	Pounds Milk	Pounds Fat	Percent Fat	Number of cows
Yearling	5250.4	308.9	5.89	16
2-year old	6091.1	336.6	5.52	43
3-year old	7333.9	403.22	5.49	31
4-year old	7817.1	418.73	5.36	26
5-year old	7743.13	432.24	5.58	24
6-year old	8561.1	467.22	5.46	20
7-year old	7517.8	428.75	5.7	13
8-year old	7552.8	412.4	5.45	11
9-year old	9090.3	493.89	5.43	6
10-year old	8463.3	459.71	5.43	3
11-year old	11336.0	532.93	*	1
				194

Table 10. Variation of Production According to
Age in 365-Day Class (30)

Figures compiled from records of 815 Register of
Merit Jersey cows in Tennessee (306 to 365 days).

Age of Cow	Pounds Milk	Pounds Fat	Percent Fat	Number of cows
Yearling	6241.1	354.6	5.68	41
2-year old	6805.3	385.1	5.63	140
3-year old	7545.8	423.13	5.61	95
4-year old	8019.5	448.24	5.58	91
5-year old	8279.25	464.7	5.61	76
6-year old	8370.25	486.25	5.49	54
7-year old	8689.5	465.18	5.35	43
8-year old	9060.7	492.63	5.44	31
9-year old	9471.8	508.71	5.37	18
10-year old	8584.0	458.16	5.33	14
11-year old	9313.4	506.32	5.44	9
12-year old	9949.5	541.39	5.44	6
13-year old	9239.6	508.87	5.51	3
				620

Table 11. Comparison of the Records of Immature Cows With the Records of Mature Cows.

<u>Class</u>		<u>305-day record</u>		<u>365-day record</u>	<u>Eckles Standard</u>
<u>No. Cows</u>		<u>194</u>		<u>620</u>	
2-year old	Milk	71.1%		76.7%	70%
	Fat	71.9%		78.7%	70%
3-year old	Milk	85.6%		85.7%	80%
	Fat	86.3%		87.0%	80%
4-year old	Milk	91.3%		90.4%	90%
	Fat	89.7%		91.8%	90%

Figure 12. Variation in milk and fat production according to age in 305 day R. of M. records.

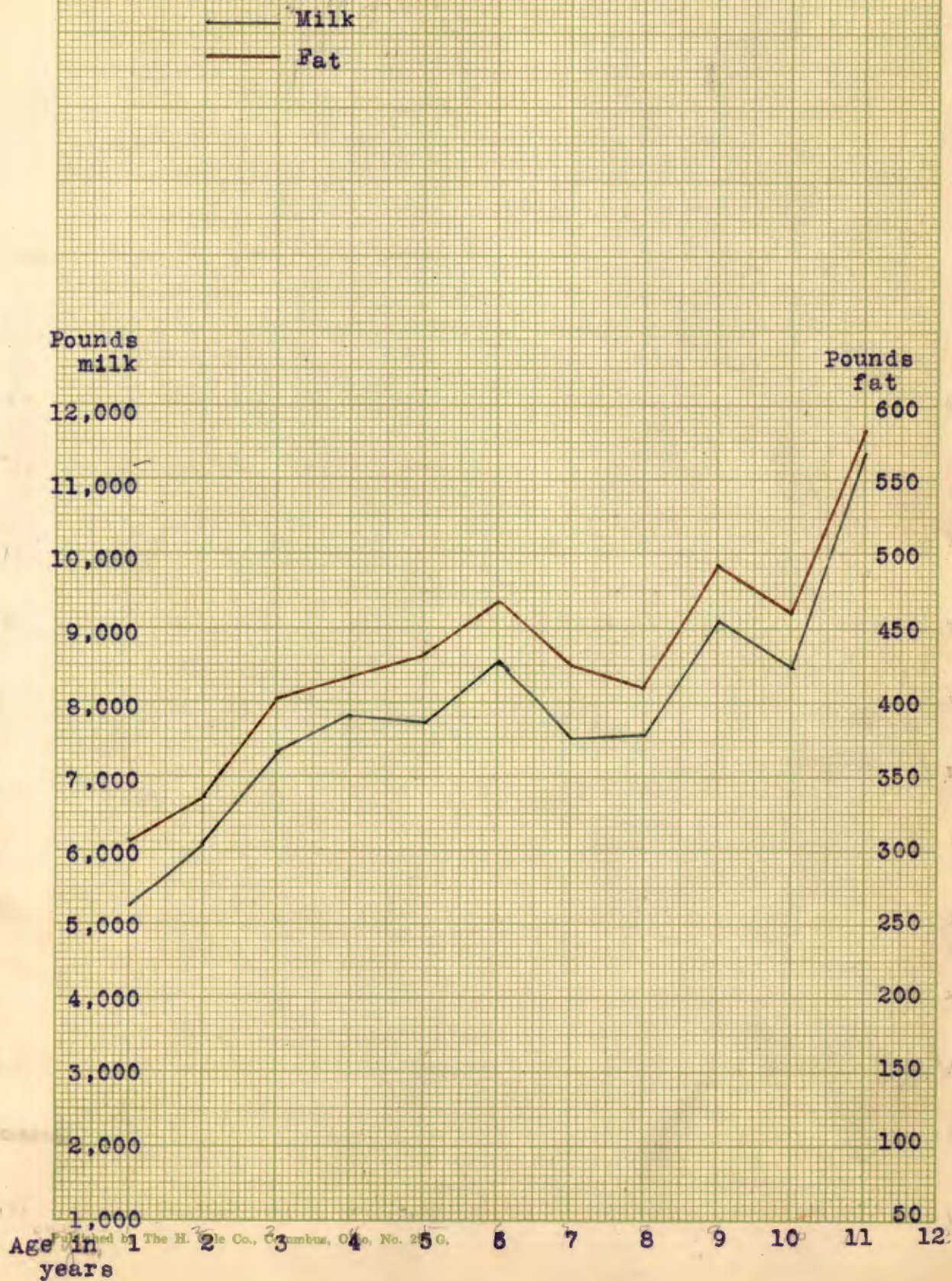


Figure 13. Variation in milk and fat production according to age in 365 day R. of M. records.

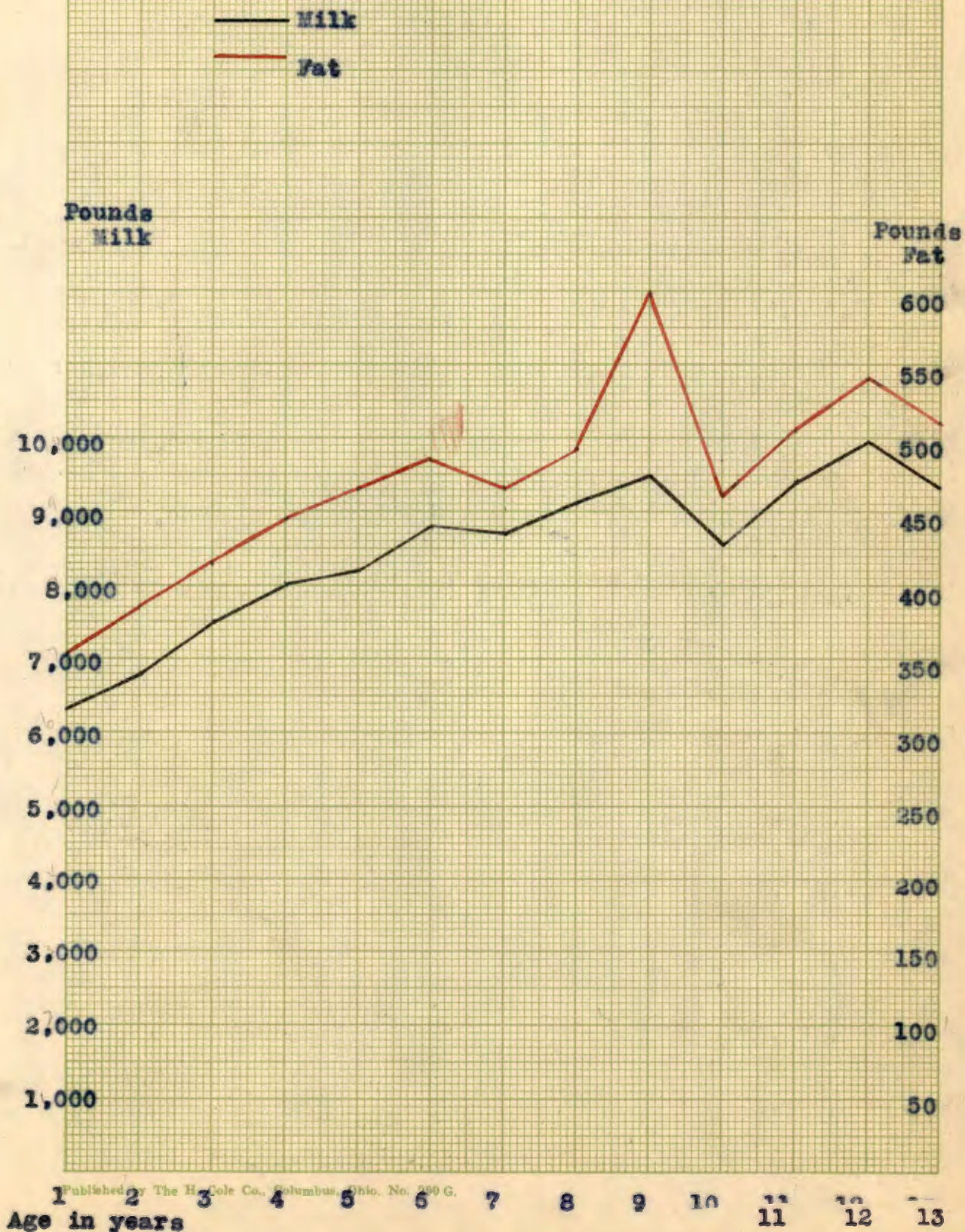


Table 12 Production According to Month of Freshening. 1547 Register of Merit Records of approximately 365 days.

Month of Freshening	Number of cows	Pounds Milk	Pounds Fat	Percent Fat
January	62	8812.1	479.01	5.34
February	54	7962.0	446.06	5.60
March	53	7482.3	430.34	5.75
April	53	8126.1	452.25	5.56
May	65	7459.0	404.81	5.43
June	49	7655.2	436.94	5.69
July	42	7613.9	409.14	5.38
August	34	7843.8	422.99	5.39
September	34	7523.0	426.12	5.66
October	26	7854.8	445.42	5.67
November	34	8028.2	447.16	5.57
December	41	7752.1	439.41	5.67
Total	547			

Figure 14.

Variation in production according to month
of freshening, for Tennessee cows.

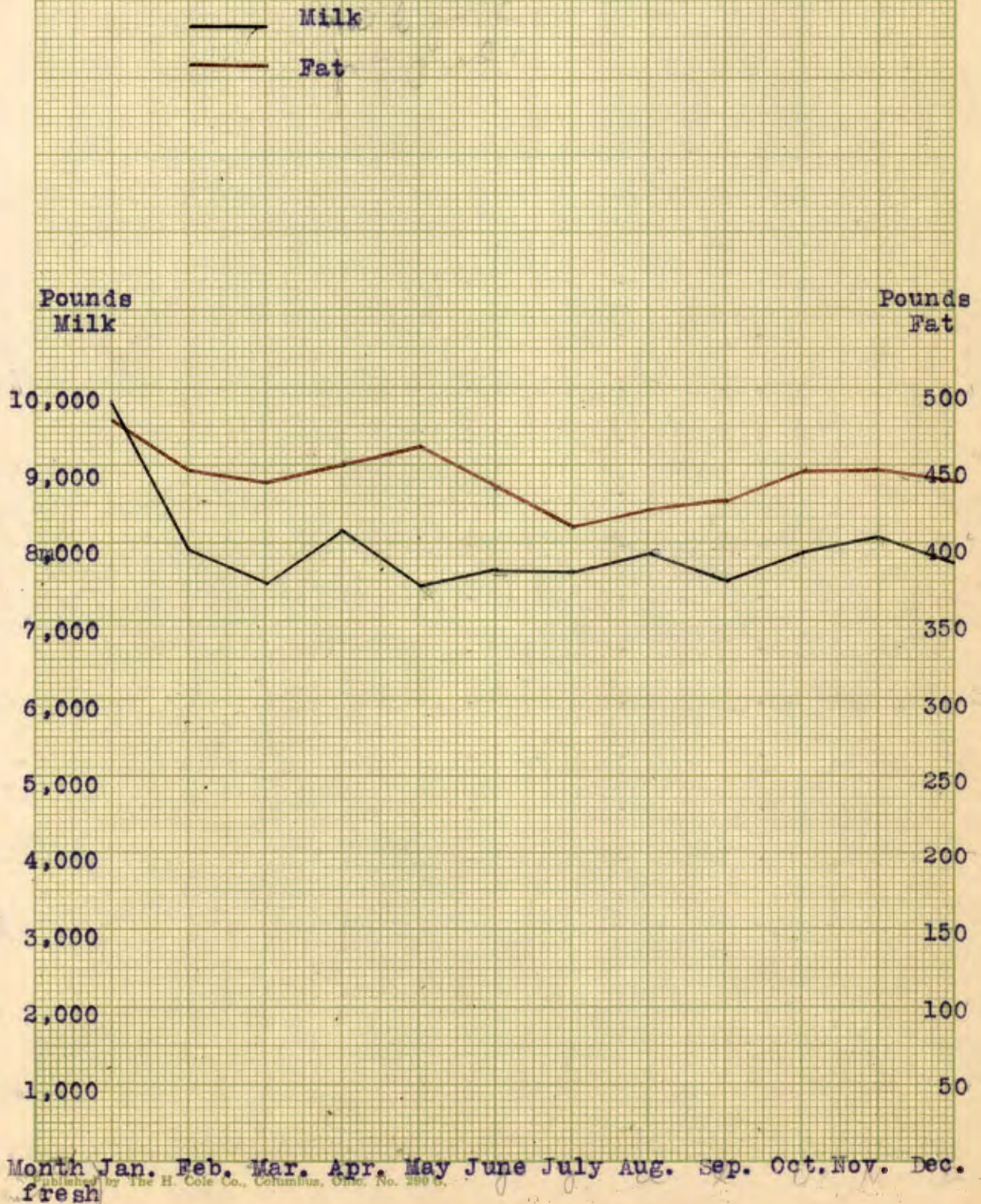


Table 13. Comparison of the Production of Tennessee Register of Merit Jerseys with those of Jerseys from the United States as a Whole.

Time of Freshening	Av. Production of 547 Tennessee Jerseys			Av. Production of 2906 Jerseys in U. S.		
	Milk	Fat	Age	Milk	Fat	Age
January	8312	479.01	5-6	8957.8	470.1	4-4
February	7962	446.03	5-2	8859.8	471.13	4-6
March	7482	430.34	5-1	8828.6	472.8	4-3
April	8126	482.25	4-8	8700.0	462.61	4-3
May	7459	404.81	4-3	8787.0	468.97	4-3
June	7655	436.94	4-6	8759.1	472.92	4-6
July	7614	409.14	4-8	8952.8	489.97	4-3
August	7843	422.99	4-11	8566.8	462.06	4-2
September	7523	426.12	4-3	8652.8	472.35	3-0
October	7855	445.49	5-6	8825.8	481.28	4-4
November	8028	447.16	5-3	8900.2	479.40	4-3
December	7752	439.41	5-1	8853.1	477.11	4-7

Figure 15.

Comparison of fat production of Tennessee Register
of Merit cows and those of the United States; also
also variation according to month of freshening.

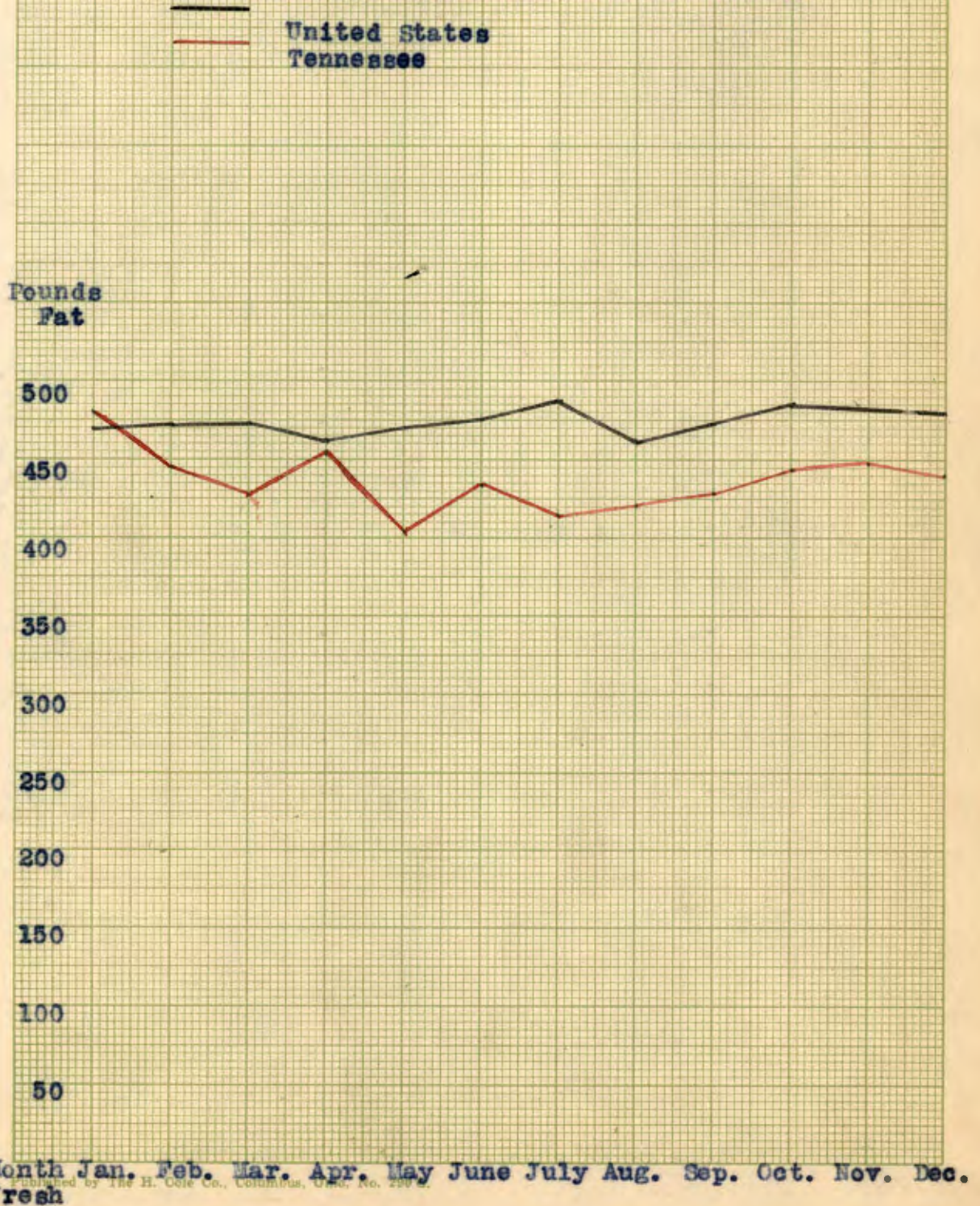


Table 14. AVERAGE PRODUCTION PER COW IN COUNTIES
IN TENNESSEE (6)
(in gallons per year according to 1920 census
report)

County	Gallons	County	Gallons
1. Robertson	399	21. Warren	320
2. Unicoi	368	22. Blount	318
3. Cocke	362	23. Greene	318
4. Carter	359	24. Hamilton	317
5. Moore	354	25. Loudon	315
6. Jefferson	354	26. Monroe	313
7. Washington	350	27. Hamblen	312
8. Davidson	341	28. Union	312
9. Perry	340	29. DeKalb	311
10. Hancock	337	30. Giles	310
11. Clay	336	31. Sevier	308
12. Knox	334	32. Lawrence	308
13. Grainger	329	33. Montgomery	307
14. Cheatham	328	34. Hickman	305
15. Lewis	327	35. Shelby	303
16. McMinn	326	36. Chester	301
17. Weakley	324	37. Jackson	301
18. Henry	322	38. Sumner	300
19. Sullivan	321	39. Gibson	299
20. Bradley	321	40. Rutherford	294

Table 14 (Continued)

County	Gallons	County	Gallons
41. Johnson	293	61. McNairy	274
42. Claiborne	292	62. James	274
43. Henderson	292	63. Benton	271
44. Carroll	292	64. Grundy	269
45. Anderson	291	65. Obion	266
46. Roane	290	66. Stewart	265
47. Hawkins	290	67. Dickson	261
48. Macon	290	68. Trousdale	261
49. Campbell	289	69. Meigs	261
50. Madison	283	70. Marshall	260
51. Franklin	283	71. Marion	260
52. Smith	283	72. Dyer	260
53. Williamson	283	73. Hardin	258
54. Lake	282	74. Wilson	255
55. White	280	75. Pickett	253
56. Tipton	279	76. Houston	252
57. Putnam	278	77. Crockett	250
58. Bedford	277	78. Bledsoe	245
59. Lincoln	275	79. Overton	244
60. Polk	275	80. Coffee	242

Table 14 (Continued)

County	Gallons	County	Gallons
81. Maury	242	89. Fayette	217
82. Morgan	241	90. Cannon	215
83. Cumberland	240	91. Fentress	210
84. Lauderdale	238	92. Hardeman	210
85. Humphreys	235	93. Haywood	200
86. Wayne	235	94. Van Buren	191
87. Rhea	235	95. Sequatchie	165
88. Decatur	230		

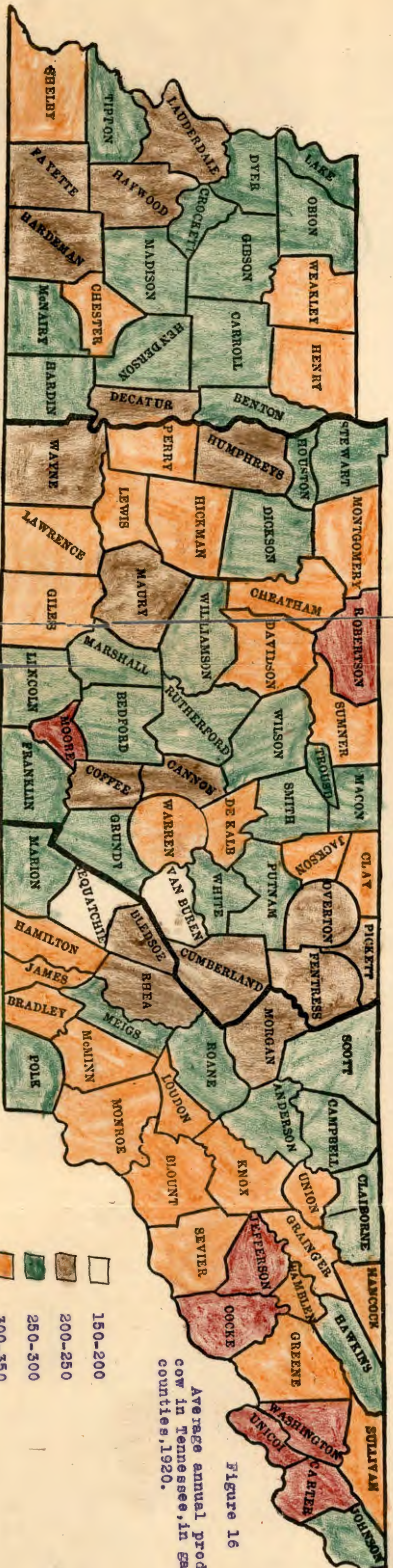


Figure 16
Average annual production per
cow in Tennessee, in Galions, by
counties, 1920.

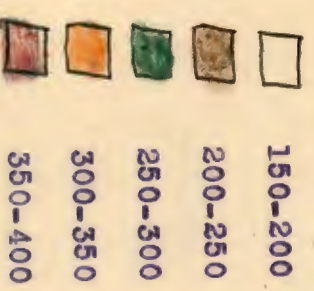


Table 15. TENNESSEE HOLSTEIN CHAMPIONS FOR PRODUCTION (15)
August 1928

	7 Days Fat	Fat		7 Days Milk	Milk
Aged	King Pontiac Calypso Rockwell 173556 Highland Rim Holstein Co., Inc., Winchester, Tenn.	25.622	Aged	Dixie Hengerveld Kimberlin 148199 Knapp School of Country Life, Nash- ville, Tennessee	623 .2
4½ yrs.	Ypsiland Katherine De Nijlander 20.525 389528 James Hopkins, Maryville, Tenn.		4½ yrs.	Knapp Dixie Snow- ball 502541 Knapp School of Country Life, Nash- ville, Tennessee.	537.0
4 yrs.	Rag Apple Manor 20.051 De Kol 469931 Aluminum Company of American, Alcoa, Tennessee		5 yrs.	Rag Apple Manor De Kol 469931 Aluminum Company of America, Alcoa, Tennessee.	557.8
3½ yrs.	Knapp Korndyke 17.512 Hengerveld Johan- na 454235 Knapp School of Country Life, Nashville.		3½ yrs.	Dixie Cora Queen 157028 Ashley S. Johnson, Kimberlin Heights, Tennessee.	558.4
3 yrs.	Flossmor Lady 17.665 Volga 146749 Ashley S. Johnson, Kimberlin Heights.		3 yrs.	Knapp Woodcrest De Kol Butter Girl 502540 Knapp School of Country Life, Nashville.	532.1
2½ yrs.	Bairdland Cream- elle Maryvale 491107 G. W. Painter, Maryville, Tenn.	15.985	2½ yrs.	Bairdland Creamelle Maryvale 491107 G. W. Painter, Marysville, Tennessee	447.8
2 yrs.	Pride Katherine 14.927 Ondine 719531 James Hopkins, Maryville, Tenn.		2 yrs.	Knapp Korndyke Hen- gerveld Johanna 454235 Knapp School of Country Life, Nash- ville, Tennessee.	452.0

(continued)

Table 15. TENNESSEE HOLSTEIN CHAMPIONS FOR PRODUCTION (15)
August 1928

(continued)

<u>305 Days Fat</u>		<u>Fat</u>	<u>305 Days Milk</u>		<u>Milk</u>
4½ yrs.	Knapp De Kol Segis Pontiac Alcartra 502539 (c.c. 205d) Knapp School of Country Life, Nashville, Tenn.	426.71	4½ yrs.	Knapp De Kol Segis Pontiac Alcartra 502539 (c.c. 205d) Knapp School of Country Life, Nashville, Tenn.	12,495.3
2½ yrs.	Belle Segis Rag Apple De Kol 613566 (c.c. 178d) James Hopkins, Maryville, Tennessee	481.63	2½ yrs.	Belle RageApple De Kol 613566 (c.c. 178d) James Hopkins, Maryville, Tennessee	14,039.7
2 yrs.	Knapp Woodcrest De Kol B. Girl 502540 (c.c. 247d) Knapp School of Country Life, Nash- ville, Tennessee	335.76	2 yrs.	Knapp Woodcrest De Kol B. Girl 502540 (c.c. 247d) Knapp School of Country Life, Nash- ville, Tennessee	10,156.7
<u>365 Days Fat</u>			<u>365 Days Milk</u>		
Aged	Aralia De Kol University of Tennessee, Knox- ville, Tennessee	Acme 593.66	Aged	Aralia De Kol University of Tennessee, Knox- ville, Tennessee	Acme 17,692.1
4½ yrs.	Ysiland Kather- ine De Nijlander 389528 James Hopkins, Maryville, Tennessee	532.74	4½ yrs.	Ysiland Kather- ine De Nijlander 389528 James Hopkins, Maryville, Tenn.	15,969.4
4 yrs.	Winona Pietertje Colantha 514816 James Hopkins, Maryville, Tenn.	668.42	4 yrs.	Winona Pietertje Colantha 514816 James Hopkins, Maryville, Tenn.	20,390.6
3½ yrs.	Ysiland Princess De Niplander 389529 James Hopkins, Maryville, Tenn.	690.62	3½ yrs.	Ysiland Prin- cess De Nijlander 389529 James Hopkins, Maryville, Tenn.	19,667.7

(continued)

Table 15. TENNESSEE HOLSTEIN CHAMPIONS FOR PRODUCTION (15)
August 1928

(continued)

	<u>365 Days Fat</u>	<u>Fat</u>		<u>365 Days Fat</u>	<u>Milk</u>
2½ yrs. Lady Hesseltje Walker Butter Boy 546713 James Hopkins, Maryville, Tenn.		580.20	2½ yrs. Lady Hesseltje Walker Butter Boy 546713 James Hopkins, Maryville, Tenn.		19,055.5
2 yrs. Knapp Dixie Snow- ball 502541 Knapp School of Country Life, Nashville, Tenn.	386.20		2 yrs. Knapp Dixie Snow- ball 502541 Knapp School of Country Life, Nashville, Tenn.		11,751.0

Table 16. TENNESSEE CHAMPION JERSIES FOR PRODUCTION.

365 Day Champion Butter-Fat Records in Tennessee (2)

<u>Class</u>	<u>Name & H.R.No. of Cow</u>	<u>Owner at start of test</u>	<u>Milk</u>	<u>Fat</u>
Yr.	Fairy Boy's Empress Am 459969	W. J. Ezell Franklin	8856	514.73
Jr. 2	Castor's Ross 482747	W. A. Griswold Nashville	9729	613.71
Sr. 2	Noble Welcome's Flossie 535905	W. J. Ezell Franklin	10676	597.71
Jr. 3	Son's Foxy Mary 550943	Duntreath Farm, Forest Hill	16411	769.37
Sr. 3	Moon's Eminent Princess 403564	Charles Pearson, Shelbyville	12481	733.26
Jr. 4	Gamboge's Royal Bess 391577	R. E. Fort, Nashville	12920	700.45
Sr. 4	Gilly's Golden Butterfly 402950	W. E. Carter, Smyrna	11709	741.07
Over 5	Little Koffee Mabel 261503	W. J. Ezell, Lewisburg	13662	794.15
Over 12	Fancy Daisy B. 2d 237626	W. J. Ezell, Lewisburg	13435	726.04

305 Day Champion Butter-Fat Records in Tennessee (2)

Yr.	Dahlia's Wanda 478387	A. D. Jordan, Franklin	5531	378.01
Jr. 2	Ida's Viola McCoy 482632	W. J. Ezell, Lewisburg	8737	519.83
Sr. 2	Ewell Farm Lady McCoy 638185	L. P. Brown, Spring Hill	8846	496.87
Jr. 3	Volunteer's Nurse Segunda 683296	Herbert Farrell, Nashville	7865	493.15
Sr. 3	Pogis' Tinker Bell 537666	Duntreath Farm, Forest Hill	10015	580.80
Jr. 4	Fern's Queen Mary 520493	A. H. Mizell & Son, Nashville	9936	486.14
Sr. 4	Lily Exile's Princess 481300	A. D. Jordan, Franklin	12101	678.32
Over 5	La Sente's Twin Onyx 593346	Herbert Farrell, Nashville	13153	677.49
Over 11	University Golden Lass 266986	McLeroy Farm, Caperville	11336	582.93

Total Milk Production and Its Value

By using the number of cows on farms on January 1, 1927 and the average production for the same year, it is found that in that year 189,173,721 gallons of milk were produced in Tennessee in 1927; if this was worth twenty-five cents (25¢) per gallon, the total value was \$47,293,430. Calculated at the same price as that of the 1920 census report ⁽²⁷⁾ (15.8¢ per gallon) the total value would be \$29,889,447. An increase in production and a greater increase in value is found from the time the first data is available.

Since 1920, while there was a general decrease in the cows kept, the total production increased because of higher average production per cow. This is a good reaction as it places the industry on a better basis and a higher level.

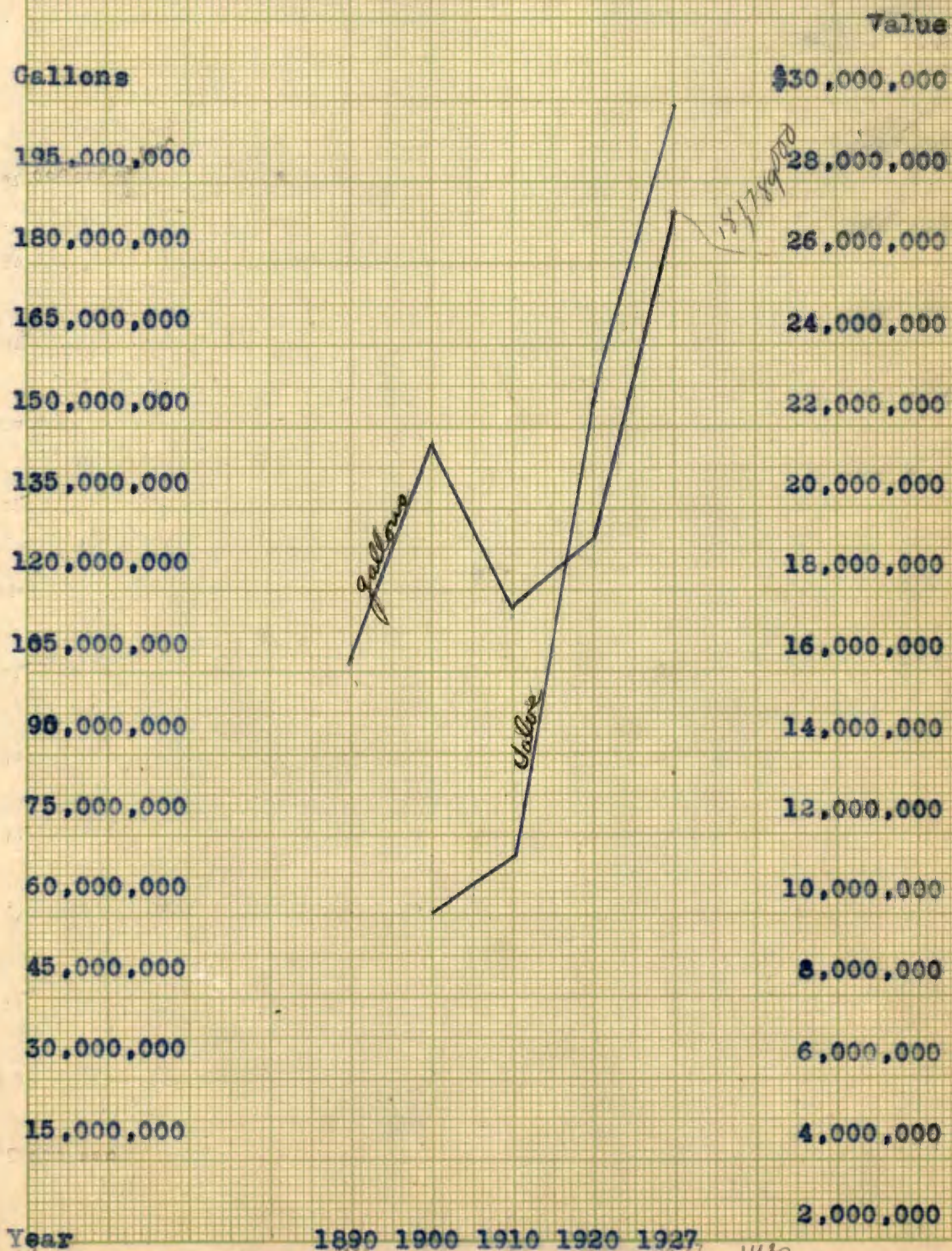
Table 17 and figure 17 show the trend of the amount and value of the milk produced in the state.

Table 17. Total Milk Production and Its Value. ⁽²⁷⁾
(except 1927 estimated) ⁽²⁵⁾

Year	Total Gallons Produced	Total Value
1927	189,173,721	\$29,889,447
1920	130,285,644	20,640,849
1910	117,101,970	9,478,872
1900	147,336,961	8,028,466
1890	107,657,116	No Data

Figure 17.

Total production and total value of milk in Tennessee



MANUFACTURED DAIRY PRODUCTS

Butter

Table 18. The Increase in Creamery Butter Manufactured from 1918 to 1925 inclusive. (23)

Year	lbs. Creamery Butter	Year	lbs. Creamery Butter
1918	2,068,000	1922	9,164,000
1919	3,735,000	1923	11,463,000
1920	5,903,000	1924	12,762,000
1921	8,707,000	1925	11,886,000
		1930	

Table 19. Showing the trend of butter production from 1850 to 1920 inclusive. The figures for 1850 to 1890 inclusive are for farm butter only, and there is no record of creamery butter for that period. The others are for all butter. (27)

Year	Pounds Butter	Year	Pounds Butter
1850	8,159,585	1890	28,314,387
1860	10,017,787	1900	29,091,696
1870	9,571,069	1910	39,827,906
1880	17,886,369	1920	37,166,063
		1925	32,461,009
		1930	29,331,246

By comparing tables 18 and 19 it will be seen that the majority of the butter is still made on farms. Figures 18 and 19 show the trend.

Figure 18.

Trend of Creamery Butter production in Tennessee.

Pounds
Butter.

13,000,000

12,000,000

11,000,000

10,000,000

9,000,000

8,000,000

7,000,000

6,000,000

5,000,000

4,000,000

3,000,000

2,000,000

1,000,000

Year 1918 1919 1920 1921 1922 1923 1924 1925

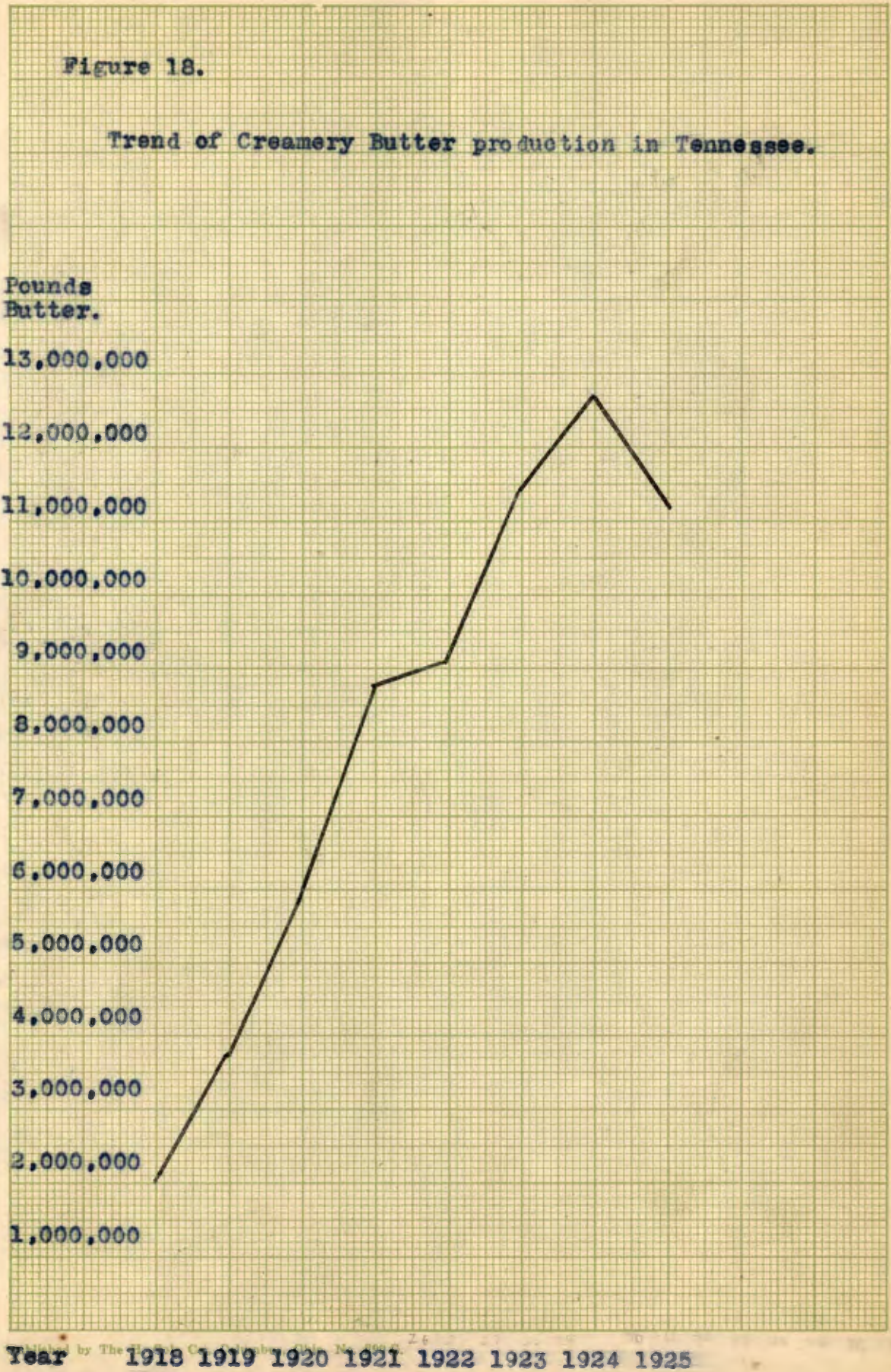
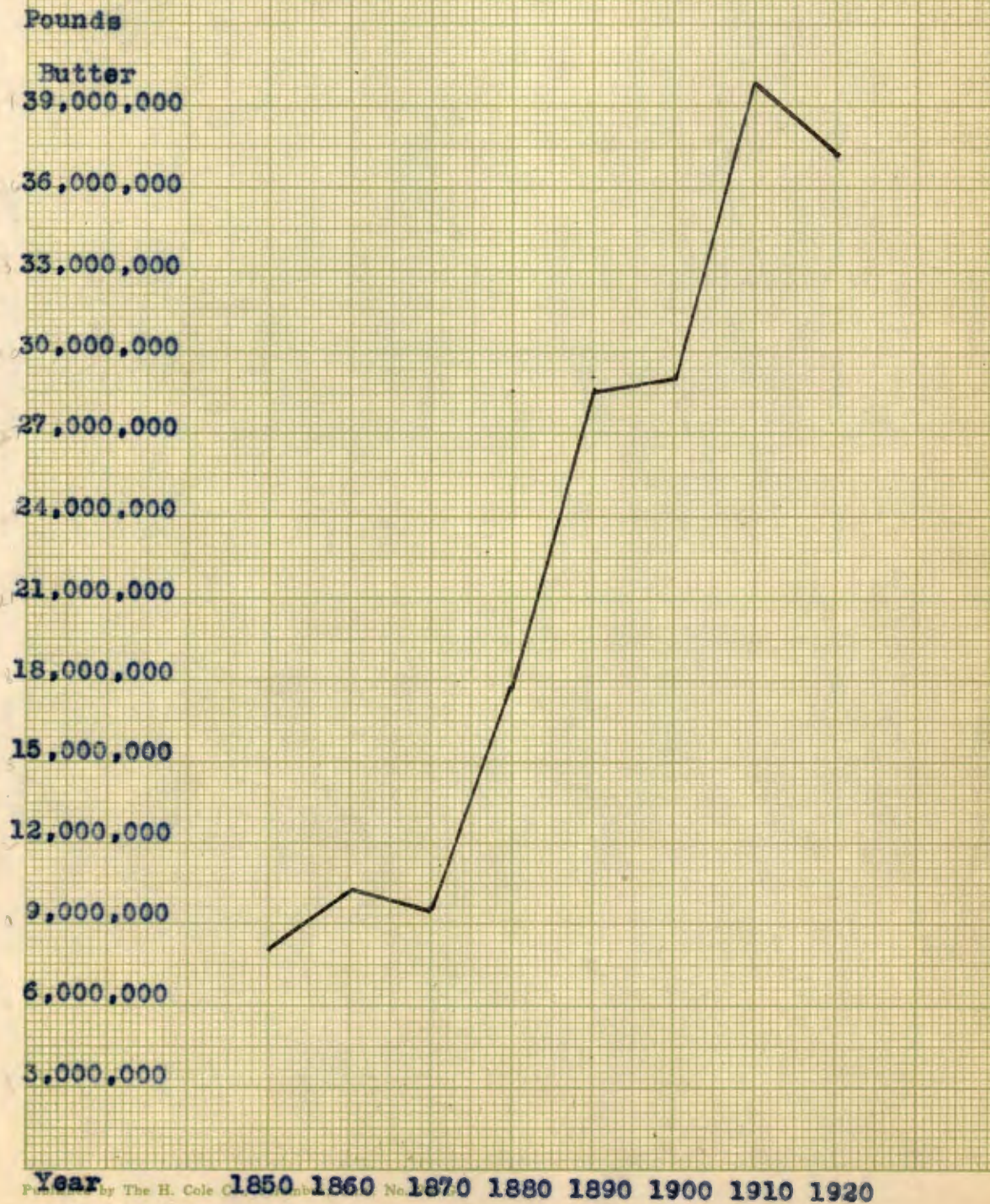


Figure 19.

Trend of Butter production in Tennessee.



Cheese Manufacture

The making of cheese in Tennessee has not been a very large industry; some American cheddar cheese is manufactured and the remainder is farm cheese, made in rather small quantities. Its production has not been very steady. Only a small amount of all the milk goes into cheese. Tables 20 and 21 and figures 20 and 21 show the trend of farm and factory cheese in the state.

Table 20. Trend of Cheese
Production. (Farm Cheese). (27)

<u>Year</u>	<u>Lbs. Cheese</u>
1850	177,681
1860	135,575
1870	142,240
1880	98,740
1890	69,919
1900	26,622
1910	18,592
1920	114,386

Table 21. American
Cheddar cheese produced.
(Factory Cheese). (23)

<u>Year</u>	<u>Lbs. Cheese</u>
1919	51,000
1920	26,000
1921	50,000
1922	71,000
1923	284,000
1924	398,000
1925	321,000

In Tennessee (1 and 16) there are 10 cheese factories

Figure 20.

Trend of Farm Cheese production in Tennessee.



Figure 21.

Trend of factory cheese production in Tennessee.



at present (1928) while in 1925 there were 14 in operation; there are 104 ice cream plants, 39 creameries, 3 condenseries with 5 feeder stations, and one powdered milk plant. The Borden Milk Company has a condensery at Lewisburg and a powdered milk plant at Fayetteville. The Carnation Milk Products Company has a condensery at Murfreesboro, at which they are receiving daily 100,000 to 125,000 pounds of milk,⁽²⁰⁾ and the plant will handle twice that capacity. The Pet Milk Company has just recently opened a condensery at Greenville. Figure 22 shows the location of these plants in the state.

The milk produced in Tennessee⁽³³⁾ is utilized in seven different ways: Country butter, creamery butter, fluid milk to city consumer, ice cream, farm cheese, factory cheese, and used on farm.

There is more made into country butter than is used for any other purpose; however, this is dropping off, as is that used for farm cheese. Creamery butter and factory cheese is increasing to take care of this drop. Also more is being used as market milk, ice cream, and on the farm. This greater consumption is due to increase in population and the realization of the value of milk as a food. Tables 22 and 22a and figures 23 and 24 show in what form it is used and marketed.

Figure 22.

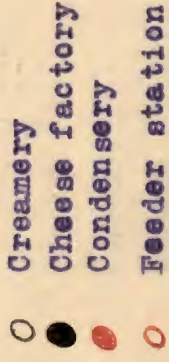


Table 22

What Becomes of the Milk Produced in Tennessee

Year	1923
<u>Total Milk Produced</u>	<u>131,000,000 gal</u>
Milk made into country butter	986,000,000 gal
Milk made into creamery butter	30,500,000
Milk marketed to milk consumers	11,000,000
Milk made into ice cream	3,000,000
Milk used on farm	1,000,000
Milk made into farm cheese	200,000
Milk made into factory cheese	<u>300,000</u>
	131,000,000

- g Only 40% of country butter reaches the market.
 60% is used on the farm.
 59% of milk produced is marketed in some form.

Gallons
milk

Figure 23.

25,000,000

20,000,000

How Tennessee's milk
is utilized, 1923.

75,000,000

70,000,000

65,000,000

60,000,000

55,000,000

50,000,000

45,000,000

40,000,000

35,000,000

30,000,000

25,000,000

20,000,000

15,000,000

10,000,000

5,000,000

Form The Factory Used Ice Market Cream- Country
marketed cheese ON Farm Cream Milk ery Butter
cheese Farm Butter

Table 22a

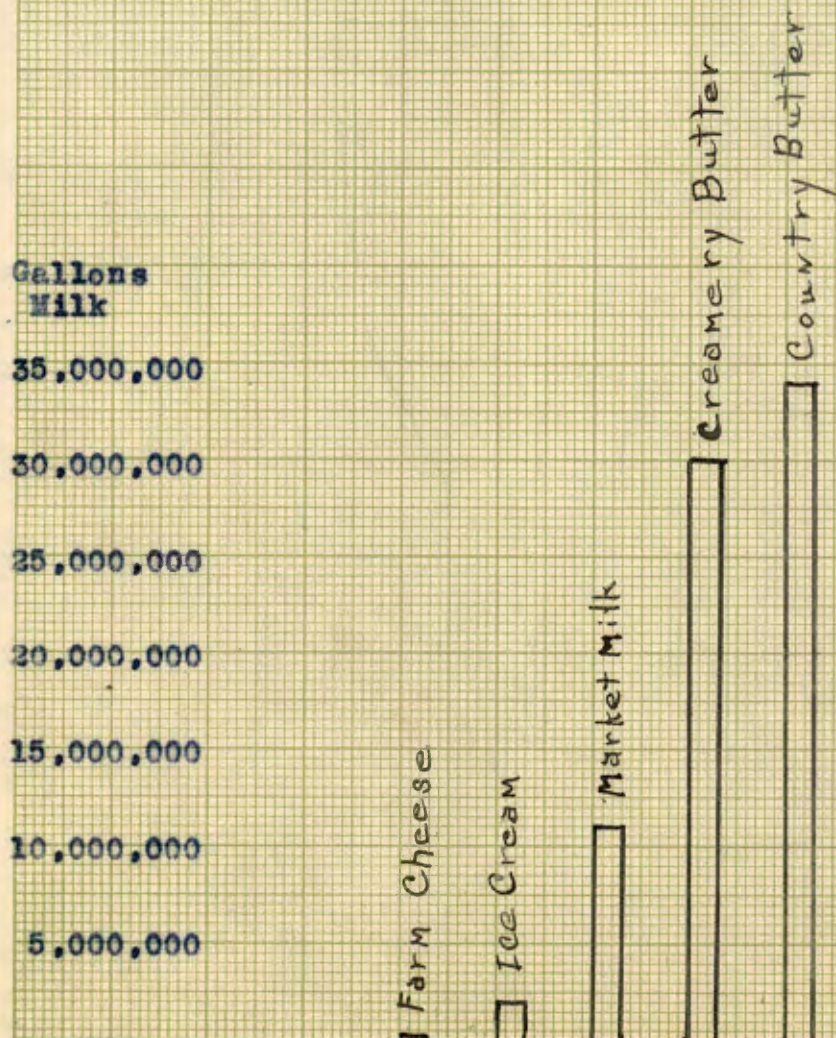
How Are Tennessee Dairy Products Marketed.

Given in terms of Gallons of Milk

In form of:	1933	Per Cent
Country Butter	34,000,000	44.5
Creamery Butter	30,000,000	38.5
Market Milk	11,000,000	14.0
Ice Cream	2,000,000	2.5
Farm Cheese	100,000	.12
Factory Cheese	<u>300,000</u>	.38
Total	77,400,000	

Figure 24.

How Tennessee's Dairy Products are marketed.



Distribution of Dairy Products

The distribution of dairy products must conform rather closely with the dairy cattle population, yet it is somewhat more centralized as those sections with more cows, have higher producing animals and employ more productive feeding and caring practices in their dairying. Also the distribution of the value of dairy products is still more centralized as the value of the milk near the larger cities and towns is higher than that of the other sections. Figure 25 shows the distribution of the value of dairy products over the state in 1920. Table 23 and Figure 26 show the value of dairy products by counties in Tennessee in 1924.

Figure 25. Showing the Value of Dairy Products by Counties in Tennessee in 1920. (32)

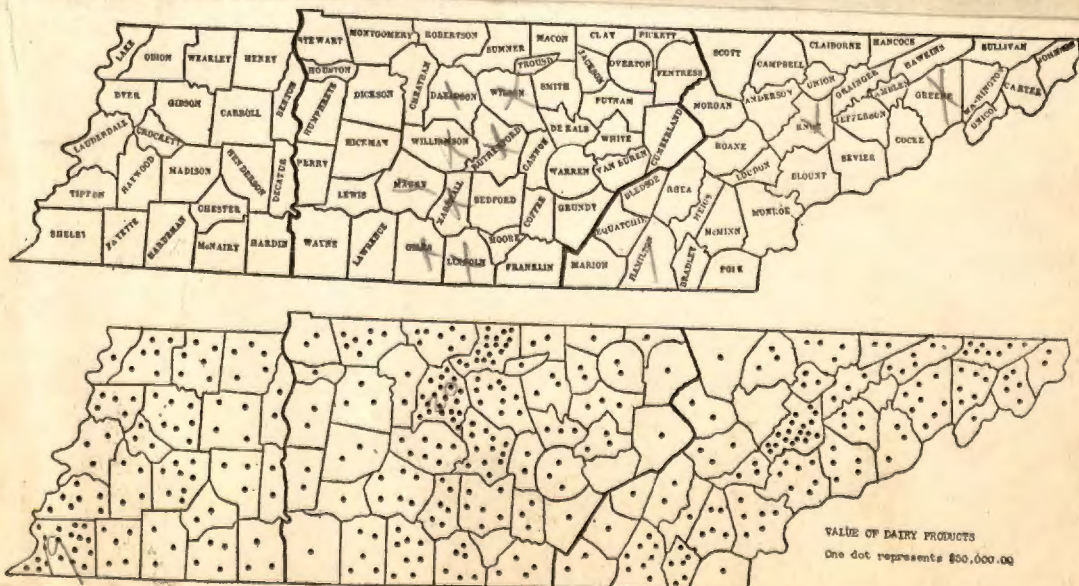


Table 23. VALUE OF DAIRY PRODUCTS IN TENNESSEE BY COUNTIES (27)
1924 (in dollars)

<u>County</u>	<u>Value of Products</u>	<u>County</u>	<u>Value of Products</u>	<u>County</u>	<u>Value of Products</u>
Anderson	\$ 81,770	Hamblen	\$ 158,546	Montgomery	\$ 154,234
Bedford	331,473	Hamilton	281,262	Moore	33,308
Benton	72,450	Hancock	56,994	Morgan	44,450
Bledsoe	37,641	Hardeman	99,151	Obion	181,801
Blount	225,070	Hardin	89,668	Overton	75,556
Bradley	241,873	Hawkins	200,317	Perry	37,892
Campbell	92,766	Haywood	134,447	Pickett	28,499
Cannon	88,666	Henderson	91,598	Polk	44,687
Carroll	140,242	Henry	164,426	Putnam	125,301
Carter	168,751	Hickman	63,529	Rhea	91,257
Cheatham	44,064	Houston	28,822	Roane	110,189
Chester	59,060	Humphreys	64,797	Robertson	139,852
Claiborne	140,678	Jackson	85,651	Rutherford	533,015
Clay	37,994	Jefferson	202,065	Scott	47,407
Cocke	118,723	Johnson	77,437	Sequatchie	35,880
Coffee	135,957	Knox	659,688	Sevier	160,415
Crockett	96,466	Lake	20,691	Shelby	1,320,745
Cumberland	43,146	Lauderdale	92,523	Smith	142,088
Davidson	1181,446	Lawrence	161,233	Stewart	70,230
Decatur	61,333	Lewis	28,830	Sullivan	320,554
DeKalb	110,925	Lincoln	196,296	Sumner	267,715
Dickson	79,334	Loudon	140,486	Tipton	188,604
Dyer	133,877	McMinn	202,405	Trousdale	44,862
Fayette	219,428	McNairy	152,887	Unicoi	38,859
Fentress	22,563	Macon	64,555	Union	98,752
Franklin	152,892	Madison	211,398	Van Buren	12,778
Gibson	333,265	Marion	51,978	Warren	127,753
Giles	239,928	Marshall	347,728	Washington	256,241
Grainger	91,769	Mauzy	288,465	Wayne	54,686
Greene	308,422	Meigs	38,635	Weakley	246,885
Grundy	28,301	Monroe	131,247	White	85,298
				Williamson	489,580
				Wilson	499,228

**Results Obtained at the University of
Tennessee in the Control of Onion Flavor
and Odor in Milk**

In Tennessee there are many wild onions, and the dairymen are confronted with the problem of onion milk and cream in the spring and fall of each year. Wild onions are hard to eradicate. The cows must be kept from eating the onions or the flavor and odor removed by the use of mineral oil. Both of these methods have been worked out in Tennessee, the first by the Dairy Department of the University of Tennessee, and the second by the Experiment Station.

(35) The Dairy Department of the University of Tennessee found that the onion tops when dry gave very little difficulty, if any, when eaten, but that the flavor was caused by the oil in the green growing tops.

When the onions had made full growth, they were all cut close to the ground with a hoe. If there are many onions, they can be pastured off close with dry cattle then with the milking cows turned on. This has worked well in the spring, but not so well in the fall. The removal of the onion flavor and odor by the McDonald

(21)
process, is to mix mineral oil with the onion milk, heating it, separating the oil and milk, and washing and sterilizing the oil.

(34)
This experiment was carried on at the University of Tennessee Creamery in a small pasteurizing tank. Lilly Colorless Mineral Oil was added to the onion milk in the tank, and was agitated. The mixture was heated to 115° F. After standing a few minutes, the milk was drawn off through a cotton pad strainer. This was a special type strainer to keep the oil from coming in contact with the cotton, and the strainer retained the oil. The milk showed no onion flavor or odor after two treatments.

Water and steam were added to the oil, and it agitated. This water was removed and the oil washed twice more with water. Live steam was then admitted to the oil until no onion odor could be detected. The oil and water were drawn off in a special type of bottle for removing the oil.

Table 24

In one of their trials the following results were obtained: (34)

Two Treatments

	Original	Treated
Milk, pounds	59	58.5 recovered
Milk temperature	75°F	115° F
Oil temperature	Room temperature	115° F
Lilly Oil, pounds	9	8.8 recovered
Fat, percent	3.4	3.4
Bacteria Count	114,000	62,000
Taste of Milk	Onion	No Onion
Milk recovered percent		99.1
Oil recovered, percent		97.7

Texas Fever and Cattle Tick Eradication

In some of the Southern States, including the western and southern portions of Tennessee, the development of cattle has been greatly retarded by the Texas fever carried by the cattle tick. This almost drew the line as to where cattle growing was profitable, and especially those of better breeding as the native cattle were somewhat immune to it. By the work of the United States Department of Agriculture and Tennessee Department of Agriculture, all the cattle of the infested areas of Tennessee were "dipped" and the sections that were not tick free were quarantined until they were free, until every county is now tick free. This met with much opposition in many counties as it was being carried out, by people who would not see the benefit of it, and it was by the most strenuous efforts of those in charge that it was ever accomplished.

Table 25. The Standing of the Tick Eradication Work up to June 30th, 1926. (26)

Counties quarantined	Counties quarantined July 1, 1926	Released Counties June 30, 1926	
		Tick-free	With 1 or more infest- ed herds
42	0	42	0
Cattle dipped year ending June 30, 1926			
Herds	Cattle		
22	164		

T. B. Eradication

The T. B. eradication work of the U. S. Department of Agriculture was begun in Tennessee ^{in 1917} in cooperation with the State Department of Agriculture. Since that time, ⁽²⁶⁾ 231 herds have been accredited, and three counties, ⁽¹⁹⁾ Shelby Marshall and Giles are modified accredited areas, with five counties, Hamilton, Bradley, Lincoln, Maury and Williamson engaged in testing all their cattle in order to become modified free areas.

Table 26. The Result of T. B. Eradication Work in the State (U. S. D. A. Report No. 935) as of June 30, 1926. ⁽²⁶⁾

Accred. Herds	Herds passed 1 test	Under supervision herds	Under supervision cattle	Total T.B. Tests 1917 to 6/30/26. total cattle	reactors No.	%
231	19,386	19,778	124,988	500,108	2,110	.7% ●

Area Eradication

Modified acc'd area-counties	Counties with one test of all cattle	Counties intensively testing	Total counties engaged	Total cattle tested
3	0	$\frac{1}{5}$	$\frac{4}{8}$	36,208

* (see next page)

© This is .7% for cattle tested under federal supervision; for cattle tested by qualified veterinarians the percent of reactors is less than .5%. (19)

¢ Later figures from State Veterinarian. (19)

/ Should also be increased as ¢.

MILK LAWS

State Laws and Standards.

Inspection

In connection with the Sanitary food laws of the state, ⁽²²⁻²³⁻²⁴⁾ is the Tennessee Milk Standards Law, which purpose is to insure milk and milk products to be fresh, wholesome and unadulterated food, and produced in sanitary places. A brief resume' of it follows. No milk shall be sold within the state that is in any way adulterated, had water added, any preservative or any other foreign substance put into it; that is produced from diseased cows; milk with cream removed; milk handled under unsanitary conditions, or containing visible dirt; milk containing less than eight and one-half percent (8.5%) of milk solids not fat or three and one-half per-

cent (3.5%) of milk fat; or milk that has been improperly pasteurized. This does not interfere with the sale of modified milk, skimmed milk, butter milk or especially prepared milk, when labeled and sold as the proper product. The manufacture and sale of "filled" milk is prohibited (filled milk is milk or a portion of it to which has been added fat other than milk fat). Ice cream standards are, that each ingredient must be a clean wholesome product, with milk fat not less than eight percent (8%) and carry a total of eighteen percent (18%) milk solids; unless it is made with such products as fruits and their juices, cakes, nuts and chocolates, when it must contain six percent (6%) milk fat and sixteen percent (16%) total milk solids.

In order that the standards shall be met, the Commissioner of Agriculture appoints a State Dairy Commissioner and as many deputies as are needed to keep check on the work and to carry it out.

The State Dairy Commissioner formulates the regulations with the approval of the Commissioner of Agriculture, and the Dean of the College of Agriculture of the University or his representative, by which he carries out his work. His duties are to see that the standards are

met; examining applicants for milk testers of the state and issuing them licenses; to inspect all Babcock testers, glassware and scales and destroy inaccurate apparatus; visit all creameries, cheese factories, milk depots, milk plants, ice cream factories, cream stations, cream routes, milk condensereries and evaporaters and similar plants, in the state every three months for their inspection.

The present Dairy Commissioner is D. P. Adams, who has been serving since 1922, before him W. T. Magruger, Jr., filled the place, and previous to that was C. H. Ramsey who was the first Dairy Commissioner of the state.

Milk Law and Inspection of the Milk Supply of Memphis, Tennessee

While the state milk laws cover all parts of the state, larger cities and towns have a special ordinance regulating the production and distribution of milk and milk products in that town. Many are just on record and are not enforced, others show different amounts of enforcement, and the larger cities have developed through several years until now they are enforcing the entire ordinance.

The growth of the inspection and grading of milk in Memphis, Tennessee, ⁽⁹⁻¹⁰⁾ has been over a good number of years. Prior to 1887 there were movements on foot to inspect milk. In 1890 and 1891 the milk supply was pointed out to be a source causing the increase in typhoid fever, diphtheria, and scarlet fever. Sanitary officers did some work and in 1892 a butter fat determination needed to be made. In 1895 dairymen were required to register with the board of health, and samples for inspection were taken from the milk wagons. In 1897 need for a bacteriologist was seen and the next year one was appointed, but because of lack of standards to go by, no milk was tested. That year an ordinance was passed and chemical and butter fat analyses were made, finding the milk supply very poor in these respects. The average butter fat test was a content of less than three percent (3%) and most all dairymen were using preservatives such as boracic acid, salicylic acid, and formaldehyde. In 1900 an inspector was appointed and he extended his work to the cattle and places of production and handling, which were found very unsanitary. Some cattle were tuberculin tested.

The next year much improvement was made and standards set for the products. In 1904 more attention was given to dairy houses and milk rooms, and an attempt was made to educate the dairymen to the necessary changes and conditions. Bacteriological examinations were made in 1908 and the next year dairies were scored. Following this the tuberculin test became extensively used and barns were being equipped with concrete floors. About this time all preservatives seemed to have passed from use in milk. A start was made to obtain some certified milk. In 1917 bacteria standards were made for grades A and B for both raw and pasteurized milk. This held on, and in 1920 was added certified milk. For three years attempt was earnestly made to enforce it and grade the milk, but it was too complicated and not satisfactory. Then it was simplified by changing to classify only certified, raw and pasteurized with very liberal requirements not over 500,000 bacteria per cc. for raw milk and not over 2,000,000 before or 200,000 after pasteurization; and certified as prescribed by the Medical Milk Commission. Aside from these cows must be free from disease, sanitary methods employed in producing and handling the milk, with clean and disease free persons handling it.

This last standard seems more satisfactory to producer and consumer and is giving a better milk supply to the city.

The increase in consumption, greatly due to better and a more wholesome supply of milk has increased as follows, other dates have no available figures:

Table 27. The amount of milk used daily (the average of the entire population) and the percent of this that was pasteurized.

<u>Year</u>	<u>Pints daily per person</u>	<u>percent pasteurized</u>
1908	.5	
1921	.51	44%
1922	.63	43%
1923	.66	45.4%
1924	.72	49.7%

The consumption per person increased nearly fifty percent during that time and forty one percent from 1921 to 1924. The percent of pasteurized milk also increased.

A survey showed that the better classes of people used more milk than the poorer classes.

The price ranges from ten cents (10) to twenty cents (20) per quart, with an average of about fifteen cents (15), and the price of certified milk about thirty cents (30) per quart.

Milk Law Inspection and Supply of Knoxville's Milk

The first inspection of milk in Knoxville (13) seems to have been in 1908, when a very simple score card was used; scoring both barns and milk houses.

Table 28. Showing the average daily sales of dairy products in Knoxville in 1912.

Wholesale milk	1993 gallons
Retail milk	547 gallons
Cream (Wholesale & Retail)	50 gallons

From 1912 to 1924 the inspection changed very little, and there was very little enforcement of any kind done.

In 1925 there were 531 dairies supplying milk from 6418 cows, of which 5451 were in milk.

Table 29. Average amount of milk sold in Knoxville daily in 1925, and the form in which it was sold.

Sweet milk	6901 gallons
Milk sold as butter milk	3630 gallons
Milk sold as sweet cream	<u>130</u> gallons
Total	<u>9661</u> gallons

Table 30. Amount of Knoxville's milk that Knox County Produces. Number of cows in Knox County and their Production.

	Entire Supply	Knox County
Dairies	531	437
Cows (all)	6418	5074
Cows (Av. in milk)	5451	4304
Cows, percent		79%
Cows (Av. in milk) %		78.9%
Dairies, percent		82.3%
Gallons milk	9861	7682
Milk, percent		77.9%
Av. No. cows per herd	12	11.6
Av. Production Milk (lbs.)	4771	4739
Fat (lbs.)	218	216.5

Table 31. Amount of milk produced according to distance from city. Arranged in zones of 5 miles each.

Zone Distance	Amount	Zone Distance	Amount
1 to 5 miles	1172 gal.	25 to 30 Miles	139 gal
5 to 10	3378	30 to 35	236
10 to 15	2949	35 to 40	30
15 to 20	1343	40 to 45	93
20 to 25	249	45 to 50	272

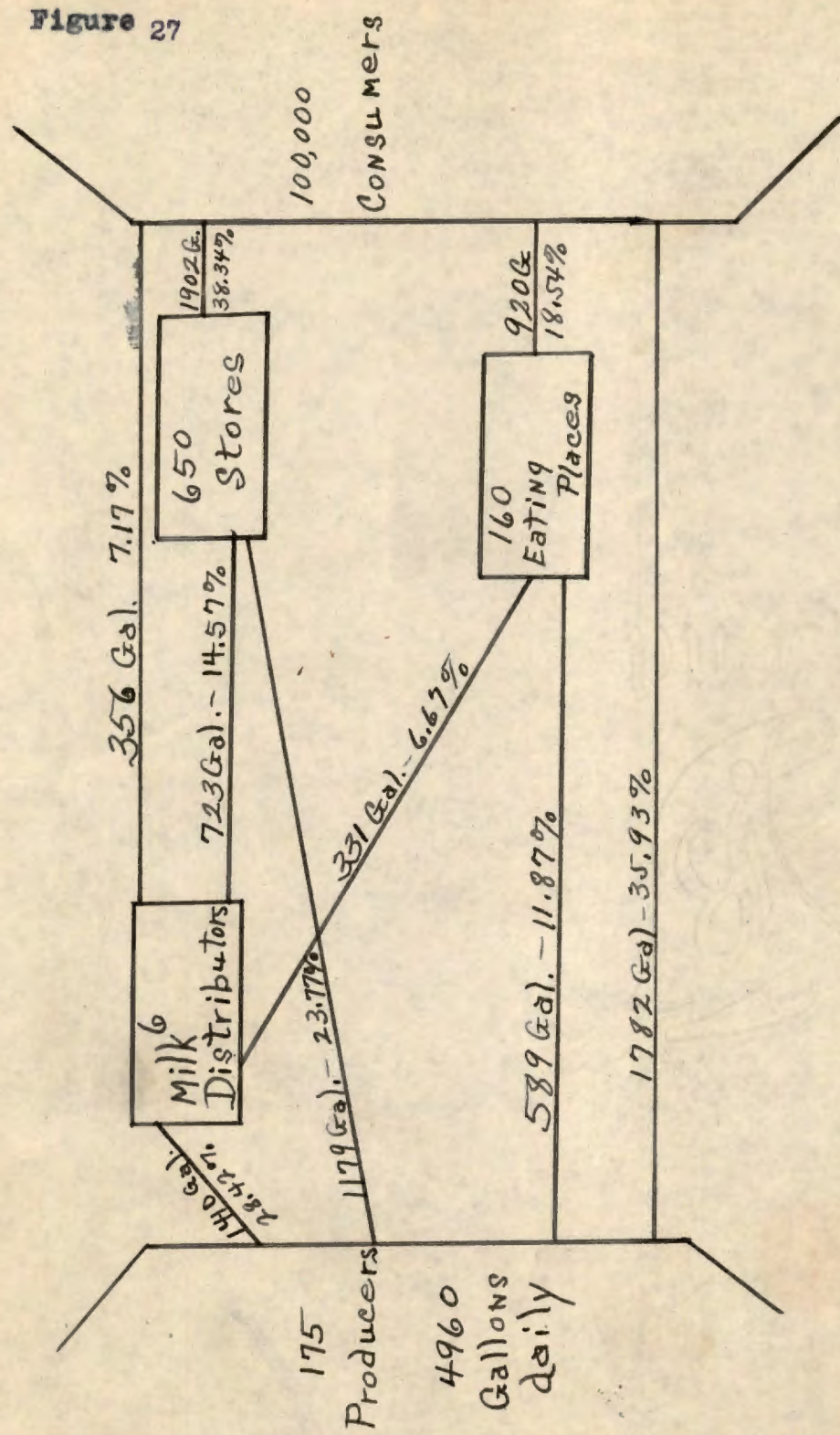
The milk came in on seventeen main roads and their tributaries, with practically none at a great distance from the North West or South East.

The average butter fat test for Knoxville's retail milk was 4.44%, the highest in November of 4.88% and lowest in March with 4.14%. The average for all shipped milk was 4.63%, making an average for all milk sent to Knoxville of 4.57%.

The solids not fat in the retail milk was 8.78% and in shipped milk 9.03%, or a total average of 8.95%.

The average bacteria count for raw, retailed milk was 107,853 and for shipped milk 1,096,814. Milk sent to pasteurizing plants averaged 563,103 count and after being pasteurized, only 155,607.

Figure 27



Channels of Knoxville's fluid milk supply from producer to consumer, 1925.

Knoxville received 4960 gallons of fluid milk daily (1925). One-third of this is delivered directly to the consumer by the producer; 1410 gallons is handled by distributors. The grocery stores handle one-third of it and the eating places one-fifth of it. Figure 27 shows this distribution in diagram form.

In 1924 a new and more rigid ordinance⁽¹⁷⁾ was passed and put into effect in 1925; with Dr. M. F. Haygood as health officer and B. P. Hazlewood as Dairy Inspector. Later the inspection work was divided and Hazlewood did the inspection of the production side of the work and issued the license, and T. G. Hinton did the city inspection, including the inspection of all milk brought into the city and the places where it was handled. A. M. Glover succeeded Hinton July 1, 1927 and a little later he succeeded Hazlewood, and H. A. Travis took the city inspection, who was succeeded by Lewis Nunley, he also was there only a short while, until being succeeded by E. C. Morgan. Mr. Morgan resigned June 1, 1928 and was succeeded by J. F. Henderson.

The milk supply now is of a very high grade, and the conditions required to produce this high quality milk especially on farms, have already gone through the greater part of their transition.

The ordinance allows only ⁽¹⁷⁾certified milk, grade A raw and grade A pasteurized milk to be retailed in the city; and grades A and B to be delivered to milk plants for pasteurization, ice cream manufacturing or other manufacturing. The sale and production of butter, buttermilk and cream (sour) has very little inspection.

The requirement for the analysis of the milk are the same as those for the state, and the bacteria count shall not exceed those given in table 32.

Table 32. Maximum Bacteria Count for the Various
(50) Grades of Knoxville's Milk

	Bacterial Count
Grade A raw	40,000 per cc.
Grade A pasteurized	30,000 per cc.
Grade B raw	150,000 per cc.
Grade B pasteurized	100,000 per cc.

Certified milk must comply with the requirements of and produced under the supervision of the Knox County Medical Milk Commission.

All cows must be Tuberculin tested each year. All persons handling the milk must be examined and found not to be a carrier of any contagious diseases.

The light and air spaces of the barns must not be limited, and the floors must be of concrete or some other impervious material. The ceilings must be tight and they and the walls must be white washed or painted.

An adequate and sanitary water supply is necessary, a straining room at the barn, a milk house of sanitary construction and a fly proof toilet are required.

Grade A milk must be cooled to 58 degrees Fahrenheit, and Grade B to 65 degrees.

Sterilization by steam, boiling water or an approved disinfectant is required.

Everyone selling or re-selling milk must secure license from the Dairy Inspector and place it in a conspicuous place.

After the inspection had been in force three years,^(18b) a great improvement had taken place. In the year 1927 there were 6704 cows in 509 dairies furnishing milk to Knoxville. There was an average of 11,526 gallons daily. This gives a decrease from 1925 in the number of dairies but there is an increase in the number of cows. The amount

of milk has also increased.

There were 102,058 people consuming this milk, making approximately one pint per capita per day.

These dairies received 1233 inspections during that year. Twelve were condemned. In 1926, twenty were condemned and forty-five in 1925.

Knox County produced about 75% of the milk, eleven other counties within a 50 mile radius helped to supply it.

There are seventy-five dairies that deliver bottled raw milk, thirty-six trucks that deliver bottled pasteurized milk from six pasteurizing plants. Twenty-four trucks deliver bulk milk to milk plants, and 172 dairies deliver buttermilk.

Six pasteurizing plants operated during the year and handled 43% of all bottled milk. There are two plants that bottle raw milk, three ice cream plants, and one that manufactures only butter and buttermilk.

There were 1447 inspections made of trucks and wagons during the year. Also 58 regular inspections made at the six pasteurization plants.

The inspection of the truck includes sanitation, cleanliness of truck, driver, cans, bottles, and milk.

The milk is inspected for visible dirt, temperature, bacteria content (taken later), and to see if label shows grade, name of producer or distributor, and whether raw or pasteurized.

There were 3933 analyses made of the milk, giving an average of 4.5% butterfat and 8.97% solids not fat for the retail raw milk and 5% butterfat and 8.98% solids not fat for the shipped milk. The average bacteria count of bottled pasteurized milk was 48,929, of bottled raw milk 104,732 and of bulk milk 266,004.

The amount of milk consumed in Knoxville is increasing and the quality is much better than in previous years.

**Milk Law and Inspection of
Nashville Milk Supply**

The milk ordinance of the city of Nashville (22) was adopted in 1918 and is still in force.

(Whole milk must contain not less than nine percent ($9\frac{1}{2}\%$) of solids not fat and three and one half percent ($3.5\frac{1}{2}\%$) of fat; cream eighteen percent ($18\frac{1}{2}\%$) fat and skimmed milk nine percent ($9\frac{1}{2}\%$) milk solids.) However under standard milk and modified milk may be sold if properly labeled. Milk shall not be sold that has had water, or other foreign substance added, or been skimmed, or produced under unsanitary conditions or from diseased cows.

Certified milk may be sold if produced and handled under the regulations of the Milk Commission of the Nashville and Davidson county Medical Society.

Dairies that score less than 60 and milk plants that score less than 70 are considered producing unsanitary milk.

The unit of measure is the quart and gallon of 57.75 cu. in. and 231 cu. in. respectively.

(License to sell milk and its products must be secured from the health officer; and the sign placed on the delivery vehicle or place of selling.

All cows must be tuberculin tested and examined physically.

Milk offered must not contain more than 300,000 bacteria per cc.

Milk Law and Inspection of Chattanooga's Milk Supply

The milk ordinance of Chattanooga (7) Tennessee, as adopted in 1935, which regulates the production, manufacturing and distribution of milk and its products, is for the purpose of safeguarding the public health and seeing that the milk and products contain the proper food value as represented in milk.

It provides for the following classes of milk:

1- certified, 2- grade A raw, 3-grade B raw, 4-grade C raw, 5-grade D raw, 6-grade A pasteurized, 7-grade B pasteurized, 8-grade C pasteurized.

Certified milk is that milk produced by the requirements of the American Association of Medical Milk Commissions, and under the supervision of the Hamilton County Milk Commission.

Grade A raw contains not more than 50,000 bacteria count and meets the following requirements for sanitation:

- 1- cows must be free of tuberculosis and other diseases;
- 2- barns must have three square feet of window space for each animal, 500 cubic feet of air space for each cow; must have impervious and easily cleaned floors; interior is to be white washed or painted and the ceiling tight; and a manure disposal that will prevent fly breeding.
- 3- The cows are to be cleaned before milking and milked in a sanitary manner.
- 4- A separate milk room with impervious floors must be provided for straining the milk.
- 5 -Utensils must be sterilized with steam.
- 6- The milk is to be handled only by those holding health certificates.

Grade B raw milk is milk with not over 200,000 bacteria count, and produced as grade A raw, except the barn requirements are not so strict and boiling water may be used instead of steam.

Grade C raw milk is milk with bacteria count up to 1,000,000 without requirements for tuberculin testing, barn or dairy house construction nor sterilization, but sanitation must be observed throughout.

Grade A pasteurized is grade A or B raw that has

been properly pasteurized and contains not more than 50,000 bacteria per cc., with a sanitary milk plant and handled so as not to contaminate it in any way.

Grade B pasteurized is grades A, B, and C raw that has been pasteurized and contains not more than 100,000 bacteria per cc., with the plant and handling about the same as grade A.

Grade C pasteurized is milk that does not meet the requirements for grade B and contains not more than 500,000 bacteria per cc. This may only be used for cooking, and must be so labeled.

Dairy Organizations of Tennessee

There are several dairy organizations in the state, all tending to better some phase of the industry. Some of them are very active, while others are only a part of the time, especially when there are problems to solve they meet and already have their organization to proceed with toward the desired work.

Among these organizations are: The Tennessee Jersey Cattle Club, Franklin; East Tennessee Jersey Breeders Association, Knoxville; Shelby County Jersey Breeders Association, Memphis; Williamson County Jersey Breeders Associa-

tion, Franklin; Shelby County Milk Producers Association, Memphis; Davidson County Milk Producers Association, Nashville; Knox County Milk Producers Association, Knoxville, and many other small organizations and cow testing associations.

Knox County Milk Producers Association

The Knox County Milk Producers Association was organized (11) July 12, 1924. N. J. Haddox was elected as its president and H. J. Fowler as secretary and treasurer. They have been reelected each year since, and are still the officers. In that year there were members. This was immediately after the City of Knoxville had passed and were putting into effect a more rigid milk ordinance than had ever been in Knoxville.

The object of the organization is to promote interest of the producers and consumers of milk by improving the conditions under which it is produced; to bring together the dairy farmers to develop the dairy industry of East Tennessee; to distribute scientific and practical information which will be helpful to its members in the production and marketing of dairy products; to improve the dairy herds; to foster a high quality market milk; to sug-

gest and support legislation that will improve the dairy industry; and to cooperate with those organizations that will better the dairy industry.

The membership is composed of milk producers of East Tennessee, mostly of Knox county, the annual dues were five dollars (\$5.00) until 1928, when they were changed to one dollar (\$1.00).

The accomplishments of this association were summarized as follows, by H. J. Fowler, secretary and treasurer (11):

"1- Secured a compromise on the Knoxville Milk Ordinance, whereby those wishing to sell raw milk are permitted to do so provided their milk is of a certain prescribed quality. Other minor clauses in the ordinance were modified also to make it more practical for the dairyman to comply.

2- For years the dairymen in Knoxville had been persecuted by the distributors of creamery milk in Knoxville because of a state law which made it a criminal offense to deliver milk in a bottle bearing a label other than that of the producer of the milk in the bottle. The association secured an agreement from the distributors to the effect that such a law was unjust and impractical, and that they would no longer use it against the dairymen. I know of not one case in which this agreement has yet been violated.

3- For about three years the association purchased bottles cooperatively from John Gruze Co. This saved the dairymen the trouble of ordering their bottles in large lots, and to many of us has proven a great convenience.

4- The association was very active in the "Milk for Health" campaign and furnished the greater part of the financing. The consumption of milk in Knoxville received

a big boost, and to a reasonable extent was permanently increased. There was no follow up program, and much of the good of the campaign was lost.

5- A very large number of the meetings of the association have been devoted to educational programs. Talks have been made from Agricultural Professors from the University of Tennessee, Extension men, and successful dairymen. Much valuable information, has in this manner, been made available to the members of the association.

6- The picnics have provided social grounds for the members to become acquainted, and the various members of the association are no longer unacquainted, jealous, suspicious of each other, but have come to understand each other and have confidence inspired in the high purpose of all.

7- The association was the instigator of the Cow Testing Association movement, which resulted in an organization that is instrumental in making a business man out of the dairyman.

"This year we have two objects (1928):

a- We are trying to educate the dairymen as a whole on the cost of producing a gallon of milk, with the intention of showing him the folly of selling at less than cost. We hope that this will have some influence in holding milk at a fair price.

b- We are organizing a campaign to advertise the high rating of milk as a food, and show the consumers of Knoxville that they are receiving a very high quality of milk.

"I consider the association as having been highly successful. The attendance has often been low, but this has been due to the extreme difficulty of a dairyman finding time from his daily work to attend, and not to a lack of interest. When we have faced a crisis, we have always won out, and I regard the association as very efficient in looking after the interests of the dairymen. I regard its potential value as a medium for bringing about better marketing conditions, better instruction (educational) to the

dairymen, and better purchasing facilities as being very high. The plans we have for this year should improve marketing conditions. When the dairymen need instruction from experts to face any given problem, the association has these men available, and furnish a medium for bringing them in contact with the dairymen who need their instruction. If the dairymen are available to purchase cooperatively, the Association will furnish the medium through which this cooperative buying can be brought to pass. This has not been possible in the past, due to the limited capital in the hand of the dairymen. It takes cold cash to purchase cooperatively.

Finally, conditions under which milk has been produced in Knox County have been vastly improved, and there has been brought to pass more economical production, and the production of a much higher quality of milk. The Association has been largely responsible for this condition."

Cow Testing Associations have been operating in Tennessee (16) since 1916. Just as they were getting started, the war demand for men made a shortage of testers, and many were not carried on that would have been. Then following that period the slump of all farm products also decreased the want of them.

The average production of cow testing association cows (16) is about 4500 pounds of milk and 218 pounds of butterfat.

In 1916 there was one association, in 1918 there were eight, but they have decreased until in 1928 there are only six. These are located in the following counties: Marshall, Davidson, Knox, Williamson, Shelby and Hamilton.

The Knox County Testing Association (18) was organized through the Knox County Milk Producers Association in 1925, and has been run continuously since that time.

There have been three testers in that time, all of whom have been University of Tennessee Agricultural graduates and have been a great help to the dairymen. At all times they have had their time practically taken up.

For the year ending August 1927, there were 320 cows completed the year's record, with an average of 5470 lbs. milk, 362 lbs. fat. 87 cows made 300 lbs. fat or over, and 2 herds averaged over 300 lbs. fat. 78 cows were culled out because of low production.

The high Holstein, produced 14,449 lbs. milk and 502 lbs. fat. The high Jersey produced 9148 lbs. milk and 417 lbs. fat.

The high herd was of 24 grade Jerseys (mostly pure-breds that had not been kept registered) with an average of 6586 lbs milk and 325 lbs. fat. (17 cows above 300 lbs) The worth of the association is outstandingly shown in this case, as the previous year their average was 4900 lbs milk and 245 lbs. fat.

Concluding Remarks

The dairy industry of Tennessee has made progress for several years, but within the last fifteen years it has grown by leaps and bounds. Tennessee has been selected as the place for many creameries, cheese factories, and condenseries. The growing cities have created a great demand for fluid milk. For some time this state has been recognized as a Jersey center and dairy cattle have been taken out of this state for both the North and the South.

The interest in dairying is widening and the bankers and other business men are backing it. The College of Agriculture and the Division of Extension of the University of Tennessee, are finding more progressive methods of dairying and are bending every effort to educate the dairymen to these. In 1927 the National Dairy Show was held at Memphis and this stimulated much interest in the work. It was a great success and so much interest manifested, that it will be held there again this year--1928.

With better cattle, improved methods, and more markets, Tennessee bids fair to a greater dairy development in the future.

BIBLIOGRAPHY

1. Adams, D. P.
November 1927 State Dairy Commissioner,
Nashville, Tennessee.
Correspondence.
2. American Jersey Cattle Club.
March 1928 Correspondence.
3. American Jersey Cattle Club.
April 1928 List of breeders and own-
ers of Registered Jersey
cattle in Tennessee.
4. Arnold, H. W.
1924 Senior Student in Dairying
University of Tennessee.
"Effect of Age on Quantity
and Quality of Milk Produced."
5. Arnold, H. W., and Hinton, T. G.
1924 Senior Students in Dairying
University of Tennessee.
"Effect of Month of Freshen-
ing on Quantity and Quality
of Milk Produced."
6. Burdette, George M.
1925 Senior Student in Dairying
University of Tennessee.
"The Distribution and Pro-
duction of Dairy Cattle."
7. Chattanooga Milk Ordinance.
1925 An ordinance regulating the
production, handling, and
distribution of milk and milk
products in the city of Chat-
tanooga.

8. Collins, S. C., Graduate Student in Dairying, University of Tennessee

1924

"Influence of Age-period of Lactation, Season, and time of freshening on the production of Jersey Cows in Tennessee.

9. Durrett, J. J., M. D. and Isley, C. J., Jr.

June 1925

A study of Memphis' Milk Supply. ✓

10. Durrett, J. J., M. D., Superintendent of Health, Memphis, Tennessee.
1928

Correspondence.

11. Fowler, H. J.

May 1928

Secretary Knox County Milk Producers Association, Ebenezer, Tennessee.

Conference and Correspondence.

12. Gusler, Gilbert.

January 1928

Rapid Changes in the Dairy Map. (Dairy Farmer January 1928). ✓

13. Hazlewood, Ben P.

1926

Graduate Student in Dairying, University of Tennessee.
Survey of Knoxville Milk Supply.

14. Hinton, T. G.

1924

Senior Student in Dairying University of Tennessee.
Factors Affecting Percent of Fat in Milk.

15. Holstein-Friesian Association of America, The
a. Class leaders for term.
b. Correspondence.

16. Hutton, C. A.

January-March 1928

Dairy Specialist, University of Tennessee.
Conferences.

17. Knoxville Milk Ordinance.

1924-1927

Ordinance No. 55, regulating the sale of milk and milk products in the City of Knoxville.

18. Knox County Cow Testing Association.

Report August, 1927.

18a. Knox County Milk Producers Association.

Constitution and by laws.

18b. Knoxville, City of,

1927

Bureau of Health Report.
Report of Dairy Inspector,
and Milk Plant Inspector.

19. Lincoln, W. B.

November 1927

March 1928

State Veterinarian,
Nashville, Tennessee.
Correspondence.
Conference.

20. McNeess, Stanley

April 1928

Superintendent Carnation
Milk Products Corporation.
Murfreesboro, Tennessee.
Conference.

21. MacDonald, Margaret B.

Tennessee Experiment Station,
Circular No. 14. "Removing
Onion Flavor From Milk."

22. Nashville Milk Ordinance.

1916

Ordinances and regulations governing the sale of milk in the city of Nashville.

23. Pirtle, T. R.

1922

United States Department of Agriculture. Handbook of Dairy Statistics.

24. Tennessee, State of, Department of Agriculture.

1925

Laws relating to the Purchase, manufacture, and sale of Dairy products, together with the regulations and approved methods for sampling and testing milk and cream.

24a. Tennessee, Sanitary Food Law.

1913

Sanitary Food Law, Providing for sanitary handling of all food stuffs.

24b. Tennessee, Milk Standards Law.

1913

Milk Standards Law.

25. Tennessee, Livestock Reports.

January 1928

United States Department of Agriculture. Division of Crop and Livestock Estimates, cooperating with University of Tennessee, Knoxville, Tennessee. Livestock Reports; Livestock Products Report.

26. United States Department of Agriculture.

1927

Separate from Yearbook 1926. No. 935. Statistics of Farm animals and animal products.

27. United States Department of Agriculture

Census Reports of 1850,
1860, 1870, 1880, 1890,
1900, 1910, 1920, 1925. ✓

28. Van Cleave, O. E.

1928

Field man Tennessee Jersey
Breeders Association.
Correspondence.

29. Van Pelt, Hugh G.

1921

Address to East Tennessee
Farmers Convention.

30. Warner, L. A.

1928

Senior Student of Dairying,
University of Tennessee,
Some Factors Affecting the
Production of Jersey Cows
in Tennessee. ✓

31. Williams, C. E.

1927

Senior Student of Dairying,
University of Tennessee,
A History of the Dairy In-
dustry of Tennessee. ✓

32. Wylie, C. Elmer

1926

Head of Dairy Department,
University of Tennessee,
Knoxville, Tennessee. Select-
ing Dairy Cattle. The Breeds. ✓

33. Wylie, C. Elmer

1928

Head of Dairy Department,
University of Tennessee,
Knoxville, Tennessee. Con-
ferences and leaflets.

34. Wylie, C. Elmer.

January 1928

Head of Dairy Department,
University of Tennessee,
Knoxville, Tennessee. The
adaptation of the MacDon-
ald Process for the Removal
of onion flavor and odor
in milk to creamery pract-
ice. ✓

35. Wylie, C. Elmer

1928

Head of Dairy Department,
University of Tennessee,
Knoxville, Tennessee. A
pasture method of prevent-
ing onion milk and cream. ✓