Economic Study of Dairying on 149 Farms in Broome County, New York

A THESIS

PRESENTED TO THE FACULTY OF THE GRADUATE SCHOOL OF CORNELL UNIVERSITY FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

BY

EDWARD GARDNER MISNER

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the interest on which amounts to $8155.45. Since veals and bulls to be sold are kept on hand for only a short time, no interest was charged on their value. The data are given in table 13.

Interest was charged to the dairy enterprise on the investment in forage for the average length of time the forage was stored before it was fed, and on the investment in concentrates from the time they were paid for until they were fed. On each record this cost was distributed to cows, heifers, and herd bulls, according to the numbers of animals kept and the quantities of feed used. The average total capital so invested was $38,160, or about $256 per farm. On some farms keeping heifers and herd bulls the interest charge on feed and supplies was so small that it was not separated. The data are given in table 14:

TABLE 14. INTEREST ON AVERAGE VALUE OF FEED AND SUPPLIES KEPT ON HAND FOR 2058 COWS, 1002 HEIFERS, AND 172 HERD BULLS

All herds			Cows		Heifers		Herd bulls	
Average value of feed and supplies on hand	Number of farms having expense	Interest at 5 per cent	Number of farms having expense	Amount charged	Number of farms having expense	Amount charged	Number of farms having expense	Amount charged
$38,160	149	$1,908	149	$1,511.50	120	$305.50	81	$91.00

Miscellaneous costs

All remaining expenses were classed as miscellaneous costs, and are given in table 15. Of these, ice, veterinary fees, medicines and disinfectants, fly protectors, whitewash, and expenses for testing milk, were the most important. Farmers having the expense for milk testing estimated the portion of this expense that should be charged to cows, to heifers, to bulls to be sold, and to herd bulls. The same was done with other items not wholly chargeable to cows.

The average amount of ice stored per cow was 1949 pounds.

Returns

Returns from dairy cattle on the farms studied were classified as (1) milk and milk products, (2) appreciation on cattle, (3) manure recovered, (4) miscellaneous returns.

Milk and milk products

Milk sold.— Of the 149 farms, 52 sold to the Empire State Dairy Company at Windsor and 1 to this company at Oquaga, 39 sold to Cloverdale Farms Company at Binghamton, 18 sold to F. W. Jansen at Whitney's Point, 16 to Bordens' at Tunnel, 7 to Sheffield Farms, Slawson-Decker Company, at Conklin, 5 to Bordens' at Whitney's Point, 3 to the Broome County Dairy Company at Binghamton, 7 a part of the year to F. W.

TABLE 15. MISCELLANEOUS COSTS, 2058 COWS, 1002 HEIFERS, 172 HERD BULLS, AND 76 BULLS TO BE SOLD

Item	All herds		Cows		Heifers		Herd bulls		Bulls to be sold	
	Number of farms having expense	Cost	Number of farms having expense	Cost	Number of farms having expense	Cost	Number of farms having expense	Cost	Number of farms having expense	Cost
Ice, 2006 tons	108	$1,711	108	$1,711	.....	.....	.....	.....	.....	.....
Veterinary fees	51	347	50	327	3	$20	.....	.....	.....	.....
Medicines, disinfectants, and louse killers	84	259	82	235	17	23	1	$1		
Fly protectors	107	268	107	259	5	5	4	4	.....	.....
Whitewashing	105	317	105	307	3	9	1	1	.....	.....
Milk testing, acids, etc	17	322	16	248	10	74	.....	.....	.....	.....
Insurance on cattle	104	176	104	162	12	13	1	1	.....	.....
Feed grinding and freight	34	100	26	81	11	16	3	3	.....	.....
Registration and transfer fees	6	31	.....	.....	3	13	2	5	2	$13
Express on stock	3	3	2	2	.....	.....	1	1	.....	.....
Advertising	1	2	.....	.....	.....	.....	.....	.....	1	2
Sawdust for ice	19	53	19	53	.....	.....	.....	.....	.....	.....
Hauling feed	3	16	3	14	1	1	1	1	.....	.....
Hauling bedding	2	18	2	15	1	2	1	1	.....	.....
Gasoline, oil, and batteries	3	33	3	28	2	4	1	1	.....	.....
Fuel for water heater	2	13	2	11	1	2	.....	.....	.....	.....
Clipping	12	17	12	16	.....	.....	1	1	.....	.....
Lime	1	1	1	1	.....	.....	.....	.....	.....	.....
Board of cows	1	26	1	26	.....	.....	.....	.....	.....	.....
Total	.....	$3,713	.....	$3,496	.....	$182	.....	$20	.....	$15
Breeding fees	28	$183	28	$183	.....	.....	.....	.....	.....	.....

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CONTENTS

AN ECONOMIC STUDY OF DAIRYING ON 149 FARMS IN BROOME COUNTY, NEW YORK

E. G. MISNER

The rapid growth of the milk trade, increases in the cost of milk production, and advances in the price of milk to consumers, have made the economic problems concerned in the production, transportation, and distribution of market milk of increasing public concern. This bulletin is

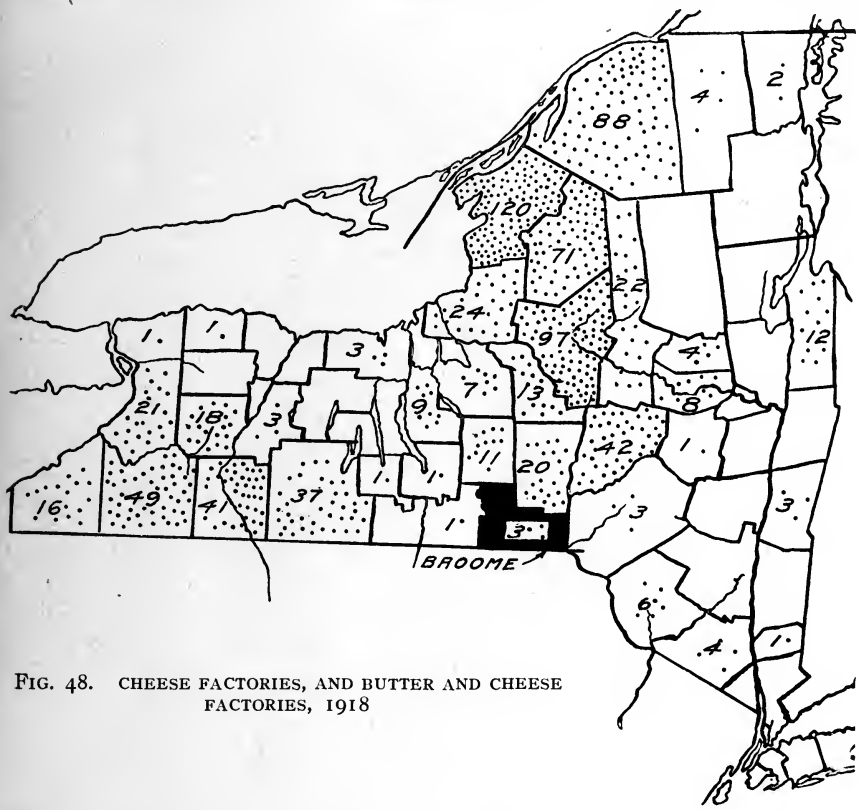

FIG. 48. CHEESE FACTORIES, AND BUTTER AND CHEESE FACTORIES, 1918

a report of a cost study, concerned only with the problems of production, not with those of transportation or distribution. The costs in terms of dollars are out of date because prices have changed, but the quantities are not affected so much by price changes.

AUTHOR'S ACKNOWLEDGMENTS. The dairymen of Broome County, New York, furnished the production data for this study. The investigation was under the direction of Professor G. F. Warren, of the Department of Agricultural Economics and Farm Management, New York State College of Agriculture. Professor E. S. Savage, of the Department of Animal Husbandry, advised for that part of the study relating to feeding. Professor K. C. Livermore gave criticisms and helpful suggestions. E. R. Minns assisted the writer in doing the field work. To these and to all others who helped with the work, the writer is indebted.

During July and August, 1915, in cooperation with the Broome County Farm Improvement Association, data concerning the dairy business for the year ending May 1, 1915, were obtained from 149 farmers in Broome County.

The exact figures for the pounds of milk delivered to the milk stations and the amount paid were obtained for each farm from the companies buying the milk. Some farmers kept no record of milk sold, and thus

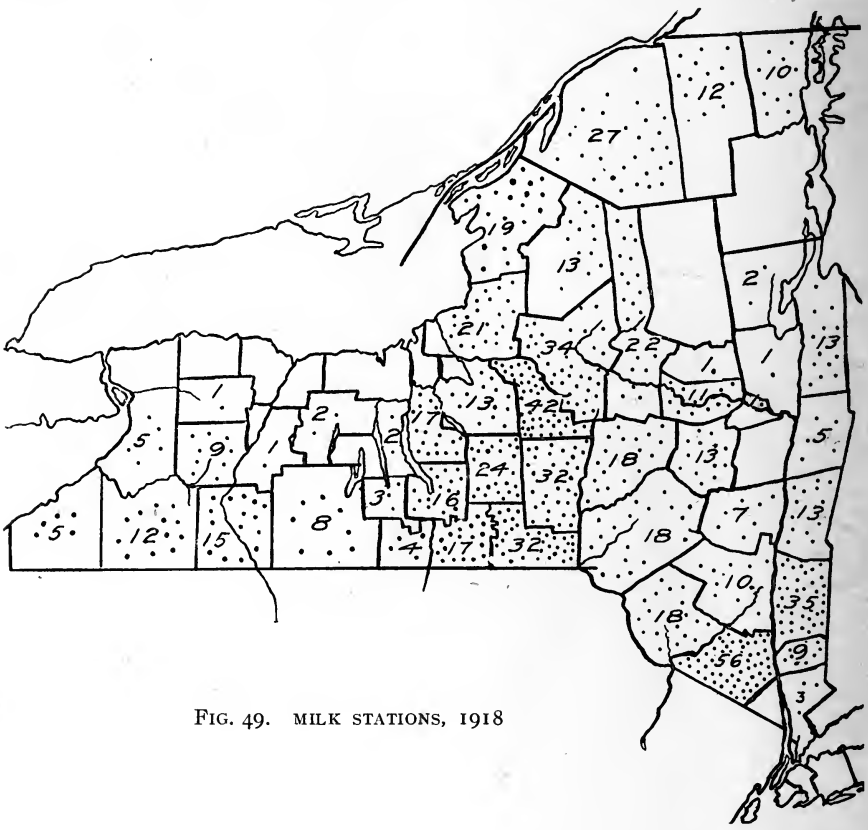

FIG. 49. MILK STATIONS, 1918

the necessity of accepting estimates as to the sales of milk was eliminated. For 114 farms, the average butterfat test of the milk by months was given by the companies. Other information was obtained from the farmers. Care was taken to obtain complete and fair estimates.

The form of blank for summarizing records in this office is shown on pages 440 to 443.

REGIONAL CONDITIONS

Broome County is one of the southern border counties of New York State. It is bounded on the east by Delaware County, on the west by Tioga County, on the north by Chenango and Cortland Counties, and on

the south by the State of Pennsylvania. It contains 705 square miles, 85 per cent of which is in farms. In 1920, according to preliminary returns for the fourteenth United States census, the population was 113,610. Binghamton, near the center of the county, the county seat and the only city of importance, had a population of 66,800. Three railroad lines — the Delaware, Lackawanna and Western, the Erie, and the Delaware and Hudson — serve the county. Binghamton furnishes a fair market

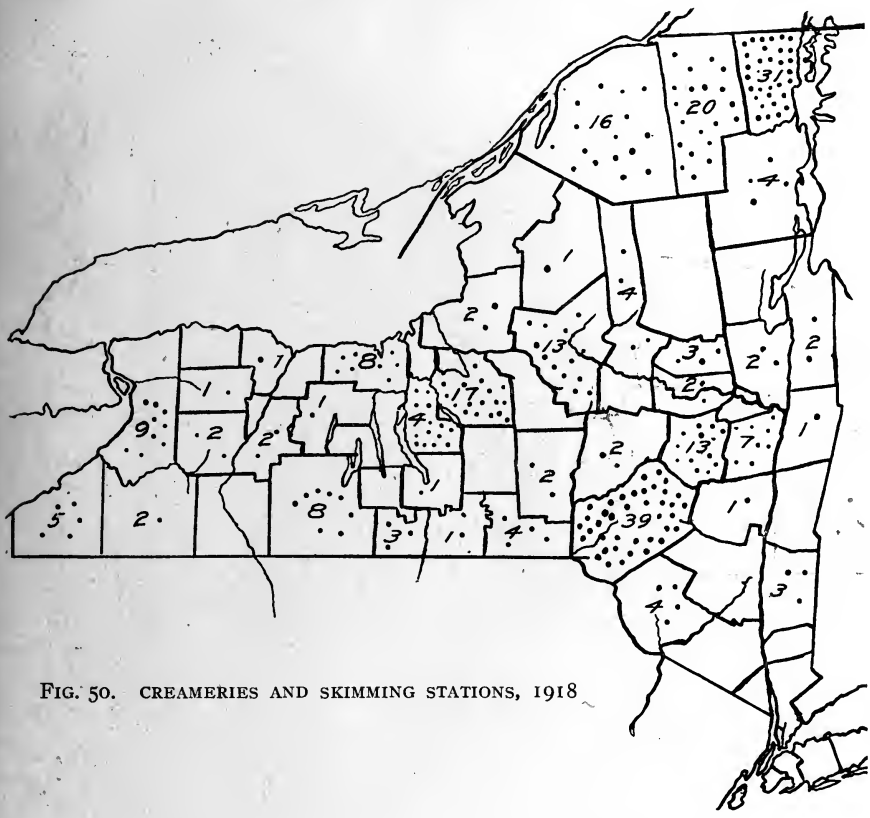

FIG. 50. CREAMERIES AND SKIMMING STATIONS, 1918

for a considerable amount of farm produce. Most of the surplus is shipped to New York City, 207 miles by rail.

The topography of Broome County is that of a feebly glaciated plateau region, thru which streams have cut deep valleys. Besides many small streams, three rivers of considerable size intersect the county, the Otselic joining the Tioughnioga at Whitney Point in the northern part, the Tioughnioga joining the Chenango at Chenango Forks, and the Chenango joining the Susquehanna at Binghamton. These river valleys are from one-half mile to almost two miles wide, and lie at an elevation of about 800 to 900 feet.

The valley soils are mapped as of the Chenango and Genesee series.[1] They are by far the more productive soils of the county, altho in some places adjacent to the rivers they are so low that crops are sometimes damaged or destroyed by floods out of season.

The land back from the valleys is rolling to steep. Much of the area is in woods, and a large proportion is suitable only for grazing. The highest elevations are in the southern part of the county, where the average level of the hilltops is about 1500 feet, altho the highest point is over 2000 feet.

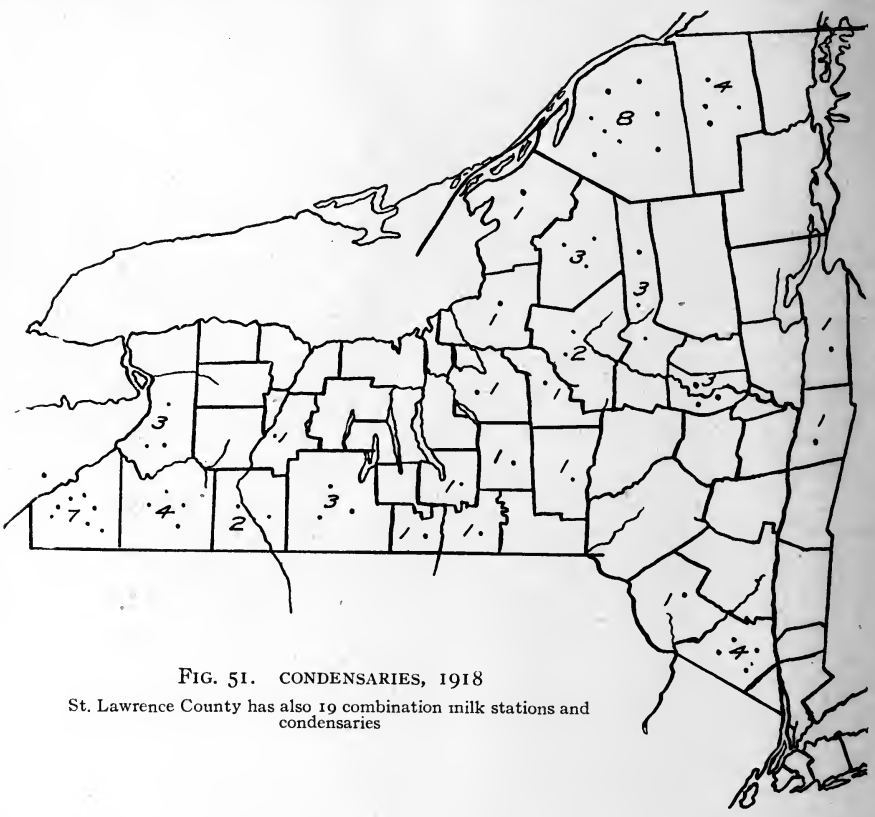

FIG. 51. CONDENSARIES, 1918

St. Lawrence County has also 19 combination milk stations and condensaries

Aside from small areas of alluvial soils in the stream valleys, the upland soils are generally of one type, Volusia silt loam. This is the most extensive and least productive type in the county. Its distinguishing characteristics are low humus content and low lime content. The compact subsoil or rock, generally lying close to the surface, makes drainage conditions unfavorable to the best crop production.

Weather records give the mean annual temperature at Binghamton, 871 feet above sea level, for the years 1890 to 1916 inclusive, as 46.8° F.,

[1] Field operations of the Bureau of Soils. United States Agr. Dept. Report 11: 71–96. 1905. Soils of the United States. United States Soils Bureau. Bul. 96: 744. 1913.

and the average rainfall as 33.18 inches. About half of the rain, 15.61 inches, falls from April to August inclusive. Much of the summer rainfall comes in heavy showers which quickly run off, and drouths are somewhat frequent, so that pastures often need to be supplemented during August and September.

The average length of the growing season at Binghamton for the years mentioned was 150 days.[2] The average date of the last killing frost in the spring was May 6, and of the first killing frost in the fall October 3. Altho there are no weather records for the uplands of this county, the growing season there averages from two to three weeks shorter. This makes the pasture season shorter, and the frost injury to crops, particularly to corn, more extensive, on the hills.

There are three types of farming common in Broome County — general farming, dairy farming, and trucking for the local markets.

Most of the trucking is confined to the valleys near the principal towns, while general and dairy farming is found both in the valleys and on the hills. The farms on the Volusia soil are devoted primarily to the production of forage crops and to dairying. On a few, potatoes are grown as a cash crop, but in general the land is too poor and the season too short to grow other intensive crops. The distance to market is much greater from the farms on the uplands, and this factor also influences the type. Everything considered, dairying is the best type of farming for the upland conditions.

According to the thirteenth census the average farm in the county in 1910 contained 102 acres. Of this, 35 acres were in crops exclusive of fruit, 22 in woods, and 45 in pasture and other land. Of the crop land, 27 acres were in hay and forage. The other principal crops are corn, oats, buckwheat, and potatoes. These crops are typical of the farms studied.

Altho Broome County may be considered a leading dairy county of the State, many dairymen, especially those of the uplands, follow an extensive system. An abundance of pasture, a short growing season, and a soil that is not naturally fertile, encourage the summer system. The industry never has been so intensively developed here as it has in the neighboring counties of Delaware and Chenango, or in many other counties of the State. This may be due mostly to less productive soil.

During the past thirty years the system of dairying has become increasingly more intensive. In 1880 there were 29,398 dairy cows two years old or older on farms in the county, and 3,659,982 pounds of butter made on farms.[3] In 1917 there were 27,029 dairy cows on 3027 farms in the county, an average of 8.9 per farm reporting dairy cows.[4] The

[2] Climatological data, New York section, August, 1916, page 94.
[3] United States census report, 1880.
[4] Census of the agricultural resources of New York, 1917.

United States census of 1910 reported 410,291 pounds of butter made on farms in the county during 1909. In 1900 there were twenty milk stations in the county, and in 1916 there were forty.[5]

The making of butter and cheese has practically ceased. This has resulted in more winter milk. The next step in the development of a more intensive system of dairying in the region will be the production of

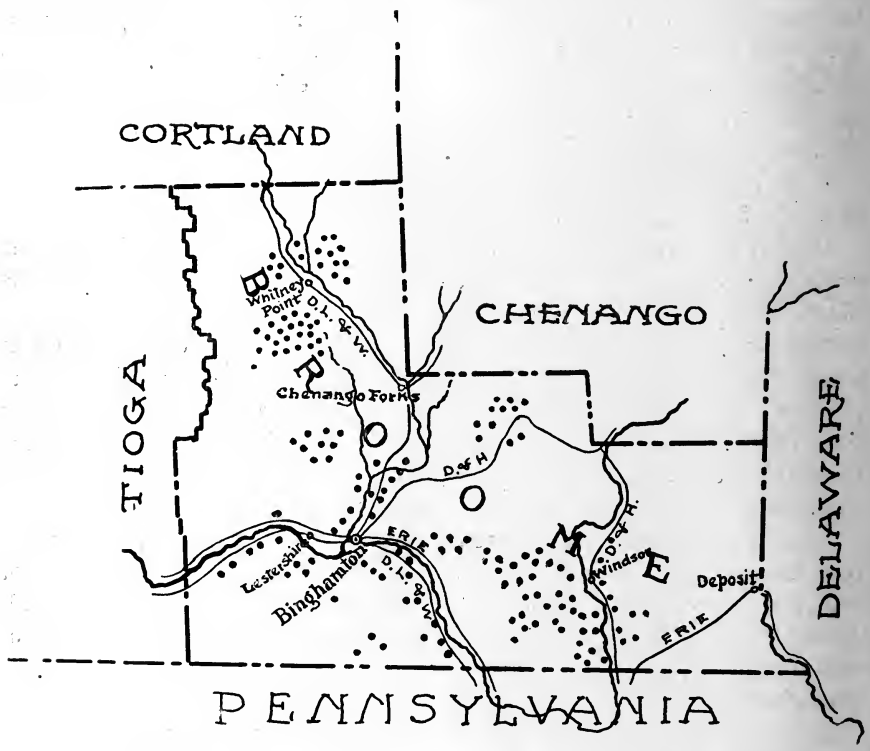

FIG. 52. MAP OF BROOME COUNTY SHOWING LOCATION OF FARMS STUDIED

Of the 149 farmers, 104 owned all of the land they farmed, 6 owned part and share-rented additional land, 12 owned part and cash-rented additional land, and 20 share-rented and 7 cash-rented all of the land they farmed. The average number of acres per farm was 157, and the average distance to market was 3.4 miles. The average age of the farmers was 47 years

a still larger proportion of the milk in winter, as the demands of Binghamton and New York City for market milk continue to grow.

The farms included in this survey were in various parts of the county, but most of them were in the vicinity of Windsor, Whitney Point, and Binghamton. Fifty were in the Susquehanna, Chenango, and Otselic Valleys, and ninety-nine were on the hills or upland. Herds of less than six cows were not included, but other than this there was no selection.

[5] Bulletin 5, New York State Department of Agriculture, pages 4–5, 1900, and Bulletin 88, New York State Department of Agriculture, pages 3, 4, and 5, 1916.

RESULTS OF THE INVESTIGATION

For convenience the results of this study are arranged in five parts. Part I considers the entire dairy enterprise as the unit of study; Part II deals with cows only, Part III with heifers, Part IV with herd bulls, and Part V with veals and bulls to be sold.

PART I. CONCERNING THE ENTIRE ENTERPRISE

When the entire dairy enterprise is considered the unit, all the costs of maintaining cows, costs of growing and maintaining heifers, calves, veals, bulls to be sold, and herd bulls, costs of marketing dairy products, and any other costs for dairy cattle, are charged. All returns from the enterprise are credited and the difference is considered the gain or loss on the enterprise.

The dairy is only one of the various parts of a farm business, and therefore the results do not show the gain or loss on the whole farm. An investigation that included the labor income as well as costs and returns for the dairy would be useful.

Costs

The various costs chargeable to dairy cattle may be classified as follows: feed, bedding, labor, milk hauling, use of buildings, use of equipment, interest, and miscellaneous charges.

Feed

No account was taken of feed given to stock other than dairy cattle. The total quantities and costs of the various feedstuffs used by all dairy cattle, by cows during the pasture period, by heifers, by herd bulls, and by bulls raised to be sold, were obtained separately in the field. The feed used by cows during the winter period was considered to be the difference between the total herd quantities and the other quantities.

All grain, succulent feed, and forage raised on the farm and used by cattle, was charged at what it would sell for at the farm, that is, its market value less the cost of marketing. All feedstuffs purchased were charged at the prices paid. The cost of hauling to the farm was included with labor, equipment, milk hauling, and other costs. Much of the purchased grain is hauled home by the farmer when returning from delivering the milk. This was included with the charge for milk hauling. Extra trips for feed, as well as the time spent hauling home-grown grains to and from the mills and the time spent mixing feed, was charged under labor.

Grain and other concentrates.— With grain and other concentrates were included all concentrated feedstuffs, namely, all grains and their by-products whether home-grown or purchased, calf meal, condimental feeds, and salt (table 1). The charge for grain represented 36 per cent of the total feed cost and 20 per cent of the total cost of the enterprise.

On the 149 farms there were six different kinds of grain raised and fed cattle, and at least forty-three different kinds of grain purchased and fed.

TABLE 1. CONCENTRATES USED BY 2058 COWS, 1002 HEIFERS, 172 HERD BULLS, AND 76 BULLS TO BE SOLD*

Kind of feed	All herds				Cows				Heifers			Herd bulls			Bulls to be sold		
	Number of herds using feed	Number of pounds used	Average price per ton†	Value	Number of pounds used	Per cent, omitting condimental feed and salt	Average price per ton	Value	Number of herds using feed	Number of pounds used	Value	Number of herds using feed	Number of pounds used	Value	Number of herds using feed	Number of pounds used	Value
Home-grown:																	
Oats	42	88,950	$30.92	$1,375	69,507	2.46	$30.01	$1,043	23	17,729	$302	9	1,714	$30	....	....	....
Buckwheat	17	27,430	33.69	462	25,220	0.89	33.54	423	2	1,970	35	1	240	4	....	....	....
Corn	7	14,140	27.44	194	13,640	0.48	27.13	185	....	.....	....	1	500	9	....	....	....
Rye	1	2,800	44.29	62	2,240	0.08	44.64	50	1	560	12	....	.....	....	....	....	....
Barley	1	1,700	35.29	30	1,250	0.05	35.20	22	1	400	7	1	50	1	....	....	....
Wheat	1	360	44.44	8	.....	.....	.....	.....	1	310	7	1	50	1	....	....	....
Total home-grown	....	135,380	$31.48	$2,131	111,857	.....	$30.81	$1,723	....	20,969	$363	....	2,554	$45	....	....	....
Purchased:																	
Gluten (feed)	134	1,113,480	$30.38	$16,916	1,072,005	37.92	$30.36	$16,274	44	31,315	$470	43	10,160	$172	....	....	....
Cornmeal	60	160,490	32.28	2,590	125,440	4.44	32.27	2,024	33	25,095	405	32	9,955	161	....	....	....
Hominy	9	28,020	30.76	431	20,495	0.72	30.35	311	6	5,705	92	3	720	12	1	1,100	$16
Corn and oats	8	8,400	35.24	148	90	.....	22.22	1	8	7,250	128	3	1,060	19	....	....	....
Corn bran	1	2,850	7.72	11	2,850	0.10	7.72	11	....	.....	....	....	.....	....	....	....	....
Corn middlings	1	1,880	18.09	17	1,880	0.07	18.09	17	....	.....	....	....	.....	....	....	....	....
Wheat feed	72	422,907	30.84	6,521	363,936	12.87	30.84	5,612	50	48,451	747	36	10,520	162	....	....	....
Wheat bran	65	262,700	28.52	3,746	235,235	8.32	28.56	3,359	38	21,975	308	28	5,490	79	....	....	....
Wheat middlings	33	19,200	32.92	316	7,650	0.27	30.59	117	28	10,815	186	7	635	11	1	100	2
Red dog middlings	2	700	34.29	12	.....	.....	.....	.....	2	600	11	1	100	1	....	....	....
Buckwheat middlings	6	25,300	30.99	392	25,000	0.88	31.04	388	1	300	4	....	.....	....	....	....	....
Ground oats	5	8,200	33.90	139	3,400	0.12	31.76	54	3	2,900	52	3	1,900	33	....	....	....
Whole oats	1	800	37.50	15	.....	.....	.....	.....	1	700	13	1	100	2	....	....	....
Cottonseed meal	67	186,975	32.74	3,061	180,141	6.37	32.73	2,948	11	5,321	87	14	1,513	26	....	....	....
Oilmeal	44	15,200	42.37	322	7,660	0.27	45.43	174	31	7,130	139	7	410	9	....	....	....
Distillers' and brewers' dried grains:																	
Continental gluten	4	22,000	33.18	365	21,560	0.76	33.49	361	....	.....	....	2	440	4	....	....	....
Dewey's	8	36,400	32.91	599	35,650	1.26	32.93	587	1	600	10	1	150	2	....	....	....
Kinds not found	6	12,500	32.96	206	11,480	0.41	32.93	189	1	720	12	1	300	5	....	....	....
Dry equivalent of brewers' grains, wet	2	60,206	15.28	460	60,206	2.13	15.28	460	....	.....	....	....	.....	....	....	.....	....
Brewers' grains, dried	25	89,800	28.00	1,257	88,655	3.14	28.02	1,242	4	800	10	5	345	5	....	....	....
Malt sprouts	2	5,000	25.60	64	5,000	0.18	25.60	64	....	.....	....	....	.....	....	....	....	....

* The number of bulls to be sold is the number born during the year, plus the number purchased, less the number slaughtered or sold for slaughter.
† Average prices per ton are obtained by dividing the total value by the quantities used.

TABLE 1 (*concluded*)

Kind of feed	All herds				Cows				Heifers			Herd bulls			Bulls to be sold		
	Number of herds using feed	Number of pounds used	Average price per ton	Value	Number of pounds used	Per cent, omitting condimental feed and salt	Average price per ton	Value	Number of herds using feed	Number of pounds used	Value	Number of herds using feed	Number of pounds used	Value	Number of herds using feed	Number of pounds used	Value
Molasses and molasses feeds:																	
Molasses	8	9,900	$23.64	$ 117	9,900	0.35	$23.64	$ 117	....	.....	....	....	.....	....	....	.....	....
Cloverleaf Feed	17	80,600	26.18	1,055	72,690	2.57	26.14	950	7	5,680	$ 75	10	2,230	$30	....	.....	....
Hammond's Dairy	2	11,200	26.61	149	10,660	0.38	26.64	142	1	370	5	1	170	2	....	.....	....
Ideal	1	10,000	25.00	125	10,000	0.35	25.00	125	....	.....	....	....	.....	....	....	.....	....
International Special	1	10,000	22.00	110	10,000	0.35	22.00	110	....	.....	....	....	.....	....	....	.....	....
Purina	1	8,000	33.00	132	7,850	0.28	33.12	130	1	150	2	....	.....	....	....	.....	....
Sucrene	2	5,600	30.71	86	5,600	0.20	30.71	86	....	.....	....	....	.....	....	....	.....	....
Xtra Vim	2	2,500	32.80	41	2,500	0.09	32.80	41	....	.....	....	....	.....	....	....	.....	....
Empress	1	2,000	23.00	23	2,000	0.07	23.00	23	....	.....	....	....	.....	....	....	.....	....
International Dairy Feed	1	30,500	24.98	381	28,000	0.99	24.93	349	1	2,200	28	1	300	4	....	.....	....
Sugar Feed	1	2,600	30.00	39	2,600	0.09	30.00	39	....	.....	....	....	.....	....	....	.....	....
Kinds not found	24	106,760	25.96	1,386	103,059	3.65	25.95	1,337	6	2,961	39	5	740	10	....	.....	....
Other mixed feeds:																	
Eggee	4	27,800	24.82	345	25,740	0.91	25.02	322	2	1,580	19	2	480	4	....	.....	....
Schumacher	32	68,450	31.56	1,080	43,875	1.55	31.23	685	22	22,000	354	10	2,575	41	....	.....	....
Union grains (Ubiko)	3	49,000	32.65	800	48,900	1.73	32.64	798	....	.....	....	1	100	2	....	.....	....
Unicorn	7	43,300	33.86	733	39,920	1.41	33.87	676	1	2,500	42	2	880	15	....	.....	....
Mixed feed (Ubiko)	1	20,000	32.00	320	.....	.....	.....	.....	1	17,400	278	1	2,600	42	....	.....	....
Grandins' Mixed Feed	6	8,975	31.42	141	4,300	0.15	32.09	69	2	4,525	70	1	150	2	....	.....	....
Kinds not found	1	2,800	33.57	47	2,800	0.10	33.57	47	....	.....	....	....	.....	....	....	.....	....
Miscellaneous:																	
Dried beet pulp	7	16,400	27.07	222	16,300	0.58	27.12	221	1	100	1	....	.....	....	....	.....	....
Calf meal	63	16,150	59.07	477	.....	.....	.....	.....	63	14,574	426	21	1,426	46	4	150	$5
Alfalfa meal	1	100	40.00	2	100	0.01	40.00	2	....	.....	....	....	.....	....	....	.....	....
Condimental feed	32	‡1,350	.....	326	1,350	.....	.....	324	1	.....	1	1	.....	1	....	.....	....
Salt	141	70,110	10.36	363	67,480	.....	.....	349	8	2,430	13	1	200	1	....	.....	....
Total purchased	....	3,087,103	$29.86	$46,088	2,783,957	100.00	$29.55	$41,135	....	246,147	$4,027	....	55,649	$903	....	1,350	$23
Total concentrates	....	3,222,483	$29.93	$48,219	2,895,814	.....	$29.60	$42,858	....	267,116	$4,390	....	58,203	$948	....	1,350	$23

‡ Quantities reported for six farms only. On the others the quantities were too insignificant to note. Probably some of this expense should have been included under miscellaneous costs, as medicines, and so forth.

The usual practice is to buy all the grain. Only 53 farms raised any grain to feed cattle. Practically all of this was oats and buckwheat. Purchased grain represented 96 per cent of the quantity used, and at the average price of $29.86 a ton it represented also 96 per cent of the charge for grain used by dairy cattle. The average value of home-grown grain used was $31.48 a ton.

Succulent feed.— Silage, green corn, potatoes, cabbage, cabbage fodder, mangels, beets, turnips, carrots, apples, soiling crops, skimmilk purchased, and other feeds with a very high percentage of water, were classed as succulent feed. Brewers' grains wet were converted to their dry equivalent by considering 3.8 pounds of wet grains equal to 1 pound of dried grains, and were charged under grain rather than under succulent feed. Quantities, costs, and the number of farms using each kind of succulent feed, are given in table 2.

Corn silage was charged at $5 a ton. Under some conditions, the market value of silage should be used when charging it to another enterprise; but generally, in New York State, corn for the silo is not raised to be sold either as grain or as silage, and hence it should be charged at cost. There is no reason to believe that the cost of producing silage on the farms studied was less than this figure.

Of the 149 farms, 69, or 46 per cent, fed silage. On these farms, 4284 tons of corn silage and 20 tons of millet silage were fed dairy cattle. An agricultural census of the State taken in 1917 showed that 3027 farms in Broome County kept dairy cows and 1033 grew corn for the silo in 1916; thus, about one-third of the farms with dairy cows grew silage.

Other succulent feeds were charged at their estimated farm values. Of all the herds, 26, or 17 per cent, fed no succulent feed. Excepting 21.8 tons of skimmilk and 1.35 tons of potatoes purchased, all succulent feed was raised on the farms where fed.

Dry forage.— All hay, corn stover, straw, and other cured roughage was classed as dry forage. One per cent was purchased. Of this, 11 farms bought 42.75 tons of hay, and two other farms bought 12 tons of cornstalks. The amount fed to dairy cattle per farm was 35.4 tons, of which mixed hay constituted 63 per cent. The average value of dry forage per ton was $9.62. Details as to quantities, costs, and number of farms using each kind of dry forage, are given in table 3.

Pasture.— Most farms had sufficient pasture for their cattle. Of the 149 farmers, 45 paid $793 to pasture some of their cattle a part or all of the season, and 20 received $305 for stock taken in.

Pasture was charged at cost. In determining this cost, interest at 5 per cent and taxes at 0.5 per cent were charged on the value of the land pastured. Charges for labor and materials used in making and repairing pasture fences, in manuring when manure was hauled and applied, in fertilizing, reseeding, mowing brush or weeds, or in any other treatment

TABLE 2. SUCCULENT FEED USED BY 2058 COWS, 1002 HEIFERS, 172 HERD BULLS, AND 76 BULLS TO BE SOLD

Kind of feed	All herds				Cows			Heifers			Herd bulls			Bulls to be sold		
	Number of herds using	Number of tons used	Average price per ton	Value	Number of tons used	Average price per ton	Value	Number of herds using	Number of tons used	Value	Number of herds using	Number of tons used	Value	Number of herds using	Number of tons used	Value
Home-grown:																
Corn silage	69	4,284	$ 5.00	$21,420	3,895.9	$ 5.00	$19,484	45	310.1	$1,548	39	78	$388	...	....	....
Millet silage	1	20	3.00	60	20	3.00	60	....	.....	.....	....	.....	.....	....	....	.....
Corn (green)	50	417.75	2.68	1,118	411.95	2.67	1,100	5	5	15	2	0.8	3	....	....	.....
Sweet corn	2	7	4.00	28	7	4.00	28	....	.....	.....	....	.....	.....	....	....	.....
Turnips	20	126.65	4.67	592	106.35	4.29	456	3	19.5	134	1	0.8	2	....	....	.....
Potatoes	36	70.73	7.20	509	70.03	7.21	505	2	0.25	2	1	0.45	2	....	....	.....
Mangels	3	47.4	3.04	144	46.4	3.06	142	1	0.5	1	1	0.5	1	....	....	.....
Carrots	3	7.6	10.79	82	7.6	10.79	82	....	.....	.....	....	.....	.....	....	....	.....
Apples	1	4.8	4.17	20	4.8	4.17	20	....	.....	.....	....	.....	.....	....	....	.....
Beets	2	0.5	10.00	5	0.5	10.00	5	....	.....	.....	....	.....	.....	....	....	.....
Cabbage fodder	7	57	1.89	108	57	1.89	108	....	.....	.....	....	.....	.....	....	....	.....
Cabbage	6	30.75	3.02	93	30.75	3.02	93	....	.....	.....	....	.....	.....	....	....	.....
Green rowen	2	36	1.81	65	36	1.81	65	....	.....	.....	....	.....	.....	....	....	.....
Millet	8	28	4.21	118	27.7	4.22	117	....	.....	.....	1	0.3	1	....	....	.....
Oats and peas	6	27.5	3.24	89	27.5	3.24	89	....	.....	.....	....	.....	.....	....	....	.....
Buckwheat	2	14	7.71	108	14.0	7.71	108	....	.....	.....	....	.....	.....	....	....	.....
Oats, corn, and millet	1	9	3.00	27	9.0	3.00	27	....	.....	.....	....	.....	.....	....	....	.....
Oats	1	2	5.00	10	2.0	5.00	10	....	.....	.....	....	.....	.....	....	....	.....
Rye	1	1.5	5.33	8	1.5	5.33	8	....	.....	.....	....	.....	.....	....	....	.....
Purchased:																
Skimmilk	21	21.8	3.53	77	.....	.....	.....	21	18.69	64	5	1.39	6	2	1.72	$7
Potatoes	1	1.35	3.70	5	1.35	3.70	5	....	.....	.....	....	.....	.....	....	....	.....
Total succulent feed	....	5,215.33	$4.73	$24,686	4,777.33	$4.71	$22,512	....	354.04	$1,764	....	82.24	$403	....	1.72	$7

TABLE 3. DRY FORAGE USED BY 2058 COWS, 1002 HEIFERS, 172 HERD BULLS, AND 76 BULLS TO BE SOLD

Kind of feed	All herds				Cows			Heifers			Herd bulls			Bulls to be sold		
	Number of herds using	Number of tons used	Average price per ton	Value	Number of tons used	Average price per ton	Value	Number of herds using	Number of tons used	Value	Number of herds using	Number of tons used	Value	Number of herds using	Number of tons used	Value
Home-grown:																
Mixed hay	130	3,322.9	$10.28	$34,158	2,571.3	$10.27	$26,414	117	608.5	$6,262	101	143.1	$1,482	....	....	.....
Timothy hay	35	557.5	10.84	6,046	445.95	10.82	4,826	22	86.0	931	17	24.65	278	1	0.9	$11
Clover hay	7	103	11.63	1,198	86.9	11.50	999	3	14.4	177	2	1.7	22	....	....	.....
Clover hay (second cut)	8	36.5	11.73	428	20.1	12 29	247	5	13.9	153	2	2.5	28	....	...	.....
Alfalfa	11	45.5	14.33	652	42.4	14.34	608	4	3.0	43	1	0.1	1	....	....	.....
Oat hay	24	140.5	9.08	1,276	131.05	9.16	1,201	4	7.75	61	4	1.7	14	....	....	.....
Oat and pea hay	20	137.0	9.40	1,288	125.2	9.33	1,168	5	10.1	103	2	1.7	17	....	....	.....
Millet	18	106.0	9.13	968	87.8	9.02	792	5	15.25	146	3	2.95	30	....	....	.....
Straw fed (oat)	22	62.5	4.86	304	53.75	4.91	264	8	7.15	35	4	1.6	5	....	....	.....
Straw fed (buckwheat)	5	4.5	4.22	19	3.65	3.84	14	1	0.5	3	1	0.35	2	....	....	.....
Corn stover	72	706.5	5.61	3,963	660.2	5.60	3,699	28	39.55	232	13	6.75	32	....	....	.....
Purchased:																
Hay	11	42.75	10.88	465	42.75	10.88	465	.....	.....	.....	....	.....	.....	....	....	.....
Cornstalks	2	12	2.08	25	12.0	2.08	25	....	.....	.....	....	.....	.....	....	....	.....
Total dry forage	....	5,277.15	$9.62	$50,790	4,283.05	$9.51	$40,722	....	806.10	$8,146	....	187.10	$1,911	....	0.9	$11

of the pasture, and money paid for the use of pasture, were included. The amount received for stock taken in to pasture was deducted to get the cost of pasturing the farmer's own stock. This cost on each record was apportioned to cows, heifers, herd bulls, horses, and sheep, on the animal-unit basis and according to the number of days pastured. Most of the pasture hired was for heifers and the amount paid was charged directly to them.

The average date of turning out in the spring was May 14, and that of beginning full barn feeding in the fall was October 19. This allowed an average of 159 days on pasture. The dates of turning out varied from May 1 to June 1. The dates of beginning to feed in the fall varied from September 15 to November 15. Usually the meadows were pastured after the hay was removed. They furnished considerable feed, especially on the river flats. For this no charge was made, altho such a charge should have been included. In late summer and early fall, pasture was frequently supplemented by grain or fodder or both. The dry matter in the feed used supplementary to pasture for cows was equivalent to the dry matter in ten days of winter feed. On this basis pasture furnished 149 days of full feed for cows.

An average of 53.2 acres to each farm was pastured. Since the average size of farm was 156.7 acres, 34 per cent of the land was in pasture. The average value was $20.25 an acre. On the average 3.1 acres were pastured per animal unit.

The cost of pasture was $4.83 per cattle unit for the season, or 3.04 cents a day. Of this, interest and taxes comprised 72 per cent, and fencing costs 20 per cent. The balance was cash paid for hired pasture and other miscellaneous items. The charge for stock taken in to pasture was at the rate of $6.30 an animal unit for the season, or about 4 cents a day.

A summary of pasture costs is given in table 4. Stock pastured, and the distribution of the cost of pasture, are given in table 5.

TABLE 4. COST OF PASTURE, 2018 COWS, 607 HEIFERS, 106 HERD BULLS, 199 SHEEP, AND 124 HORSES AND COLTS

7,927.5 acres of pasture land at $20.25 = $160,509

Item	Farms having expense	Cost
Interest and taxes at 5.5 per cent	149	$8,828
Making and repairing fences	147	2,395
Mowing and reseeding	5	69
Fertilizing and manuring	2	165
Amount paid for pasture rented	45	793
Total	.....	$12,250
Received for pasture	20	305
Difference (= cost of pasture)	.....	$11,945

TABLE 5. STOCK PASTURED, AND DISTRIBUTION OF PASTURE COST

Kind of stock	Number of farms pasturing	Number of animals pastured	Average number of days pastured to each farm pasturing	Equivalent in animal units for entire season	Amount charged
Stock owned:					
Cows	149	2,018	159	2,018.5	$9,338
Heifers	122	607	146	305.7	1,907
Herd bulls	100	106	131	76.1	346
Total cattle	.....	2,731	.....	2,400.3	$11,591
Sheep	8	199	134	31.3	106
Horses and colts	52	124	99	64.8	248
Total owned	.....	3,054	.....	2,496.4	$11,945
Stock taken in:					
Mature	11	19	133	15.9	.....
Young	12	68	152	32.5	.....
Total	.....	3,141	.....	2,544.8	.....

Acres of pasture per animal unit, 3.1.
Cost for each cattle unit of farmer's own stock, $4.83.

Bedding

Waste hay and stover from the mangers furnished a considerable quantity of bedding. No charge was made for this, since it was charged to the cattle as forage. Very little bedding was purchased. The bedding cost was apportioned to cows, heifers, and herd bulls on each farm. The data are given in table 6:

TABLE 6. BEDDING USED BY 2058 COWS, 1002 HEIFERS, AND 172 HERD BULLS

Kind of bedding	All herds			Cows		Heifers		Herd bulls	
	Number of farms using	Amount (tons)	Value	Number of farms using	Value	Number of farms using	Value	Number of farms using	Value
Home-grown:									
Oat straw	90	269.3	$1,483	92	$1,171	65	$225	51	$87
Buckwheat straw	21	32.7	105	22	101	1	4	.....	0
Wheat straw	1	0.5	2	1	2	.....	0	.....	0
Rye straw	1	3.0	24	1	18	1	2	1	4
Chaff	6	?	27	6	17	2	6	3	4
Swamp and marsh hay	6	9.5	50	5	40	3	8	2	2
Sawdust	9	?	22	8	22	.....	0	.....	0
Total home-grown	.....	.....	$1,713	.....	$1,371	.....	$245	.....	$97
Purchased:									
Sawdust	52	?	$315	51	$275	12	$28	8	$12
Shavings	5	?	26	5	18	1	5	1	3
Buckwheat straw	1	?	14	1	2	1	10	1	2
Oat straw	3	?	12	2	7	2	4	1	1
Total purchased	.....	.....	$367	.....	$302	.....	$47	.....	$18
Total bedding	.....	.....	$2,080	.....	$1,673	.....	$292	.....	$115

Labor

Some farmers hauled their own milk, while many hired it hauled. Some spent considerable time in making and repairing pasture fences or in constructing and repairing buildings, while others spent little. For these reasons it was thought best to include such time under charges for milk hauling, pasture, and use of buildings, rather than under labor.

Excepting this, and also time spent in raising and harvesting crops and time spent hauling manure from the barnyard, all human and horse labor for the dairy enterprise was charged under the heading *Labor*. This includes all labor in milking, taking care of milk and dairy equipment, feeding, cleaning cattle and stables, hauling and mixing feed, hauling bedding, buying and selling cattle, and all other time spent for cattle. Not only was this labor divided as to whether it was spent for cows, for heifers, or for herd bulls, but it was also divided according to whether it was spent during the pasture period or during the winter period. The average wage of male farm labor without board in New York in 1915 was $35.80 a month.[6] This is about fifteen cents an hour for a nine-hour day, but probably is too low because use of house, wood, and other things furnished are not included in all cases. Farm operators, however, could ordinarily hire out to operate farms at more than hired men's wages, and their time, therefore, should be counted at a higher rate. The time of women and children usually is not so valuable as the time of men.

The cost of labor per hour depends largely on the size of the business, on the layout of the farm, on the type and intensity of farming, and on wages. Other things being equal, the rates are usually higher on the one-man farms than on the two-man farms. But since no records of the cost of labor on these farms were available, it was necessary to charge labor to dairy cattle at the same rate on each farm, irrespective of the variations mentioned.

Man labor was charged at 15 cents an hour. Since no records of any kind were available to show what woman and child labor cost, it was charged at 10 cents an hour. Horse labor was charged at 15 cents an hour.

The data for labor costs are given in table 7 (page 288).

Milk hauling

In order to make comparisons between farms that hired milk hauled and those where milk was hauled by the farmer, the cost of hauling milk was kept separate from other costs.

When the farmer drew his own milk only, or when he cooperated with neighbors in hauling, the cost was found by multiplying the hours of human and horse time required by the same rates per hour as were used for other labor.

[6] United States Department of Agriculture. Monthly crop report, March, 1917, page 25.

TABLE 7. LABOR CHARGES, 2058 COWS, 1002 HEIFERS, AND 172 HERD BULLS

Labor for	Pasture period, 159 days			Winter period, 206 days			Total				
	Number of farms using	Hours spent	Per cent	Number of farms using	Hours spent	Per cent	Number of farms using	Hours spent	Per cent	Value	Per cent
Cows:											
Human labor:											
Milking:											
Man	147	70,159	59	149	86,585	38	149	156,744	54	$23,511.60	53
Woman	36	8,640	7	26	7,819	4	37	16,459		1,645.90	
Child	25	5,254	5	20	6,897	3	26	12,151		1,215.10	
Care of cows, product, and utensils:											
Man	135	26,420	22	148	107,157	47	148	133,577	44	20,036.55	45
Woman	120	6,185	5	121	8,285	4	121	14,470		1,447.00	
Child	15	1,775	2	8	3,095	1	18	4,870		487.00	
Hauling feed	1	35	.....	102	4,014	2	103	4,049		607.35	
Other human labor for cows	9	618	.....	26	2,432	1	32	3,050	2	457.50	2
Total human labor for cows	.....	119,086	100	.....	226,284	100	.....	345,370	100	$49,408.00	100
Horse labor for cows	1	16	.....	119	11,263	.....	119	11,279	.....	$1,691.85	.....
Heifers:											
Human labor	75	4,696	.....	142	23,038	.....	144	27,734	.....	$4,160.10	.....
Horse labor	1	10	.....	48	1,249	.....	49	1,259	.....	188.85	.....
Herd bulls:											
Human labor	34	1,145	.....	120	6,852	.....	122	7,997	.....	1,199.55	.....
Horse labor	.....	.....	.....	5	37	.....	5	37	.....	5.55	.....
Total human labor	.....	124,927	.....	.....	256,174	.....	.....	381,101	.....	$54,767.65	.....
Total horse labor	.....	26	.....	.....	12,549	.....	.....	12,575	.....	1,886.25	.....

TABLE 8. CHARGES FOR HAULING AND DELIVERING TO THE MILK STATIONS 104,732 HUNDREDWEIGHT OF MILK

Labor used	Total				Time spent hauling independently			Time spent hauling in cooperation		
	Number of farms using	Hours spent	Value		Number of farms using	Hours spent	Value	Number of farms using	Hours spent	Value
			Total	Per cent						
Human labor:										
Man	88	36,697	$5,504.55	.....	68	30,816	$4,622.40	22	5,881	$882.15
Boy	5	1,540	154.00	.....	5	1,540	154.00	.....	.....	.....
Girl	2	1,092	109.20	.....	2	1,092	109.20	.....	.....	.....
Woman	9	1,008	100.80	.....	8	918	91.80	1	90	9.00
Total human labor	.....	40,337	$5,868.55	29.8	69	34,366	$4,977.40	22	5,971	$ 891.15
Horse labor	.....	58,390	8,758.50	44.5	69	46,912	7,036.80	22	11,478	1,721.70
Paid for hauling	87	.....	5,057.74	25.7	.....	.....	.....	.....	.....	.....
Total	149	.....	$19,684.79	100.0	69	.....	$12,014.20	22	.....	$2,612.85

All charges for the use of the milk wagon, cans, and other equipment used in hauling milk, were included under dairy equipment, rather than under milk hauling. The charge, therefore, includes no expense for use of equipment. When the farmer hired his milk hauled, the money paid was considered the cost of hauling. Whenever a combination of methods was used, the cost was found by adding the cash cost to the farmer's labor charge for hauling.

At the rates used in this study, human labor made up 29.8 per cent, horse labor 44.5 per cent, and cash paid 25.7 per cent, of the cost of hauling the milk. Milk-hauling charges made up 8.2 per cent of the total charges to the enterprise. Of the total time spent, only 14.8 per cent was in cooperation with neighbors.

The figures for milk-hauling costs are given in table 8.

Use of buildings

Values at the beginning and at the end of the year, of the silos, milk houses, ice houses, and those parts of the barns and other buildings used by dairy cattle, or in storing all feed except dry forage used by them, are given in table 9:

TABLE 9. VALUE OF BUILDINGS, 2058 COWS, 1002 HEIFERS, 172 HERD BULLS, AND 76 BULLS TO BE SOLD

Buildings	May 1, 1914		May 1, 1915	
	Number of farms reporting	Value	Number of farms reporting	Value
Dairy and cattle barns*	149	$127,612	149	$128,577
Silos	54	8,932	60	9,777
Milk houses	122	4,708	124	4,821
Ice houses	94	3,494	95	3,507
Total	.....	$144,746	.....	$146,682

Average value, $145,714.
Increase in value, $1,936.

* Includes 9 silos built in barns.

The average of these values was $145,714, or about $978 per farm. During the year six new silos were erected, so that at the end of the year about 40 per cent of the farms had silos not built inside the barns. The number of silos does not agree with the number of farms feeding silage, for the reason that on some farms the silos were built in the barns and were included with the value of the barn. Most of the farms have milk houses separate from the barns, and 64 per cent have separate ice houses, altho

108 farmers used ice. Often one building is used as both a milk house and storage for ice.

The charge for the use of buildings was made up of interest at 5 per cent on the average value, the cost of new buildings, cost of repairs, insurance, and decreased value. When buildings were worth more at the end of the year, the increase in value was deducted to determine the charge for their use. This was then apportioned to cows, to heifers, to herd bulls, and to bulls to be sold, according to the average number of cattle units of each class on hand at the beginning and at the end of the year.

The data for use of buildings are given in table 10:

TABLE 10. CHARGES FOR USE OF BUILDINGS, 2058 COWS, 1002 HEIFERS, 172 HERD BULLS, AND 76 BULLS TO BE SOLD

	Number of farms reporting	Amount
New buildings and building repairs:		
Purchased lumber	7	$ 287.40
Shingles and roofing	18	565.00
Paint and glass	40	427.70
Hardware	3	113.60
Materials from farms	17	424.50
Sand and gravel	6	21.25
Cement	9	200.40
Labor:		
Hired	18	942.45
Farm	26	516.16
Horse	7	74.20
Board of labor	6	26.50
New buildings, labor and materials	10	1,911.50
Total	86	$5,510.66
Interest on $145,714 at 5 per cent	.....	$7,285.70
Insurance	.....	455.00
Total	.....	$13,251.36
Less increase in value*	.....	1,936.00
Net charge	.....	$11,315.36

Apportionment of cost

	Number of farms having expense	Amount charged
Cows	149	$8,705.69
Heifers	146	2,143.21
Herd bulls	126	464.46
Bulls to be sold	1	2.00

* Depreciation on buildings, 2.45 per cent of average value.

Use of equipment

The value of the different kinds of equipment used by dairy cattle, on hand at the beginning and at the end of the year, and the number of farms having each kind, are given in table 11:

TABLE 11. VALUE OF EQUIPMENT USED BY 2058 COWS, 1002 HEIFERS, AND 172 HERD BULLS

	May 1, 1914		May 1, 1915	
	Number of farms	Value of equipment	Number of farms	Value of equipment
Milk cans	120	$1,040	122	$ 997
Coolers	10	30	11	34
Testers, bottles, and scales	17	44	18	46
Separators	15	311	16	323
Churns and workers	40	85	40	85
Bottles and containers	7	11	7	11
Milk wagons	90	1,710	92	1,686
Milking machines	.....	.....	1	250
Ice tools	91	237	91	236
Feed cutters	1	25	1	25
Pumps	1	3	1	3
Root cutters	4	10	2	6
Grinders and engines	10	788	14	794
Milk pails and strainers	147	314	148	332
Extra calf pails	31	33	33	34
Clipping machines	24	115	28	141
Veterinary outfits	11	21	13	25
Forks, shovels, and other barn tools	126	360	122	364
Wheelbarrows and trucks	41	103	47	114
Staffs and halters	22	23	24	28
Total	.....	$5,263	.....	$5,534

Average value, $5,398.
Increase in value, $271.

More than three-fifths of the value of equipment is in milk cans, pails, strainers, and other dairy utensils, and wagons used in hauling milk. The farmers, with the exception of the patrons of one company, owned the cans they used. Since much of this equipment is in daily use, it requires frequent repairing and must be replaced often. Hence its upkeep represents the largest part of the annual cost of dairy equipment.

The charge for the use of equipment includes interest at 5 per cent on the average value at the beginning and at the end of the year, cost of equipment purchased during the year, repairs on equipment, and decreased value less any increase in value. This cost was apportioned for each farm, to cows, to heifers, and to herd bulls, according to the number of animals and the amount of equipment used by them. The charges are given in table 12:

TABLE 12. CHARGES FOR USE OF EQUIPMENT, 2058 COWS, 1002 HEIFERS, AND 172 HERD BULLS

	Number of farms having expense	Amount
Interest on $5,398 at 5 per cent*	149	$ 269.90
Equipment purchased	133	1,079.30
Repairs	76	230.00
Total	.....	$1,579.20
Less increase in value	.....	271.00
Net charge	.....	$1,308.20

Apportionment of cost

	Number of farms having expense	Amount charged
Cows	149	$1,015.10
Heifers	138	221.45
Herd bulls	102	71.65

* Depreciation, 19.2 per cent of average value.

Interest

Separate interest charges at 5 per cent were made on the average value of cattle and on the average investment in feed and supplies kept on hand for cattle. As previously indicated, the other interest charges were included under use of pasture, use of buildings, and use of equipment.

The average value of cows, heifers. and herd bulls was $163,124. Due to averaging each record separately, the value here used is $163,109,

TABLE 13. INTEREST ON AVERAGE VALUE OF 2058 COWS, 1002 HEIFERS, AND 172 HERD BULLS

Kind of stock	Average number from inventory	Average value from inventory	Value used in charging interest	Interest at 5 per cent	Number of farms having expense
Cows	2,058	$133,152	$133,148	$6,657.40	149
Heifers under one year	532.5	7,296	23,626	1,181.30	146
Heifers one year or over	469.5	16,338			
Bull calves to be kept	67	1,074			
Herd bulls one to two years	59.7	2,162	6,335	316.75	126
Herd bulls over two years old	45	3,102			
Total	.....	$163,124	$163,109	$8,155.45	.....

the interest on which amounts to $8155.45. Since veals and bulls to be sold are kept on hand for only a short time, no interest was charged on their value. The data are given in table 13.

Interest was charged to the dairy enterprise on the investment in forage for the average length of time the forage was stored before it was fed, and on the investment in concentrates from the time they were paid for until they were fed. On each record this cost was distributed to cows, heifers, and herd bulls, according to the numbers of animals kept and the quantities of feed used. The average total capital so invested was $38,160, or about $256 per farm. On some farms keeping heifers and herd bulls the interest charge on feed and supplies was so small that it was not separated. The data are given in table 14:

TABLE 14. INTEREST ON AVERAGE VALUE OF FEED AND SUPPLIES KEPT ON HAND FOR 2058 COWS, 1002 HEIFERS, AND 172 HERD BULLS

All herds			Cows		Heifers		Herd bulls	
Average value of feed and supplies on hand	Number of farms having expense	Interest at 5 per cent	Number of farms having expense	Amount charged	Number of farms having expense	Amount charged	Number of farms having expense	Amount charged
$38,160	149	$1,908	149	$1,511.50	120	$305.50	81	$91.00

Miscellaneous costs

All remaining expenses were classed as miscellaneous costs, and are given in table 15. Of these, ice, veterinary fees, medicines and disinfectants, fly protectors, whitewash, and expenses for testing milk, were the most important. Farmers having the expense for milk testing estimated the portion of this expense that should be charged to cows, to heifers, to bulls to be sold, and to herd bulls. The same was done with other items not wholly chargeable to cows.

The average amount of ice stored per cow was 1949 pounds.

Returns

Returns from dairy cattle on the farms studied were classified as (1) milk and milk products, (2) appreciation on cattle, (3) manure recovered, (4) miscellaneous returns.

Milk and milk products

Milk sold.— Of the 149 farms, 52 sold to the Empire State Dairy Company at Windsor and 1 to this company at Oquaga, 39 sold to Cloverdale Farms Company at Binghamton, 18 sold to F. W. Jansen at Whitney's Point, 16 to Bordens' at Tunnel, 7 to Sheffield Farms, Slawson-Decker Company, at Conklin, 5 to Bordens' at Whitney's Point, 3 to the Broome County Dairy Company at Binghamton, 7 a part of the year to F. W.

TABLE 15. MISCELLANEOUS COSTS, 2058 COWS, 1002 HEIFERS, 172 HERD BULLS, AND 76 BULLS TO BE SOLD

Item	All herds		Cows		Heifers		Herd bulls		Bulls to be sold	
	Number of farms having expense	Cost	Number of farms having expense	Cost	Number of farms having expense	Cost	Number of farms having expense	Cost	Number of farms having expense	Cost
Ice, 2006 tons	108	$1,711	108	$1,711	.....	.....	.....	.....	.....	.....
Veterinary fees	51	347	50	327	3	$20	.....	.....	.....	.....
Medicines, disinfectants, and louse killers	84	259	82	235	17	23	1	$1		
Fly protectors	107	268	107	259	5	5	4	4	.....	.....
Whitewashing	105	317	105	307	3	9	1	1	.....	.....
Milk testing, acids, etc	17	322	16	248	10	74	.....	.....	.....	.....
Insurance on cattle	104	176	104	162	12	13	1	1	.....	.....
Feed grinding and freight	34	100	26	81	11	16	3	3	.....	.....
Registration and transfer fees	6	31	.....	.....	3	13	2	5	2	$13
Express on stock	3	3	2	2	.....	.....	1	1	.....	.....
Advertising	1	2	.....	.....	.....	.....	.....	.....	1	2
Sawdust for ice	19	53	19	53	.....	.....	.....	.....	.....	.....
Hauling feed	3	16	3	14	1	1	1	1	.....	.....
Hauling bedding	2	18	2	15	1	2	1	1	.....	.....
Gasoline, oil, and batteries	3	33	3	28	2	4	1	1	.....	.....
Fuel for water heater	2	13	2	11	1	2	.....	.....	.....	.....
Clipping	12	17	12	16	.....	.....	1	1	.....	.....
Lime	1	1	1	1	.....	.....	.....	.....	.....	.....
Board of cows	1	26	1	26	.....	.....	.....	.....	.....	.....
Total	.....	$3,713	.....	$3,496	.....	$182	.....	$20	.....	$15
Breeding fees	28	$183	28	$183	.....	.....	.....	.....	.....	.....

Jansen and a part of the year to Bordens' at Whitney's Point, and 1 a part of the year to Cloverdale Farms Company and a part of the year to the Broome County Dairy Company at Binghamton. Milk sold to Cloverdale Farms and the Broome County Dairy Company was used in Binghamton, while the remainder was for the New York market.

Practically all milk was sold on six-months contracts made with the milk companies on October 1 and April 1. All concerns except two paid a flat price for milk containing a minimum percentage of butterfat. This per cent was 3.7 for one concern, and 3.8 and 4 per cent for the others. A premium was paid when the milk tested above a certain percentage specified in the contract. The monthly prices paid by three companies are given in table 16. Prices paid by the other companies were about the same.

TABLE 16. MONTHLY PRICES PAID FOR MILK BY THREE COMPANIES, PER HUNDREDWEIGHT

	Company no. 1	Company no. 2	Company no. 3
1914:			
May	$1.20	$1.05	$1.25
June	1.10	1.00	1.20
July	1.35	1.15	1.35
August	1.55	1.30	1.50
September	1.80	1.40	1.60
October	1.95	1.70	1.90
November	2.05	1.80	2.00
December	2.05	1.80	2.00
1915:			
January	1.95	1.75	1.95
February	1.80	1.65	1.85
March	1.75	1.60	1.80
April	1.50	*1.55	1.50
Per cent of butterfat required	†4.0	3.7 (for April, 3.8)	
Barn score required:			
Equipment	25	25	....
Methods	45	43	....
Premiums in addition to above:			
Butterfat	10 cents a hundred pounds if 4.5 per cent or better	10 cents a hundred pounds if 3.8 per cent or better	3 cents a hundred pounds if 4.1 to 4.5 per cent inclusive
Barn score	2 cents a hundred pounds for each 5 points above 70	10 cents a hundred pounds if score 25 on equipment, 43 on methods	None

* For 3.8-per-cent milk with barn score.
† Average for year.

With one exception, each concern had an inspector visit and score the premises at regular intervals. A premium was paid by some of the companies for a higher score. This encouraged the production of clean milk. One company furnished the lime and equipment, and assisted the

TABLE 17. RETURNS FROM MILK SOLD, 2058 COWS

	Number of farms selling	Number of pounds of milk sold	Per cent of total milk sold	Number of pounds of fat in milk	Average per cent of butterfat	Average amount received for 100 pounds of milk sold	Total amount received for milk sold	Per cent of total amount received
1914:								
May	149	1,263,511	12.1	49,277	3.9	$1.28	$16,176.20	9.4
June	149	1,277,921	12.2	49,839	3.9	1.21	15,427.53	9.0
July	149	1,031,219	9.8	41,249	4.0	1.36	14,038.80	8.2
August	148	804,535	7.7	32,986	4.1	1.55	12,468.13	7.3
September	149	729,411	7.0	30,635	4.2	1.69	12,322.50	7.2
October	149	757,937	7.2	31,833	4.2	1.96	14,858.83	8.7
November	149	678,288	6.5	28,488	4.2	2.06	13,955.19	8.1
December	147	710,820	6.8	29,854	4.2	2.06	14,668.57	8.6
1915:								
January	142	735,854	7.0	29,434	4.0	2.00	14,693.08	8.6
February	140	674,841	6.4	26,319	3.9	1.88	12,700.94	7.4
March	140	813,750	7.8	31,736	3.9	1.80	14,673.42	8.5
April	146	924,341	8.8	36,049	3.9	1.51	13,941.59	8.1
Retail	53	70,798	0.7	2,974	4.2	2.30	1,627.44	0.9
Total or average	.....	10,473,226	100.0	420,673	4.0	$1.64	$171,552.22	100.0

farmers in whitewashing their barns twice a year, without charge. The figures for the returns from milk sold are given in table 17.

Milk products sold.— Only seven farms sold butter, and one farm sold 200 pounds of cream. The figures are given in tables 18 and 19.

Milk and milk products used.— The value of all milk used on each farm was calculated by multiplying the number of pounds used by the weighted average price received for all milk sold from the farm. Some farmers

TABLE 18. RETURNS FROM MILK PRODUCTS SOLD AND MILK AND ITS PRODUCTS USED ON FARMS, 2058 COWS

	Number of farms	Number of pounds of product	Number of pounds of fat	Price	Total value	
Milk products sold:						
Butter	7	1,015	863	$0.31	$312.76	
Cream	1	200	40	1.50	30.00	
Total milk products sold	.....	.....	.....	.....	.....	$342.76
Milk used:						
Family	147	313,048	12,522	$1.63	$5,103.33	
Hired men	14	17,638	706	1.72	304.16	
Milk products used:						
Skimmilk:						
Hogs	10	30,700	.....	0.20	59.97	
Poultry	1	2,200	.....	0.15	3.30	
Buttermilk:						
Family use	21	7,264	.....	0.22	15.93	
Hogs	10	3,250	.....	0.23	7.50	
Poultry	1	100	.....	0.20	0.20	
Butter, family use	36	5,656	4,808	0.29	1,633.97	
Cream, family use	11	1,000	200	1.81	180.64	
Total milk and its products used, except that fed cattle	.....	.....	19,139	.....	.....	$7,309.00
Equivalent in pounds of milk*	.....	371,457	.....	.....	.....	
Milk used:						
Heifers	134	215,464	8,619	$1.63	$3,517.77	
Veals and bulls to be sold	94	193,535	7,741	1.62	3,126.91	
Bull calves to be kept for herd bulls	65	26,275	1,051	1.63	429.47	
						$7,074.15
Milk products used:						
Skimmilk:						
Heifers	32	96,068	.....	$0.18	$171.17	
Veals and bulls to be sold	4	3,072	.....	0.20	6.16	
Bull calves to be kept for herd bulls	8	6,493	.....	0.17	11.08	
						$188.41
Buttermilk:						
Heifers	3	1,300	.....	$0.19	$2.45	$2.45
Total milk and its products fed cattle	.....	.....	17,411	.....	.....	$7,265.01
Equivalent in pounds of milk*	.....	540,907	.....	.....	.....	.....

* Excluding buttermilk.

fed more milk in months when the price was below the average price for the year, and others fed more when the price was above the average. But the quantity used in the house was practically uniform thruout the season. Since the months in which milk was used were not ascertained, it was necessary to use the average yearly price. The prices used in calculating the value of skimmilk and buttermilk were those furnished by the farmers. An average of 2130 pounds of milk per family was used. The figures are given in table 18 and summarized in table 19.

TABLE 19. SUMMARY OF RETURNS FROM MILK PRODUCTS SOLD AND MILK AND ITS PRODUCTS USED ON FARMS, 2058 COWS

	Milk		Skimmilk		Buttermilk		Butter		Cream		Equivalent in whole milk*	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
Total used, except that fed cattle	330,686	$5,407.49	32,900	$ 63.27	10,614	$23.63	5,656	$1,633.97	1,000	$180.64	370,242	.....
Total fed cattle	435,274	7,074.15	105,633	188.41	1,300	2.45	.....	.....	.....	.....	540,907	.....
Total used on farms	765,960	$12,481.64	138,533	$251.68	11,914	$26.08	5,656	$1,633.97	1,000	$180.64	911,149	.....
Milk products sold	.....	.....	.....	.....	.....	.....	1,015	312.76	200	30.00	1,215	.....
Total	765,960	$12,481.64	138,533	$251.68	11,914	$26.08	6,671	$1,946.73	1,200	$210.64	912,364	$14,916.77

* Excluding buttermilk.

Appreciation on cattle

On most farms where dairy cattle are raised to replace those that die and those that are sold, the increased value of young cattle exceeds the depreciation and all losses due to death. On the farms studied, this excess, or appreciation, amounted to $27,988, or 12 per cent of the returns from cattle. Appreciation and depreciation were calculated in the following manner:

When considering the entire herd as a unit, cattle were charged with the first inventory and all purchases of dairy cattle. They were credited with cattle sold or used, hides, and the second inventory.

Cows were charged with the inventory at the beginning, cows purchased, and heifers that became cows. They were credited with cows sold or slaughtered, cow hides, and the inventory at the end.

Heifers were charged with the first inventories, heifers purchased, and value at birth of heifers born during the year. They were credited with heifers sold and slaughtered, value at time of freshening of heifers that freshened during the year for the first time, heifer hides, and the inventories at the end.

Herd bulls were charged with the inventories at the beginning, herd bulls purchased, and value at birth of bull calves born during the year and to be kept for future service. They were credited with herd bulls sold or slaughtered, hides, and the inventories at the end.

Veals and bulls to be sold were charged with the inventories at the beginning, purchases, and value at birth of veal calves and of bulls to be sold that were born during the year. They were credited with veals and bulls sold or slaughtered, hides, and the inventories at the end.

A summary of the appreciation or depreciation on each part of the enterprise is given in table 20.

Calves born during the year were charged to heifers, herd bulls, and veals and bulls to be sold, at their values at birth. They were credited to cows but were not included in the returns from cattle. The data are given in table 21.

Manure recovered

No credit was given for manure produced on pasture, and neither was the pasture charged with it. To have credited and charged manure in these different places would have increased the total costs and total returns for cattle by the same amount, without affecting the gain or loss on the enterprise or the cost of producing milk. The 149 farmers estimated that 20,642 tons of manure was recovered from cattle for use on crop land. This is 7.7 tons per cattle unit, there being 2670.3 cattle units.

The value of manure depends, not only on the composition of the ration, but also on the proportion and kind of litter and especially on the possible returns from its use. Estimates as to its value at the barn averaged about

TABLE 20. APPRECIATION AND DEPRECIATION ON CATTLE, 149 HERDS

	All herds		Cows			Heifers					
						Under 1 year			1 year or over		
	Total number	Total value	Number of farms	Number of cows	Value	Number of farms	Number of heifers	Value	Number of farms	Number of heifers	Value
On hand May 1, 1914	3,079.5	$156,153	149	2,029	$130,499	124	491	$6,636	109	389	$13,445
Purchased during year	284	12,445	47	134	8,620	20	53	474	13	32	1,358
Born during year	.....	.....	.....	.....	.....	140	733	2,232	.....	.....	.....
Heifers that became cows	304	17,217	103	304	17,217	.....	.....	.....	.....	.....	.....
Total	.....	$185,815	.....	.....	$156,336	.....	.....	$9,342	.....	.....	$14,803
								($24,145)			
Slaughtered or sold for slaughter	1,193.5	$ 15,988	86	208	$ 8,009	2	2	$ 40	5	7	$ 239
Sold for breeding and production	374	8,800	42	117	6,370	61	188	910	7	13	372
Died or killed by accident	135	.....	38	*55	.....	25	54	.....	5	6	.....
Hides sold	134.5	590	38	50	†430	15	31	32	5	7	37
Heifers that became cows	304	17,217	.....	.....	.....	.....	.....	.....	103	304	17,217
Deacon hides	158	169	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dead calf hides	21	20	.....	.....	.....	.....	.....	.....	.....	.....	.....
On hand May 1, 1915	3,460	171,019	149	2,087	135,805	137	574	7,955	127	550	19,230
Total	.....	$213,803	.....	.....	$150,614	.....	.....	$8,937	.....	.....	$37,095
Appreciation‡	.....	$27,988	.....	.....	.....	.....	.....	$21,887	($46,032)	.....	.....
Depreciation	.....	.....	.....	.....	$5,722	.....	.....	.....	.....	.....	.....

* Includes 4 killed on railroad and 2 killed by lightning.
† Includes $70 indemnity for 2 cows killed by lightning on one farm.
‡ The appreciation on cattle exceeds the difference between the appreciation on heifers, herd bulls, and veals and bulls to be sold, and the depreciation on cows, by $4608, because the value of calves at birth is considered a separate credit for cows but is charged to young cattle in calculating appreciation.

TABLE 20 (*concluded*)

	Herd bulls									Veals						Bull calves to be sold		
	Bull calves to be kept			1 to 2 years			Over 2 years			Calves fatted			Calves not fatted					
	Number of farms	Number of bulls	Value	Number of farms	Number of bulls	Value	Number of farms	Number of bulls	Value	Number of farms	Number of calves	Value	Number of farms	Number of calves	Value	Number of farms	Number of bull calves	Value
On hand May 1, 1914	55	62	$824	51	51.5	$1,726	40	41	$2,865	4	11	$88	....	....	.....	5	5	$ 70
Purchased during year	24	24	752	19	20.5	719	‖ 11	10.5	458	....	....	.....	3	4	$ 6	3	6	58
Born during year	50	54	226	....	....	.....	....	....	.....	....	....	.....	137	937	1,650	42	75	311
Heifers that became cows	....	....	.....	....	....	.....	....	....	.....	....	....	.....	....	....	.....	....	....	....
Total	....	....	$1,802	....	....	$2,445	....	....	$3,323	....	....	$88	....	....	$1,656	....	....	$439
					($7,570)							($2,183)						
Slaughtered or sold for slaughter	2	2	$ 40	26	25.5	$ 990	29	30	$1,697	94	368	$3,889	97	546	$963	5	5	$121
Sold for breeding and production	....	....	.....	6	7	308	7	7	573	....	....	.....	....	....	.....	26	42	267
Died or killed by accident	2	2	.....	1	1	.....	....	....	.....	9	16	.....	....	....	.....	1	1	....
Hides sold	3	3	11	4	3.5	28	....	....	.....	18	39	51	....	....	.....	1	1	1
Heifers that became cows	....	....	.....	....	....	.....	....	....	.....	....	....	.....	....	....	.....	....	....	....
Deacon hides	....	....	.....	....	....	.....	....	....	.....	....	....	.....	....	....	.....	....	....	....
Dead calf hides	....	....	.....	....	....	.....	....	....	.....	....	....	.....	....	....	.....	....	....	....
On hand May 1, 1915	66	72	1,323	61	68	2,539	§50	49	3,340	8	20	209	1	2	4	20	38	554
Total	....	....	$1,374	....	....	$3,925	....	....	$5,610	....	....	$4,149	....	....	$967	....	....	$943
Appreciation	....	....	$3,339		($10,909)		.....	....	....	.....	....	($6,059)		$3,876	.....	....	....	....
Depreciation	....	....	.....	....	....	.....	....	....	.....	....	....	.....	....	....	.....	....	....	.....

‖ One farmer purchased half interest in bull.
§ Two farmers owned half interest in bulls.

$1.25 a ton. This does not include the cost of hauling it to the field. Manure was credited to cattle on each farm at this rate. The credit was then apportioned to cows, to heifers, and to herd bulls, according to the average inventory of cattle units. No attempt was made to calculate

TABLE 21. NUMBER OF CALVES BORN DURING THE YEAR, AND VALUE AT BIRTH

	Number of farms	Number	Per cent	Value	Value of each at birth
Heifers to be raised or to be sold	140	733	37	$2,232	$3.05
Bulls to be kept	50	54	3	226	4.19
Bulls sold or to be sold	42	75	4	311	4.15
Calves vealed or to be vealed	137	937	48	1,650	1.76
Calves deaconed	51	162	8	.....	.....
Deacon hides	50	158	.....	169	1.07
Total calves born alive	147	1,961	100	$4,588	$2.34
Live calves per 100 cows	.....	95	.....	.....	.....
Calves born dead	35	53	.....	.....	.....
Dead calf hides	13	21	.....	20	.....
Total credited to cows	.....	.....	.....	$4,608	.....
Cows that aborted	25	41	.....	.....	.....
Farrow cows	47	97	.....	.....	.....

the value of manure on the basis of rations fed, for the reason that other factors have an equal, if not greater, influence. Neither was it considered practical to vary the credit to different classes of stock on the basis of the composition of the rations. The value of manure was $9.66 per cattle unit. This was 11.1 per cent of the total returns from cattle.

The data for manure recovered are given in table 22.

TABLE 22. MANURE RECOVERED FROM 2058 COWS, 1002 HEIFERS, 172 HERD BULLS, AND 76 BULLS TO BE SOLD

Manure recovered	All herds	Cows	Heifers	Herd bulls	Bulls to be sold
Tons	20,642	15,917	3,870	851	4
Value at $1.25 a ton at the barnyard	$25,802	$19,896.64	$4,837.65	$1,063.21	$4.50

Miscellaneous returns

Two farms received $157 for hauling neighbors' milk, three farms received $52 for boarding cattle, and fifteen farms received $142 for the use of herd bulls. These receipts were included under miscellaneous returns and represented 0.2 per cent of the total returns from the enterprise. The figures for miscellaneous returns are given in table 23:

TABLE 23. MISCELLANEOUS RETURNS

Item	Number of farms having receipt	Total amount received	Credited to	
			Cows	Herd bulls
Hauling neighbors' milk	2	$157	$157	.....
Breeding fees	15	142	.....	$142
Boarding cows	3	52	52	.....
Total	.....	$351	$209	$142

Summary of costs and returns

The separate items of costs and returns for the whole enterprise, and for cows, heifers, herd bulls, and veals and bulls to be sold, given in previous tables, are summarized in table 24.

Cost of producing milk and butterfat

In this investigation two different methods of calculating the cost of producing milk or butterfat were used.

By one method, considering the entire herd as a unit, all returns from the herd except milk sold were deducted from the total herd costs, and the difference was considered the cost of milk or fat sold. Any expense for raising young cattle to replace the herd was included in determining the cost of production. The cost calculated in this manner is designated thruout this bulletin as the " herd cost " of milk or butterfat.

By the second method, the returns from cows other than milk sold were deducted from the total cost of keeping cows to determine the cost of milk or fat. Bull service was charged at cost. The raising of heifers to replace the herd was considered separately, and any loss or gain on them was not charged nor credited to milk production. The cost determined in this manner is designated thruout this bulletin as the " cow cost " of producing milk or butterfat.

The herd cost and the cow cost of milk are practically identical. The herd cost is the simpler to calculate, because it is not necessary to separate the feed, labor, and other costs for heifers, bulls, and other cattle. But the quantities of feed and labor used by the herd per hundred pounds of milk are not so useful as the quantities used by cows only.

In purebred herds, the value of young stock for breeding purposes is sometimes so great as to make the herd cost of producing milk very low. The investment in cows, depreciation on cows, amount of feed and labor, bull service, and all other costs, are higher for purebred than for grade herds. But the greater value of the calves at birth usually more than offsets these higher costs, so that the cow cost of producing milk is also usually less in purebred than in grade herds.

TABLE 24. SUMMARY OF COSTS AND RETURNS, 2058 COWS, 1002 HEIFERS, 172 HERD BULLS, 377 VEALS*, AND 76 BULLS TO BE SOLD

	Table	All herds			Cows	
		Amount	Value	Per cent	Amount	Value
Costs:						
Grain	1	3,222,483 pounds	$48,219.00	20.1	2,895,814 pounds	$42,858.00
Succulent feeds (except skimmilk)	2	5,193.53 tons	24,609.00	10.2	4,777.33 tons	22,512.00
Dry forage	3	5,277.15 tons	50,790.00	21.1	4,283.05 tons	40,722.00
Skimmilk, purchased	2	21.8 tons	77.00	0.1	.....	.....
Skimmilk, farm	.....	.....	.....	.....	.....	.....
Whole milk, farm	.....	.....	.....	.....	.....	.....
Buttermilk, farm	.....	.....	.....	.....	.....	.....
Pasture	5	7,927.5 acres	11,591.00	4.8	.....	9,338.00
Total feed	.....	.....	$135,286.00	56.3	.....	$115,430.00
Bedding	6	.....	2,080.00	0.9	.....	1,673.00
Human labor	7	381,101 hours	54,767.65	22.8	345,370 hours	49,408.00
Horse labor	7	12,575 hours	1,886.25	0.8	11,279 hours	1,691.85
Hauling milk	8	.....	19,684.79	8.2	.....	19,684.79
Use of buildings	10	.....	11,315.36	4.7	.....	8,705.69
Use of equipment	12	.....	1,308.20	0.5	.....	1,015.10
Interest on cattle	13	.....	8,155.45	3.4	.....	6,657.40
Interest on feed and supplies for cattle	14	.....	1,908.00	0.8	.....	1,511.50
Breeding fees	15	.....	183.00	0.1	.....	183.00
Cost of keeping herd bulls	131	.....	.....	.....	.....	1,788.30
Depreciation on cows	20	.....	.....	.....	.....	5,722.00
Miscellaneous	15	.....	3,713.00	1.5	.....	3,496.00
Total costs	.....	.....	$240,287.70	100.0	.....	$216,966.63
Returns:						
Other than milk sold:						
Milk products sold	18	.....	$ 342.76	0.1	.....	$ 342.76
Milk and its products used on the farm, except that fed cattle	18	.....	7,309.00	3.1	.....	7,309.00
Milk and its products fed cattle	18	.....	.....	.....	.....	7,265.01

* Fat calves sold, slaughtered, and on hand at end of year, less number on hand at beginning of year.

TABLE 24 (*continued*)

	Table	All herds			Cows	
		Amount	Value	Per cent	Amount	Value
Returns (*concluded*):						
Other than milk sold (*concluded*):						
Appreciation on cattle	20	.....	$27,988.00	12.0	.....	.....
Calves and calf hides	21	.....	.....	.....	.....	$ 4,608.00
Manure	22	20,642 tons	25,802.00	11.1	15,917 tons	19,896.64
Miscellaneous	23	.....	351.00	0.2	.....	209.00
Total returns, excluding milk sold	.....	.....	$61,792.76	.....	.....	$39,630.41
Milk sold	17	10,473,226 pounds	$171,552.22	73.5	10,473,226 pounds	$171,552.22
Total returns	.....	.....	$233,344.98	100.0	.....	$211,182.63
Profit or loss	.....	.....	−$6,942.72	.....	.....	−$5,784.00
Costs less returns other than milk sold (= cost of milk at market)	.....	.....	$178,494.94	.....	.....	$177,336.22
Cost per hundred pounds sold	.....	.....	$1.704	.....	.....	$1.693

TABLE 24 (*continued*)

	Table	Heifers		Herd bulls		Veals and bulls to be sold	
		Amount	Value	Amount	Value	Amount	Value
Costs:							
Grain	1	267,116 pounds	$4,390.00	58,203 pounds	$ 948.00	1,350 pounds	$ 23.00
Succulent feeds (except skim-milk)	2	335.35 tons	1,700.00	80.85 tons	397.00	.....	.....
Dry forage	3	806.1 tons	8,146.00	187.1 tons	1,911.00	0.9 ton	11.00
Skimmilk, purchased	2	18.69 tons	64.00	1.39 tons	6.00	1.72 tons	7.00
Skimmilk, farm	18	96,068 pounds	171.17	6,493 pounds	11.08	3,072 pounds	6.16
Whole milk, farm	18	215,464 pounds	3,517.77	26,275 pounds	429.47	193,535 pounds	3,126.91
Buttermilk, farm	18	1,300 pounds	2.45	.....	.....	.....	.....
Pasture	5	.....	1,907.00	.....	346.00	.....	.....
Total feed	.....	.....	$19,898.39	.....	$4,048.55	.....	$3,174.07
Bedding	6	.....	292.00	.....	115.00	.....	.....
Human labor	7	27,734 hours	4,160.10	7,997 hours	1,199.55	.....	.....
Horse labor	7	1,259 hours	188.85	37 hours	5.55	.....	.....
Hauling milk	8	.....	.....	.....	.....	.....	.....
Use of buildings	10	.....	2,143.21	.....	464.46	.....	2.00
Use of equipment	12	.....	221.45	.....	71.65	.....	.....
Interest on cattle	13	.....	1,181.30	.....	316.75	.....	.....
Interest on feed and supplies for cattle	14	.....	305.50	.....	91.00	.....	.....
Breeding fees	15	.....	.....	.....	.....	.....	.....
Cost of keeping herd bulls	131	.....	.....	.....	.....	.....	.....
Depreciation on cows	20	.....	.....	.....	.....	.....	.....
Miscellaneous	15	.....	182.00	.....	20.00	.....	15.00
Total costs	.....	.....	$28,572.80	.....	$6,332.51	.....	$3,191.07
Returns:							
Other than milk sold:							
Milk products sold	18	.....	.....	.....	.....	.....	.....
Milk and its products used on the farm, except that fed cattle	18	.....	.....	.....	.....	.....	.....

TABLE 24 (*concluded*)

	Table	Heifers		Herd bulls		Veals and bulls to be sold	
		Amount	Value	Amount	Value	Amount	Value
Returns (*concluded*):							
Other than milk sold (*concl'd*):							
Milk and its products fed cattle	18	.....	.....	.....	.....	.....	.....
Appreciation on cattle	20	.....	$21,887.00	.....	$3,339.00	.....	$3,876.00
Calves and calf hides	21	.....	.....	.....	.....	.....	.....
Manure	22	3,870 tons	4,837.65	851 tons	1,063.21	4 tons	4.50
Miscellaneous	23	.....	.....	.....	142.00	.....	.....
Total returns, excluding milk sold	.....	.....	.....	.....	.....	.....	.....
Milk sold	17	.....	.....	.....	.....	.....	.....
Total returns	.....	.....	$26,724.65	.....	$4,544.21	.....	$3,880.50
Profit or loss	.....	.....	−$1,848.15	.....	†-$1,788.30	.....	+$689.43
Costs less returns other than milk sold (= cost of milk at market)	.....	.....	.....	.....	.....	.....	.....
Cost per hundred pounds sold	.....	.....	.....	.....	.....	.....	.....

† Charged to cows.

The cost includes delivering to the receiving stations. Prices are paid for milk delivered. In order to be comparable the cost of production on different farms should therefore include the cost of delivery.

A comparison of the herd cost and the cow cost of producing milk and butterfat is given in table 25:

TABLE 25. SUMMARY OF COST OF PRODUCING AND DELIVERING TO MARKET 104,732 HUNDREDWEIGHT OF MILK CONTAINING 420,673 POUNDS OF BUTTERFAT

	Herd cost (2058 cows, 1002 heifers, 172 herd bulls, 377 veals, and 76 bulls to be sold)			Cow cost (2058 cows)		
	Per hundred pounds of milk sold	Per cent	Per pound of butterfat	Per hundred pounds of milk sold	Per cent	Per pound of butterfat
Costs:						
Grain	$0.460	20.1	$0.1146	$0.409	20.2	$0.1019
Succulent feed	0.236	10.3	0.0587	0.215	10.6	0.0535
Dry forage	0.485	21.1	0.1207	0.389	19.2	0.0968
Pasture	0.111	4.8	0.0276	0.089	4.4	0.0222
Total feed	$1.292	56.3	$0.3216	$1.102	54.4	$0.2744
Bedding	0.020	0.9	0.0049	0.016	0.8	0.0040
Human labor	0.523	22.8	0.1302	0.472	23.3	0.1174
Horse labor	0.018	0.8	0.0045	0.016	0.8	0.0040
Hauling milk	0.188	8.2	0.0468	0.188	9.3	0.0468
Use of buildings	0.108	4.7	0.0269	0.083	4.1	0.0207
Use of equipment	0.012	0.5	0.0031	0.010	0.5	0.0024
Interest on cattle	0.078	3.4	0.0194	0.064	3.1	0.0158
Interest on feed and supplies	0.018	0.8	0.0045	0.014	0.7	0.0036
Breeding fees	0.002	0.1	0.0004	0.002	0.1	0.0004
Cost of keeping herd bulls	.....	.....	.....	0.017	0.8	0.0043
Depreciation on cows	.....	.....	.....	0.055	0.5	0.0136
Miscellaneous	0.035	1.5	0.0088	0.033	1.6	0.0083
Total costs	$2.294	100.0	$0.5711	$2.072	100.0	$0.5157
Returns other than milk sold:						
Milk products sold	$0.003	.....	$0.0008	$0.003	.....	$0.0008
Milk and its products used on farm, except that fed cattle	0.070	.....	0.0174	0.070	.....	0.0174
Milk and its products fed cattle	.....	.....	.....	0.070	.....	0.0173
Appreciation on cattle	0.267	.....	0.0665	.....	.....	.....
Calves and calf hides	.....	.....	.....	0.044	.....	0.0109
Manure	0.247	.....	0.0613	0.190	.....	0.0473
Miscellaneous	0.003	.....	0.0008	0.002	.....	0.0005
Total returns, other than milk sold	$0.590	.....	$0.1468	$0.379	.....	$0.0942
Cost of milk or butterfat at market	$1.704	.....	$0.4243	$1.693	.....	$0.4215

The gross herd charges per hundred pounds of milk sold were $2.29, but the returns other than milk sold amounted to 59 cents per hundred pounds. The herd cost of milk, therefore, was $1.70 per hundred pounds sold.

The gross cow charges were $2.07 per hundred pounds, and the returns other than milk sold were 38 cents. Hence, the cow cost of milk was $1.69 per hundred pounds sold.

The herd cost and the cow cost were practically the same, the former being 1.1 cents per hundred pounds higher. In other words, the loss on heifers, above the gain on veals and bulls to be sold, increased the cost of milk production only by this amount.

The gross herd charges were 57.1 cents per pound of butterfat sold. The returns other than for milk sold were 14.7 cents, so that the net herd cost per pound of butterfat was 42.4 cents.

FIG. 53. VARIATION IN HERD COST OF PRODUCING MILK, 149 FARMS

The cow charges were 51.6 cents per pound of butterfat. The returns, except for milk sold, were 9.4 cents, making the net cow cost per pound of butterfat sold 42.2 cents.

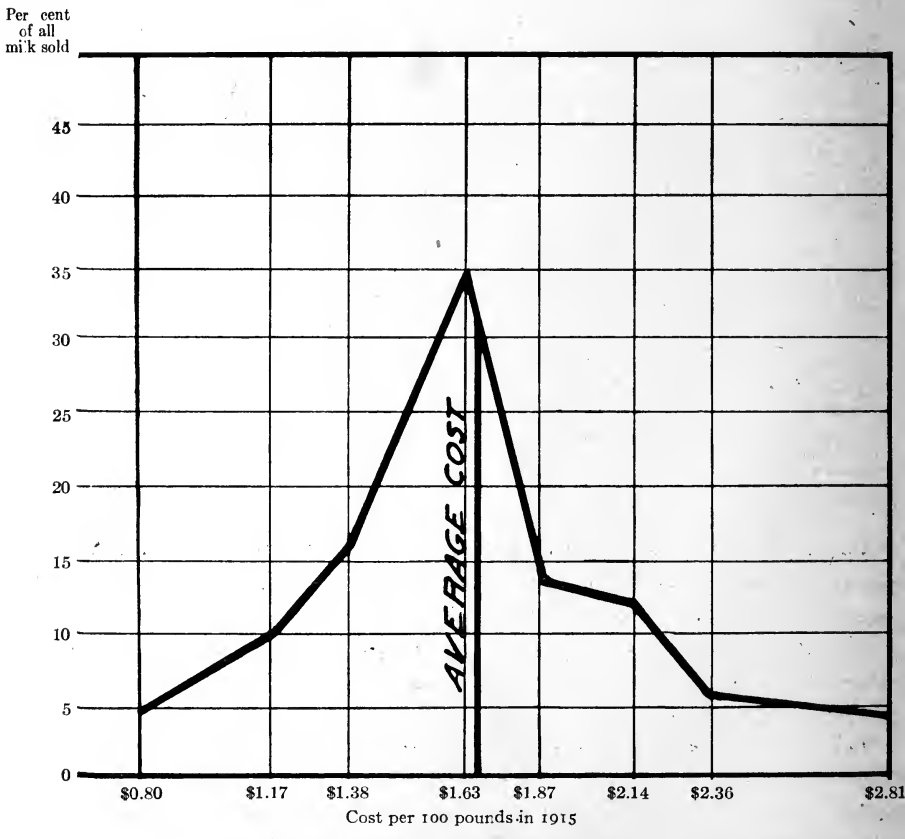

FIG. 54. VARIATION IN HERD COST OF PRODUCING MILK, 149 FARMS

TABLE 26. VARIATIONS IN THE HERD COST OF PRODUCING MILK ON 149 FARMS

Herd cost of milk per hundredweight	Number of farms	Per cent of number of farms	Average cost per hundredweight	Number of cows	Per cent of number of cows	Hundredweight of milk sold	Per cent of all milk sold by each group	Cumulative per cent of milk sold	Hundredweight of milk sold, November to April	Per cent of all milk sold, November to April	Per cent of group milk sold, November to April
Under $1.00	4	2.7	$0.80	72.5	3.5	3,902	3.7	3.7	1,334	2.9	34.2
$1.00–$1.25	15	10.1	1.17	195.5	9.5	10,131	9.7	13.4	4,175	9.2	41.2
1.26– 1.50	20	13.4	1.38	311.5	15.1	17,026	16.3	29.7	7,127	15.7	41.9
1.51– 1.75	45	30.2	1.63	696.5	33.9	36,735	35.1	64.8	15,586	34.4	42.4
1.76– 2.00	24	10.1	1.87	270.0	13.1	13,481	12.9	77.7	6,005	13.3	44.5
2.01– 2.25	17	11.4	2.14	245.5	11.9	12,200	11.6	89.3	5,913	13.0	48.5
2.26– 2.50	13	8.7	2.36	144.0	7.0	6,428	6.1	95.4	3,142	6.9	48.9
Over $2.50	11	7.4	2.81	122.5	6.0	4,829	4.6	100.0	2,097	4.6	43.4

When the calculations were based on the total amount of milk or butterfat produced, the cow cost of production was practically the same as when the milk or fat sold was used. The cow cost per hundred pounds of milk produced was $1.689, and the cost per hundred pounds sold was $1.693. The cow cost of fat was 42 cents per pound produced, or 42.2 cents per pound sold.

The lowest herd cost of milk production was 56 cents per hundred pounds. To increased value on purebred cows and higher values of the calves at birth this low cost was due. The highest cost was $3.19 per hundred pounds. Of the farms studied, 48 per cent produced milk at less than the average cost, but 54 per cent of the milk was produced at less than the average cost. The more efficient farms produce a larger proportion of the product. The average cost of all milk produced below the average cost was $1.39 per hundred pounds, and of all milk at the average cost or above, $2.06 per hundred pounds.

Variations in the herd cost of producing milk on these farms are shown in table 26 and in figures 53 and 54.

Quantities of feed and labor per unit of product

The amounts of feed and labor used by all herds, per hundred pounds of milk produced, per hundred pounds produced except that fed cattle, and per hundred pounds sold, are given in table 27:

TABLE 27. AMOUNTS OF FEED AND LABOR USED BY 2058 COWS, 1002 HEIFERS, 172 HERD BULLS, AND 76 BULLS TO BE SOLD, PER HUNDRED POUNDS OF MILK

	Per 100 pounds of milk		
	Produced	Produced, except that fed cattle	Sold
	Pounds		
Grain	28.3	29.7	30.8
Succulent feed	91.6	96.1	99.6
Dry forage	92.7	97.3	100.8
	Hours		
Human labor:			
Hauling milk	0.35	0.37	0.39
Other labor	3.35	3.51	3.64
Horse labor:			
Hauling milk	0.51	0.54	0.56
Other labor	0.11	0.12	0.12

Capital invested for milk production

The average investment for milk production was $3381 per farm, $244.78 per cow, and $4.42 per hundred pounds of milk or $1.10 per pound of

butterfat produced. These values would have been higher in 1920, due to a higher price level for all commodities. The data are given in table 28:

TABLE 28. CAPITAL INVESTED FOR THE PRODUCTION OF 11,385,590 POUNDS OF MILK CONTAINING 457,223 POUNDS OF BUTTERFAT, 149 HERDS

	Total capital	Per cent	Per farm	Per cow	Per 100 pounds of milk produced	Per pound of butterfat produced
Cows	$133,148	26.4	$ 894	$64.70	$1.17	$0.29
Herd bulls	6,335	1.3	42	3.08	0.05	0.01
Other cattle	23,626	4.7	159	11.48	0.21	0.05
Buildings	145,714	28.9	978	70.80	1.28	0.32
Equipment	5,398	1.1	36	2.62	0.05	0.01
Pasture land	151,376	30.0	1,016	73.56	1.33	0.33
Feed and supplies	38,160	7.6	256	18.54	0.33	0.09
Total	$503,757	100.0	$3,381	$244.78	$4.42	$1.10
Interest at 5 per cent.	$25,188	.....	$169	$12.24	$0.221	$0.055

Effect of changes in the price of labor, of feed, and of other factors, on the cost of milk production

The cost of producing milk for any particular farm or for any region is not constant. Whenever the price of cows, the price of feed, the value of land, or wages, change, then the cost of milk production also changes. Hence, when interpreting results of milk-production studies, it is important to keep in mind the possible effect of such changes on cost.

In table 29 are shown the approximate changes in cost made by the change of a single item, provided all other costs remain constant. An increase in any item, however, is accompained by changes in practically all other items. For example, if any cost increases, the cost of cows, and

TABLE 29. EFFECT OF CHANGES IN PRICES OF LABOR, FEED, AND OTHER FACTORS, ON COST OF PRODUCTION WHEN THE ENTIRE HERD IS CONSIDERED

If other conditions remained exactly the same, a change of:	Would change on these farms	
	The cost of producing 100 pounds of milk	The cost of producing 1 pound of butterfat
	Cents	Cents
1 per cent in the interest rate	4.4	1.1
$10 an acre in the value of pasture land	3.3	0.8
1 cent an hour of human labor	3.8	0.9
$1 a ton for grain	1.4	0.4
$1 a ton for succulent feed	4.6	1.1
$1 a ton for dry forage	4.6	1.2

hence depreciation and interest on them, also increases. If wages increase, the cost of pasture and buildings goes up. Moreover, a change in the cost of feed, cows, or labor causes dairymen to modify their practices. For all these reasons, one can never safely predict what will be the effect of a change in any one item on the cost of production as a whole.

PART II. CONCERNING COWS

Breeds

Practically all of the dairy herds in Broome County are of grade stock, but most of the cattle carry some Holstein blood. Probably animals of this breed are best adapted to the production of market milk under the prevailing conditions of the region, chiefly because of their large size.

About two per cent of the dairy cattle in the county are purebred. In January, 1917, there were 498 purebred Holsteins on 45 farms, 53 purebred Jerseys on 7 farms, 40 purebred Ayrshires on 2 farms, and 20 purebred Guernseys on 6 farms, in Broome County. On 31 of the farms there were less than 6 head of purebred dairy cattle, and on only 8 of the 149 farms were there as many as 20 purebreds.

On the farms included in this study there were only 39 registered cows. Excepting one Ayrshire and one Dutch Belted, these were all Holsteins. Records for two purebred Holstein herds containing 52 cows were obtained, but were not included in the tabulations. The market for purebred dairy cattle in the southern-tier counties is relatively undeveloped. It is no doubt due largely to this fact, and to the more extensive system of dairying, that few purebred animals have been brought into the county.

Owing to the fact that the herds were so largely of Holstein characteristics, it was impossible to group them in any manner that would allow a comparison of one breed with another. There were six herds of purebred Holstein and Holstein grades, twenty-eight high-grade Holstein herds, twenty-eight herds comprised of Holstein grades and animals of mixed breeding, eleven herds of part Holstein grades and part Jersey grades, six herds of part Holstein grades and part Guernsey grades, and seventy herds of various other combinations of breeding. Most of the larger herds are Holstein grades, while more of the smaller herds are of mixed breeding.

Numbers

The inventories, purchases, sales, and deaths of cows are given in detail in table 20 (page 301). The average number of cows was 2058, and the average value was $65 a head. The number per farm varied from 6 to 37, the average being 13.8.

During the year 47 farms purchased 134 cows at an average price of $64 a head. On 103 farms there were 304 heifers that freshened for the

first time during the year. The average value at the time of freshening was $57 a head. About one cow was purchased or raised for each five kept. But as the herds are increasing in size, and as some cows are sold for production, only one cow of each seven or eight is actually replaced each year. The estimates of 131 dairymen as to the time cows remained in the herd after first freshening averaged 7.5 years.

Of the cows disposed of, 208 were slaughtered or sold for slaughter on 86 farms, and 117 were sold for breeding and production on 42 farms. The average price received for the former was $38, for the latter $54, a head.

Fig. 55. Going to the butcher

The figures indicate that about two-thirds of the cows disposed of are slaughtered or sold for slaughter, and that the remaining third go into other herds to be milked. But farmers do not know exactly where the cows they sell go. The relatively low price of those sold for production suggests that probably some that went to the block have been included in this group.

During the year 38 farms lost 55 cows by death or accident. Of these cows, 49 died, 4 were killed on the railroad, and 2 were killed by lightning. This is 2.7 per cent of the average number of cows. Receipts from the sales of hides and insurance for cows killed amounted to $7.82 per cow lost.

The average price of all cows slaughtered and sold was $44 a head. This is $21 a head less than the average value of cows. The depreciation

on cows and the loss due to death was $5722, or 4.3 per cent of the average value of cows. About two-thirds of this loss is represented by the difference between the value of cows and the price received for those sold, and one-third by deaths. Since the beef value of cows is not in proportion to their value for milk, depreciation and losses due to death are higher with higher-priced cows.

Average production

The average production per cow was 5532 pounds of milk, of which 5089 pounds was sold and 443 pounds was used on the farms, and 222.2 pounds of butterfat, of which 204.4 pounds was sold. About 42 per cent of the milk was produced in the six months beginning on October 1, and 58 per cent in the summer months from April to September.

The income from the sale of milk was more evenly distributed thruout the year than was the production. While more milk was sold in summer, the price received was so much less that the returns did not far exceed the returns in the winter months.

The data on average production are given in table 30:

TABLE 30. PRODUCTION PER COW AND ITS DISTRIBUTION, 2058 COWS

	Number of pounds of milk per cow	Per cent of total yearly production	Number of pounds of butterfat per cow	Receipts per cow from milk sold	Per cent of total receipts
Milk sold:					
May	614	12.1	24.0	$7.86	9.4
June	621	12.2	24.2	7.50	9.0
July	501	9.8	20.0	6.82	8.2
August	391	7.7	16.0	6.06	7.3
September	355	7.0	14.9	5.99	7.2
October	368	7.2	15.5	7.22	8.7
November	330	6.5	13.8	6.78	8.1
December	345	6.8	14.5	7.13	8.6
January	358	7.0	14.3	7.14	8.6
February	328	6.4	12.8	6.17	7.4
March	395	7.8	15.4	7.13	8.5
April	449	8.8	17.5	6.77	8.1
Retail	34	0.7	1.5	0.79	0.9
Total	5,089	100.0	204.4	$83.36	100.0
Milk not sold	443	.....	17.8	7.25	.....
Total	5,532	.....	222.2	$90.61	.....

Relative to the receipts on the New York market, much more milk was produced during the summer on the farms studied. The production in February, the lowest month, was 53 per cent of the June production, while on the New York market for the same year the amount received in February was 92 per cent of the amount received in June.

Less milk is furnished the city during July, August, or September than during January by the zones nearer the city.[7] These zones are the districts of most intensive dairying. The supply from the further zones, however, is much greater during the summer months. Prices paid for milk to be

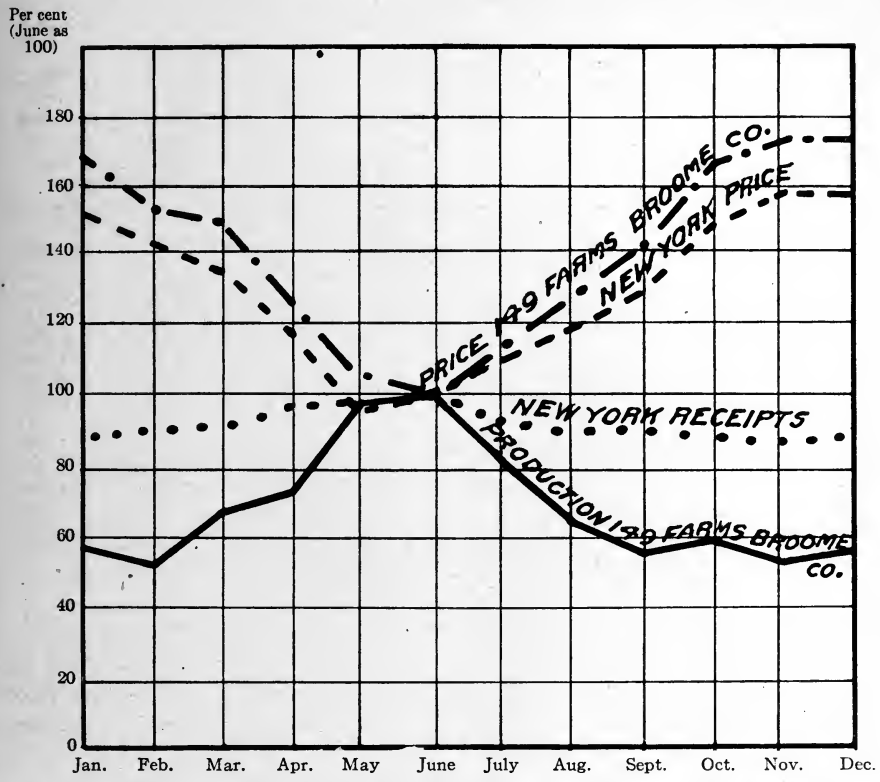

FIG. 56. PRODUCTION AND PRICE FOR 149 BROOME COUNTY FARMS COMPARED WITH RECEIPTS ON, AND WITH AVERAGE PRICES PAID AT SHIPPING STATIONS TO PRODUCERS FOR, THE NEW YORK MARKET

shipped to cities during these months must be in close accord with the prices that can be obtained from milk by making it into butter, cheese, or condensed milk, else milk will be attracted to the shipping stations from the factories and too great a surplus results. Production on these Broome County farms is more typical of the far zones than of the districts nearer the city.

[7] Preliminary Report of the Joint Legislative Committee on Dairy Products, Livestock, and Poultry. New York Senate Document, no. 35, page 340.

The figures for distribution are given in table 31:

TABLE 31. DISTRIBUTION OF PRODUCTION, AND PRICES RECEIVED FOR MILK, ON 149 BROOME COUNTY FARMS, COMPARED WITH DISTRIBUTION OF RECEIPTS IN THE NEW YORK MARKET AND WITH AVERAGE PRICES PAID AT SHIPPING STATIONS TO PRODUCERS OF MILK FOR NEW YORK CITY, IN THE SAME YEAR

Month	Daily average receipts on New York market, 40-quart cans	Per cent (June figure taken as 100)	Milk sold by 149 farms (hundredweight)	Per cent (June figure taken as 100)	Average prices paid producers for New York market*	Average prices received by 149 farms
1914:						
May	53,450	98	12,635	99	$1.25	$1.28
June	54,807	100	12,779	100	1.29	1.21
July	51,454	94	10,312	81	1.41	1.36
August	50,058	91	8,045	63	1.53	1.55
September	49,831	91	7,294	57	1.64	1.69
October	48,641	89	7,579	59	1.76	1.96
November	47,852	87	6,783	53	2.00	2.06
December	48,411	88	7,108	56	2.00	2.06
1915:						
January	48,332	88	7,359	58	1.94	2.00
February	50,529	92	6,748	53	1.85	1.88
March	50,996	93	8,138	64	1.76	1.80
April	52,419	96	9,243	72	1.53	1.51

*As given in *The Milk Reporter*, Sussex, New Jersey, for the respective months.

Feeds used

The total amounts and values of the various kinds of feed used by cows are given in previous tables. The amounts per cow, per hundred pounds of milk produced, and per pound of butterfat produced, are shown in table 32:

TABLE 32. FEED USED BY 2058 COWS

	From table	Total	Pounds used		
			Per cow	Per 100 pounds of milk produced	Per pound of butterfat produced
Grain	1	2,895,814 pounds	1,407	25.4	6.3
Silage	2	3,915.9 tons	3,806	68.8	17.1
Other succulent feed	2	861.43 tons	837	15.1	3.8
Hay	3	3,553.45 tons	3,453	62.4	15.5
Other dry forage	3	729.60 tons	709	12.8	3.2

An average of about 4 pounds of milk, containing 4 per cent of butterfat, was produced per pound of grain fed. The quantities of feed used on these farms per pound of butterfat produced, check closely with the quantities used in experiment station herds, as shown in table 33. The

TABLE 33. FEED USED AND PRODUCTION PER COW IN EXPERIMENT STATION HERDS

Station	Number of years covered by record	Number of records	Pounds of milk	Butterfat test of milk (per cent)	Pounds of fat	Pounds of concentrates	Pounds of silage	Pounds of other succulent feed	Pounds of hay	Pounds of other dry forage
Connecticut [a]	10	227	5,947	4.67	278	2,277	8,535	176	1,859	38
Massachusetts [b]	15	131	6,036	5.07	306	2,155	1,820	3,118	4,820	278
Michigan [c]	1	29	6,610	3.71	245	2,774	3,649	1,990	3,252	734
Minnesota [d]	1	23	6,408	4.70	301	3,474	3,479	1,827	2,029	.....
Missouri [e]	1	12	5,927	4.18	248	3,027	.....	.....	3,480	.....
Montana [f]	1	15	5,992	4.17	250	1,169	.....	.....	6,468	.....
Nebraska [g]	2	52	8,796	3.87	340	1,981	3,684	.....	2,343	.....
New Jersey [h]	14	415	6,792	4.16	283	2,721	8,008	8,076	1,383	679
Utah [i]	5	49	5,601	4.23	237	1,305	.....	.....	4,518	.....
Wisconsin [j]	12	261	7,540	4.28	322	2,014	7,549	1,648	1,356	.....
Total	.....	1,214	.....	.....	.....	.....	.....	.....	.....	.....
Simple averages:										
Per cow	.....	.....	6,565	4.30	281	2,290	3,672	1,684	3,151	173
Per 100 pounds of milk	.....	.....	.....	.....	.....	34.9	55.9	25.7	48.0	2.6
Per pound of butterfat	.....	.....	.....	.....	.....	8.1	13.1	6.0	11.2	0.6

[a] Bulletins 29, 73. [b] Bulletin 145. [c] Bulletin 166. [d] Bulletin 35. [e] Bulletin 26. [f] Report 1905.
[g] Bulletin 101. [h] Reports 1897–1906, 1909, 1912–1915. [i] Bulletin 68. [j] Reports 1905–1907; Bulletins 102, 187, 217.

station herds used more grain but less dry forage. Since grain contains from two to two and one-half times as much energy as does hay, the extra grain used compensates for the smaller amount of dry forage, especially if one allows for the use of a better grade of hay at the stations. No account could be taken of pasture, as it was reported in days but not in acres used. At the New Jersey and Massachusetts stations, very little pasture was used. These stations depended largely on soiling crops for summer feeding.

Labor required

An average per cow of 90.1 hours of human labor was spent in milking, 19.6 hours in hauling the milk, and 77.7 hours in other work. This is a total of 187.4 hours per cow, 3.38 hours per hundred pounds of milk produced, and 0.85 hour per pound of butterfat produced.

Most of the horse labor was in hauling the milk. This amounted to 28.4 hours out of a total of 33.9 hours per cow.

The data on labor required are given in table 34:

TABLE 34. LABOR REQUIRED FOR 2058 COWS

	Hours per cow*	Hours per 100 pounds of milk produced	Hours per pound of butterfat produced
Human labor:			
Milking:			
Man	76.2	1.38	0.34
Woman	8.0	0.14	0.04
Child	5.9	0.11	0.03
Total	90.1	1.63	0.41
Care of cows, product, and utensils:			
Man	64.9	1.17	0.30
Woman	7.0	0.13	0.03
Child	2.4	0.04	0.01
Hauling feed	2.0	0.04	0.01
Other human labor	1.4	0.02	0.00
Total	167.8	3.03	0.76
Hauling milk	19.6	0.35	0.09
Total human labor	187.4	3.38	0.85
Horse labor:			
Hauling milk	28.4	0.51	0.13
Other horse labor	5.5	0.10	0.02
Total horse labor	33.9	0.61	0.15

* Totals are given in table 7 (page 288).

Costs and returns

The total costs per cow were $105.43. Of this, 53.2 per cent was for feed including pasture, 22.8 per cent was for human labor except milk

hauling, and 24 per cent was for the remaining items. The total returns per cow were $102.62, of which 81.2 per cent was for milk sold, 9.4 per cent was for manure, and 9.4 per cent was for other items. The average loss on cows was $2.81 per cow. (Table 35.) Of the 149 herds, there were 61, or 41 per cent, that showed a profit on cows.

A common question that arises whenever results of cost studies are stated, is, if the actual loss is equal to the apparent loss, how do such producers remain in business? The answer is that they do one or more of the following things: first, accept lower wages than the rate at which their time is charged; secondly, accept less than farm value for roughage used; thirdly, accept a lower rate of interest on their investment than the rate charged.

If these farmers received interest on their investment, the farm value of farm-grown roughage, and all other costs, they then received 11.3 cents an hour for human labor.

TABLE 35. AVERAGE COSTS AND RETURNS, 2058 COWS*

Item	Per cow	Per cent of total
Costs:		
Grain	$20.83	19.7
Succulent feed	10.94	10.4
Dry forage	19.79	18.8
Pasture	4.54	4.3
Total feed	$56.10	53.2
Bedding	0.81	0.8
Human labor	24.01	22.8
Horse labor	0.82	0.8
Hauling milk	9.57	9.1
Use of buildings	4.23	4.0
Use of equipment	0.49	0.4
Interest on cows	3.23	3.1
Interest on feed and supplies	0.73	0.7
Depreciation on cows	2.78	2.6
Bull service	0.96	0.9
Miscellaneous	1.70	1.6
Total costs	$105.43	100.0
Returns:		
Milk sold	$83.36	81.2
Milk products sold	0.17	0.2
Milk and its products used	7.08	6.9
Calves and calf hides	2.24	2.2
Manure	9.67	9.4
Miscellaneous	0.10	0.1
Total returns	$102.62	100.0
Loss	$2.81	.....

* Totals are given in table 24 (pages 305 to 308).

If they received 15 cents an hour for all man time and 10 cents an hour for all time of women and children, and interest on their investment, they then received 90 per cent of the value of hay and other roughage used.

If it be assumed that the cost of feed and human labor represents the same proportion of the net cost of producing milk when feed and labor costs are high as when they are low, and that the quantities found in this study are used in the production of milk, then the yearly cost for 1920 price conditions may be computed as shown in table 36. The cost with the prices used would be $3.47 per hundred pounds. The index number of the prices of all commodities in the United States for the year 1920 was 243, as compared with 99 for the twelve months covered by this investigation.[8] The average price paid in 1920 to producers of milk for the New York market was $3.56 per hundred pounds.[9] Considering that the general price level stood at 245 as compared with that of 1914–15, this price of $3.56 in 1920 was about equal to a price of $1.45 in the years covered by this study. A cost of $3.47 would be approximately no greater when compared with the general price level than a cost of $1.42 in 1914–15. In the spring months of March, April, and May, 1920, the price of milk was low relative to feed and labor costs, but considering the year as a whole, it would appear that prices paid to shippers of fluid milk for the New York market were fairly well adjusted to cost of production.

The figures for costs and returns are given in table 35, and the probable cost in 1920 of keeping a cow and producing milk is shown in table 36.

TABLE 36. PROBABLE COST IN 1920 OF PRODUCING MILK

	Per cow			Per 100 pounds of milk	
	Amount used by 2058 cows in 1914–15	Estimated price in 1920	Cost at estimated 1920 prices	Amount used by 2058 cows in 1914–15	Cost at estimated 1920 prices
Grain	1,407 pounds	$60.00	$42.21	25.4 pounds	$0.762
Silage	3,806 pounds	7.00	13.32	68.8 pounds	0.241
Other succulent feed	837 pounds	5.00	2.09	15.1 pounds	0.038
Hay	3,453 pounds	20.00	34.53	62.4 pounds	0.624
Other dry forage	709 pounds	10.00	3.54	12.8 pounds	0.064
Human labor	187.4 hours	0.35	65.59	3.38 hours	1.183
Total feed and human labor	.....	.....	$161.28	.....	$2.912
Per cent of net cost, 83.9					
Total cost assuming that feed and labor represent the same per cent of the net cost as in 1914–15	.....	.....	$192.23	.....	$3.471

Size of herd

Of the herds on the farms studied, 36 per cent had from six to ten cows, 26 per cent had more than ten but not more than fourteen cows, 18

[8] United States Bureau of Labor Statistics. Monthly Review, vol. 12, no. 5, May, 1921.
[9] *The Milk Reporter*, Sussex, New Jersey, January, 1921, page 16.

per cent had more than fourteen but not more than eighteen cows, and 20 per cent had more than eighteen cows.

Size of farm

The size of the dairy is governed largely by the size of the farm. Farms keeping from six to ten cows averaged 111 acres, those with more than ten but not more than fourteen cows averaged 145 acres, those with more than fourteen but not more than eighteen cows averaged 177 acres, and those with more than eighteen cows averaged 238 acres.

The average distance to the milk station is less from farms with large herds than from farms with small herds. This is explained by the fact that a greater proportion of the large herds are in the valleys. The combined effect of a large load and a shorter haul considerably reduced marketing charges for the larger herds.

Feed used

Larger herds used more grain and more succulent feed per cow, but less dry forage, than did smaller herds. Production was better, and more of the milk was made, in winter. In other words, a more intensive system was followed. This is to be expected since many of these farms are nearer

TABLE 37. RELATION OF SIZE OF HERD TO VARIOUS FACTORS

	Number of cows per farm			
	6 to 10	10+ to 14	14+ to 18	Over 18
Number of farms	54	39	27	29
Acres per farm	111	145	177	238
Miles to market	3.7	3.8	2.5	3.1
Number of farms on hills	33	31	19	16
Number of farms in valleys	21	8	8	13
Per cent of farms on hills	61	79	70	55
Number of cows	461	485	436	676
Cows per farm	8.6	12.4	16.1	23.3
Number of cattle units	612.9	623.0	569.1	865.3
Acres per cattle unit	9.7	9.1	8.4	8.0
Cattle units per farm	11.4	16.0	21.1	29.8
Number using purebred bulls	9	8	7	15
Per cent using purebred bulls	17	20	25	52
Per cent of milk produced in six months, October to March	40	40	40	45
Pounds of milk per cow	5,461	5,323	5,344	5,853
Test of milk	4.1	4.0	4.0	4.0
Pounds of butterfat per cow	223	213	216	233
Pounds of grain per cow	1,313	1,343	1,448	1,484
Pounds of silage per cow	2,549	3,822	1,712	6,001
Pounds of other succulent feed per cow	811	837	633	988
Pounds of dry forage per cow	4,534	4,225	4,777	3,468
Number of farms feeding silage	18	22	9	20
Per cent feeding silage	33	56	33	69

TABLE 38. RELATION OF SIZE OF HERD TO LABOR USED PER COW AND PER UNIT OF PRODUCT

	Number of cows per farm											
	6 to 10			10+ to 14			14+ to 18			Over 18		
	Total hours	Hours per cow	Hours per 100 pounds of milk produced	Total hours	Hours per cow	Hours per 100 pounds of milk produced	Total hours	Hours per cow	Hours per 100 pounds of milk produced	Total hours	Hours per cow	Hours per 100 pounds of milk produced
Milking	46,768	101.5	1.86	45,981	94.8	1.78	36,326	83.3	1.56	56,279	83.3	1.42
Other chores	42,970	93.2	1.70	38,762	79.9	1.50	32,361	74.2	1.39	41,874	61.9	1.06
Hauling feed	925	2.0	0.04	1,230	2.6	0.05	602	1.4	0.02	1,292	1.9	0.03
Total	90,663	196.7	3.60	85,973	177.3	3.33	69,289	158.9	2.97	99,445	147.1	2.51
Hauling milk	9,371	20.3	0.37	10,377	21.4	0.40	11,125	25.5	0.48	9,464	14.0	0.24
Total	100,034	217.0	3.97	96,350	198.7	3.73	80,414	184.4	3.45	108,909	161.1	2.75

the market and on land that is better adapted to raising good winter feed. Some of the better production in the large herds may be due to the use of silage and to better feeding generally.

Data showing the relation of the size of herd to various other factors are given in table 37.

Labor required

The most important influence of size of herd is on labor per cow and per unit of product. The higher farm wages are, the more important this influence becomes.

In herds of from six to ten cows, averaging 8.6 cows, the labor averaged 217 hours per cow and 3.97 hours per hundred pounds of milk. Less labor was required in each of the groups of larger herds. In herds with more than eighteen cows, averaging 23.3 cows, the figures were 161 hours per cow and 2.75 hours per hundred pounds of milk. The data are given in table 38.

At 15 cents an hour the labor charges per hundred pounds of milk would be 19 cents more for 9-cow herds than for 23-cow herds. At 30 cents an hour they would be 37 cents more, and at 40 cents per hour they would be 49 cents more, per hundred pounds. The figures are given in table 39:

TABLE 39. RELATION OF SIZE OF HERD TO LABOR CHARGE PER UNIT OF PRODUCT

Number of cows per farm	Hours per cow*	Hours per 100 pounds of milk produced*	Labor charges at various rates per hour			
			15 cents	20 cents	30 cents	40 cents
8.6	217	3.97	$0.60	$0.79	$1.19	$1.59
12.4	199	3.73	0.56	0.75	1.12	1.49
16.1	184	3.45	0.52	0.69	1.04	1.38
23.3	161	2.75	0.41	0.55	0.82	1.10
Difference between 9- and 23-cow herds			$0.19	$0.24	$0.37	$0.49

* Including time for hauling milk.

Use of buildings

Much time is often wasted in doing chores in unhandy barns. The inconvenient location of milk house, ice house, or silo increases labor. Barns with cows facing outward so that a wagon, a sled, or a spreader may be driven thru for the manure, save labor, especially if the manure is hauled daily. Such an arrangement is also more convenient when a milking machine is used. There is very little work at the mangers during the pasture period.

The investment in buildings per cow, and the charge for their use, was highest in the small herds. Many small herds were housed in additions attached to the main barn, which reduced the cost of shelter. The larger

TABLE 40. RELATION OF SIZE OF HERD TO COSTS AND RETURNS

	Number of cows per farm							
	6 to 10		10+ to 14		14+ to 18		Over 18	
	Value		Value		Value		Value	
	Total	Per cow	Total	Per cow	Total	Per cow	Total	Per cow
Costs:								
Grain, summer	$ 634.00	$ 1.37	$ 989.00	$ 2.04	$ 838.00	$ 1.92	$ 1,564.00	$ 2.31
Grain, winter	8,637.00	18.74	8,675.00	17.89	8,546.00	19.60	12,975.00	19.19
Succulent feed	3,594.00	7.80	5,458.00	11.25	2,390.00	5.48	11,070.00	16.38
Dry forage	9,476.00	20.55	9,676.00	19.95	9,842.00	22.57	11,728.00	17.35
Total feed	$22,341.00	$48.46	$24,798.00	$51.13	$21,616.00	$49.57	$37,337.00	$55.23
Pasture	2,310.00	5.01	2,208.00	4.55	1,994.00	4.57	2,826.00	4.18
Bedding	384.00	0.83	514.00	1.06	309.00	0.71	466.00	0.69
Human labor	12,963.35	28.12	12,060.15	24.87	9,946.95	22.81	14,437.55	21.36
Horse labor	329.70	0.72	451.35	0.93	304.20	0.70	606.60	0.90
Hauling milk	4,823.80	10.46	5,031.26	10.37	5,113.33	11.73	4,716.40	6.98
Use of buildings	2,183.88	4.74	2,114.08	4.36	1,686.89	3.87	2,720.84	4.03
Use of equipment	290.10	0.63	242.85	0.50	188.50	0.43	293.65	0.43
Interest on cows	1,485.60	3.22	1,526.75	3.15	1,354.70	3.11	2,290.35	3.39
Interest on feed and supplies	333.00	0.72	342.00	0.71	307.50	0.71	529.00	0.78
Depreciation on cows	1,198.00	2.60	1,403.00	2.89	1,280.00	2.94	1,841.00	2.72
Bull service	404.10	0.88	462.61	0.95	369.42	0.85	735.17	1.09
Miscellaneous	805.00	1.75	862.00	1.78	732.00	1.68	1,097.00	1.62
Total costs	$49,851.53	$108.14	$52,016.05	$107.25	$45,202.49	$103.68	$69,896.56	$103.40
Returns:								
Milk sold	$36,861.53	$79.96	$38,207.68	$78.78	$34,776.34	$79.76	$61,706.67	$91.28
Milk products sold	127.69	0.28	115.07	0.24	100.00	0.23	.....	.....
Milk and milk products used	4,285.82	9.30	3,537.10	7.29	2,794.14	6.41	3,956.95	5.85
Calves and calf hides	952.00	2.07	936.00	1.93	814.00	1.87	1,906.00	2.82
Manure	3,984.77	8.64	4,646.12	9.58	4,488.75	10.30	6,777.00	10.03
Miscellaneous	.....	.....	165.00	0.34	24.00	0.05	20.00	0.03
Total returns	$46,211.81	$100.25	$47,606.97	$98.16	$42,997.23	$98.62	$74,366.62	$110.01
Loss	3,639.72	7.89	4,409.08	9.09	2,205.26	5.06	.....	.....
Gain	.....	.....	.....	.....	.....	.....	4,470.06	6.61

FIG. 57. A WELL-LIGHTED, WELL-VENTILATED, CLEAN, AND COMFORTABLE STABLE

herds were kept in more expensive basements. This increased the cost of shelter. For these reasons the difference in the charge per cow for the use of buildings is relatively little between small and large herds.

Costs and returns

The cost of keeping a cow was less in the larger herds. Partly because of this, but also because the returns were better, there was a greater profit per cow in the larger herds. In small herds the loss was $8 per cow. In the medium-sized herds the average loss was $9 per cow. But in the larger herds with an average of 23.3 cows there was a gain of about $7 per cow. The figures are given in table 40.

TABLE 41. RELATION OF SIZE OF HERD TO COST OF PRODUCTION AND TO AVERAGE PRICE FOR PRODUCT

	Number of cows per farm							
	6 to 10		10+ to 14		14+ to 18		Over 18	
	Herd cost	Cow cost	Herd cost	Cow cost	Herd cost	Cow cost	Herd cost	Cow cost
Cost per hundred pounds of milk sold	$1.82	$1.80	$1.81	$1.81	$1.74	$1.72	$1.54	$1.54
Per cent of cost (first group taken as 100)	100	100	99	101	96	96	85	86
Cost per pound of butter-fat in milk sold	$0.448	$0.441	$0.454	$0.454	$0.429	$0.424	$0.388	$0.387
Amount received per hundred pounds of milk sold	$1.64		$1.62		$1.61		$1.66	