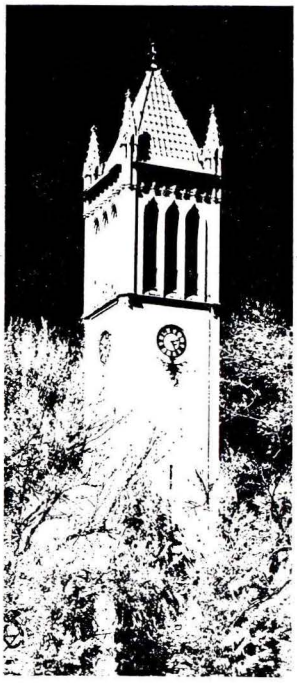
Trends in the Iowa Dairy Industry



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SUMMARY

This report is intended to serve as a source of Iowa dairy data and to highlight major characteristics and major trends in Iowa dairying. Some United States data are presented for comparative purposes. Among the important trends shown by the data are:

1. United States per-capita consumption of milkfat, butter and cream have declined, but per-capita consumption of nonfat milk solids, skim-milk items, ice cream, cheese and cottage cheese have risen.

2. The numbers of dairy cows in Iowa and in the United States have fallen, while production per cow has risen. The volume of milk used on Iowa farms where produced has declined, as has the amount of milk sold as farm-separated cream. The volume of milk sold to plants and dealers as whole milk by Iowa farmers was more than four times as large in the mid-1960's as in the late 1940's.

3. The number of Iowa farms having milk cows has fallen, while the average number of cows per farm has risen and larger herds have become more common.

4. Between 1954 and 1964 the northern three tiers of counties in Iowa and the counties in the east central part of the state showed increases in volumes of milk marketed. The southern three tiers of counties showed decreases in volumes of milk marketed between 1954 and 1964.

5. In Iowa, production of butter has declined steadily, but production of cheese, nonfat dry milk and cottage cheese has risen steadily since the early 1940's. For every processed dairy product the average size of plant has increased.

Trends In The Iowa Dairy Industry[1]

by George W. Ladd

This report has three purposes: (a) to serve as a source of Iowa dairy data, (b) to highlight major characteristics and important trends in Iowa dairying and (c) to discuss some probable future trends. To accomplish these purposes, data from various sources —some published and some previously unpublished— have been brought together and interpreted.

DAIRY PRODUCTS CONSUMPTION

The prices dairy farmers receive and the incomes they earn from dairying are affected by consumer prices and purchases and by the federal price-support program. The first four tables present data on trends in consumption of dairy products.

Tables 1 and 2 present annual data on national consumption of various dairy products. Table 1 refers to per-capita consumption of the civilian population, and table 2 presents data on total consumption: armed forces and civilian. Over time, substantial changes have taken place in consumption levels for some of these products.

The major influences affecting total demand for dairy products are: (a) growth of the total population and changes in its age distribution and occupational composition, (b) changes in the level and distribution of income, (c) changes in people's preferences for dairy products and (d) prices and availabilities of competing food products. This discussion will emphasize per-capita consumption.

Between 1930 and 1965, farm population declined from 30.5 million to 12.4 million. The movement of families from farm to city tended to reduce total dairy products consumption and to increase commercial sales of dairy products. This is because average *consumption* of dairy products by farm residents exceeds average *consumption* of dairy products by nonfarm residents, although average *purchases* are smaller for farm residents. This difference reflects the farm consumption of farm-produced dairy foods.

Growth in average levels of income has expanded the consumption of dairy products. The impact of the growth in per-capita income has been especially noticeable in the market for frozen desserts.

In recent years, dairy products consumption has been affected by changing consumer attitudes toward fat in the diet and overweight (1, p. 7). These changing attitudes reflect, among other things, the declining need for hard physical labor in this country. As jobs are made physically easier through power and machines, workers' need for food energy declines. Table 3 shows that per-capita milk-fat consumption has steadily declined since the 1930's, but per-capita consumption of nonfat solids is higher than in the 1930's.

The main part of the decline in consumption of butterfat has come from the decline in butter consumption, which has been accompanied by a rise in margarine consumption. Per-capita butter consumption has fallen faster than per-capita margarine consumption has risen so that per-capita consumption of the two together has fallen. Consumption of table fats (butter and margarine) has been reduced by declining consumption of baked goods and potatoes (27).

The growing importance of margarine relative to butter has been generated by several factors. One is the removal of legal restrictions on the production and sale of margarine (27, 36). Since 1935, 25 states have repealed laws prohibiting the retail sale of colored margarine, and several states have repealed taxes on margarine sales or license fees on margarine distributors. In 1950, the federal government repealed excise taxes and license fees on margarine sale and distribution. The effect of repealing these laws has been to reduce margarine prices, to reduce butter consumption and to increase margarine consumption.

Butter consumption also has been affected by increases in the ratio of butter to margarine prices. Increases in this price ratio, in turn, have been influenced by the previously mentioned repeal of legal restrictions on production and sale of margarine and by the operation of the federal government's dairy products price-support program. According to Rojko (35, p. 162), retail prices of butter would have averaged 13 percent lower and per-capita consumption 9 percent higher in 1952-1955 if no price-support programs had been in effect those years. Studies of consumer preferences have shown that many housewives who prefer butter to margarine nevertheless buy margarine because of the difference in cost (1, p. 10). Increases in advertising expenditures by margarine manufacturers and concern over the relation of saturated fats to circulatory diseases may also have played a role (1, p. 10).

Substantial quantities of butter purchased by the Commodity Credit Corporation are donated to school-lunch programs, charitable institutions and needy persons. Since 1953, domestic butter consumption from Commodity Credit Corporation supplies or other supplies bought wholly or partially by government funds has averaged 0.7 pounds per capita annually. This

[1]Projects 1458 and 1635 of the Iowa Agricultural and Home Economics Experiment Station.

Table 1. Per-capita civilian consumption of major dairy products and of margarine, United States, 1940-1965 (in pounds).[a]

Year	Fluid milk and cream: Fresh whole milk	Fluid milk and cream: Cream	Evaporated whole milk	Butter	Cheese[b]: American	Cheese[b]: Other	Cottage cheese	Skim milk or low-fat items	Nonfat dry milk	Evaporated and condensed skim milk[c]	Frozen desserts[d]: Net milk used	Frozen desserts[d]: Ice cream, product weight	Margarine
1940-49 average	302	11.8	17.0	12.6	4.4	1.8	2.3	41.7	2.6	5.7	40.6	16.3	4.1
1950-54 average	303	10.9	16.1	9.3	5.3	2.3	3.4	31.8	4.2	4.8	46.5	17.6	7.4
1955-59 average	302	9.6	13.0	8.4	5.3	2.6	4.5	27.3	5.6	4.5	49.9	18.1	8.6
1960	286	9.1	11.2	7.5	5.4	2.9	4.7	27.1	6.2	4.5	51.5	18.3	9.4
1961	276	8.7	10.7	7.4	5.7	2.9	4.6	27.9	6.2	4.8	51.5	18.0	9.4
1962	275	8.5	10.1	7.3	6.1	3.1	4.6	29.0	6.1	4.8	51.6	17.9	9.3
1963	276	8.1	9.4	6.8	6.1	3.1	4.6	30.4	5.8	4.5	51.9	18.0	9.6
1964	273	7.8	9.0	6.8	6.2	3.3	4.7	33.1	6.0	4.7	52.7	18.2	9.7
1965[e]	270	7.7	8.4	6.5	6.1	3.3	4.7	34.7	5.9	4.7	53.7	18.4	9.9

[a] Per-capita consumption for total population through 1940; per-capita civilian consumption only, 1941 to date.
[b] Excludes cottage, pot, and bakers' cheese.
[c] Includes evaporated and condensed buttermilk.
[d] Includes ice cream, sherbet, ice milk, mellorine, other frozen dairy products.
[e] Preliminary.

Sources: U. S. Econ. Res. Serv. U. S. food consumption sources of data and trends 1909-63. U. S. Dept. Agr. Stat. Bul. 364. 1965. Supplements for 1964 and 1965 Stat. Bul. 364.

Table 2. Total consumption of major dairy products and margarine, United States, 1940-1965.[a]

Year	Fluid milk and cream	Ice cream	Evaporated and condensed whole milk	All cheese[b]	Nonfat dry milk	Butter	Margarine
	(bill. lbs.)	(bill. lbs.)	(bill. lbs.)	(bill lbs.)	(bill. lbs.)	(bill. lbs.)	(bill. lbs.)
1940-49 average	50.0	2.317	2.912	0.902	0.425	1.813	0.559
1950-54 average	54.6	2.793	2.884	1.190	0.660	1.469	1.174
1955-59 average	58.8	3.146	2.636	1.353	0.939	1.482	1.460
1960	58.5	3.359	2.494	1.498	1.107	1.382	1.687
1961	57.5	3.357	2.448	1.556	1.134	1.381	1.715
1962	58.0	3.381	2.336	1.690	1.123	1.405	1.711
1963	58.8	3.440	2.216	1.730	1.079	1.344	1.787
1964	59.2	3.516	2.181	1.778	1.111	1.355	1.837

[a] Includes both military and civilian consumption.
[b] Includes all types of cheese except full-skim American and cottage, pot, and bakers' cheese.

Sources: U. S. Econ. Res. Serv. U. S. food consumption sources of data and trends 1909-63. U. S. Dept. Agr. Stat. Bul. 364. 1965. Supplements for 1964 and 1965 to Stat. Bul. 364.

donated butter represented about 12 percent of domestic civilian consumption of butter in 1962-65 (41).

One characteristic of the market for butter is the importance of institutional butter purchases. The commercial market for butter includes the market for creamery butter and farm-churned butter sold; it excludes consumption on farms of farm-churned butter and consumption from government supplies. About half of the commercial butter sales in the civilian market are to bakeries, institutions and similar large-volume users; only half of the commercial butter sales represent consumers' purchases of butter for home use (1).

The trends in consumer attitudes toward the fat and nonfat solids portions of milk also affect the composition of fluid milk and cream products consumed, though this effect does not show in the data in tables 1 and 2. The fluid milk and cream consumption data in those tables measure consumption on the basis of milkfat equivalent. On this basis of measurement, if a person consumed 300 pounds of fluid milk in 2 years, but used 4 percent milk the first year and 2 percent the second year, his reported consumption would be only half as great the second year because he used only half as much fat that year.

Table 3 shows how the percentage of milk fat in fluid milk products has declined. Table 4 presents various measures of consumption of fluid items. The first two columns measure per-capita consumption of fat solids and nonfat solids in fluid products. The third column shows the actual pounds of whole milk consumed per capita; the next two columns show the actual pounds of low-fat items and cream consumed per capita. The last column is the sum of columns three, four and five. Per-capita consumption of cream has fallen since 1950, and per-capita consumption of whole milk has fallen slightly, but per-capita consumption of skim milk items has more than doubled.

A look at columns three and four of table 4 might suggest that the increase in consumption of skim milk items has been at the expense of whole milk. Evidently part of the increase in skim milk consumption is a replacement for other fluid items, but part represents a net increase in total fluid milk use (33).

The 1956-65 decline in total consumption shown in column six of Table 4 does not all represent a loss in sales of dairy products. Fluid milk may have been partly replaced by nonfat dry milk reconstituted for fluid use. Per-capita consumption of nonfat dry milk rose 12 percent between 1958 and 1964. A study by the U. S. Department of Agriculture found that a large part of a family's increase in nonfat dry milk consumption represents a net addition to total dairy products consumption; only a small part of it is a replacement for purchased fluid milk items (44).

With fluid milk and cream products, as with most other dairy products, there are appreciable differences between consumption rates of farm and nonfarm residents. Per-capita consumption of fluid products by farm residents is about 30 percent greater than per-capita consumption by nonfarm residents (8, p. 20), but the difference is narrowing. Measured on the same basis as in tables 1 and 2 (i.e., milkfat equivalent) per-capita nonfarm consumption fell by 9 percent between 1950 and 1962, per-capita farm consumption fell by 15 percent in the same period. In recent years, the consumption of fluid milk under the school-lunch and special school-milk programs has amounted to 5 percent of total domestic civilian consumption. There is evidence that these programs serve to increase consumption of fluid milk products (3, 9, 34).

Although milk concentrates, except for nonfat dry milk, are not a currently important part of the total national dairy picture, they are worth looking at because of their potential future importance. Magdsick of United States Steel has estimated that a fresh tasting canned sterile concentrated milk product would capture 10 percent of the fluid milk market (9, p. 38). Another student of dairy marketing has estimated that milk concentrates—fresh, sterile and dry—may account for 25 percent of the fluid market by 1970 (5, p. 7). If fresh or sterile concentrates are to replace substantial volumes of fresh whole milk, it will have to be because of their lower retail prices per quart equivalent. Bartlett has estimated that sterile concentrates will not be an important competitor of fresh whole milk unless the price of the sterile concentrate is 2 cents or more per reconstituted quart below the price per quart of the fresh product and that the volume of concentrate sales will rise as the price differential in favor of the concentrate increases (5, 11).

Because of the importance of price, the greatest opportunities for increasing either sterile or refrigerated

Table 3. Per-capita domestic civilian consumption of fat and nonfat solids (in pounds), 1930-65 and percentage of milk fat in fluid-milk products, United States, 1950-65.

Year	Consumption (pounds)		Percentage of milk fat in fluid-milk products
	Milk fat	Nonfat solids	
1930-39 average	32.0	36.1	—
1940-49 average	31.0	42.4	—
1950-54 average	27.8	43.9	3.97
1955-59 average	26.2	44.1	3.82
1960	24.5	43.2	3.74
1961	23.9	42.5	3.70
1962	23.8	42.4	3.68
1963	23.3	41.6	3.65
1964	23.3	41.7	3.61
1965[a]	22.9	41.1	—

[a] Preliminary estimates.

Sources: U. S. Econ. Res. Serv. U. S. food consumption sources of data and trends 1909-63. U. S. Dept. Agr. Stat. Bul. 364. 1965. Supplements for 1964 and 1965 to Stat. Bul. 364. U. S. Econ. Res. Serv. Dairy situation, DS-301, June 1964, DS-303, Oct. 1964, DS-306, July, 1965. U. S. Dept. Agr.

Table 4. Per-capita consumption of fluid milk and cream items, product weight, United States, 1950-65 (in pounds).

Year	Milk equivalent		Per-capita whole milk sales	Per-capita skim milk items	Per-capita cream consumption	Total
	Fat solids basis	Nonfat solids basis				
1950	321	304	278	15.6	11.1	304.7
1951	324	310	282	17.4	11.1	310.5
1952	325	314	285	18.5	10.5	314.0
1953	322	313	284	19.3	10.3	313.6
1954	324	316	287	19.4	9.8	316.2
1955	327	320	291	20.1	9.7	320.8
1956	330	325	295	20.6	9.8	325.4
1957	328	324	293	21.2	9.6	323.8
1958	322	319	288	21.5	9.3	318.8
1959	316	315	283	22.7	9.1	314.8
1960	311	311	278	23.9	9.1	311.0
1961	301	303	269	25.7	8.8	303.5
1962	300	304	268	27.2	8.6	303.8
1963	301	307	269	29.0	8.2	306.2
1964	299	308	268	31.9	7.9	308.1
1965[a]	298	309	266	34.2	7.7	308.0

[a] Preliminary.

Source: U. S. Econ. Res. Serv. Dairy Situation, DS-311. July 1966. U. S. Dept. Agr.

whole-milk concentrates lie in the South and Northeast where retail prices and farm production costs are relatively high. The West also seems a potentially important market. These opportunities can be exploited only if legislative and administrative barriers to distribution of milk concentrates can be overcome. Among the possible trade barriers that can keep concentrated milk out of a market—at least temporarily—are (a) sanitary requirements, (b) distributor trade associations, (c) state milk-control laws, (d) federal milk-marketing orders and (e) farmer cooperatives. Some lawyers who have studied the problem are optimistic that many of these barriers can be overcome (6, 25). If these obstacles are surmounted, the question of whether milk concentrates will become an outlet for large quantities of milk from the upper Midwest will be affected by whether or not midwestern farmers must be paid the class I price for the milk used in the concentrates.

Table 1 shows that per-capita consumption of cottage cheese has doubled since the 1940's. This growth has been in response to many forces: growing consumer preference for low-fat foods, increasing appreciation of the nutritive value of cottage cheese and increasing promotional efforts by processors. A belief that consumption could be increased still further led the Governor's Dairy Marketing Committee in Wisconsin to recommend cottage cheese promotion and quality improvement as one means of increasing the market for nonfat milk solids (14, p. 55). They based this recommendation on three considerations: (a) the Committee believed that increasing cottage cheese consumption would have little effect on the consumption of other dairy products, (b) per-capita cottage cheese consumption runs about 20 pounds per year in California, about four times the national average, and (c) promotional campaigns can be successful in increasing cottage cheese consumption (28).

The Committee was concerned with increasing sales of nonfat solids since, in spite of growth in consumption of nonfat and low-fat items, the nonfat solids portion of milk is in greater surplus than the fat solids portion. About 98 percent of the milk fat produced is used for human consumption; 80 percent of the nonfat solids is used for human consumption. Since 1955, between 10 and 20 percent of the nonfat dry milk consumed by civilians has been financed wholly or partly with government funds, and between 40 and 60 percent of the nonfat dry milk produced in this country has been sold to the federal government under its price-support program.

Two exceptions to the trend toward reduced consumption of high-fat dairy foods are ice cream and cheese. Per-capita ice cream consumption has changed little since the early 1950's. Per-capita cheese consumption rose about 25 per cent from 1950-1952 to 1965. Butter is about 80 percent milk fat, cheese is about 30 percent, and ice cream averages around 10 percent. To maintain butterfat consumption, a 3-pound increase in cheese consumption or an 8-pound increase in ice cream consumption is required to offset a 1-pound decrease in butter consumption. Cheese and ice cream consumption have not risen this rapidly. We still only use about 50 percent as much milk fat in cheese production as in butter production and about 80 percent as much milk fat in cheese and ice cream as in butter (42).

As with butter, the market for American cheese (which makes up two-thirds of the cheese consumed in this country) has been significantly affected by the government's price-support operations. According to Rojko (35, p. 162), from 1952-1955 the retail price of American cheese would have averaged 11 percent lower than it actually was if there had been no price-support program in operation, and consumption would have been 9 percent higher. Partially offsetting the loss of commercial sales resulting from the higher cheese prices is the consumption of cheese from government donations for school-lunch programs and welfare uses. In recent years, 10 to 15 percent of the American cheese consumed by civilians has come from Commodity Credit Corporation supplies or other partly or wholly governmentally financed supplies (41).

Although ice cream consumption has grown little since the early 1950's, ice milk consumption has grown rapidly: from 1.2 pounds per capita in 1950 to 6.4 pounds per capita in 1964. Mellorine is a frozen dessert containing vegetable fat or animal fat other than milkfat. Per-capita mellorine consumption quadrupled in the same period, but national mellorine consumption of 1.3 pounds per capita still amounts to only 7 percent of ice cream consumption. In the 12 states that permit sales of mellorine, however, mellorine sales amount to 22 percent of ice cream and mellorine sales (22).

An important cause of the rise in mellorine consumption has been the lower price of mellorine compared with ice cream (2). The higher cost of butterfat over vegetable fat is responsible for this difference. On a price basis, ice milk is competitive with mellorine. If the present trend toward the production of ice cream with a lower butterfat content is reflected in lower ice cream prices, this will make ice cream somewhat more competitive with mellorine on a price basis.

It is likely that additional states will permit the production and sale of mellorine and that we will, therefore, see further increases in mellorine consumption. Part of this growth will probably come from reduced consumption of ice cream. Part will be a net addition to consumption of frozen desserts.

FARM MILK PRODUCTION, DISPOSITION, AND INCOME

Table 5 shows the relative importance of dairy products as a source of cash income from farm marketings in Iowa and the United States. Table 5 does not show the relative importance of dairying as a source of income since it excludes income from sale of dairy

Table 5. Cash receipts from total farm marketings and farm marketings of dairy products, Iowa and United States, 1940-1965.[a]

Year	Total cash receipts from farm marketings			Cash receipts from marketings of dairy products			Cash receipts from farm marketings of dairy products as percentage of total cash receipts from farm marketings	
	Iowa	U.S.	Iowa as percentage of U.S.	Iowa	U.S.	Iowa as percentage of U.S.	Iowa	U.S.
	(bill. dol.)			(mill. dol.)				
1940-44 average	1.159	15.043	7.8	100.8	2,290	4.4	9.0	15.7
1945-49 average	1.942	26.828	7.2	158.6	3,776	4.2	8.2	14.1
1950-54 average	2.279	31.036	7.4	156.9	4,216	3.7	6.9	13.6
1955-59 average	2.270	31.377	7.2	165.4	4,505	3.7	7.3	14.4
1960	2.488	34.012	7.3	174.0	4,737	3.7	7.0	13.9
1961	2.462	34.886	7.1	184.0	4,919	3.7	7.5	14.1
1962	2.610	36.187	7.2	179.4	4,858	3.7	6.9	13.4
1963	2.665	37.253	7.2	181.0	4,847	3.7	6.8	13.0
1964	2.685	36.899	7.3	191.7	5,008	3.8	7.1	13.6
1965	2.950	38.930	7.6					

[a] Government payments not included.

Sources: U. S. Dept. Agr., Major statistical series of the U. S. Dept. Agr., Agr. Handbook 118, Vol. 3, 1957. Iowa Crop and Livestock Reporting Service. Iowa Cash farm income, Bul. 92.9A. 1955. U. S. Crop Reporting Board. Milk production, disposition, and income revised estimates 1960-64. U. S. Dept. Agr. Stat. Bul. 368. 1967. U. S. Econ. Res. Serv. Farm income situation Fls-201, Feb. 1966. U. S. Dept. Agr.

Table 6. Number of cows, milk production and butterfat content, Iowa and United States, 1940-1966.

Year	Number of cows[a]		Production per cow[b]		Butterfat content		Total milk production[b]		
	Iowa	U.S.	Iowa	U.S.	Iowa	U.S.	Iowa	U.S.	Iowa as percentage of U.S.
	(thousand)		(pounds)		(percentage)		(billion pounds)		
1940-44 average	1,416	24,807	4,802	4,653	3.80	3.97	6.800	115.415	5.89
1945-49 average	1,236	23,362	5,196	5,000	3.80	3.97	6.416	116.623	5.50
1950-54 average	1,080	21,612	5,514	5,444	3.77	3.90	5.955	117.654	5.06
1955-59 average	967	19,586	6,382	6,327	3.70	3.81	6.156	124.283	4.95
1960	851	17,515	6,980	7,029	3.70	3.76	5.940	123.109	4.82
1961	846	17,243	7,230	7,496	3.70	3.75	6.117	125.707	4.87
1962	825	16,842	7,510	7,700	3.65	3.74	6.196	126.251	4.91
1963	797	16,260	7,900	7,700	3.60	3.71	6.296	125.202	5.03
1964	770	15,677	7,850	8,099	3.60	3.70	6.607	126.967	5.20
1965	718	14,954	8,280	8,304	3.60	3.70	5.945	124.173	4.79
1966[c]	657	14,123	8,560	8,513	3.60	3.69	5.624	120.230	4.68

[a] Average number during year; heifers that have not freshened excluded.

[b] Excludes milk sucked by calves and milk produced by cows not on farms.

[c] Preliminary.

Sources: U. S. Econ. Res. Serv. Dairy statistics through 1960. U. S. Dept. Agr. Stat. Bul. 303, 1962. Supp. for 1962 to Stat. Bul. 303. 1963. Crop Reporting Board. Milk production, disposition, and income revised estimates 1960-64. U. S. Dept. Agr. Stat. Bul. 398, 1967. U. S. Crop Reporting Board. Milk production, disposition and income 1965-66, U. S. Dept. Agr. Da 1-2 (67), 1967.

cows and calves. In recent years, about 7 percent of Iowa cash farm income has come from dairy products compared with about 14 percent nationally. Dairy products have been of less relative importance in Iowa and in the United States in recent years than they were in pre-World War II years. In Iowa, cash income from farm marketings of dairy products is about equal to cash income from farm marketings of soybeans. Cattle and calves provide 35 percent of Iowa cash receipts from farm marketings; hogs provide 30 percent; and all crops provide 20 percent. For the United States, cattle and calves, hogs and all crops provide 20 to 25 percent, 10 percent and 45 percent of cash income from farm marketings.

Tables 5 and 6 show that Iowa produces about 4.9 percent of total United States milk production and receives about 3.8 percent of total cash receipts from marketings of dairy products. Iowa's share of farm in-

come from dairying is smaller than Iowa's share of farm production because the average farm price of milk in Iowa is lower than the average United States farm price of milk: $3.44 per hundredweight versus $4.16 per hundredweight in 1964. This, in turn, is largely a reflection of the price of grade A milk for fluid use being higher than the price of other milk. About 20 percent of Iowa milk production is used for fluid use, whereas nearly 50 percent of total United States production is used for fluid use (8). This is because Iowa lacks the large population concentrations found in the metropolitan areas of many other states, and many of the dairy products produced in Iowa have to be shipped to distant markets. In addition, prices of grade A milk in Iowa are below the national average of grade A milk prices. Again, one reason is the absence of large consuming centers in Iowa. Another reason is Iowa's proximity to the important dairy production areas of Minnesota and Wisconsin where milk prices are relatively low.

As table 6 also shows, Iowa milk production per cow is slightly above United States milk production per cow, and the fat content of Iowa milk is slightly below the United States average fat content.

Butterfat content has declined steadily since the late 1940's. This may represent, in part, farmers' response to the decline in the demand for butterfat and the rise in demand for the nonfat solids portion of milk. This decline also reflects a shift by many farmers to larger breeds of cows; these larger breeds produce milk of lower average fat content. Also, within breeds, as production per cow rises, average butterfat content declines.

Production per cow has risen steadily. It is now nearly 90 percent higher than in the early 1930's. When we compare these data with Dairy Herd Improvement Association records, we see that production per cow will rise still further. In 1963-64, production per cow in Dairy Herd Improvement Association herds averaged 11,517 pounds for the United States (43) and 11,362 pounds for Iowa (21). If in 1964 the United States average production for all cows had been 11,517 pounds, only 11 million cows would have been required to produce the total 1964 milk supply; this is two-thirds of the number of cows actually milked in 1964. Likewise, if, in 1964, average production for all cows in Iowa had been 11,362 pounds, only 582,000 cows would have been needed to produce the total 1964 Iowa milk supply; this is three fourths the number actually milked in 1964 in Iowa.

Average production per cow has risen more rapidly in recent years than in previous years. In Iowa it rose 18 percent between 1944 and 1954 and 39 percent between 1954 and 1964. If Iowa production per cow rises by 39 percent again between 1964 and 1974, production per cow will be 11,000 pounds in 1974. This is somewhat less than production per cow in Iowa Dairy Herd Improvement Associations in 1963-64.

The main explanation for this upward trend in production per cow is that the average cost of producing 100 pounds of milk declines as production per cow rises. For example, with fixed prices for inputs, the average cost of producing 100 pounds of milk declines by about one fourth as average production per cow rises from 5,000 to 7,000 pounds (32). Farmers,

Table 7. Milk used and marketed by Iowa farmers, 1940-1966.

Year	Total milk produced	Milk used on farms where produced[a]	Milk marketed by farmers			
			Delivered to plants and dealers		Retailed by farmers as milk and cream[b]	Total in combined milk and cream marketings
			As whole milk	As farm-skimmed cream		
	(billion lbs.)	(billion lbs.)	(billion lbs.)		(billion lbs.)	(billion lbs.)
1940-44 average	6.800	0.836	0.828	5.018	0.118	5.964
1945-49 average	6.416	0.806	1.100	4.409	0.102	5.611
1950-54 average	5.955	0.679	1.300	3.914	0.62	5.276
1955-59 average	6.156	0.507	2.804	2.808	0.37	5.649
1960	5.940	0.408	3.770	1.730	0.32	5.532
1961	6.117	0.386	4.250	1.450	0.31	5.731
1962	6.196	0.366	4.600	1.200	0.30	5.830
1963	6.296	0.347	4.900	1.020	0.29	5.949
1964	6.607	0.329	5.370	0.880	0.28	6.278
1965	5.945	0.308	4.950	0.660	0.27	5.637
1966[c]	5.624	0.288	4.750	0.560	0.26	5.336

[a] Includes milk used in farm-churned butter used on farms and farm-churned butter sold, milk fed to calves, and milk consumed as fluid milk and cream.

[b] Approximations based on information on sales by producer-distributors and other farmers on own routes or at farm.

[c] Preliminary.

Sources: U. S. Econ. Res. Serv. Dairy Statistics through 1960. U. S. Dept. Agr. Stat. Bul. 303. 1962. U. S. Crop Reporting Board. Milk production, disposition and income revised estimates 1960-64. U. S. Dept. Agr. Stat. Bul. 398, 1967. U. S. Crop Reporting Board, Milk production, disposition and income 1965-66. U. S. Dept. Agr. Da 1-2 (67), 1967.

Table 8. Percentage of total milk used and marketed by Iowa farmers, 1940-1966.

Year	Total milk produced	Milk used on farms where produced	Milk marketed by farmers			
			Sold to plants and dealers		Retailed by farmers as milk and cream	Total milk and cream marketings
			As whole milk	As farm-skimmed cream		
	(percentage)					
1940-44 average	100	12.3	12.2	73.8	1.7	87.7
1945-49 average	100	12.5	17.2	68.7	1.6	87.5
1950-54 average	100	11.4	21.8	65.7	1.0	88.6
1955-59 average	100	8.2	45.6	45.6	0.6	91.8
1960	100	6.9	63.5	29.1	0.5	93.1
1961	100	6.3	69.5	23.7	0.5	93.7
1962	100	5.9	74.2	19.4	0.5	94.1
1963	100	5.5	77.8	16.2	0.5	94.5
1964	100	5.0	81.3	13.3	0.4	95.0
1965	100	5.2	83.3	11.1	0.4	94.8
1966	100	5.1	84.4	10.0	0.5	94.9

Source: Figures calculated from table 7.

Table 9. Income from milk produced on Iowa farms, 1940-1966 (in million dollars).

Year	Gross farm income from dairy products[a]	Value of milk used for farm consumption and farm butter[b]	Milk marketed by farmers			
			Total	Milk sold to plants and dealers	Cream sold to plants and dealers	Milk and cream retailed by farmers
1940-44 average	111.324	10.493	100.830	18.338	76.774	5.571
1945-49 average	175.763	17.183	158.580	39.682	111.842	6.899
1950-54 average	172.196	14.825	157.372	49.099	103.032	5.215
1955-59 average	174.999	9.629	165.369	95.375	66.642	3.352
1960	180.776	8.050	172.726	128.180	41.606	2.940
1961	196.177	8.069	188.108	150.450	34.872	2.786
1962	193.750	7.528	186.222	155.940	27.594	2.688
1963	199.933	7.193	192.740	166.600	23.501	2.639
1964	213.540	6.876	206.664	183.654	20.306	2.704
1965	199.426	6.601	192.825	174.735	15.360	2.730
1966[c]	218.749	7.067	211.682	195.225	13.793	2.664

[a] Cash receipts from marketings of milk and cream plus value of milk used for farm consumption and farm-churned butter.

[b] Milk used for fluid consumption or homemade butter on farms where produced, valued at average per unit returns for milk utilized in all forms for sale. Prior to 1951, this category excludes value of farm-churned butter sold.

[c] Preliminary.

Sources: U. S. Econ. Res. Serv. Dairy Statistics through 1960. U. S. Dept. Agr. Stat. Bul. 303. 1962. U. S. Crop Reporting Board. Milk production, disposition and income revised estimates 1960-64. U. S. Dept. Agr. Stat. Bul. 398, 1967. U. S. Crop Reporting Board. Milk production, disposition and income 1965-66, U. S. Dept. Agr. Da 1-2 (67), 1967.

therefore, have strong incentive to upgrade their herds to higher-producing cows. Because of the increased output per cow between the early 1940's and the early 1960's, total Iowa milk production fell by only 12 percent, but numbers of dairy cows in Iowa fell by about 43 percent.

Tables 7 and 8 describe the disposition of milk production by Iowa farmers over the years. Milk used on farms where produced declined from one fourth of total milk production in the mid-1920's to one sixteenth of total milk production in the early 1960's. The proportion of milk production sold as whole milk doubled between 1924 and 1944 and has more than quadrupled since. The portion sold as farm-separated cream rose about 10 percent between 1924 and 1944 and has fallen by more than two thirds since 1944.

These changes in the disposition of milk reflect the interaction of a number of forces. The decline in consumption of fluid milk and cream and of farm-churned butter on farms where produced is largely due to the decline in the number of farms with dairy cows.

Most farmers have found it efficient and profitable to shift from selling farm-separated cream to selling

Table 10. Annual average prices received by Iowa farmers for whole milk and cream, 1940-1966.

Year	Milk sold to plants and dealers (Price per 100 lbs.)	Cream sold to plants and dealers (Price per lb. fat)	Milk and cream retailed by farmers (Prices per quart)	Average per unit cash returns from combined milk and cream marketings[a] (Per 100 lb. milk)	(Per lb. milk fat)
	(dollars)	(cents)	(cents)	(dollars)	(cents)
1940-44 average	2.18	42	10.2	1.68	44
1945-49 average	3.60	69	14.7	2.84	75
1950-54 average	3.81	71	18.2	2.99	79
1955-59 average	3.40	64	19.3	2.93	79
1960	3.40	65	19.6	3.11	84
1961	3.54	65	19.9	3.27	88
1962	3.39	63	19.2	3.18	87
1963	3.40	64	20.3	3.22	89
1964	3.42	65	20.8	3.29	91
1965	3.53	65	21.0	3.42	95
1966[b]	4.11	69	22.2	3.97	110

[a] For 1950 and earlier years, also includes cash receipts from farm-churned butter sold.

[b] Preliminary.

Sources: U. S. Econ. Res. Serv. Dairy Statistics through 1960. U. S. Dept. Agr. Stat. Bul. 303. 1962. U. S. Crop Reporting Board. Milk production, disposition and income revised estimates 1960-64, U. S. Dept. Agr. Stat. Bul. 398, 1967. U. S. Crop Reporting Board, Milk production, disposition and income 1965-66. U. S. Dept. Agr. Da 1-2 (67), 1967.

Table 11. Iowa and West North Central price ratios, 1940-1964.

Year	Butterfat-feed price ratio[a] Iowa	Butterfat-feed price ratio[a] West North Central[b]	Milk-feed price ratio West North Central[b]	Iowa price per pound of fat divided by index of prices paid by U.S. farmers	Iowa price per 100 lbs. milk divided by index of prices paid by U.S. farmers
	(pounds)		(pounds)	(cents)	(dollars)
1940-44 average	28.9	28.1	1.56	27	1.42
1945-49 average	27.5	27.1	1.42	30	1.56
1950-54 average	24.8	23.7	1.31	26	1.38
1955-59 average	26.5	25.4	1.44	23	1.19
1960	28.8	27.1	1.54	22	1.16
1961	28.4	27.5	1.54	22	1.17
1962	26.7	25.7	1.45	20	1.11
1963	27.6	24.8	1.39	20	1.09
1964	26.5	24.4	1.41	20	1.09

[a] Pounds of feed equivalent in value to 1 pound of butterfat.

[b] Includes an allowance for dairy production payments, Oct. 11, 1943, through June 30, 1946.

Sources: U. S. Econ. Res. Serv. Dairy statistics through 1960. U. S. Dept. Agr. Stat. Bul. 303. 1962. Supp. for 1962 to Stat. Bul. 303. 1963. Iowa State Univ. Iowa Farm Science. Vol. 17, No. 8, Feb. 1963. Supp. for 1963 and 1964 to Stat. Bul. 303. 1965. U. S. Dept. Agr.

whole milk. They thereby eliminate the work and time of separating and can spend that time in some more profitable activity. The use of dry rations is more convenient than the use of skim milk as a calf or hog feed. The sale of whole milk avoids the inconvenience of feeding skim milk. The increase in consumer demand for nonfat solids and government purchases of nonfat dry milk have maintained the price of nonfat dry milk in spite of the rapid growth of production. Without these two forces, the price of nonfat dry milk, and hence of whole milk, would have been much lower and the shift from selling farm-separated cream to selling whole milk would have been slower. Also important has been the growth in total consumer demand for fluid milk and cream.

Table 9 is the dollar counterpart of table 7, showing the value of milk disposed of in various ways. Since the early 1950's, gross farm income from dairy products has risen by one fourth, whereas value of milk used on the farm where produced has fallen by half. During this same period, the value of whole milk sales to plants and dealers rose by 300 percent and value of cream sales fell by 90 percent.

PRICES

Dairy farm income is affected by production and prices. Table 10 presents data on Iowa farm prices for milk and cream, and table 11 presents price ratios.

The next to last column of table 10 is obtained by dividing total cash receipts from milk and cream marketings by the hundredweight equivalent of whole milk and cream marketings. The last column is obtained by dividing total cash receipts from milk and cream marketings by the pounds of butterfat marketed. The average returns in these last two columns have risen more rapidly than prices have because of the rapid growth in sales of whole milk and the decline in the volume of cream sales. Even if farm prices were to remain steady, average receipts per pound of butter fat would rise as the farmer changed from selling cream to selling whole milk.

Table 12 shows average annual prices of milk cows. From 1940 to 1965 average milk cow prices rose by 229 percent. During this period, average price of milk sold to dealers rose 168 percent; average cream price rose 114 percent; average return per hundredweight of milk rose 173 percent; and average production per cow rose 66 percent.

Table 13 presents more detail on the prices received for milk sold to plants and dealers. It shows average prices received for manufacturing grade milk and for milk eligible for the fluid market. In recent years, only grade A milk has been eligible for the fluid market. The difference between the two prices has ranged from $0.68 and $1.10.

It was previously mentioned how commercial sales and retail prices of dairy products have been affected by the federal government's price-support program.

Its effect on farm prices has also been analyzed. If no price-support program had been in effect, the United States average farm prices for all milk sold in the marketing years beginning April 1, 1953, 1954 and 1955 would have been 25, 12 and 12 percent lower, respectively, than they actually were (35). Cash receipts from farm marketings of dairy products would have declined by these same percentages (35).

In a 1963 study (16) it was estimated that if no support programs were in effect in the 1963-64 marketing year, gross dairy farm cash receipts would be 16 percent less and net dairy farm cash income (gross dairy farm cash receipts minus dairy farm cash expenses) would be 43 percent less than they would be if the then-current dairy price support program were continued. Thus, we see how important price support programs have been in supporting income from dairying.

Table 12. Average prices per head received by Iowa farmers for milk cows, 1940-1965.

Year	State average Price (dollars)
1940-44 average	93
1945-49 average	162
1950-54 average	215
1955-59 average	194
1960	223
1961	229
1962	226
1963	217
1964	214
1965	215

Sources: Iowa Farm Science, Vol. 15, No. 8, pp. 20-65. Iowa State Univ. of Science and Technology, Ames, Iowa, Feb. 1961. Iowa Farm Science, Vol. 16, No. 8; Vol. 17, No. 8. Iowa State Univ., Iowa Farm Science, Vol. 17, No. 8, Feb. 1963; Supp. for 1963-64 to Stat. Bul. 303. 1965, U.S. Dept. Agr. U. S. Crop Reporting Board Agricultural prices 1965 annual summary. U. S. Dept. Agr. Pr 1-3 (66), 1966.

HERD SIZES

Tables 5 to 9 presented totals on milk and cream production sales and marketings. Tables 14 to 16 will present information on numbers of farms and herd sizes.

Table 14 shows that the average number of cows per farm has risen but that the number of farms with milk cows has fallen. For 1940 it shows that 90, 85 and 76 percent, respectively, of all farms in Iowa, the West North Central Region and the United States had milk cows. By 1959, the proportions had declined to 53, 55 and 48 percent.

Table 13. Average price per 100 pounds received by Iowa farmers for milk eligible for fluid market and for manufacturing grade milk, 1948-1965.

Year	Milk eligible for fluid market	Manufacturing grade milk
	(dollars)	(dollars)
1948	4.70	3.90
1949	4.05	2.95
1950	3.95	3.00
1951	4.41	3.51
1952	4.62	3.62
1953	4.16	3.23
1954	3.98	2.99
1955	3.95	2.99
1956	4.04	3.10
1957	4.08	3.16
1958	4.00	3.04
1959	4.13	3.06
1960	4.16	3.13
1961	4.13	3.33
1962	3.97	3.21
1963	3.92	3.24
1964	3.95	3.26
1965	4.14	3.35

Sources: U. S. Econ. Res. Serv. Dairy statistics through 1960. U. S. Dept. Agr. Stat Bul. 303. 1962. Supp. for 1962 to Stat. Bul. 303. 1963. Supp. for 1963-1964 to Stat. Bul. 303. 1965. U. S. Dept. Agr. U. S. Crop Reporting Board. Agricultural prices 1965 annual summary. U. S. Dept. Agr. Pr 1-3 (66), 1966.

Table 14. Total farms, farms reporting milk cows and number of cows per farm for Iowa, West North Central Region and United States. Census Years 1940-64.

Area	Total number of farms					Farms reporting milk cows					Average number of cows per farm				
	1940	1950	1954	1959	1964	1940 (April 1)	1950 (April 1)	1954 (Fall)	1959 (Fall)	1964 (Fall)	1940	1950	1954	1959	1964[a]
Iowa	213,318	203,159	192,933	174,707	154,162	192,364	168,599	138,142	92,730	59,673	7.4	6.9	7.5	9.0	12.3
West North Central Region	1,090,574	982,735	905,248	794,518	703,780	929,545	775,291	639,959	434,953	285,004	6.8	6.7	7.4	8.7	
United States (48 states)	6,096,799	5,382,162	4,782,416	3,703,894	3,152,613	4,644,317	3,648,257	2,935,842	1,791,729	1,133,587	5.2	5.8	6.9	9.2	

[a] 1964 census figures not available for West North Central Region and United States.

Sources: U. S. Econ. Res. Serv. Supp. for 1962 to Dairy statistics through 1960, U. S. Dept. Agr. Stat. Bul. 303. 1963. U. S. Agr. Marketing Service, Dairy Statistics, U. S. Dept. Agr. Stat. Bul. 218. 1957. U. S. Bureau of Census, 1964 Census of Agriculture Preliminary Reports, U. S. Dept. Comm. 1966.

Table 15 shows how the number of farms selling cream has fallen and the number selling whole milk has risen in Iowa. Average sales of whole milk per farm selling whole milk rose 200 percent between 1949 and 1964 in Iowa.

Table 16 presents additional data on the growth of herd sizes in Iowa. The proportion of Iowa herds with nine or fewer cows fell from 78 percent in 1939 to 65 percent in 1959; the proportion with 10 to 29 cows rose from 22 percent to 32 percent; the proportion of herds having 30 or more cows rose from 0.4 to 3 percent. (To find the number of farms reporting herds of various sizes, multiply the percentages in table 16 by the number of farms reporting milk cows in table 14.)

Table 16 shows the increasing importance of larger herds and the declining importance of small herds as sources of milk marketings.

There are two sets of reasons for the trend toward larger herd sizes — one set is short term in nature, the other long term. In the short run, with a given set of buildings and equipment, a farmer's average production cost per hundredweight of milk is least if he is operating at capacity; that is, if he has as large a herd size as his facilities can handle. There are two reasons for this: (a) Labor requirements per cow decline as herd size increases. (b) Fixed overhead costs per cow fall as number of cows rises. A study of grade A dairy farms in the Des Moines milkshed in the late 1950's (4) showed, for example, that, in a 50-cow stanchion barn, annual capital and labor costs per cow were a minimum at a herd size of 50 cows. At this herd size, annual capital and labor costs per cow were about 35 percent less than with a herd size of 15 cows in a 50-cow stanchion barn and 15 percent less than with a herd size of 30 cows in a 50-cow stanchion barn.

The long-term reasons lie in the existence of economies of large-scale production. A farmer operating at or near capacity tends to have lower average costs, the larger is his capacity. For example, the study of Grade A farms in the Des Moines milkshed (4) showed that a 70-cow stanchion parlor when operated at capacity had annual capital and labor costs per cow that were 30 percent less than capital and labor costs per cow in a 50-cow stanchion barn when operated at capacity. There are at least two reasons for this: (a) Labor requirements per cow decline as herd size increases. (b) Investment per cow declines as herd size increases becauses investment required in many items is not proportional to herd size. For example, in 1958 the average cost of a bulk milk tank installed in Iowa was $2,100 for a tank of less than 200 gallons and $3,900 for a tank of over 500 gallons (10). The construction cost per cubic foot of silo capacity is less for large silos than for small silos.

If there were no technological advances, the effect of large-scale economies would sooner or later be worked off as farmers adjusted their operations to the existing technology to take advantage of the economies of scale available. After this time, average herd size would grow slowly, if it grew at all. The effect of technological advance generally is to compound the effect of economies of scale. Each new technology or technique of production generally requires a larger

Table 16. All Iowa farms reporting milk cows, distribution by herd size, Census Years 1939-59.[a]

Herd size	Percentage of farms reporting			
	1939	1950	1954	1959
1 cow	18.2[b]	11.1	14.4	16.9
2-9 cows	59.5[c]	63.9	56.1	48.4
10-19 cows	20.0	21.2	23.2	23.8
20-29 cows	1.9	3.2	5.1	7.8
30-49 cows	0.3	0.5	1.1	2.7
50 or more cows	0.1	0.1	0.1	0.4
Totals	100.0	100.0	100.0	100.0

[a] 1964 data not available.

[b] 1-2 cows.

[c] 3-9 cows.

Sources: U. S. Bureau of Census. 1940 Census of Agriculture. General Report, Vol. 3, p. 622. U. S. Econ. Res. Serv. The Dairy Situation. Nov. 1961. DS-286.

Table 15. Farm reporting sales of cream and whole milk and sales of whole milk per farm, Iowa, West North Central Region and United States, Census Years, 1949-64.

Area	Number of farms reporting sales of								Sales of whole milk per farm (cwt.)			
	Cream				Whole milk							
	1949	1954	1959	1964	1949	1954	1959	1964	1949	1954	1959	1964
Iowa	123,418	88,613	42,720	16,763	22,510	24,328	35,156	33,176	481	711	969	1,431
West North Central Region[a]	454,094	324,828	176,664		177,044	165,578	171,165		457	640	947	
United States (48 states)[a]	862,128	540,556	262,327		1,096,650	934,143	770,043		625	876	1,266	

[a] 1964 census figures not available for West North Central Region and the United States.

Sources: U. S. Econ. Res. Serv. Supp. for 1962 to Dairy statistics through 1960, U. S. Dept. Agr. Stat. Bul. 303. 1963. U. S. Agr. Market. Serv. Dairy Statistics, U. S. Dept. Agr. Stat. Bul. 218. 1957. U. S. Bureau of Census, 1964 Census of Agriculture Preliminary Reports, U. S. Dept. Comm. 1966.

level of operation to attain minimum average cost than do earlier production methods.

At any one time, then, there are four different sets of forces operating to encourage increasing average milk production per dairy farm: (a) cost advantages of higher-producing cows, (b) advantage of operating at capacity, (c) economies of large-scale operation with current technology and (d) cost-reducing and herd-size increasing effects of new technology.

Some of the forces tending to encourage larger herd sizes are also responsible for the decline in the number of farms selling milk or cream. Just as economies of scale and technological developments in milk production encourage larger operations, so economies of scale and technological developments in crops and other livestock encourage larger operations in their production. Most farmers cannot go off in all directions at once; they cannot increase their output of all products, so they eliminate some enterprises and expand others. The choices of which to eliminate and which to expand are influenced by their personal attitudes and preferences for one enterprise over another and the relative profitability of one enterprise compared with another. The relative profitability of dairying, for example, is influenced by prices of milk and cream in comparison with other prices; the kind of market available — grade A milk, manufacturing milk, or farm-separated cream; the farmer's dairy managerial abilities relative to his ability in other enterprises; and soil type and topography of the farm. As farming has become more complex — with new machinery, new fertilizer, new pesticides and insecticides, new feeds, etc.— this has created a need for more specialization because a farmer finds it difficult to keep up with recent developments in all different crops and livestock.

Part of the decline in the number of farms having milk cows is related to the decline in the number of farms. From 1940 to 1959 the number of Iowa farms reporting milk cows fell by 52 percent, and the number of farms in Iowa fell by 18 percent.

COUNTY PRODUCTION DATA

Table 17 presents data for census years on marketings of whole milk and butterfat by Iowa counties. From these data estimates of the whole milk equivalent of milk and butterfat sold can be easily obtained. Divide pounds of butterfat in cream sold by the average fat test from table 5 (quoted as a fraction) and add to this the pounds of whole milk sold. For example, take Adair County in 1959:[2]

1959 Iowa average fat test = 0.0365
727 ÷ .0365 = 19,387
9,853 + 19,387 = 29,240

[2]**The answer here does not agree exactly with the value in table 18. The figures in table 17, used in this example, are rounded to thousands of pounds. The values in table 18 were computed by using unrounded data.**

Table 17. Millions of pounds of milk and butterfat sold, by Iowa counties, Census Years 1949, 1954, 1959 and 1964.

	1949		1954		1959		1964	
County	Whole milk sold	Butterfat in cream sold	Whole milk sold	Butterfat in cream sold	Whole milk sold	Butterfat in cream sold	Whole milk sold	Butterfat in cream sold
IOWA	1,082.733	123.726	1,730.572	103.885	3,406.837	53.090	4,746,020	24.268
Adair	0.351	1.076	1.721	0.994	9.853	0.727	12.531	0.592
Adams	0.772	0.672	1.889	0.694	12.206	0.492	7.014	0.273
Allamakee	13.030	2.620	33.647	2.424	108.634	0.789	177.640	0.139
Appanoose	6.925	0.618	10.609	0.695	12.495	0.370	14.365	0.169
Audubon	2.090	0.938	1.922	1.050	9.715	0.899	27.158	0.662
Benton	13.847	1.461	24.113	1.011	45.846	0.249	51.492	0.179
Black Hawk	41.949	1.570	61.580	1.195	65.817	0.376	102.433	0.161
Boone	14.994	0.866	15.826	0.698	12.772	0.290	16.734	0.111
Bremer	25.727	3.027	45.193	2.945	97.406	0.289	156.613	0.456
Buchanan	25.949	1.516	50.315	1.075	66.169	0.567	100.740	0.225
Buena Vista	3.941	1.030	3.919	0.695	17.337	0.454	23.804	0.127
Butler	15.825	1.850	39.736	1.606	81.798	0.418	106.541	0.224
Calhoun	8.174	0.703	12.818	0.479	18.812	0.169	17.042	0.073
Carroll	6.223	1.089	12.682	0.867	31.232	0.449	39.355	0.171
Cass	2.668	0.903	6.261	0.851	11.345	0.778	10.326	0.474
Cedar	11.793	1.613	21.402	1.141	32.741	0.710	53.264	0.303
Cerro Gordo	16.461	1.155	19.919	0.855	36.765	0.159	35.746	0.062
Cherokee	3.394	0.916	4.846	0.830	17.443	0.479	27.589	0.193
Chickasaw	10.573	1.946	29.464	1.546	60.743	1.002	87.946	0.409
Clarke	1.473	0.631	3.170	0.603	6.866	0.531	8.958	0.243
Clay	6.502	0.949	9.992	0.658	15.438	0.308	30.780	0.078
Clayton	23.365	4.483	54.559	4.109	150.657	2.689	238.119	1.160
Clinton	10.688	1.654	14.175	1.413	45.542	0.581	75.156	0.192
Crawford	2.568	1.318	6.018	1.652	20.337	1.304	41.050	0.661
Dallas	19.048	0.927	22.765	0.648	22.308	0.244	19.070	0.136

Table 17. (continued)

County	1949		1954		1959		1964	
	Whole milk sold	Butterfat in cream sold	Whole milk sold	Butterfat in cream sold	Whole milk sold	Butterfat in cream sold	Whole milk sold	Butterfat in cream sold
Davis	4.501	0.689	7.889	0.657	12.759	0.493	20.174	0.266
Decatur	3.015	0.818	6.083	0.686	7.400	0.420	16.475	0.239
Delaware	22.933	3.607	42.605	3.446	102.524	2.048	190.848	1.007
Des Moines	14.217	0.401	15.134	0.330	12.145	0.137	11.970	0.060
Dickinson	9.625	0.608	13.678	0.505	26.180	0.189	27.734	0.101
Dubuque	35.127	3.468	51.694	3.173	127.137	1.870	193.949	1.332
Emmet	7.273	0.608	12.383	0.412	20.145	0.179	22.404	0.059
Fayette	43.510	3.428	77.086	3.020	166.897	1.242	225.571	0.422
Floyd	10.025	0.893	25.711	0.505	49.924	0.109	45.808	0.048
Franklin	7.693	1.732	20.973	1.309	47.261	0.239	57.610	0.132
Fremont	2.499	0.327	2.457	0.244	1.608	0.165	3.167	0.079
Greene	5.246	0.853	9.563	0.521	9.283	0.266	12.763	0.093
Grundy	4.768	1.522	15.630	1.182	47.724	0.478	58.918	0.157
Guthrie	2.413	1.066	6.904	1.044	9.017	0.753	16.768	0.496
Hamilton	5.005	0.960	6.236	0.665	14.961	0.219	14.072	0.063
Hancock	4.637	1.621	5.395	1.374	38.018	0.465	48.079	0.115
Hardin	6.370	1.521	15.117	1.158	33.923	0.264	42.018	0.113
Harrison	2.369	1.081	3.159	1.014	5.040	0.718	11.055	0.474
Henry	6.416	0.970	8.615	0.890	12.519	0.428	12.550	0.102
Howard	9.928	1.631	22.148	1.356	69.436	0.694	100.465	0.218
Humboldt	8.901	0.658	15.030	0.428	21.209	0.113	24.659	0.047
Ida	2.125	0.762	2.412	0.632	5.499	0.407	17.183	0.259
Iowa	13.214	1.216	18.294	1.071	31.630	0.614	34.499	0.406
Jackson	5.737	1.934	10.900	1.767	57.236	0.428	105.216	0.167
Jasper	13.437	1.720	22.548	1.456	43.482	0.615	63.746	0.144
Jefferson	4.025	0.637	5.338	0.668	9.635	0.385	8.217	0.242
Johnson	15.102	1.029	18.451	0.789	16.837	0.462	25.166	0.281
Jones	10.648	2.568	18.784	2.210	62.782	0.952	92.596	0.504
Keokuk	3.488	1.158	4.765	1.113	6.552	0.707	9.902	0.527
Kossuth	14.291	1.893	23.688	1.388	61.149	0.484	84.392	0.157
Lee	14.471	0.639	18.993	0.502	32.346	0.278	30.680	0.150
Linn	28.502	2.169	49.494	1.471	82.165	0.752	83.303	0.276
Louisa	1.422	0.507	2.930	0.430	3.170	0.319	5.224	0.086
Lucas	3.173	0.668	2.313	0.599	5.103	0.354	8.946	0.156
Lyon	5.299	1.858	11.245	1.617	37.729	1.158	81.797	0.287
Madison	4.197	0.855	7.724	0.722	10.346	0.459	10.954	0.213
Mahaska	8.082	1.403	8.220	1.200	20.678	0.723	33.830	0.357
Marion	8.806	1.150	14.924	0.940	28.600	0.621	34.748	0.184
Marshall	9.864	1.315	14.497	1.024	30.033	0.232	36.426	0.081
Mills	9.075	0.331	11.457	0.323	10.650	0.250	7.428	0.097
Mitchell	6.806	1.390	20.897	0.855	43.180	0.244	71.582	0.099
Monona	4.721	0.633	2.713	0.630	5.966	0.467	11.608	0.234
Monroe	2.780	0.528	3.957	0.458	8.464	0.308	11.260	0.123
Montgomery	4.651	0.613	6.487	0.628	4.274	0.422	12.203	0.333
Muscatine	17.934	0.857	24.591	0.669	23.582	0.362	35.303	0.120
O'Brien	15.742	1.246	21.288	1.010	37.031	0.629	52.047	0.123
Osceola	10.392	0.666	11.270	0.633	32.462	0.168	53.950	0.073
Page	3.861	0.682	3.657	0.665	7.711	0.538	5.953	0.405
Palo Alto	4.914	1.084	9.843	0.819	19.223	0.375	31.134	0.071
Plymouth	17.893	1.026	24.009	0.815	31.214	0.566	42.059	0.185
Pocahontas	3.659	0.892	6.223	0.674	16.582	0.373	25.918	0.066
Polk	34.058	0.680	38.057	0.454	37.326	0.209	26.696	0.056
Pottawattamie	14.076	1.420	18.757	1.305	14.415	0.686	28.186	0.295
Poweshiek	4.727	1.288	4.471	1.260	27.322	0.533	39.739	0.261
Ringgold	1.403	0.725	2.488	0.681	10.853	0.492	12.630	0.338
Sac	13.564	0.897	17.624	0.712	39.397	0.352	39.550	0.195
Scott	67.764	0.814	63.198	0.574	60.480	0.360	61.945	0.116
Shelby	1.873	1.237	7.472	1.145	22.055	0.929	34.081	0.542
Sioux	18.742	2.841	49.253	2.351	79.304	1.359	154.196	0.272
Story	15.225	1.193	19.689	0.765	46.650	0.089	30.994	0.029

Table 17. (continued)

	1949		1954		1959		1964	
	Whole milk sold	Butterfat in cream sold	Whole milk sold	Butterfat in cream sold	Whole milk sold	Butterfat in cream sold	Whole milk sold	Butterfat in cream sold
Tama	6.049	1.431	9.306	1.263	32.556	0.435	41.578	0.241
Taylor	0.951	0.849	2.245	0.869	10.858	0.638	11.145	0.399
Union	1.917	0.584	3.759	0.607	6.845	0.480	9.385	0.243
Van Buren	2.783	0.672	5.810	0.603	10.204	0.356	14.814	0.152
Wapello	9.843	0.523	12.374	0.472	14.339	0.224	12.602	0.131
Warren	24.072	0.841	32.683	0.634	31.993	0.388	34.926	0.180
Washington	4.451	0.976	10.326	0.735	10.202	0.506	14.107	0.228
Wayne	9.544	0.752	10.689	0.786	18.008	0.450	26.048	0.232
Webster	25.806	0.717	25.163	0.427	20.156	0.142	18.914	0.043
Winnebago	2.173	1.472	5.519	1.226	30.118	0.335	44.733	0.108
Winneshiek	27.315	3.296	62.847	2.334	186.670	0.732	238.793	0.265
Woodbury	16.804	0.749	14.827	0.656	13.585	0.490	22.400	0.241
Worth	2.580	1.296	6.744	0.948	22.812	0.282	32.282	0.155
Wright	3.861	0.996	13.339	0.598	29.941	0.108	30.482	0.045

Sources: "1950 Census of Agriculture," Vol. I, Counties and State Economic Areas, Part 9, Iowa, pp. 60-68. Bureau of Census, U. S. Dept. of Commerce. "1954 Census of Agriculture," Vol. I, Counties and State Economic Areas, Part 9, Iowa, pp. 90-98. Bureau of Census, U. S. Dept. of Commerce. "1959 Census of Agriculture," Vol. I, Part 16, Counties — Iowa, pp. 184-187. U. S. Bureau of Census, 1964. Census of Agriculture Preliminary Reports, U. S. Dept. of Commerce, 1966.

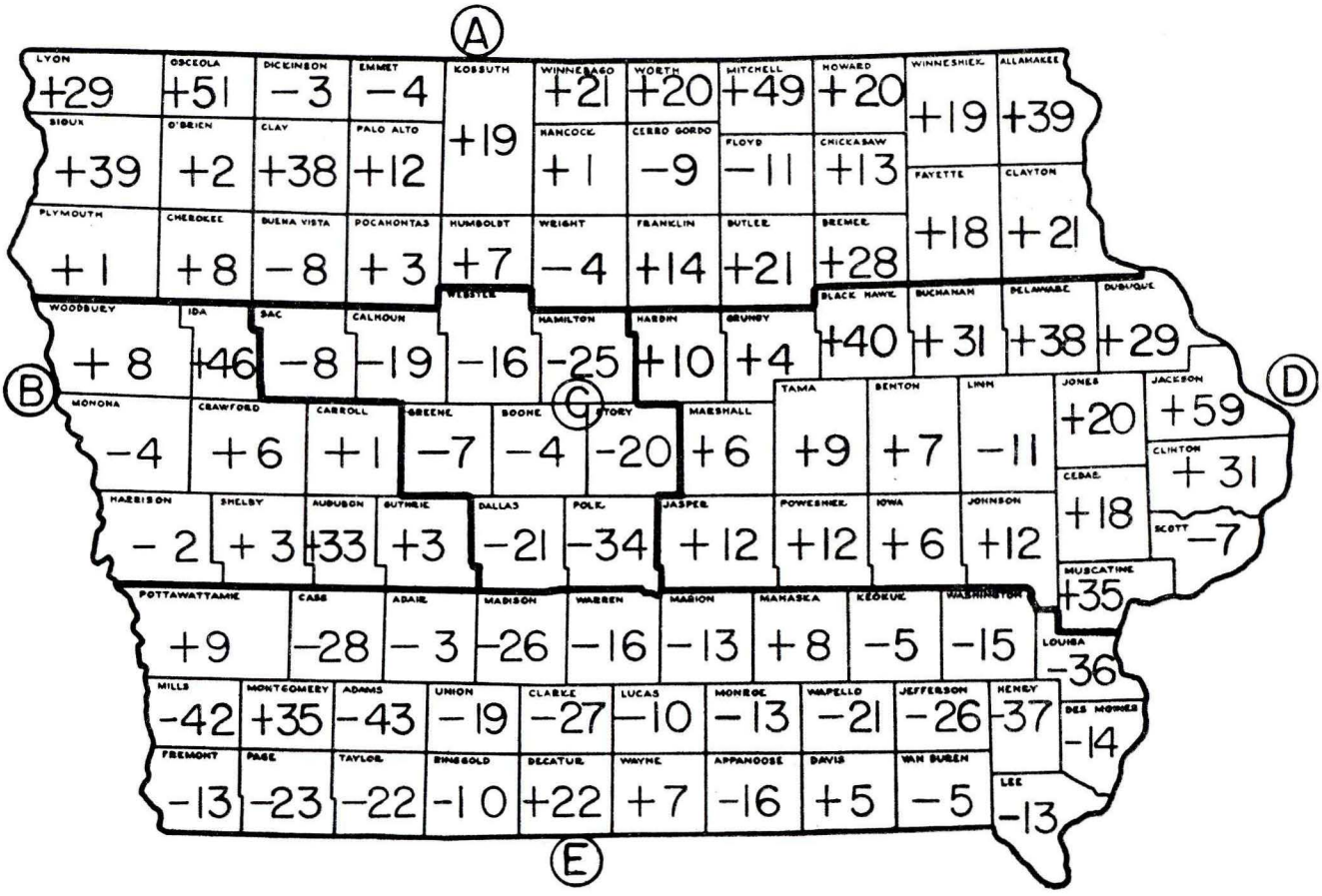

Fig. 1. Percentage changes by Iowa counties, 1959 to 1964, in whole milk equivalent of milk and cream sold.

Table 18 presents the results of such computations and shows the percentage change in whole milk equivalent of sales between 1959 and 1964. Fig. 1 gives the percentage changes. As shown by the map, Iowa counties can be divided into five groups — marked A, B, C, D, and E on map. Of the 30 counties in the upper tier of counties (A on the map), only 6 had a decrease. In 5 of these 6, marketings increased between 1954 and 1964; only in Cerro Gordo County did marketings decrease between 1954 and 1964. Group B contains the 9 western counties in the central tier of counties. Only 2 of these — Monona and Harrison counties — show decreases between 1959 and 1964; they also show decreases between 1954 and 1964. Of the 9 counties in west-central Iowa (Group C), all show decreases between 1959 and 1964. Of the 20 eastern counties in the central tier of counties (Group D) only Linn and Scott counties show decreases and Linn County had an increase in marketings between 1954 and 1964. In the lower tier of counties (Group E), only 5 had an increase between 1959 and 1964; of these only 2 — Mahaska and Wayne counties — had increases between 1954 and 1964.

Table 18. Whole milk equivalent of milk and cream sold, millions of pounds, Iowa counties, 1954, 1959 and 1964 and percentage change, 1959 to 1964.

County	Whole milk equivalent, 1954	Whole milk equivalent, 1959	Whole milk equivalent, 1964	Percentage change 1959-64
IOWA	4,500.829	4,861.346	5,420.131	+11
Adair	28.245	29.788	28.975	— 3
Adams	20.412	25.686	14.597	—43
Allamakee	98.309	130.263	181.501	+39
Appanoose	29.145	22.643	19.059	—16
Audubon	29.942	34.352	45.546	+33
Benton	51.087	52.676	56.464	+ 7
Black Hawk	93.473	76.120	106.905	+40
Boone	34.453	20.731	19.817	— 4
Bremer	123.728	132.723	169.279	+28
Buchanan	78.982	81.716	106.990	+31
Buena Vista	22.460	29.801	27.331	— 8
Butler	82.572	93.262	112.763	+21
Calhoun	25.611	23.459	19.069	—19
Carroll	35.811	43.552	44.105	+ 1
Cass	28.962	32.672	23.492	—28
Cedar	51.834	52.201	61.680	+18
Cerro Gordo	42.743	41.139	37.468	— 9
Cherokee	26.985	30.583	32.950	+ 8
Chickasaw	70.706	88.220	99.307	+13
Clarke	19.259	21.435	15.708	—27
Clay	27.563	23.881	32.946	+38
Clayton	164.140	224.340	270.341	+21
Clinton	51.862	61.482	80.489	+31
Crawford	50.094	56.083	59.411	+ 6
Dallas	40.045	29.020	22.847	—21
Davis	25.430	26.280	27.562	+ 5
Decatur	24.383	18.926	23.113	+22

Table 18. (continued)

County	Whole milk equivalent, 1954	Whole milk equivalent, 1959	Whole milk equivalent, 1964	Percentage change 1959-64
Delaware	134.524	158.640	218.820	+38
Des Moines	23.958	15.921	13.636	—14
Dickinson	27.150	31.363	30.539	— 3
Dubuque	136.322	178.376	230.949	+29
Emmet	23.388	25.050	24.042	— 4
Fayette	157.631	200.929	237.293	+18
Floyd	39.178	52.936	47.141	—11
Franklin	55.901	53.834	61.276	+14
Fremont	8.973	6.149	5.361	—13
Greene	23.468	16.585	15.346	— 7
Grundy	47.154	60.843	63.279	+ 4
Guthrie	34.764	29.656	30.546	+ 3
Hamilton	23.985	20.973	15.822	—25
Hancock	42.048	50.768	51.273	+ 1
Hardin	46.016	41.169	45.157	+10
Harrison	30.210	24.727	24.221	— 2
Henry	32.362	24.268	15.383	—37
Howard	58.309	88.466	106.520	+20
Humboldt	26.444	24.311	25.965	+ 7
Ida	19.278	16.652	24.377	+46
Iowa	46.877	48.467	45.776	+ 6
Jackson	58.043	68.979	109.854	+59
Jasper	61.393	60.352	67.746	+12
Jefferson	23.177	20.205	14.939	—26
Johnson	39.497	29.500	32.971	+12
Jones	77.742	88.872	106.596	+20
Keokuk	34.449	25.925	24.540	— 5
Kossuth	60.724	74.427	88.753	+19
Lee	32.405	39.985	34.846	—13
Linn	88.742	102.781	90.969	—11
Louisa	14.414	11.930	7.613	—36
Lucas	18.299	14.829	13.279	—10
Lyon	54.383	69.476	89.769	+29
Madison	26.999	22.936	16.870	—26
Mahaska	40.240	40.499	43.747	+ 8
Marion	39.992	45.619	39.859	—13
Marshall	41.820	36.408	38.676	+ 6
Mills	20.097	17.502	10.122	—42
Mitchell	43.706	49.891	74.332	+49
Monona	19.532	18.779	18.108	— 4
Monroe	16.178	16.913	14.676	—13
Montgomery	23.238	15.848	21.453	+35
Muscatine	42.456	33.514	45.109	+35
O'Brien	48.247	54.281	55.464	+ 2
Osceola	28.153	37.077	55.977	+51
Page	21.410	22.456	17.203	—23
Palo Alto	31.695	29.518	33.106	+12
Plymouth	45.752	46.745	47.197	+ 1
Pocahontas	24.212	26.814	27.751	+ 3
Polk	50.183	43.063	28.251	—34
Pottawattamie	53.560	33.229	36.380	+ 9
Poweshiek	38.090	41.946	46.989	+12
Ringgold	20.662	24.341	22.018	—10

Table 18. (continued)

County	Whole milk equivalent, 1954	Whole milk equivalent, 1959	Whole milk equivalent, 1964	Percentage change 1959-64
Sac	36.611	49.066	44.967	— 8
Scott	78.513	70.363	65.167	— 7
Shelby	38.012	47.524	49.136	+ 3
Sioux	111.951	116.552	161.751	+39
Story	40.103	49.114	39.049	—20
Tama	42.995	44.478	48.272	+ 9
Taylor	25.431	28.361	22.228	—22
Union	19.964	20.012	16.135	—19
Van Buren	21.903	19.974	19.036	— 5
Wapello	24.962	20.484	16.241	—21
Warren	49.606	42.629	39.926	—16
Washington	29.944	24.087	20.440	—15
Wayne	31.651	30.339	32.492	+ 7
Webster	36.556	24.046	20.108	—16
Winnebago	38.213	39.315	47.733	+21
Winneshiek	125.096	206.726	246.154	+19
Woodbury	32.326	27.012	29.094	+ 8
Worth	32.037	30.543	36.587	+20
Wright	29.295	32.907	31.732	— 4

Source: Computed from table 17.

These trends are generally what one would expect on the basis of farm management studies of farms in various parts of Iowa to determine profitability of various enterprises. Because of markets, topography and relatively low grain yields, dairying is one of the most profitable enterprises on northeastern Iowa farms (18, 19, 20). In many other parts of the state, dairying is one of the most profitable enterprises only for farmers with a special aptitude for dairying or with a market for grade A milk (2, 11, 12, 17).

Data on numbers of milk cows and heifers on farms by counties are presented in table 19. Table 18 presents only data on marketings for census years. Data in tables 6 and 19 can be used to estimate production by counties for census years and other years. (Before taking up how this can be done, the difference between the number of cows in Iowa shown in table 6 and the number of cows in Iowa shown in table 19 needs to be noted. The difference evidently exists because table 19 refers to the number at the beginning of the year and table 6 refers to the average number during the year.)

To estimate production and marketings in a single county proceed as follows:

(a) Divide the number of cows in Iowa shown in

Table 19. Milk cows and heifers two years old and over kept for milk, on Iowa farms, January 1, by counties, for selected years 1945 to 1966.

County	1945-49 average	1950	1952	1954	1956	1958	1960	1962	1964	1966
IOWA	1,190,939	1,038,800	940,957	960,786	897,434	860,091	783,821	769,810	713,997	617,324
Adair	9,382	8,248	7,282	7,631	7,120	6,659	5,822	5,244	4,562	3,857
Adams	6,016	5,074	4,874	5,181	4,873	4,884	4,374	3,850	2,734	1,889
Allamakee	22,639	20,780	19,553	21,034	22,110	22,349	22,098	22,971	23,331	21,617
Appanoose	7,524	6,929	6,291	6,510	6,221	5,446	4,888	4,584	3,753	3,088
Audubon	8,214	6,841	6,291	6,833	6,102	6,290	5,900	5,904	5,677	4,925
Benton	13,715	11,706	10,345	10,584	8,989	8,660	7,755	7,589	7,079	6,300
Black Hawk	18,612	16,156	14,634	15,871	15,080	14,321	12,828	12,844	12,435	11,027
Boone	9,826	8,210	7,241	7,164	5,650	4,837	3,853	3,422	2,714	1,963
Bremer	22,875	21,437	20,860	22,026	21,790	21,629	20,542	20,264	20,402	18,626
Buchanan	17,700	16,184	14,274	15,722	15,074	15,306	14,506	14,834	13,846	11,979
Buena Vista	9,455	7,388	6,223	5,523	4,580	4,360	3,949	3,829	3,430	3,015
Butler	19,074	16,768	16,381	16,777	16,445	16,091	14,862	14,767	14,775	12,284
Calhoun	8,496	7,050	6,628	6,172	5,131	4,751	4,050	3,576	2,649	1,828
Carroll	11,517	8,893	7,836	7,690	7,294	6,946	6,604	6,590	5,881	4,931
Cass	9,019	7,193	6,578	7,044	6,077	5,313	4,285	4,312	3,266	2,995
Cedar	13,161	11,711	10,268	10,579	9,783	9,717	8,429	9,080	8,346	6,937
Cerro Gordo	12,772	10,332	8,657	8,716	7,982	7,021	6,049	5,890	5,288	3,752
Cherokee	7,920	6,974	6,104	6,282	5,630	5,301	4,671	4,934	4,381	3,830
Chickasaw	17,234	14,935	13,628	14,762	15,978	15,194	14,143	13,671	13,759	12,376
Clarke	5,715	5,157	4,804	4,899	4,687	4,442	4,083	3,489	2,736	1,806
Clay	9,229	7,441	6,401	6,170	5,419	4,945	4,419	4,339	4,122	3,501
Clayton	34,161	32,145	30,322	32,549	32,201	32,842	31,380	32,716	32,478	29,523
Clinton	15,198	11,979	11,752	11,407	9,892	9,884	8,754	9,769	10,568	9,016
Crawford	13,923	12,095	10,771	12,271	11,719	11,314	10,656	10,066	9,347	7,654
Dallas	10,550	9,207	7,679	7,729	6,164	5,746	4,326	3,679	2,965	2,043
Davis	8,346	7,653	7,141	7,460	6,906	6,494	6,519	6,412	5,488	4,261
Decatur	7,984	6,964	6,384	6,374	5,970	5,265	4,998	4,578	3,761	3,151
Delaware	25,751	25,044	23,660	25,025	25,606	26,204	25,593	26,093	26,760	25,240
Des Moines	6,600	5,972	5,327	5,276	4,631	4,014	3,196	2,709	2,145	1,465
Dickinson	7,661	5,948	5,220	5,208	4,691	4,827	3,832	4,216	3,611	3,078

Table 19. (continued)

County	1945-49 average	1950	1952	1954	1956	1958	1960	1962	1964	1966
Dubuque	28,960	26,982	25,173	26,630	26,658	27,731	27,711	28,137	28,379	27,753
Emmet	7,369	5,662	5,174	4,979	4,617	4,187	3,431	3,683	3,139	2,336
Fayette	29,899	28,147	26,651	28,572	28,786	28,315	27,754	28,926	28,177	26,833
Floyd	11,154	9,323	8,441	8,617	8,430	8,259	7,201	6,982	6,229	5,612
Franklin	15,661	13,336	11,882	11,958	11,157	10,744	9,525	9,095	7,689	6,095
Fremont	4,847	3,761	3,417	3,170	2,868	2,428	1,840	1,517	1,162	758
Greene	8,224	7,007	6,045	5,626	5,047	4,376	3,461	3,219	2,273	1,414
Grundy	12,244	10,609	10,018	10,247	9,436	9,339	8,332	7,979	7,661	6,604
Guthrie	9,397	8,123	7,467	7,961	7,662	6,624	5,777	5,518	4,497	3,788
Hamilton	9,753	7,919	7,228	6,326	4,909	4,209	3,172	3,394	2,578	1,777
Hancock	13,293	10,952	9,385	9,123	8,339	8,431	7,360	7,220	6,372	5,126
Hardin	12,425	10,129	8,812	9,049	8,124	7,551	6,056	6,346	5,707	4,432
Harrison	10,288	8,763	8,104	7,947	7,172	6,336	5,538	4,908	4,512	3,444
Henry	8,112	7,496	6,653	6,577	6,160	5,278	4,252	3,667	2,651	1,810
Howard	16,675	14,699	13,122	14,098	13,773	13,474	13,037	12,688	13,372	12,267
Humboldt	7,883	6,691	5,775	5,245	4,852	4,741	4,151	4,069	3,461	2,525
Ida	6,632	5,502	4,863	4,858	4,653	4,720	3,696	3,630	3,225	2,883
Iowa	11,694	10,775	9,881	9,655	8,861	9,096	7,641	7,293	6,365	5,624
Jackson	17,893	15,363	13,908	13,997	13,140	14,144	14,303	14,682	14,768	14,022
Jasper	14,020	12,895	11,849	11,864	10,780	10,639	9,893	9,344	4,819	7,033
Jefferson	7,638	6,567	5,764	5,780	5,254	4,400	3,704	3,475	2,734	1,814
Johnson	12,370	10,777	9,808	8,727	7,997	7,151	5,910	5,431	5,034	4,204
Jones	19,006	17,287	15,013	15,755	15,139	14,706	13,712	13,373	12,768	11,208
Keokuk	10,018	8,692	7,697	7,736	7,492	6,507	5,886	5,158	4,245	3,465
Kossuth	18,829	15,208	13,063	13,003	11,796	11,863	10,646	10,869	10,329	8,673
Lee	8,897	7,896	7,368	7,192	6,895	5,754	5,800	5,225	4,560	4,194
Linn	21,497	18,564	16,906	17,224	15,836	15,170	13,747	13,597	12,232	10,616
Louisa	4,596	4,249	3,867	3,883	3,370	2,766	2,309	1,886	1,635	1,039
Lucas	6,294	5,892	5,327	5,143	4,632	3,963	3,528	3,242	2,519	1,879
Lyon	14,012	11,980	11,135	11,749	10,520	10,677	10,805	10,763	10,989	10,851
Madison	8,137	7,204	6,736	6,541	6,096	5,173	4,419	3,544	2,843	2,023
Mahaska	12,688	11,056	10,057	9,883	9,058	7,993	7,103	6,740	6,228	5,657
Marion	10,238	9,079	8,303	8,983	8,403	7,811	7,306	6,478	6,402	5,019
Marshall	11,042	9,439	8,236	8,370	7,390	7,151	6,433	5,641	4,819	3,645
Mills	5,663	4,725	4,436	4,474	4,087	3,266	2,491	2,251	1,760	1,438
Mitchell	12,131	10,662	8,998	9,689	8,735	8,439	8,279	9,179	9,253	8,332
Monona	8,120	6,709	6,054	6,265	5,426	4,735	4,026	3,534	3,079	2,272
Monroe	5,945	5,322	4,989	4,728	4,214	3,905	3,297	2,869	2,542	2,291
Montgomery	6,555	5,803	5,301	5,573	5,088	4,601	4,198	4,052	3,324	2,343
Muscatine	10,404	8,850	7,994	8,227	7,355	6,950	5,747	5,994	5,098	4,080
O'Brien	11,712	10,101	8,542	9,078	8,429	7,761	7,332	7,711	7,242	6,534
Osceola	8,485	6,999	6,340	6,247	5,859	5,490	5,415	6,522	6,667	5,598
Page	7,895	6,605	6,050	6,005	5,286	5,010	4,141	3,963	3,233	2,483
Palo Alto	10,401	8,112	6,905	6,772	5,889	5,446	4,615	4,516	4,046	3,224
Plymouth	14,199	12,140	10,684	10,599	10,075	9,452	8,379	7,709	6,627	6,403
Pocahontas	8,485	7,118	6,127	6,232	5,344	5,114	4,591	4,777	3,651	2,742
Polk	11,523	9,920	8,680	8,676	7,651	6,496	5,602	4,961	4,078	2,300
Pottawattamie	15,477	12,907	11,800	11,293	9,458	8,175	6,789	6,872	5,520	4,658
Poweshiek	10,527	9,502	8,268	8,193	7,320	7,517	6,801	6,841	6,170	5,168
Ringgold	7,063	5,886	5,453	5,469	5,207	5,161	4,811	4,649	3,976	3,375
Sac	9,908	8,865	7,720	7,690	7,167	7,483	6,568	6,458	5,460	4,766
Scott	17,583	15,553	13,678	13,404	12,061	11,141	8,926	8,413	7,771	5,866
Shelby	10,082	8,564	7,811	8,844	8,168	8,144	7,885	8,143	7,132	6,333
Sioux	19,552	17,500	15,801	17,873	17,677	16,974	16,641	17,917	17,771	16,556
Story	10,651	9,070	8,176	7,583	6,348	5,806	5,120	4,670	3,736	2,919
Tama	12,353	10,697	9,718	9,725	8,248	8,238	6,766	6,471	6,337	5,484
Taylor	7,779	6,832	6,743	6,711	6,282	6,102	5,736	5,158	4,037	3,122
Union	6,174	5,103	4,723	4,893	4,365	4,568	4,434	3,612	3,073	1,917
Van Buren	7,099	6,068	5,783	5,574	5,148	4,501	4,031	3,606	2,973	2,236
Wapello	8,023	6,698	5,964	6,038	5,702	4,926	4,204	3,425	2,697	2,028
Warren	11,041	10,809	9,738	8,988	8,543	7,650	6,470	5,680	5,080	3,989
Washington	8,809	7,930	6,953	7,507	6,444	5,665	4,706	4,199	3,304	2,629

Table 19. (continued)

County	1945-49 average	1950	1952	1954	1956	1958	1960	1962	1964	1966
Wayne	8,115	7,929	7,429	7,850	7,060	6,237	5,602	5,159	4,839	3,911
Webster	11,420	9,167	8,117	7,792	6,951	5,785	4,450	4,072	2,776	1,745
Winnebago	11,958	9,868	8,725	8,718	7,488	7,339	6,389	6,782	6,216	5,129
Winneshiek	30,203	27,404	26,381	27,490	28,177	29,808	29,913	30,316	30,808	29,840
Woodbury	12,162	9,902	8,846	8,291	7,711	7,115	6,248	5,270	4,934	4,075
Worth	12,094	9,981	8,460	8,571	7,302	6,520	5,408	5,438	5,193	4,178
Wright	9,369	8,061	7,033	6,787	6,072	5,812	5,007	4,681	3,934	2,980

Source: Iowa Dept. Agr. Annual farm census, various years.

table 6 by the number of cows in Iowa shown in table 19.

(b) Multiply the result from (a) by the number of cows in the county as listed in table 19. The result is the estimated average number of cows in the county.

(c) Multiply the result from (b) by the Iowa production per cow shown in table 6. The result is an estimate of county production.

Applying this procedure to Allamakee County in 1966:

(a) $\frac{657,000}{617,324} = 1.064$

(b) 1.064 x 21,617 = 23,000 milk cows in Allamakee County

(c) 23,000 x 8,560 = 196,880,000 pounds of milk produced

PLANT NUMBERS, SIZES AND PRODUCTION

The first few tables dealt with consumption of dairy products; the next tables dealt with various aspects of farm production of milk. Table 20 contains data on production of manufactured dairy products in Iowa. The amount of whole milk equivalent used in manufactured dairy products in Iowa was nearly the same in the early 1960's as in the 1930's.

As the earlier data on consumption would lead one to expect, annual butter production in Iowa (as in the nation) has declined over the past 30 years, while Iowa production (and national production) of the other products in table 20 has risen. Iowa production of American cheese and nonfat dry milk solids rose during World War II in response to federal programs to encourage their production. Iowa volume of production of these two products remained quite stable from 1946 to 1951 and has grown rapidly since 1952. Domestic consumption of these two products also rose rapidly during World War II and has continued to grow in the postwar years. In response to these forces and to government price-support purchases of these two products, national and Iowa production have grown tremendously. The growth in production of these two products has also been greatly encouraged by the desire of many farmers to switch from selling farm-separated cream to selling whole milk. The main force behind the growth in ice cream and cottage cheese

Table 20. Production of principal manufactured dairy products in Iowa, number of plants and average production per plant 1940-1965.

Year	Butter			Total American[a] cheese made from whole milk			Nonfat dry milk solids for human consumption spray process			Nonfat dry milk solids for human consumption roller process		
	Annual production	Number of plants	Average production	Annual production	Number of plants	Average production	Annual production	Number of plants	Average production	Annual production	Number of plants	Average production
	(mill. lbs.)		(mill. lbs.)	(mill. lbs.)		(mill. lbs.)	(mill. lbs.)		(mill. lbs.)	(mill. lbs.)		(mill. lbs.)
1940-44 average	239.125	472	.506	8.000	34	.234	0.341	b	——	4.213	7	.575
1945-49 average	202.464	416	.490	10.578	30	.396	4.035	b	——	6.967	10	.775
1950-54 average	187.133	363	.515	14.357	30	.464	14.216	9	1.505	7.969	9	.867
1955-59 average	183.220	298	.618	34.716	37	.941	78.263	18	4.274	25.650	17	1.479
1960	168.303	240	.701	41.376	42	.985	140.211	20	7.011	34.630	23	1.506
1961	169.202	210	.806	56.823	44	1.291	173.463	22	7.885	20.493	21	.976
1962	171.080	192	.891	53.805	45	1.196	182.453	24	7.602	20.981	15	1.399
1963	160.035	170	.941	64.871	45	1.442	203.932	24	8.997	18.248	13	1.404
1964	165.339	149	1.100	74.779	40	1.869	227.776	27	8.436	20.297	8	2.537
1965	149.085	133	1.121	65.987	36	1.833	211.838	27	7.846	16.668	7	2.381

Table 20. (continued).

Year	Ice Cream: Total Annual production	Ice Cream: Total Number of plants	Ice Cream: Wholesale Annual production	Ice Cream: Wholesale Number of plants	Ice Cream: Wholesale Average production	Cottage cheese, curd: Annual production	Cottage cheese, curd: Number of plants	Cottage cheese, curd: Average production	Cottage cheese, creamed: Annual production	Cottage cheese, creamed: Number of plants	Cottage cheese, creamed: Average production	Net total of whole milk used in manufactured dairy products
	(mill. gal.)		(mill. gal.)		(1,000 gal.)	(mill. lbs.)		(1,000 lbs.)	(mill. lbs.)		(1,000 lbs.)	(bill. lbs. milk)
1940-44 average	8.180	505	7.198	127	57.0	——	—	——	——	—	——	5.290
1945-49 average	12.485	450	9.255	119	86.2	3.908	—	——	3.929	—	——	4.623
1950-54 average	11.230	480	9.718	81	120.9	7.615	51	144	6.909	51	137	4.361
1955-59 average	12.308	515	10.886	78	140.6	9.964	38	260	12.228	46	265	4.591
1960	11.752	418	——	—	——	7.526	28	269	11.934	41	291	4.409
1961	10.145	367	——	—	——	8.150	28	291	13.581	38	357	4.551
1962	9.759	347	——	—	——	11.405	28	407	14.479	35	414	4.515
1963	9.645	327	——	—	——	9.357	26	360	9.612	34	283	4.438
1964	10.534	252	——	—	——	9.716	23	422	10.812	26	416	4.838
1965	10.567	225	——	—	——	8.607	20	430	10.607	21	505	4.374

[a] Listed as American Cheddar cheese prior to 1944.
[b] Less than five plants reporting.

Source: U. S. Crop Reporting Board. Production of manufactured dairy products, annual issues 1938-1965. U. S. Dept. Agr. 1939-66.

Table 21. Distribution of butter plants and butter production in Iowa by plant size, 1955 and 1962.

Butter production per plant	1955 Number of plants	1955 Total volume	1962 Number of plants	1962 Total volume
		(1,000 lbs.)		(1,000 lbs.)
0-99,999	44	1,968	45	2,539
100,000-199,999	64	9,526	32	4,901
200,000-499,999	121	36,878	39	12,464
500,000-999,999	55	39,638	32	23,187
1,000,000-1,499,999	22	27,802	14	17,453
1,500,000-1,999,999	8	13,631	7	12,417
2,000,000-2,999,999	10	23,710	10	24,662
3,000,000-4,999,999	8	28,775	7	25,076
Over 5,000,000	—	———	7	48,381
	332	181,928	193	171,080

Source: Unpublished data of Statistical Reporting Service, U.S.D.A. and Iowa Crop and Livestock Reporting Service.

production has been the steady growth in consumer demand for these products.

The number of Iowa plants producing butter has fallen steadily since 1939; the number of plants producing American cheese in Iowa rose, fell, rose again and has recently fallen again. For every product in table 20, average production per plant has steadily risen. Here we have the dairy plant counterpart of the steady growth in average size of dairy farms.

Tables 21 and 22 present more detail on the size of butter operations in Iowa plants. Between 1955 and 1962 average butter production per plant rose about 65 percent. In 1955 there were no plants over 5 million pounds; in 1962 there were seven such plants producing nearly 30 percent of all butter produced in Iowa. In 1955, 8 percent of the plants produced over 1.5 million pounds of butter each; they produced 36 percent of all butter produced in Iowa. In 1962, 16 percent of the plants produced over 1.5 million pounds of butter each; they produced 65 percent of the butter. The number of plants producing between 100,000 pounds and 1.5 million pounds of butter per plant fell by more than half, and their total production fell by half. In contrast, the number of plants producing less than 100,000 pounds of butter per plant rose by one, and total production of these plants rose by one-third. Many of the plants in this class are not butter plants; many are cheese or ice cream or bottled milk plants, which from time to time use excess butterfat to produce butter.

We can also compare whole milk and cream operations (table 23). In 1955, 57 percent of the plants received cream only, and they produced 57 percent of the butter. By 1962, 35 percent of the plants received cream only; they produced 20 percent of the butter. Table 23 shows that the growth in average output per plant that occurred between 1955 and 1962 was due entirely to the growth in size of plants receiving whole milk. The average size of plants receiving only cream declined somewhat.

The distribution of butter plants and butter production in the United States by plant size is almost identical to the distribution for Iowa (table 22). The proportion of plants in each size group is nearly the same in the two areas; the proportion of total production produced by plants in each size group is nearly the same in the two areas (8).

The situation in other dairy products is similar to that in butter: A large number of the plants are small and produce a small part of output; a small number of plants are large and produce a large part of output. For example, in the United States in 1961, two-thirds of the American cheese plants produced less than 1 million pounds of cheese per plant; they produced one fourth of the total output. Only 7 percent of the plants produced over 3 million pounds; they produced one third of the American cheese (8).

The trends in plant sizes in Iowa are similar to trends in the United States (8). The average production per plant for all plants producing butter in the United States in 1944 was 371,000 pounds; in 1961, it was 983,000 pounds. Average production per American cheese plant in 1944 was 380,000 pounds in the United States. In 1961, it was 1,130,000 pounds.

The trends in numbers of plants in Iowa are similar to the trends in the United States, as table 24 shows.

In the United States as a whole, the number of dairy manufacturing plants has declined: from 9,739 in 1944 to 5,281 in 1961 (8). Virtually all the decline has occurred in specialized (i.e., single-product) plants. Their number declined from 7,000 in 1944 to 2,701 in 1961. The number of multi-product plants rose from 2,739 to 3,433. In 1944 there were 2.5 times as many specialized plants as multi-product plants; in 1961, the number of multi-product plants was 25 percent greater than the number of single-product plants. During this same period, in the West North Central Region, the number of single-product plants declined from 1,666 to 664 and the number of multi-product plants rose from 612 to 635 (8).

Table 22. Percentage distribution of butter plants and butter production in Iowa by plant size, 1955 and 1962.

Butter production per plant	1955		1962	
	Percentage of plants	Percentage of total production	Percentage of plants	Percentage of total production
0-99,999	13.2	1.1	23.3	1.5
100,000-199,999	19.3	5.2	16.6	2.9
200,000-499,999	36.5	20.3	20.2	7.3
500,000-999,999	16.6	21.8	16.6	13.5
1,000,000-1,499,999	6.6	15.3	7.3	10.2
1,500,000-1,999,999	2.4	7.5	3.6	7.3
2,000,000-2,999,999	3.0	13.0	5.2	14.4
3,000,000-4,999,999	2.4	15.8	3.6	14.6
Over 5,000,000	—	—	3.6	28.3
	100.0	100.0	100.0	100.0

Source: Table 21.

Table 25 summarizes data on changes in the size distribution of fluid milk plants in Iowa. The number of small plants and the total number of plants have declined, and the number of large plants has increased. These same kinds of changes have occurred nationally.

The main causes of the trend toward larger and fewer dairy farms are the same as the causes of the trend toward larger dairy plants: economies of large scale production. Farm production costs per hundredweight of milk tend to be lower for large dairy farms than for small dairy farms. Likewise, processing costs per pound of butter, or cheese, or other dairy products tend to be lower in large plants than in small ones. One study showed that, under conditions existing in Iowa during the mid-1950's, plants designed to produce butter from whole milk and sell the skim milk could achieve these results: A plant designed to produce 2.2 million pounds of butter per year could operate at this volume at a cost of 5.2 cents per pound of butter; a plant designed to produce 1 million pounds of butter annually could produce this volume at a cost of 7.2 cents per pound of butter (13, pp.8-9). The larger plant had a cost advantage of 2 cents per pound over the smaller plant. Other studies have shown economies of large scale operation to exist in nonfat dry milk plants (24), cheese plants (31), evaporated milk plants (7), and fluid milk bottling plants (37). Many farm products besides milk and many food processing activities other than dairy processing are subject to economies of large scale operation.

There are various reasons for these economies: (a) Construction and equipment costs do not rise in proportion to plant capacity. Thus, the 1-million-pound butter plant referred to in the study by Frazer et al. (13) cost $146,000 to build and equip in the mid-1950's; the 2.2-million-pound butter plant cost $192,000 to build and equip, a 110-percent increase in capacity for a 32 percent increase in cost. (b) Employees frequently operate larger machines in larger plants. One

Table 23. Comparisons between butter plants receiving cream and butter plants receiving whole milk, Iowa, 1955 and 1962.

Item	1955		1962	
	Plants receiving cream only	Plants receiving whole milk only or whole milk and cream	Plants receiving cream only	Plants receiving whole milk only or whole milk and cream
Number of plants	194	138	68	125
Total butter production (thousand pounds)	103,689	78,239	34,623	136,457
Average butter production (thousand pounds)	534	567	509	1,092

Source: Unpublished data of Statistical Reporting Service, U.S.D.A. and of Iowa Crop and Livestock Reporting Service.

man is needed to operate a pasteurizer whether it be a 3,000 pound-per-hour or a 35,000 pound-per-hour pasteurizer (37, p. 13). Labor costs per unit of output will be lower with the larger equipment. (c) Workers in small plants are usually idle a larger part of the day than are workers in large plants. (d) The amount of labor required to prepare, clean up and maintain large machines may be only slightly greater than the labor required to prepare, clean up and maintain small machines. (e) Price reductions in the form of quantity discounts available to large plants are not available to small plants. The existence of economies of scale has caused the construction of larger plants and the growth in volume per plant over the years. In dairy processing the magnitude of economies of scale has grown over time as new types and sizes of equipment and new processes have been developed. After a large plant is built, there is pressure to use it at or near to capacity since the cost per pound of output is less at capacity than at smaller volumes.

There are also economies of scale in management. In Minnesota and Wisconsin dairy manufacturing cooperatives, total management cost in 1955 declined from 4.73 cents per hundredweight of milk in plants receiving 25 to 74 million pounds of milk to 1.77 cents per hundredweight in plants receiving 200 to 399 million pounds of milk (15).

The continued improvement in the quality of the farm-to-market road system has also contributed to the growth in the size of dairy processing plants in Iowa. This improvement has allowed the economical hauling of milk over greater distances, so that one plant can now serve farmers located at a greater distance from the plant.

A larger plant will frequently have more market power than small plants, especially in procurement. Because of its size, a large plant is apt to be a price leader in setting prices to farmers. Because of its lower costs, it can set prices higher than the prices small plants can afford to pay if they are to remain in business.

In addition to the advantages accruing to large plants or firms from economies of large-scale operation, there are qualitative advantages arising from large-scale operation. A large firm employs specialists to supervise and carry out various activities. A large plant usually can do a better job of helping farmers with production and quality-control problems. This results in a better and more consistent quality of processed product from the plant. This gives the large plant a selling advantage over the small plant.

Changes in the marketing system have also made it more advantageous to be a large plant than a small plant. Distributors of dairy products have become fewer and larger. As a distributor becomes larger he may find it cheaper to deal with two or three large plants than with eight or ten small plants. As he makes a shift to large suppliers, small plants lose their outlet and have to find new markets that may be less desirable than their original market. Hence, a large dairy plant can tap markets unavailable to small plants.

A comprehensive measure of the effect of growing size and declining numbers of butter plants in Iowa between 1955 and 1962 can be obtained from the

Table 24. Number of plants producing specified manufactured dairy products, by region and total, for the United States, 1944 and 1961; change in numbers and percent change.

Product and Year	Number of manufacturing plants		
	East North Central	West North Central	United States
Creamery butter			
1944	1,028	1,745	4,015
1961	310	11	1,510
Change	—718	—934	—2,505
Percent change	—69.8%	—53.3%	—62.4%
American cheese			
1944	1,503	188	2,119
1961	685	131	1,023
Change	—818	—57	—1,096
Percent change	—54.4%	—30.3%	—51.7%
Cottage cheese			
1944	688	210	1,644
1961	400	127	1,206
Change	—288	—83	—438
Percent change	—41.9%	—39.5%	—26.6%
Condensed milk			
1944	201	60	507
1961	125	53	396
Change	—76	—7	—111
Percent change	—37.8%	—11.7%	—21.9%
Nonfat dried milk			
1944	203	109	498
1961	137	130	431
Change	—66	21	—67
Percent change	—32.5%	19.3%	—13.5%

Source: Carley, D. H. and T. L. Cryer. Flexibility of operation in dairy manufacturing plants: changes 1944 to 1961. U. S. Dept. Agr. Agr. Econ. Rep. 61. 1964.

Table 25. Distribution of fluid milk plants and fluid milk volume in Iowa by plant size, 1950-51 and 1961-62.

Volume per plant		Number of plants		Percentage change
Annual	Daily	1950-51	1961-62	
(mill. qts.)	(lbs.)			
No volume listed	No volume listed	350	52	— 85
Under 1	Under 7,517	231	121	— 48
1 - 5	7,517 - 37,587	26	24	— 8
5 - 10	37,587 - 75,174	10	5	— 50
Over 10	Over 75,174	3	6	+100
Total		620	208	— 66

Source: In the Matter of Beatrice Foods Company, Federal Trade Commission Docket No. 6653, Proposed findings of fact, conclusion, and order, Part I, p. 46.

following comparison. Compare total costs of making butter in Iowa in 1962 under actual 1962 conditions with what total costs of making butter would have been in Iowa in 1962 if the size distribution of plants and the average size of plant had been the same in 1962 as in 1955. The latter total cost figure works out to be $2,100,000 greater than the former, which is equivalent to 1.5 cents per pound of butterfat used in making butter in 1962. The growth in sizes and reduction in number of Iowa butter plants that occurred between 1955 and 1962, with consequent savings through economies of large-scale operation, meant that dairy farmers supplying these plants received about $2,100,000 more for their milk and cream in 1962 than they would have received if this growth in size had not occurred. Most of the growth in size and resultant savings accruing through economies of scale occurred in plants receiving whole milk. Average size of plants receiving only cream decreased slightly. Of the plants receiving only cream, large plants became more important, but so did small plants. The savings resulting from the growth in size of large plants were more than offset by the higher costs resulting from the decline in size of small plants.

This $2,100,000 figure may be an underestimate of the savings to farmers. It takes no account of savings in farm-to-plant milk hauling costs. When several plants procure milk in the same area, there is considerable overlap and duplication of routes. As merger or consolidation reduces the duplication of routes, total hauling costs are reduced.

Even though the number of plants located in a three- or four-county area has declined, this does not necessarily mean that there is less competition for farmer's milk in that area. There may be just as many plants buying milk in that area as before. The decline in the number of nearby plants may be offset by increases in the number of distant plants buying milk in that area. Economies of scale and improvements in highway networks and hauling facilities now permit large plants to cover a larger area than small plants used to be able to cover.

IOWA CONSUMPTION OF DAIRY PRODUCTS

The third column of table 26 presents estimates of the amount of milk marketed by Iowa farmers that is consumed in fluid form by humans. These estimates are obtained as the difference between the amount of milk marketed by Iowa farmers and the amount of milk used in manufactured dairy products in Iowa plants; they are not adjusted for milk produced on Iowa farms but made into manufactured products in states bordering on Iowa, nor of milk produced on farms in states bordering on Iowa but processed into manufactured products in Iowa plants. If the volumes of these two interstate movements of milk are approximately equal each year, table 26 gives a good estimate of the amount of milk marketed in Iowa that finds its way into human consumption in fluid form. In years when these two volumes are not equal, table 26 shows overestimates or underestimates of fluid usage. In any event, this procedure is sufficiently accurate to show trends in fluid usage. Not all the milk counted in column 3 of table 26 is consumed in Iowa; some is shipped to bottlers outside Iowa—some as far away as Texas.

Fluid consumption of Iowa-marketed milk reached a peak in 1944-46 not achieved again until 1956.

Table 26. Total milk marketed by Iowa farms, total milk used in manufactured dairy products in Iowa, milk produced in Iowa used as fluid milk and cream for human consumption, 1940-1965.

Year	Total milk marketed by Iowa farms in combined milk and cream marketings[a]	Net total whole milk used in manufactured dairy products in Iowa[b]	Milk marketed in Iowa used as fluid milk and cream for human consumption[c]	Milk produced in Iowa used as fluid milk and cream for human consumption[d]
	(bill. of lbs.)	(bill. of lbs.)	(bill. of lbs.)	(bill. of lbs.)
1940-44 average	5.964	5.291	0.674	1.203
1945-49 average	5.611	4.625	0.986	1.509
1950-54 average	5.276	4.377	0.899	1.333
1955-59 average	5.668	4.631	1.037	1.325
1960	5.532	4.409	1.123	1.355
1961	5.731	4.551	1.180	1.405
1962	5.830	4.515	1.315	1.534
1963	5.949	4.438	1.511	1.719
1964	6.278	4.838	1.440	1.637
1965	5.637	4.374	1.263	1.446

[a] From table 7.

[b] From table 20.

[c] Computed as difference between first two columns.

[d] Column (3) plus milk consumed as fluid milk or cream on farms where produced.

Table 27. Production and estimated consumption of dairy products in Iowa, 1964.

Product	Volume of production	Volume of consumption	Ratio of consumption to production
	(mill. lbs.)	(mill. lbs.)	(percentage)
Evaporated and condensed milk	n.a.[a]	16.566	—
Nonfat dry milk	248.073	10.768	4
Ice cream	50.563	65.436	129
Cottage cheese	10.812	19.603	181
Cheese	74.779	26.230	35
Butter	165.849[b]	23.469[b]	14
Total fat solids	222.000[c]	74.823	33
Total nonfat solids	518.334[d]	125.902	24

[a] n.a. = not available.

[b] Includes farm-churned butter.

[c] 208,300 thousand pounds marketed by farmers. The remainder used on farms where produced.

[d] 479,676 thousand pounds marketed by farmers.

This is consistent with national fluid milk and cream consumption, which reached a peak in 1946, and then dropped off and did not reach the 1946 level again until 1952. Total national fluid milk and cream consumption has been quite stable since 1955 as has fluid consumption of Iowa-produced milk. In 1942, 10 percent of the milk marketed by Iowa farmers found its way into human fluid consumption; in 1952, 19 percent; and in the early 1960's, 20 percent.

The United States Department of Agriculture publishes data on production of milk and dairy products by states. Similar data on consumption of dairy products by states are not available. We have made some rough estimates of consumption of dairy products for Iowa for 1964 to compare consumption with production. These estimates are presented in table 27. These consumption figures represent only direct consumption — consumption of dairy products as dairy products. Not included are such things as butter or nonfat dry milk consumed in bakery products or in prepared food mixes. This type of indirect consumption is small compared with direct consumption.

On the balance Iowa is a substantial exporter of dairy products, producing substantially more fat and nonfat solids than are consumed in Iowa. Even allowing for possible margins of error, these estimates show that Iowa is a substantial net exporter of fat solids, nonfat solids, butter, cheese and nonfat dry milk.

In this respect, Iowa is similar to the rest of the North Central Region. About 80 percent of the butter, 75 percent of the natural cheese and 75 percent of the dried milk products produced in the United States are made in the North Central Region (39).

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