

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Conservation and Survey Division

Natural Resources, School of

3-1938

The Butter Industry of Nebraska

Walter Kollmorgen

University of Nebraska-Lincoln

Follow this and additional works at: <https://digitalcommons.unl.edu/conservationsurvey>



Part of the [Geology Commons](#), [Geomorphology Commons](#), [Hydrology Commons](#), [Paleontology Commons](#), [Sedimentology Commons](#), [Soil Science Commons](#), and the [Stratigraphy Commons](#)

Kollmorgen, Walter, "The Butter Industry of Nebraska" (1938). *Conservation and Survey Division*. 353.
<https://digitalcommons.unl.edu/conservationsurvey/353>

This Article is brought to you for free and open access by the Natural Resources, School of at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Conservation and Survey Division by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

THE BUTTER INDUSTRY OF NEBRASKA

By

WALTER KOLLMORGEN
Research Assistant
Conservation and Survey Division
The University of Nebraska

BULLETIN 16
CONSERVATION DEPARTMENT
of the
CONSERVATION AND SURVEY DIVISION
UNIVERSITY OF NEBRASKA



Printed by Authority of the State of Nebraska
Lincoln, Nebraska
March, 1938

THE BUTTER INDUSTRY OF NEBRASKA

By

WALTER KOLLMORGEN

Research Assistant

Conservation and Survey Division

The University of Nebraska

BULLETIN 16
CONSERVATION DEPARTMENT
of the
CONSERVATION AND SURVEY DIVISION
UNIVERSITY OF NEBRASKA



Printed by Authority of the State of Nebraska
Lincoln, Nebraska
March, 1938

THE UNIVERSITY OF NEBRASKA
EDGAR A. BURNETT, CHANCELLOR

BOARD OF REGENTS

HON. STANLEY D. LONG, Grand Island
HON. FRANK J. TAYLOR, St. Paul
HON. MARION A. SHAW, David City
HON. CHARLES Y. THOMPSON, West Point
HON. ARTHUR C. STOKES, Omaha
HON. ROBERT W. DEVOE, Lincoln

CONSERVATION AND SURVEY DIVISION

G. E. CONDRA, Dean and Director

As defined by law, the Conservation and Survey Division of the University includes the following state departments and surveys: Soil, Geological, Water, Biological, Industrial, Conservation, and Information Service. Its major purpose is to study and describe the state's resources and industries for use in development. Reports are published in three series, i. e., Nebraska Soil Survey, Nebraska Geological Survey, and the Conservation Department.

TABLE OF CONTENTS

	PAGE
History of Development of the Butter Industry.....	5
Early Cream Gathering Routes.....	6
Power Separators and Skimming Stations.....	7
The Hand Separator and the Babcock Butterfat Test.....	8
Production and Consumption of Butter.....	9
National Butter Consumption.....	9
Nebraska's Position in Butter Production.....	10
Recent Changes in Creamery-Butter Production.....	12
Rank of States in Production of Butterfat per Cow and Butterfat Content of Milk.....	13
The Sale of Butterfat in Nebraska.....	16
Country Butter.....	20
The Production and Disposition of Country Butter.....	20
Federal Legislation and the Production of Renovated Butter.....	22
Creameries in Nebraska.....	23
Early Creameries.....	23
Centralizer Creameries.....	25
Output of Nebraska Creameries.....	26
Proprietary and Corporation Creameries.....	27
Local Cooperative Creameries and Cooperative Centralizers.....	28
Cream-Buying Practices in Nebraska.....	30
Early Methods.....	30
Cream Stations.....	32
Direct Shipping System.....	34
The Production and Disposition of Creamery Butter.....	35
The Manufacture of Butter.....	35
The Disposition of Nebraska Creamery Butter.....	42
The Problem of Producing Good-Quality Butter.....	50
Federal Program of Butter Improvement.....	51
The Cream Station Problem.....	53
Recent Butter Legislation in Nebraska.....	58
Processing and Utilization of Skimmilk and Buttermilk.....	59
Comparative Feed Costs.....	63
Margarine and Oleomargarine.....	63
Source of Ingredients.....	68
Coconut Oil, Its Production and Value.....	70
The Origin and Problem of Margarine.....	71
Federal Legislation on Margarine.....	72
Production and Consumption of Margarine.....	74
Summary.....	75
Acknowledgments.....	77

The Butter Industry of Nebraska

The discovery of butter, according to tradition, resulted from carrying milk on horseback in an animal skin, the agitation caused by the movement of the horse converting the butterfat into butter. In certain parts of South America butter was prepared in this ancient way as recently as 1887.¹

Butter is one of the oldest foods in our present diet, although in early times its use for non-dietary purposes exceeded its use for food. It is known that the Hindus were interested in cattle raising as early as 1500 B. C. and that they valued their animals according to their yield of butter.² The Old Testament gives a number of references to this food. Butter, according to the Greek derivation of the word, means "cow cheese", and it is probable that the product as then produced contained considerable casein.

Butter has been used in many and varied ways throughout historical times. The Hindus used it for the greatest and holiest sacrifices in their worship. The Greeks and Romans used butter not as a food but as the standard remedy for skin injuries and as a dressing for the hair. In cold countries people used butter in the bath, and in certain tropical countries it was used as a remedy for wounded elephants. In Spain, as late as the 17th century, it was dispensed in the medicine shops for external use only.³ Butter has been in general use only within the last hundred years and the few who did use it before that time seldom ate it fresh. The general practice was to melt it before storing it and, instead of using butter as a spread, it was employed to enrich cooked foods. Others, even in comparatively recent times, used rancid, stored butter as an appetizer.

The dairy industry was one of the last major industries to be affected by the industrial revolution. It remained completely a home industry until the middle of the nineteenth century. The first cheese factory in the United States was built in Oneida County, New York, in the 1850's and the first creamery was built in the same state in 1861.

The making of butter was almost exclusively a home industry in Nebraska prior to 1880. Butter that was produced was consumed by the farmer, retailed directly to village and city folk, or it was sold to the grocery store for distribution. Prior to the eighties the number of creameries in the state was too small to supply a constant market for cream.

¹ Wiest, Edward, *The Butter Industry in the United States*, Ph. D. thesis, Columbia University, 1916, p. 13.

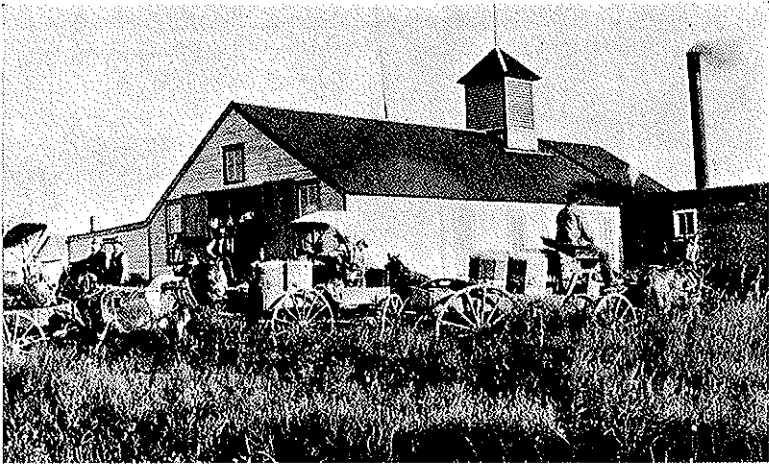
² Hayward, Harry, *Facts Concerning the History, Commerce, and Manufacture of Butter*, Circular 56 of the Bureau of Animal Industry, U. S. Dept. of Agriculture, 1904, p. 177.

³ *Idem*.

The absence of the cream separator made the accumulation of cream a long and tedious process. Milk was usually placed in shallow pans and crocks which were kept in the cellar or some other cool place for a period of about twenty-four hours, after which most of the cream which had accumulated on the surface of the milk was skimmed off. Considerable cream was wasted by this method. The milk was then fed to the stock and the accumulated cream was churned at convenient intervals in the old fashioned dasher churns.

EARLY CREAM GATHERING ROUTES

During the seventies and particularly during the eighties a considerable number of creameries were built in Nebraska, largely by promoters. It was during this time that the "cream-gathering" plan developed. Cream haulers were paid about \$50 per month to gather cream along certain routes and usually covered a distance of about 30 miles a day with a team of horses or mules (Figure 1).



Courtesy, A. L. Haecker, Lincoln

FIGURE 1.—Cream gatherers arriving at the creamery. In Nebraska, cream was commonly gathered by wagons in the 80's and early 90's. Note the jacketed cream cans on the wagons. These cans had a capacity of 30 gallons and were fitted with "floats" to prevent the cream from churning before it reached the creamery.

The shotgun can was introduced at this time to facilitate the skimming of the cream and to measure the amount of cream per customer. This elongated type of can, approximately 8 inches in diameter, had a glass measuring gauge near the top calibrated in quarter inches. A given thickness of cream, it was assumed, would yield one pound of butter.

Into such cans the farmer poured his milk and let it stand from 24 to 48 hours, preferably in cold water. When the cream gatherer arrived, note would be taken of the gauges of cream which the can registered, and the amount would be credited to the farmer. The cream was then skimmed with a special dipper and poured into the jacketed cream cans on the gatherer's wagon. These large cans, holding about 30 gallons, were fitted with special floats to prevent the cream from churning on its rather turbulent trip to the creamery. The farmer was paid for his cream generally on the tenth day of every month. Cream was gathered in this manner until about the middle of the nineties. At this time the centrifugal separator was invented and it effected a profound change in the dairy industry.

POWER SEPARATORS AND SKIMMING STATIONS

The centrifugal cream separator was invented in 1872 by William LeFeldt, a German engineer. Several years later it was greatly improved by a Swedish engineer, Dr. Gustave de Laval. The first separators were introduced into the United States between 1885 and 1890.

The first separators introduced in Nebraska were large in size, were powered by steam engines, and were capable of separating large quantities of milk in a short time. Creameries installed these power separators and farmers brought their milk to the plants once a day to be separated, the skimmed milk being returned to the farm to be fed to pigs, calves, and poultry. Skimming stations were established at convenient distance intervals in sections which seemed to assure an adequate supply of milk. The cream which accumulated at these stations was sent to a creamery, which usually owned the skimming stations. These stations multiplied very rapidly. In 1897 there were 20 such stations in Nebraska—in addition, most creameries had separators—and by 1899 there were 213 stations. In 1900 the Beatrice Creamery Company had 96 skimming stations. By 1902 the total number of these plants in the state was reduced to 167, and by the next year so many of them ceased operating that no statistics relative to their number are available. This change was brought about by the introduction of the small hand separator which was particularly suited to Nebraska needs.

The short period of usefulness of skimming stations made them a very costly experiment. Mr. S. C. Bassett, who for many years played an important part in the Nebraska Dairymen's Association, estimated the average cost of these skimming stations at \$2,000.⁴ Since about 230 such stations were erected in Nebraska, they represented an investment of about \$460,000.

⁴ Annual Report of Nebraska Dairymen's Association, 1912, pp. 133-135.

THE HAND SEPARATOR AND THE BABCOCK BUTTERFAT TEST

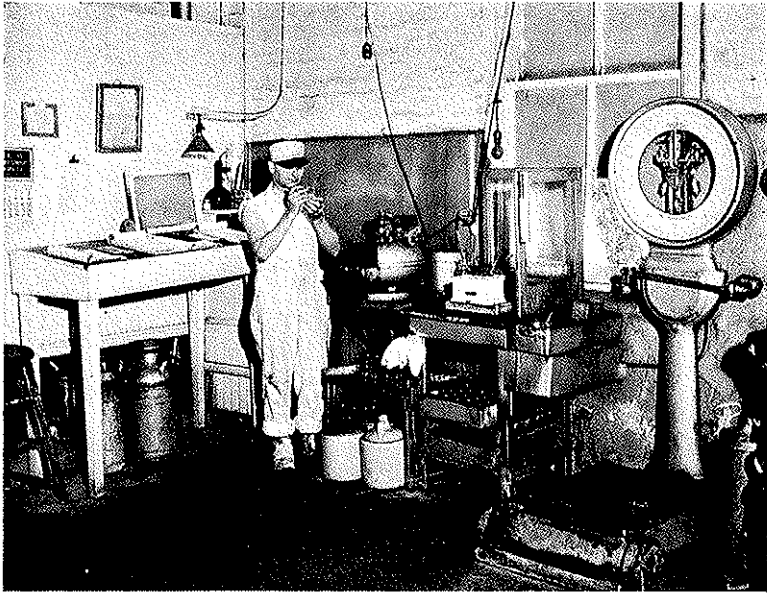
The first hand separators were introduced in Nebraska in 1892. These machines were not highly perfected and their cost was considerable. Therefore the skimming-stations were not immediately abandoned.

Once the hand separator had passed the experimental stage, it was adopted very rapidly in this state. According to A. L. Haecker,⁵ formerly of the Dairy Department of the University of Nebraska, this state led in the adoption of this device in the early years of this century. The old gravity system of raising cream and the skimming-station methods were both bothersome and time-consuming. Milking, for the production of cream and butter, was not a specialized activity in this state. Herds of beef or dual-purpose milk cows were small, and the production of milk was modest. The production of butter was largely in the hands of women. It was an incidental activity, receiving incidental care. With a cream separator, milk could be separated promptly. The skimmed milk, wholesome, tasty, and still warm, could be fed to the stock immediately. All forms of stock thrived on this food. Calves, ordinarily very sensitive to the feed they receive, did well on skimmed milk. The cream could either be used fresh, or it could be added to an accumulating supply to be churned or sent to the market. The ratio of cream volume to value was such that it could be shipped several hundred miles to creameries.

Toward the close of the 19th century, butter-making shifted very rapidly from a home activity to a factory industry. To the factories cream represented a raw product to be procured directly or indirectly from farmers. Since milk and cream vary greatly in butterfat content, the problem of paying for the product on an equitable basis was a considerable one. Creameries would frequently make a churn test to determine the butterfat content of cream. The difficulties inherent in this method are obvious. A method of cream testing that could be accomplished readily and with little effort was greatly needed.

In 1890 Doctor S. M. Babcock, chemist at the Wisconsin Agricultural Experiment Station, perfected a cream-testing method which was promptly adopted and which has been named for its discoverer. By the use of this method, milk and cream producers can be paid promptly according to the actual value of the butterfat content of their products; creameries can determine how much butter can be obtained from a given quantity of cream; and farmers and experiment stations can readily determine the actual butterfat production per cow for given periods. All of our dairy-herd improvement work is based to a large degree on production records. The remarkable increase in butterfat production per cow in recent years is traceable, in large measure, to the Babcock test.

⁵ Personal communication.



Picture taken in the Beatrice Creamery Company plant, Lincoln

FIGURE 2.—Typical equipment in a cream station. Note the Babcock testing machine to the left of the cream station operator.

PRODUCTION AND CONSUMPTION OF BUTTER

NATIONAL BUTTER CONSUMPTION

According to the census of 1849, the average per capita consumption of butter in the United States was 13.9 pounds (Table 1). This is the first and lowest record we have of butter production and consumption in this country. The low-production record per cow and the undeveloped nature of the dairy industry in this country largely explain this small per capita consumption of butter.

TABLE 1.—Trend in the Annual Per Capita Consumption of Butter in the United States.*

Year	Butter Consumed, Pounds	Year	Butter Consumed, Pounds
1849	13.9	1921	16.1
1859	15.1	1923	17.0
1869	13.7	1925	17.39
1879	15.8	1927	17.49
1889	19.5	1929	17.29
1899	19.9	1931	18.00
1909	18.0	1933	17.68
1919	14.8		

* U. S. Dept. of Agriculture, October 26, 1934.

Material increases in butter production and consumption continued to 1899 when the highest level was reached. During the period of the World War, consumption of butter declined to a low level, but rose again as abnormal conditions subsided. For the last decade the per capita consumption of butter in the United States has approximated 18 pounds per year.

NEBRASKA'S POSITION IN BUTTER PRODUCTION

In late years Nebraska has produced from 100,000,000 to 110,000,000 pounds of butter annually, with the exception of the recent drought years. Of this amount from 85 to 88 per cent was creamery butter. Creamery-butter production in Nebraska has exceeded the farm-butter production since about 1910 (Figure 3). In the United States as a whole the production of farm butter exceeded the production of creamery butter up to the period of the World War.

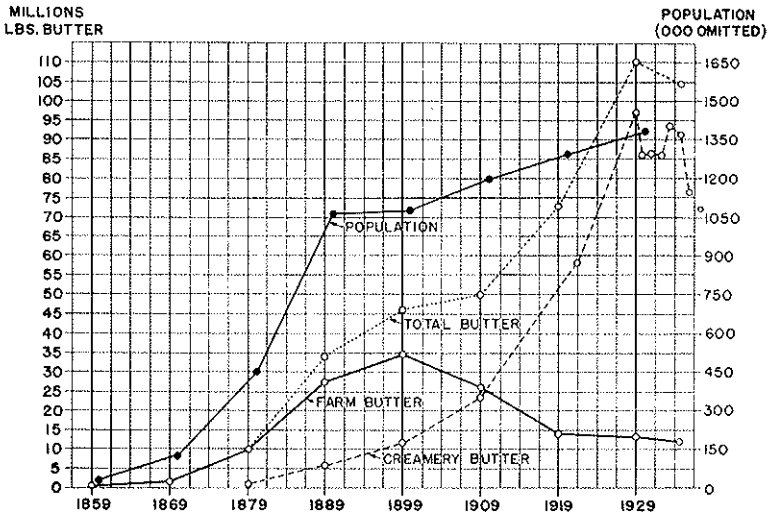


FIGURE 3.—Pounds of total butter, farm butter, and creamery butter produced in Nebraska and population increase in the state.

Source: Butter production figures for 1859 to 1929 taken from census reports; creamery production figures for Nebraska from 1930 to 1935 from *Annual Report on Dairy Products* by the U. S. Dept. of Agriculture; 1936 creamery butter figure preliminary estimate, by State-Federal Division of Agricultural Statistics, Lincoln; population figures from census reports.

In 1860, Nebraska produced about 12 pounds of butter for each citizen living within its borders; by 1900 and 1930 the per capita yearly production had increased to 43 and 80 pounds respectively (Figure 4). Since the average per capita consumption of butter in the United States is about

18 pounds per year, Nebraska clearly produces a great surplus of this food annually.

The production and the consumption of butter in the United States roughly approaches a balance. In 1860 about 10 pounds of butter were produced for each citizen in the country. Since 1900, the average annual

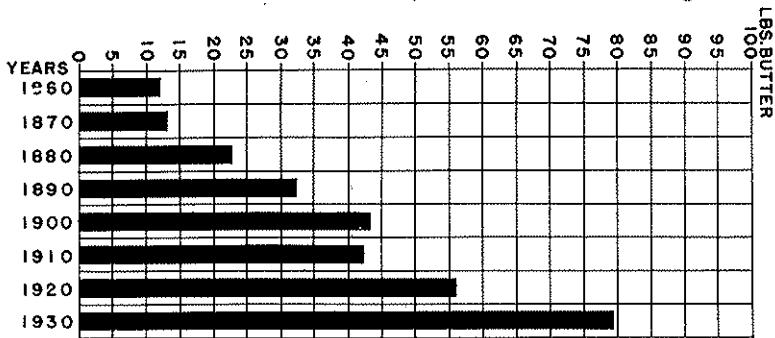


FIGURE 4.—Per capita production of butter in Nebraska, 1860-1930.

Source: U. S. census reports.

production of butter for each inhabitant of the country has averaged from 14 to 20 pounds. This increase reflects a similar increase in consumption of this food for the nation. The imports and exports of butter are negligible and so have never affected the balance between production and consumption.

At present Nebraska ranks fourth among the states in butter production. It is greatly exceeded by Minnesota, Iowa, and Wisconsin (Figure 5). In 1932 Minnesota produced 280 million pounds of butter, or roughly three times as much as was produced in Nebraska. Iowa, with a less specialized form of dairying than Minnesota, comes second with a production record of 200 million pounds. A more uniform distribution of smaller-sized farms in Iowa than in Nebraska accounts for a greater number of farmers and cream producers in the former state and a greater aggregate production of butter. Wisconsin, the foremost dairy state in the Union, ranks third in butter production. Its 1932 production record of 170 million pounds virtually doubled the Nebraska figure.

Nebraska has a slight margin in butter production over a group of seven states, viz., Missouri, Ohio, Michigan, Indiana, Kansas, California, and Illinois. A modest increase in butter production in any one of these states may readily displace Nebraska from its present rank. A number of these states rank lower than Nebraska in butter production because of great demands for fluid milk by urban centers located within them or near their margins.

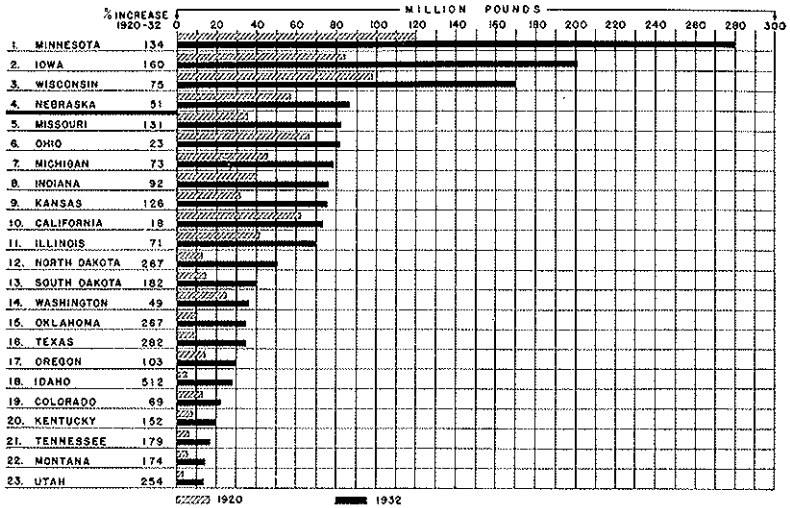


FIGURE 5.—Rank of states producing more than ten million pounds of creamery butter in 1932, and amount of creamery butter produced in these states in 1920.

Source: *Yearbooks of Agriculture*.

RECENT CHANGES IN CREAMERY-BUTTER PRODUCTION

Since the period of the World War a phenomenal increase in butter production has occurred in many western and southern states. Figure 5 shows the percentage of increase in butter production in states producing more than 10 million pounds in 1932. The percentage of increase from 1920 to 1932 for the states listed ranged from 23 per cent in Ohio to 512 per cent in Idaho. It seems plausible that a number of the states listed have very nearly reached their limit for the present in butter production. This seems particularly true of states in which or near which large urban centers are located.

A considerable increase in butter production may be anticipated in certain states in the Cotton Belt, particularly those on the northern and western margin of the Belt. From 1920 to 1932 Texas increased its butter production 282 per cent. This is in part traceable to the unsettled conditions in cotton agriculture and industry. With low cotton prices and restricted marketing possibilities, other agricultural activities must be introduced. Increased milking for butter production seems to find favor as a substitute agricultural activity in Texas and other Gulf States.

Increased dairying activities are at present also promoted by the Tennessee Valley Authority in the area over which this Federal agency functions. The dissected landscape in the drainage basin of the Tennessee River needs to be forested to a large extent and also sodded with grasses. Potentially, such land may well be pastured by dairy cows.

Butter production increased 51 per cent in Nebraska from 1920 to 1930. This is a substantial increase when one considers that this state is characterized by a highly diversified form of farming in which dairying, on the whole, plays but a minor part. The future trend of butter production in this state will depend upon the relative profit in raising and fattening stock and in cereal production, such as wheat, as well as on the need and profit of milking.

Figure 5 lists the states in which butter production increased materially from 1920 to 1930. It will be noted that these states all fall, roughly, into the central, the western, and the southern part of the United States. Without further explanation it might be assumed that the increased production records of these states has raised the aggregate butter-production record of the United States proportionately. This, however, is not the case. Butter production has decreased very materially in certain sections of the country. All of New England and the adjoining states of New York, Pennsylvania, Maryland, Delaware, New Jersey, and West Virginia show a decrease. Only one other state, Nevada, also experienced a decrease in butter production during the twenties.¹

Decreased butter production in the northeastern part of the United States may be ascribed in a large measure to increased demands for fluid milk by large urban centers. In addition, a considerable number of processing plants have been established in this section of the country, and these create a greater demand for fluid milk. In the light of these demands, it does not seem likely that butter production will again become prominent in the northeastern section of the country. The Middle West, West, and South will continue, it seems likely, to supply the greater share of the nation's butter.

RANK OF STATES IN PRODUCTION OF BUTTERFAT PER COW AND BUTTERFAT CONTENT OF MILK

The production of milk with a satisfactory content of butterfat is the primary object of all dairy enterprises. To make these activities profitable it is desirable that both milk and butterfat production be high in relation to type and amount of feed consumed and work applied. Available data show that there is a close correlation between the production of milk per cow and the production of butterfat. Thus, while Nebraska ranks thirtieth in average annual production of milk per cow, she ranks twenty-fifth in the average production of butterfat per cow (Figure 6).

In 1933 the average production of butterfat per cow in Nebraska was 160 pounds. Available evidence indicates that this production was ma-

¹ These states do not appear on Figure 5 which lists states producing more than 10 million pounds of butter in 1920 and 1922. These eastern state produced relatively small amounts of butter even in 1920.

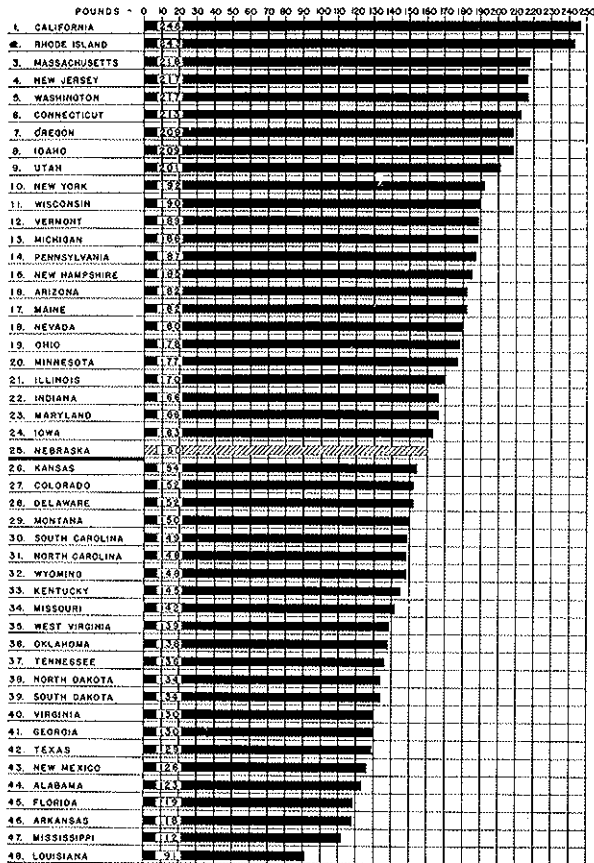


FIGURE 6.—Rank of states in average production of butterfat per cow in 1933.

Source: *Yearbook of Agriculture*, 1934.

terially greater than it was a decade or more ago. However, a state as prominent in butter production as Nebraska would do well to increase this average production record materially. The average farmer should have no difficulty in maintaining a herd of cows which would produce on an average between 250 and 300 pounds of butterfat a year. Specialized dairymen, on the other hand, should set their expectations even higher. Cows producing between 300 and 350 pounds of butterfat a year may be considered good; those averaging nearly 400 pounds or more may be considered excellent. Every producer of dairy products can develop a good producing herd by proper feeding, culling, and breeding. With increased production, profits become progressively greater.

California led all the other states in the average production of butterfat per cow in 1933. From the standpoint of the state as a whole this record must be considered good, since no other state equals or surpasses it. Louisiana ranks lowest in the average production of butterfat per cow. Dairying in Louisiana and a number of other Gulf and South Atlantic States is still greatly retarded in development.

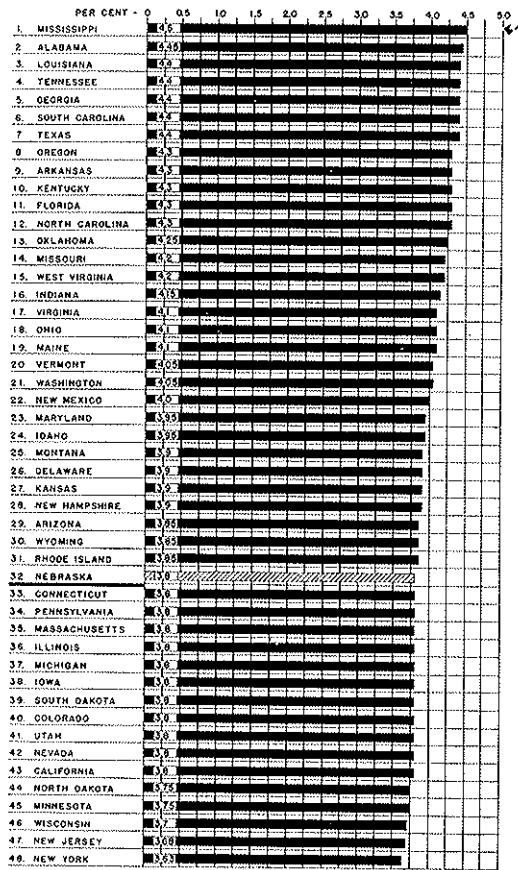


FIGURE 7.—Rank of states in estimated average butterfat content in milk produced, 1929-32.
Source: *Yearbook of Agriculture*, 1934.

Cows producing large quantities of milk generally rank high also in total amount of butterfat produced. The percentage of butterfat in a unit of milk, however, does not bear such a direct relationship to the per capita production of milk. The Holstein cow, as is generally known,

produces large quantities of milk of relatively low butterfat content. Jerseys, on the other hand produce smaller quantities of milk with a higher butterfat content. Other cattle usually give milk with an intermediate content of butterfat. The average content of butterfat in milk produced in any one state, therefore, depends largely upon the kinds of milk cows predominating in that state.

The estimated average butterfat content in milk produced in Nebraska from 1929 to 1932 was 3.8 per cent (Figure 7). Only five states produced milk with a lower butterfat content. States ranking high in the average production of milk per cow rank low in average butterfat content of milk. The Gulf-South Atlantic and adjacent states, as a group, rank exceedingly high in butterfat content classification. The predominance of the Jersey cow in this area largely accounts for the richer milk. The predominance of Holsteins in the more specialized dairy states, on the other hand, serves to reduce the average of butterfat content in milk.

THE SALE OF BUTTERFAT IN NEBRASKA

Nebraska is one of the foremost states in the production of cereals as well as of livestock. The state usually ranks third in the production of corn and wheat and also produces considerable quantities of oats, barley, and rye. With respect to livestock the state ranks second in the raising of hogs and fourth in cattle production. In recent years Nebraska farmers have fed yearly from four to five million hogs, from three to three and one-third million cattle, as well as large numbers of chickens and

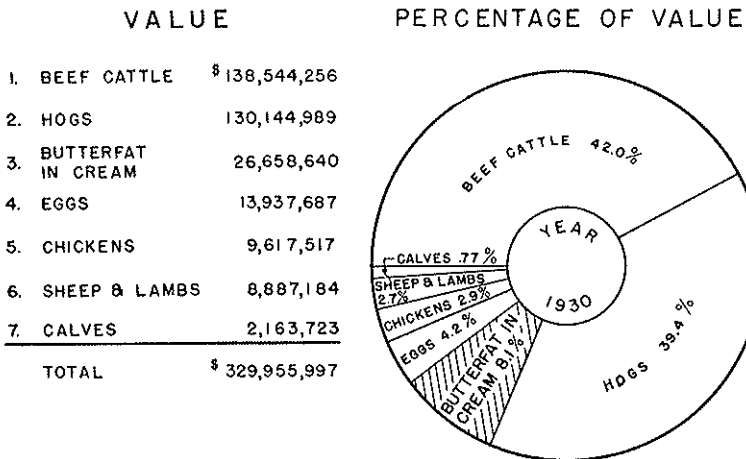


FIGURE 8.—Value and percentage of value of livestock and livestock products marketed in Nebraska in 1930.

Source: *Nebraska Agriculture Statistics*, 1930, p. 25.

sheep. With the exception of wheat, the cereals produced in this state are nearly all fed to livestock. The returns from livestock, therefore, represent the most important source of income to Nebraska farmers.

Figure 8 shows the relative income derived from the sale of the principal livestock and livestock products in Nebraska for 1930. The greatest returns are realized from the sale of beef cattle and hogs, these two forms of stock representing nearly eighty per cent of the income derived from the sale of livestock and livestock products. In point of importance, butterfat follows these two forms of income, grossing slightly over 8 per cent of the farmers' income in 1930. Since the gross income from the sale of all dairy products represented about 10 per cent of the farmers' income in 1930 and 11.6 per cent for the years 1929 to 1932 inclusive, it follows that the production of butterfat is the main commercial objective of the milking enterprise in the state. Other considerations that make the production of butterfat important in this state are (1) the sustained form of income which this activity provides, (2) the provisions which it supplies for the home table, and (3) the excellent feed qualities of skim milk and buttermilk for the raising of young stock.

In 1930 about 80 per cent of the farm income from the sale of dairy products in Nebraska came from the sale of butterfat. The production and sale of this dairy product, however, receives different degrees of emphasis in various sections of the state. Although considerable quantities of milk are produced adjacent to urban centers and villages, such milk is largely sold for fluid-milk consumption. This practice reduces the percentage of farmers in such districts and milksheds who sell butterfat.

Figure 9 shows the percentage of farmers in the counties of Nebraska keeping cows and heifers for milk production and reporting the sale of butterfat in 1929. A relatively small percentage of the farmers with milk cows in the Omaha and Lincoln milkshed report the sale of butterfat. In the counties of Dakota, Stanton, Cuming and Burt and the counties south of these there is slightly less emphasis on butterfat production than in the tier of counties southward from Dixon, Cedar, Knox, Boyd and Keya Paha. Farther to the west butterfat production again becomes less prominent.

The eastern section of the state is more thickly populated than the section farther west and a considerable percentage of the whole milk produced is consumed in a fresh or processed form. This section, because of climate and population centers, also has the greatest percentage of small-farm enterprises, clustered around cities, towns, and villages and engaged in forms of agricultural activities in which milking on a commercial scale is not included. Truck gardening acreages and chicken ranches are two forms of farming which may be so specialized that few, if any, milk cows

are kept. On such farms a cow or two may be kept merely to supply the domestic needs. As a result, no butterfat sale is reported. Of equal importance is the fact that the agricultural possibilities in this section are such that the farmers enjoy considerable latitude with reference to choice in crop and livestock production. Among the possible choices, milking may or may not play a part.

Westward of these eastern counties lies a zone—southward from Dixon, Knox, Boyd, and Keya Paha counties—in which a relatively high percentage of the farmers with milk cows report the sale of butterfat. In Howard, Garfield, and Rock counties, which rank highest in this respect, more than 90 per cent of the farmers with milk cows reported the sale of butterfat in 1929. Nearly all of the other counties in this zone, excepting most of those along the Platte River and counties immediately south of them, reported percentage averages of 80 and more. A number of factors account for the prominence of butterfat production in this zone. As a whole, the farm units in this sometimes droughty zone are undersized. Cereal culture is not consistently successful. Soil texture and relief forms are such in many sections that the ground may not be broken without serious wind and water erosion. Grazing and milking are in part logical responses under these conditions. Butterfat must then be sold, since there are no large urban centers creating a demand for fluid milk.

In the western section of the state the sale of butterfat again becomes less prominent. In a large measure the more specialized agricultural practices such as grazing and wheat, potato, and sugar beet production account for this. In late years more diversified farming methods have been instituted in this section of the state, and milking activities have become somewhat more important than they were formerly.

The number of farmers reporting the sale of butterfat in the counties of Nebraska and the average number of pounds sold by each farmer reporting are also shown on Figure 9. The number of farmers reporting the sale of butterfat, is less important because of the unequal area of the various counties but the average number of pounds sold by each farmer is significant because it indicates the emphasis that is placed on butterfat production in the different counties of the state. In 1929 the greatest average amount of butterfat per herd of milk cows was produced in Arthur County (1186 pounds) and the smallest average amount per milking herd in Saunders County (402 pounds). Other counties which produced exceptionally great average amounts of butterfat per herd were Rock, Grant, Brown, Garfield, and Keya Paha counties. A number of other counties in the north central part of Nebraska produced more than 800 pounds of butterfat per herd. In general the greatest individual cream producers are found in the north-central and to some extent in the north-western

part of the state. Most of this cream is produced by beef cows or cows of predominantly beef-type extraction. In parts of these regions distance to marketing places presents a serious problem in disposing of fresh cream.

COUNTRY BUTTER

THE PRODUCTION AND DISPOSITION OF COUNTRY BUTTER

During the early period of settlement in Nebraska butter-making was entirely a household activity. The method of making it was similar to the simple, chance ways that had prevailed for centuries. The milk was set in pans and crocks in as cool a place as could be found to permit the cream to gather on the milk. The accumulated cream was then churned, the most common device being the old stamping churn. Finished butter was then washed, salted, worked, and stored for use.

With the use of the separator, milk and butterfat are now separated with an expenditure of little time and effort. Where electricity is found on the farm, the separator may be run by an electric motor. Hand separators, however, are more prevalent. The butterfat is stored in cellars, wells, caves, ice boxes, or electrical refrigerators. Those devices and aids which maintain a constant and cool temperature are most desirable. Churning may be accomplished in several ways. A small number of farms have electricity in the home and so can utilize this energy to work the churn. The majority, however, still rely on "arm power" to convert butterfat into butter.

The object of churning is to rupture the minute fat globules in cream and to consolidate the butterfat into butter. This is accomplished by agitation. The common churns used by country housewives consist of a revolving container on a stand or a fixed container equipped with revolving beaters. Since most churning is still done by hand, every purchaser of a small churn should attempt to obtain a device which affords the maximum of agitation for the least expenditure of effort.

The census of 1930 reports that 90,586 farmers in Nebraska made 13,065,941 pounds of country butter in 1929. This means that each farmer reporting produced on an average of about 144 pounds. Most of this butter was consumed in the homes in which it was produced. The prices of cream in recent years have been such that it was usually more profitable to sell butterfat than country butter. A large number of farmers' wives, nevertheless, still market a certain amount of butter directly to village and city consumers.

To produce 13,000,000 pounds of country butter by methods prevailing in farm homes represents an expenditure of much effort. It is desirable that this effort be rewarded by the production of good butter, both tasty and hygienically wholesome. Much of the butter produced on the farm

meets these standards; some of it does not. Good butter can be produced if the proper methods are used. Farmers' Bulletin 876, of the United States Department of Agriculture, describes the preparation of good country butter with a revolving barrel churn.¹

INCREASE AND DECLINE IN THE PRODUCTION OF COUNTRY BUTTER IN NEBRASKA

Since no creameries were established in Nebraska prior to 1870, all butter consumed in the state up to that time was produced on the farm. After the advent of a few creameries in the seventies, small quantities of creamery butter were made. Farm butter output, however, exceeded creamery butter output up to 1910. The production of farm butter in Nebraska reached its height in 1899, when about 35,000,000 pounds were produced in the homes of this state. In the same year about 12,000,000 pounds of creamery butter were produced in Nebraska (Figure 3).

According to the census of 1910 Nebraska produced about 26,000,000 pounds of farm and 24,000,000 pounds of creamery butter in 1909. After 1910 the production of creamery butter rapidly became more popular, and the making of farm butter sank to a level commensurate with farm and local butter consumption. Since 1919, the production of farm butter in Nebraska has varied from 13 to 15 million pounds (Figure 3).

Prior to the 20th century it was believed by many that creamery butter was made from cream which the farmers did not care to use themselves. This, in part, created a hesitancy on the part of village and city consumers to purchase creamery butter. At present good creamery butter is well-accepted by the majority of food purchasers in cities. By discriminate and proper grading of cream, as well as proper churning and packing of butter, a good creamery can supply a uniform and good-quality product to the consumer.

Today farm butter is produced primarily to supply the domestic needs of the producers. Surplus butter is disposed of to stores or delivered directly to customers in villages and cities. Thrifty farm women producing good butter in many instances develop a considerable butter trade and so receive a maximum return for their efforts. Excellent farm butter frequently brings a premium of several cents per pound from selected customers.

Some of the butter produced on the farm is not sold directly to consumers. This may be the result of the poor quality of such butter, or it may result from the absence of time and inclination on the part of the producer to seek out a sufficient number of customers to dispose of all the butter produced. Thus, varying amounts of farm butter are sold to

¹ White, William, *Making Butter on the Farm*, Washington, D. C., 1930, pp. 20, 21.

grocery stores or produce firms. These firms dispose of the product in various ways.

Much country butter was sold through the village grocer in past years. He, in turn, had two common ways of disposing of it. The better grades were frequently set aside to be sold to store customers. The remaining butter, which constituted the larger per cent purchased, was dumped into a barrel. At intervals—usually much too protracted—this bulk butter was sold to renovating plants, to some creameries, or to packing plants. The butter arriving at these places was nearly always unfit for human consumption because it had not been properly refrigerated while at the store nor while being transported to the renovating or processing plant. Hence the renovators had the task of renovating, or of recreating, a “fit” food from an unfit product.

At the butter renovating plants, the country butter was reprocessed to remove the odor and gross impurities, to recreate to some extent the flavor in the butter, and to give it as excellent a body as possible. Usually the butter was melted, strained, washed in water, aerated, pasteurized, and “re churned” with the use of a milk starter. Animal fats were sometimes added to effect a better taste and appearance. Some of the renovated country butter was mixed with second grade creamery butter and in this manner placed on the market.

FEDERAL LEGISLATION AND THE PRODUCTION OF RENOVATED BUTTER

As creamery butter production has become more prominent, farm butter production has become less prominent. Today the production of surplus farm butter is largely restricted to certain areas. Left to its fate, it will probably disappear from the channels of trade as soon as creameries become accessible to all surplus cream production regions, and the farm practices become adjusted to newer developments.

The decline of surplus farm butter, however, has been hastened by legislation. A federal act of 1902, entitled “An Act defining butter, also imposing a tax upon and regulating the manufacture, sale, importation, and exportation of oleomargarine”, placed, among other things, a tax of one-fourth of one cent per pound on renovated butter.² The act also provided for the proper inspection of plants engaged in the production of this food and stipulated that the quality of renovated butter shipped in interstate commerce should be of satisfactory standard. The act was clearly designed to establish such standards for renovated butter that it would become increasingly more unprofitable to market it. In addition the act made the bold requirement that renovated butter shipped in interstate commerce must be marked “Renovated Butter”. These statutory

² Statutes at large, 57th Congress, 1903-4, Vol. 32, Part 1, pp. 193-97, Chapt. 784, May 9, 1902.

requirements plus the more widespread use of creamery butter have served to restrict to a greater and greater extent the sale of renovated butter. Whereas its production and sale in the United States exceeded 62 million pounds in 1907, the output was reduced to about one million pounds by 1932.³ No butter is renovated in Nebraska at this time.

CREAMERIES IN NEBRASKA

EARLY CREAMERIES

The first creamery in the United States was built in Orange County, New York, in 1861.¹ Six years later the first creamery in Illinois was constructed and Iowa, according to the same report, acquired its first creamery in 1871. According to available records, Dexter F. Woods erected a plant for the manufacture of dairy products at Palmyra, Nebraska in 1868.² Prior to 1870 the plant was used for the manufacture of cheese. In 1870, it is reported, it began the manufacture of butter and the plant continued to operate until 1881.

Additional creameries were built in Nebraska in the seventies, but the exact number is not known. The real boom in the building of creameries was delayed until the eighties. This boom resulted from a combination of factors. When the drouth and the grasshopper plague of the seventies had been forgotten, great waves of new settlers arrived during the eighties and occupied the new land up to the western border of the state. The "up-building" activities in every part of the state made for a boom in every activity. A series of years with adequate rainfall caused unwarranted optimism. Easterners, not realizing the limitations of the semiarid nature of much of Nebraska and adjoining states north and south, invested freely in all enterprises promoted in this western country.

The overpromotion of the creamery industry in the eighties is also traceable in part to an unadjusted agricultural situation. Crop patterns had not been fully established in these early years. Trial-and-error methods of farming were required to establish these on a somewhat fixed basis. The proponents of various farming methods advocated their particular method of farming. Among such proponents were the advocates of dairying. Since Nebraska produced great amounts of excellent feed for dairy cattle, they believed that the state would become a prominent dairy state in a few years.

In this unstable, optimistic period appeared the early creamery promoters. In a few years creameries thus promoted and constructed were abandoned in all parts of the state. According to S. C. Bassett, for many

³ Pirtle, T. P., *A Handbook of Dairy Statistics*, U. S. Dept. of Agriculture, Washington, D. C., 1933, p. 85.

¹ *Yearbook of Agriculture*, 1899, p. 386.

² Rector, E. T., "Nebraska as a Butter State," address given at the formal opening of the Dairy Barn, University of Nebraska, College of Agriculture, Lincoln, October 21, 1926.

years secretary of the Nebraska Dairymen's Association, this state had 38 local cooperative and independent creameries in 1885.³ Of this number not one was in operation in 1912. In all, 316 creameries had been built in this state by 1912, not including centralized creameries having their headquarters in Omaha and Lincoln. Of this number, less than 40 plants were actually operating in this same year.

Mr. Bassett says that the cost of these creameries ranged from \$5,000 to \$10,000 and that this average cost approximated \$7,000.⁴ Mr. Bassett's estimates indicate that Nebraskans invested \$2,212,000 in small creameries prior to 1912. Since only about thirty of these plants operated in 1912, it appears that Nebraska individuals invested about \$2,000,000 in creameries with no material benefit to themselves.

During the period of the World War, creamery promotion was not particularly active in Nebraska. According to Stitts and Laughlin,⁵ 51 local cooperative creameries were organized in Nebraska by 1935, all but 7 of these being organized between 1921 and 1931. Many of these plants were promptly precipitated into financial difficulties. As a result, some ceased operating; others, after being reorganized and refinanced, continued to operate.

The number of creameries erected in this state does not indicate the number of plants actually operating. Determination of the number of operating plants is complicated by the fact that many plants operated only part of the year, particularly prior to 1900. From 1885 to 1915 the annual reports of the Nebraska Dairymen's Association listed the number of creameries in this state. Only a small percentage of these plants operated the year round. These data are further complicated by the fact that in some years no clear distinction is made between creameries and skimming stations. It seems reasonable to assume that prior to 1920 the number of operating creameries in Nebraska at any one time rarely exceeded 50 plants. Since 1920 the number of licensed creameries has increased considerably. According to duplicates of license receipts in the Nebraska Department of Agriculture, this state had 113 operating plants in 1928, 154 in 1931, and 149 in 1933.

The rapid increase in the number of operating creameries since 1920 must be attributed largely to increased dairying as a result of the unadjusted farming conditions that have prevailed since the World War period.

³ *Annual Report of the Nebraska Dairymen's Association*, 1912, pp. 133.

⁴ *Idem.*

⁵ Stitts, T. G., and Laughlin, G. C., *Operating Problems of Nebraska Cooperative Creameries*: Bull. 11, Farm Credit Administration, Cooperative Division, March 1937.

CENTRALIZER CREAMERIES

The percentage of local creameries failing has always been exceedingly high in Nebraska. The most important reason for this failure is the relatively small milk-cow population in Nebraska. Many plants could not obtain enough cream within their trade area to operate a creamery efficiently. The shortage of cream was particularly acute during the winter months, when cows produced a negligible amount of milk and cream. As a result, many creameries ceased operation with the advent of winter. A heavy investment in plant equipment, however, required continuous operation to cover expenses and to insure some profit. Good butter-makers were scarce in the early days, and hence could be obtained only at a high price. As is frequently the case in cooperative enterprises, poorly trained managers and operators were employed. This led to poor and wasteful operation of plants.

Another difficulty experienced by early creameries relates to the marketing of butter. Because of unstandardized production methods with varying qualities of cream, a wide variety of types of butter was produced, and it was difficult to market such butter profitably. Small producers or creameries had to sell their butter to Eastern wholesale houses which could virtually set their own prices. Small, unorganized plants could not avoid the Eastern middle man, nor could they offer him a uniform quality of butter. The result was mutually unsatisfactory.

The development of the great centralizer creameries⁶ is an outgrowth of the conditions discussed above. The small surplus of butterfat which was not sufficient to support a local creamery could be gathered over large areas, and in the aggregate it could supply the raw material for a large butter-manufacturing plant. Large centralizer creameries could obtain expert butter-makers who could produce butter of as good quality as the quality of the cream permitted. The cream received at such plants could be graded and large quantities of various grades of butter could be produced. Mass production of butter also permitted favorable marketing. Representatives of centralizers could be sent to, or be maintained in, butter-consuming centers to obtain information with regard to the type of butter desired. Better freight rates could be obtained on large shipments. Centralizers pioneered the way in wrapping and boxing butter in more attractive containers. They could also afford to advertise brands of butter and thus push their product on the market.

The period from 1900 to 1920 was preeminently the period of the centralizer creameries in sections of the United States where the cow population was insufficient to support local creameries. Nebraska seemed

⁶ A centralizer creamery is a butter-manufacturing plant which obtains its butterfat through a number of cream-buying stations or through direct shipments from points which may be several hundred miles distant.

particularly well suited for the growth of these plants. This fact is well illustrated by the growth of such establishments in Omaha. In 1899 Omaha had but two small creamery establishments, whereas in 1909 it had four large centralizer creameries which produced 49.3 per cent of the total value of butter produced in the entire state.⁷

There is much evidence to sustain the contention that Nebraska has several of the largest creameries in the world. Census data show that this state has a greater average production of butter per creamery than any other state; the average record per plant slightly exceeded 1,200,000 pounds in 1929. Unfortunately, the census figure for total number of plants does not include creameries producing less than 5,000 pounds per year, a factor which invalidates to some extent the above comparison. The high production average results from the presence of numerous centralizers. Prior to 1920 one large creamery in Omaha produced about 16,000,000 pounds of butter in one year. This was more butter than the aggregate of country butter made in the entire state during the same year. States in which the average output exceeds 500,000 and 600,000 pounds usually have a large number of centralizers.

The average output of creameries in Minnesota, Wisconsin, and Iowa ranged from 300,000 to 400,000 pounds in 1929. A much greater concentration of milk cows in these states makes it possible to obtain considerable quantities of butterfat in small areas. Nearly all of this butterfat is marketed daily or several times a week to local plants for the production of a superior quality of butter. Cream stations which play such an important part in the Nebraska butter industry are relatively less important in these more specialized butter-producing states.

OUTPUT OF NEBRASKA CREAMERIES

The production record per creamery operating more than one year in Nebraska can readily be ascertained from duplicate license receipts in the State Department of Agriculture. The first year's license to operate a creamery in the state costs \$10. The second year's license fee is \$10 for the first 100,000 pounds of butter produced in the previous year plus \$2.00 for each additional 100,000 pounds or fraction thereof.

Figure 10 shows the output of various creameries during the 1933-34 fiscal year. It will be noted that each of 13 "creameries" produced up to 50,000 pounds of butter during this year. Most of these plants, however, were not strictly creameries but dairy plants, which processed a variety of dairy products. No plant producing only butter could long sustain itself on such a modest production record. Seven plants produced from 1,000,000 to 2,000,000 pounds of butter, and twelve produced from 2,000,000

⁷ *Thirteenth Census of the United States, 1910, Vol. XI, p. 694.*

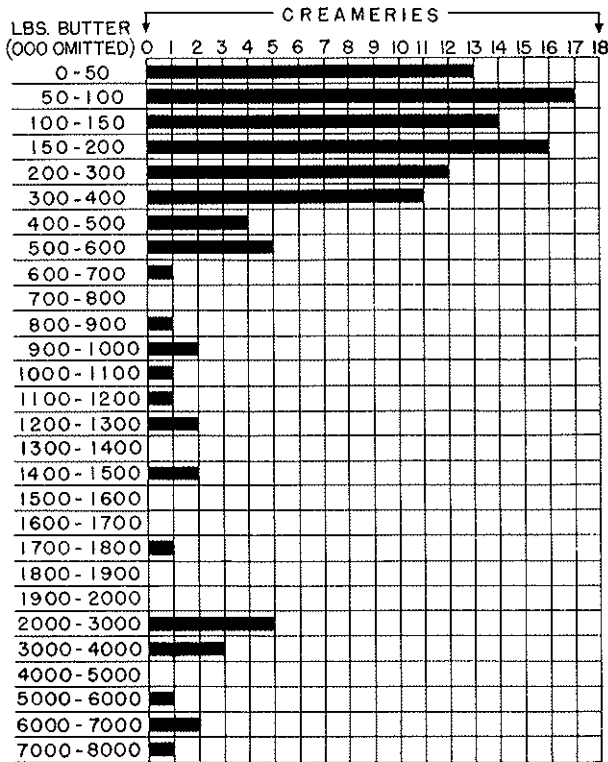


FIGURE 10.—Grouping of Nebraska creameries by output of butter from July 1, 1933, to July 1, 1934.

Source: Duplicate license receipts in the office of the Department of Agriculture, Lincoln.

to 8,000,000 pounds. Local creameries rarely produce more than 1,000,000 pounds of butter annually, and large centralizer creameries rarely produce less than this amount.

PROPRIETARY AND CORPORATION CREAMERIES

Proprietary creameries are owned by one or several individuals who receive all the profits or bear all the losses. Proprietary creameries are restricted to the smaller firms because every partner is individually responsible and liable for all debts of the firm. Numerous small proprietary creameries are found in this state. They frequently engage in the processing of a variety of dairy products, such as butter, ice cream, and bottle milk.

Corporation creameries differ from proprietary creameries in that each stockholder is liable only to the extent of the amount of money he invested

in the enterprise. This feature makes this form of organization particularly attractive as a promotion or an investment enterprise. All the large centralizer creameries in Nebraska are corporation creameries. Many of the small plants over the state are also corporation creameries in that they are financed by stock and the investor's liability is limited to the extent of his investment. All farmers' cooperative creameries are corporation creameries.

Cooperative creameries may be classified as local cooperative creameries or centralizer cooperatives. Each of these groups may be subdivided according to plans of incorporation and management. A brief consideration of these distinctive types of creameries follows.

LOCAL COOPERATIVE CREAMERIES AND COOPERATIVE CENTRALIZERS

A considerable number of local cooperative creameries have been built in this state, largely since the period of the World War. A number of these were operated for short periods of time only. Others have fared fairly well because of proper management, the availability of sufficient butterfat, and a cooperative spirit among the farmers.

The money to construct and equip the common cooperative creameries is obtained by selling units of stock, the denominations of which usually vary from \$5 to \$25 with the \$10 unit the most popular. The stock, in nearly every instance, is sold to farmers as well as to merchants of the community where the creamery is to be established. It is desirable that as much as possible of this stock be sold to farmers so as to enlist their full interest in the enterprise. To obtain a rather widespread distribution of the stock, it is also desirable that the units be small. Shares in denominations of \$5 and \$10 seem advisable for this purpose.

The outstanding purpose of the cooperative creamery is to bring the greatest possible return to the butterfat producer. Various plans are used to accomplish this. The two plans commonly used in Nebraska are the *interest-butterfat price-dividend plan* and the *interest-butter price plan*.

According to the interest-butterfat price-dividend plan the creamery offers the standard butterfat price or sometimes slightly more for cream. Returns from the sale of butter are first used to cover all operating expenses, including a sum to cover depreciation and the payment of a fixed interest charge on the stock. In local cooperatives this fixed interest charge commonly ranges from 4 to 8 per cent. The surplus which remains at the end of the year, after the fixed charges have been covered, is then divided as a patrons' dividend. The size of each dividend depends upon the amount of the surplus and the amount of the butterfat sold by the patron to the creamery. Not all cooperative creameries consistently accumulate a surplus, and in the absence of surplus earnings a dividend cannot be

declared. Some cooperative creameries have declared patrons' dividends ranging from $\frac{1}{2}$ cent to 3 cents per pound of butterfat purchased.

It is sometimes possible for local creameries, cooperative or otherwise, to offer more than the standard butterfat price offered by other purchasers. Such a price may or may not be warranted by the earnings of the creamery. The increased price offered, however, in nearly every instance leads to price imitation by other purchasers of cream in the same town and district. By such methods the price advantages brought to a community by a cooperative creamery may be offset by reprisal methods of other cream-purchasing establishments. The practice of price imitation or matching has resulted in the failure of many local creameries.

Creameries operated under the interest-butter price plan are also financed by the sale of stock, denominations usually ranging from \$5 to \$25 per share. Butter is made from the patrons' cream and sold at the most advantageous prices. Returns from the sale of butter are first used to pay interest charges and operation costs. The balance of the return is then prorated to the patrons in proportion to the amount of butterfat sold. This means that the butterfat producer receives the maximum returns promptly from current butter prices, provided the processing of the butter is done economically. The common practice of creameries operating under this plan is to prorate the butter returns every two weeks. Thus the complete returns to the farmer are realized more promptly. The increased price which creameries using this plan may offer is also met by other cream-purchasing establishments.

Not all cooperative creameries in Nebraska are local ventures, more or less dependent upon a local supply of butterfat for operation. Cooperative creamery enterprises have also appeared as centralizers, which obtain butterfat by the cream-station method. As a result their field of operation is greatly extended. At present two systems of farmers' cooperative centralizers are operating in Nebraska, *viz.*, the Farmers Union Co-operative Creamery Company with plants at Superior, Aurora, Fremont, Fairbury and Deshler and the Farmers Equity Co-operative Creamery Association with plants at Orleans and Crawford.

The Farmers Union Co-operative Creamery Company was organized in 1917, and its first creamery was established at Superior, Nebraska. The concern was incorporated for \$500,000, and this amount was divided into 50,000 shares with a par value of \$10 per share. Stockholders are limited to members of the Farmers Educational and Co-operative Union of Nebraska and other states, with the further restriction that they may not own stock in a competitive institution. Local farmers' union associations may own from ten to one hundred shares of stock and may share in the dividends of the company accordingly.

The directors, after paying all overhead expenses and setting up a fund for improvements and extensions, are allowed to pay a maximum of 8 per cent in dividends. Any profits remaining are prorated to the patrons in proportion to the amount of the business. Payments to non-members are not made in cash but are given as credit on stock.⁸

The farmers Equity Co-operative Creamery at Orleans began operation in 1917.⁹ It is a member organization of the Farmers Equity Union, a national organization founded in 1910. The national organization has been instrumental in the establishment of many cooperative ventures in the grain belt, most important of which are grain elevators. Besides the Orleans creamery another plant is operated at Crawford, Nebraska, and at several other points in the Middle West.

The Farmers Equity Co-operative Creamery at Orleans was incorporated with a capital stock of \$500,000, divided into 5,000 shares of \$100 each. The articles of incorporation of this firm limit the dividend on outstanding stock to an amount not to exceed 3 per cent. This modest dividend payment makes a considerable percentage of the net earning of the association available for patronage distribution. Briefly, the net earnings of the company are distributed as follows:

- (1) In the event of certain expected obligations money is set aside in a sinking fund.
- (2) Reasonable reserves are maintained to meet depreciation, business requirements, and contingencies.
- (3) Dividends may be declared on outstanding stock not to exceed 3 per cent.
- (4) The balance of the earnings are allocated on a patronage basis which may be at different rates upon different classes or kinds of goods handled.

CREAM BUYING PRACTICES IN NEBRASKA

EARLY METHODS

The oldest system of transferring cream is direct delivery by the producer to the creamery. This method is still popular in places where there are local creameries. It has the advantage of establishing a close relationship between cream producer and butter producer. In this relationship, the latter may offer suggestions to the cream producer as to practical methods of improving the quality of the cream sold. Price differences may also be adjusted readily where contact between producer and processor are common.

⁸ *Article of Incorporation and By-Laws of Farmers Union Co-operative Creamery Company, Superior, Nebraska.*

⁹ For full information about the Farmers Equity Co-operative Creamery Association of Orleans, Nebraska, see its Articles of Incorporation and By-Laws.

Cream-gathering routes were common in Nebraska during the eighties. The small cow population of this state at this early period, however, made it impossible to gather sufficient cream in the small radius circumscribed by the horse-and-buggy method of transportation. Hence many creameries failed. In the nineties, the cream-gathering practice disappeared. Not until the 1920's did the cream-gatherer reappear; at this time he was equipped with an auto truck. The extension of the good road system of the state helped his purpose considerably. By covering a greater territory the truck can partly overcome the problem of sparse cow population and small cream production averages per farmer.

A good deal of conflicting opinion exists among creamery men regarding the merits and demerits of the cream-gathering plan. Obviously, the plan may not be recommended to all creameries, for the costs of such an overlapping system would be suicidal to the industry. For individual plants, the cost of cream gathering should determine whether or not the system should be used. Important considerations determining the cost are (1) density of cow population and distance traveled, (2) average cream production per farmer, (3) seasonal variation in cream production, (4) condition of the roads traveled, and (5) willingness of cream producers to dispose of cream to cream haulers.

The number of creameries that have engaged cream haulers in recent years have varied but an increase may be noted. At present, the practice is not common among cooperative creameries in the eastern part of Nebraska. A number of these plants show cost figures for hauling that compare very favorably with the average cost of obtaining cream by the cream-station method. For the plants interviewed during the summer of 1934, the average cost of hauling cream ranged from 1½ to 4 cents per pound. In most instances, the hauler drives his own truck and receives this price for compensation. Not every creamery can institute the hauling system profitably. If a number of creameries are located in a small area, the institution of the cream-gathering system by one plant may compel neighboring plants to do likewise. Hence, considerable overlapping in routes may occur with a consequent reduction in amount of cream obtained by each hauler. In this manner, the cost per pound of butterfat gathered may become disproportionately high.

Creameries operating under the cream gathering plan cite a number of its advantages. The common practice is for cream gatherers to cover a given route twice a week which insures the delivery of a relatively good quality of butterfat at the creamery. If there were no hauler, much of the cream would reach the market only once a week or at an even greater time interval. From the better-quality cream may be made a better butter, which in turn brings a higher price on the market. All experienced cream-

ery men insist that the most money is made on the higher-quality butter.

A more sustained weekly butter production record may be maintained if cream is purchased daily in relatively equal amounts throughout the week. In the absence of haulers, the amount delivered to the creamery would be great on certain days and much cream would have to be processed. On other days the plant would be, for the most part, idle. This situation is undesirable.

CREAM STATIONS

The growth of the cream station in Nebraska parallels the growth of the centralizer creameries. These two institutions have developed largely since 1900. Statistics on the number of cream stations in Nebraska in the early part of this century are not available. Since 1928, the number has ranged from about 2,200 to 2,900. The number of competitive stations in a single village or town ranged from 1 to as high as 18 at the time of this study.

Cream stations may represent separate institutions which specialize in the handling of farm produce, particularly cream and poultry, or they may represent an associate activity of various other business enterprises. In the latter instances, cream may be bought by general-merchandise stores or by firms which engage in the handling of tools and implements. In 1929 2,253 stations were operating in Nebraska of which number 2,135 were operated on a commission basis, 45 were run by salaried employees and 73 were independent stations.¹ Independent buyers own their station equipment, determine the price they wish to offer for butterfat, and sell the cream purchased to creameries which offer the best price. The larger number of stations are company equipped and company managed. Station men are hired to purchase cream at a price determined by the creamery managing the station, and "commission-station-operators" receive several cents, usually 2 to 4 cents, per pound of butterfat purchased. In late years the price has approximated more nearly the lower figure.

In 1929, the 2,253 stations operating in Nebraska shipped 33,533,620 pounds of butterfat to creameries, while the state produced 52,792,254 pounds. Assuming that cream moves to cream stations into and out of the state in equal volume, 64 per cent of Nebraska butterfat was marketed by stations. Figure 11 shows that the figure is exceeded by only two other states, viz., Kansas and Utah. Since Nebraska is the fourth state in the Union in butter production it is interesting to compare the percentage of cream shipped by the stations in the four leading butter states. Minnesota, leading butter state, shipped 10 per cent of its butterfat by the station method in 1929. Iowa, the second butter state, shipped 27 per cent and

¹ *Assembling of Butterfat Through Cream Stations*, Distribution No. A-201, U. S. Bureau of the Census, Washington, 1932.

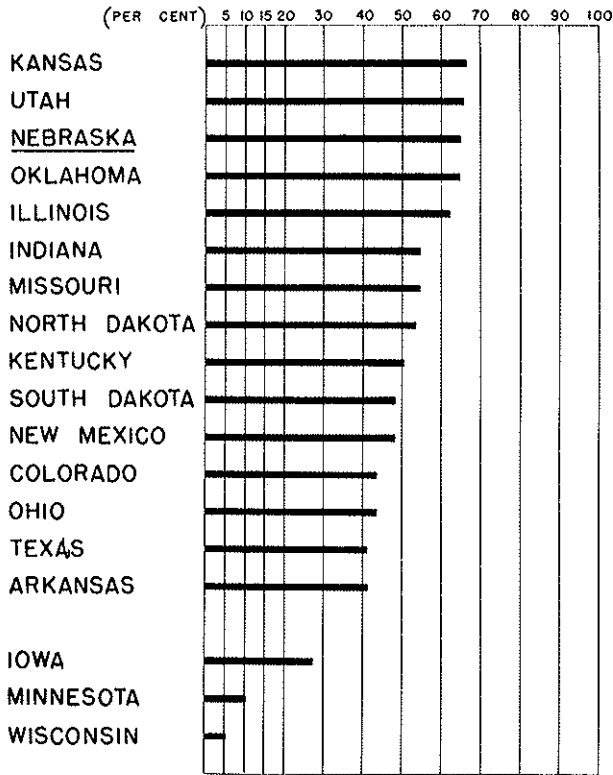


FIGURE 11.—Percent of farm sales of butterfat reported purchased by cream stations in 1929. Chart shows states reporting more than 40 per cent of butterfat as purchased by cream stations (upper part of chart) and also the three leading butter producing states of Minnesota, Iowa, and Wisconsin (lower part of chart).

Source: *Assembling of Butterfat through Cream Stations*, Distribution No. A-201, U. S. Bureau of the Census, Washington, 1932.

Wisconsin, the third butter state, shipped nearly 5 per cent by this method. A high percentage of the butter produced in Minnesota and Wisconsin is sweet-cream butter, the production of which required the daily marketing of fresh quality cream.

The butterfat shipped by the Nebraska cream stations in 1929 was valued at \$14,225,817 and the creameries paid \$901,015 in salaries, wages, and commissions to station operators. The salaries, wages, and commissions paid equalled 6.3 per cent of the butterfat value, or, 2.7 cents per

pound of butterfat. The latter expenses represent but a fraction of the butterfat procurement costs of creameries.

The minimum equipment needed for a cream station are scales, a Babcock testing device, shipping cans, and facilities to provide hot water and possibly steam. Hot water is necessary to perform the butterfat test and is also frequently used to clean the producer's cream can. The supply of hot water is often inadequate to clean a large number of cans so a boiler producing steam under pressure is desirable. Cans can be cleaned more readily and more thoroughly with this piece of equipment.

Cooling facilities are also essential for cream stations. Formerly few stations were equipped to maintain stored cream at proper temperatures. Deterioration of the cream was, therefore, common. Recent attempts to improve the quality of butter made from "station cream" have led to the adoption of various cooling devices in stations. Frequently the cans are merely placed in water of varying depth and of relatively cool temperature. Since village and city water is not always very cool in summer, this method is not always effective. During very warm periods, ice should be added to moderately cool water. In places where a plentiful supply of water is available, the spray system is often used. Under this method, cream cans are placed under a constant shower of fine spray. This assures a cream-can temperature slightly below the temperature of the water. The burlap-sack method of keeping cream cool has also been used in recent years. A wet burlap sack is placed over the cream can, which is kept in a shaded, relatively cool place. Evaporation of the water in the wet sack will lower the temperature of the cream can over which it is placed. For very short periods of time, this method has much to commend it. It is cheap in operation and entails little time and effort to apply. Since station cream is frequently old when it is sold by the producer, the best of cooling methods should be used by all stations, and the cream should be forwarded to the centralizer as promptly as possible.

Prior to the use of auto trucks, all cream was shipped from station to centralizer by railroad. With the coming of the truck and good roads, truckers have acquired most of the shipping business. Many large centralizers now have varying numbers of cream-gathering trucks which cover given station routes several times each week. The object is to get the cream to the centralizer as promptly and cheaply as possible. In Nebraska no cream may now legally be kept in a cream station for more than 48 hours.

DIRECT SHIPPING SYSTEM

Some large creameries do not use the station method of procuring cream from the farmer, but attempt to establish a clientele among direct shippers. Since such creameries need not maintain cream stations nor pay

commissions to station cream buyers, they are in a position to pay a price several cents above the standard cream station price. Large cream producers frequently avail themselves of this additional price increment. Small producers do not use the system so commonly because of the time involved in shipping the cream and awaiting the return of the check.

THE PRODUCTION AND DISPOSITION OF CREAMERY BUTTER

THE MANUFACTURE OF BUTTER

The making of good creamery butter, like the processing of all good dairy products, depends, first of all, upon the production of clean wholesome milk and cream. The precautions suggested for the production of clean milk should be observed up to the time of separation, which should occur immediately after straining,¹ while the warmth of the milk still approximates body temperature. A warm temperature is essential for the proper separation of the fat globules from the non-fatty portion of milk.

The condition of the separator with reference to cleanliness is highly important if quality cream is to be produced. The separator should always be washed after it is used. Experience has shown that a good washing powder is preferable to soap as a cleanser for milk utensils. A generous quantity of boiling water should be used to sterilize all cans, pails, and separator parts. After being washed, the utensils should be exposed in a well-ventilated place, preferably in sunlight.

The practice of washing the separator only once a day results in the production of an inferior cream and inferior butter. Millions of bacteria will remain and multiply in that portion of the milk which lodges in the separator after it has been used, their rate of increase depending largely upon the temperature. These bacteria in the machine mix with the fresh milk and cream and add greatly to the infection of these products resulting in a more rapid souring and deterioration of the cream.

Ideal Richness of Cream for Churning. The ideal richness of cream for churning is a fat content of about 33 per cent.² Since some dilution of cream results with the rinsing of cream cans and the churn, the cream flowing from the separator should test slightly above 33 per cent. Authorities agree that for the best quality cream, the separator should be set to produce a butterfat of between 35 and 45 per cent fat. Cream with a smaller concentration of fat deteriorates more rapidly, reduces the farmer's allotment of skim milk, and churns less effectively. A separator set to give a higher concentration of butterfat wastes a greater percentage of the fat, and the highly concentrated cream is difficult to handle.

¹ See *The Milk Industry of Nebraska*, by Walter Kollmorgen, Bull. 15, Conservation and Survey Division, University of Nebraska, 1937, pp. 31-34.

² Hunziker, Otto F., *The Butter Industry* (2nd ed), pp. 98-99.

Following separation, the cream should immediately be cooled to a temperature of about 50° F. or less, but it should not be frozen. Warm cream should never be added to cold cream but should be cooled before being added. The method recommended for cooling milk may also be used with satisfactory results for cooling and keeping cream.

The best butter is made from sweet, fine-flavored cream, which should be slightly soured by the addition of a culture before churning. This culture should contain only such bacteria as impart the proper aroma to the butter. Cream soured by the more common method of merely aging contains types of bacteria which, upon multiplying, impart objectionable flavor and taints to the butter. Similar bacteria also cause fermentation, high acids, molds, and yeast growths. To assure the consistent selling of good butterfat, the well-cared-for cream should be marketed daily or at least two or three times a week. This practice may be varied somewhat in accordance with prevailing temperatures.

Effect of Time, Temperature, and Bacteria on Cream. Milk, as it issues from the cow, is not sterile. Numerous bacteria are lodged in the milk organs of the animal, and some of these escape with the milk flow. In milk from a healthy cow, these bacteria are not unfavorable to the health of the consumer. At certain temperatures, however, such bacteria will cause souring, and eventual putrefaction.

A considerable addition of bacteria to the milk occurs upon its exposure to the air, even if the utensils containing the milk are relatively sterile, for the air is always charged with countless numbers of this minute form of life. Milk and cream form an ideal environment for bacterial growth provided the temperature is reasonably high. All dairy products intended for home consumption and the market should, therefore, be chilled properly and be kept at temperatures that will arrest the growth of bacteria as much as possible.

Bacterial growth is directly related to time and temperature. Cream, with an original bacteria count of 31,000 per cubic centimeter, kept at a temperature of 50 degrees Fahrenheit showed an increase to 1 million bacteria per cubic centimeter after the first day, 22 million after the second day, 47¾ million the third day, 65 million the fourth day, 150 million the fifth day, and 663 million the sixth day. Cream with an original bacteria count of 37,000 per cubic centimeter, kept at a temperature of 80 degrees Fahrenheit showed an increase to 63 million after the first day, 150 million the second day, 400 million the third day, 1,500 million the fourth day, 6,400 million the fifth day, and too many to count after the sixth day.³ The average summer temperature in Nebraska is not much

³ According to information compiled by the Cream Quality Improvement Committee, Dr. N. W. Hepburn, Chairman.

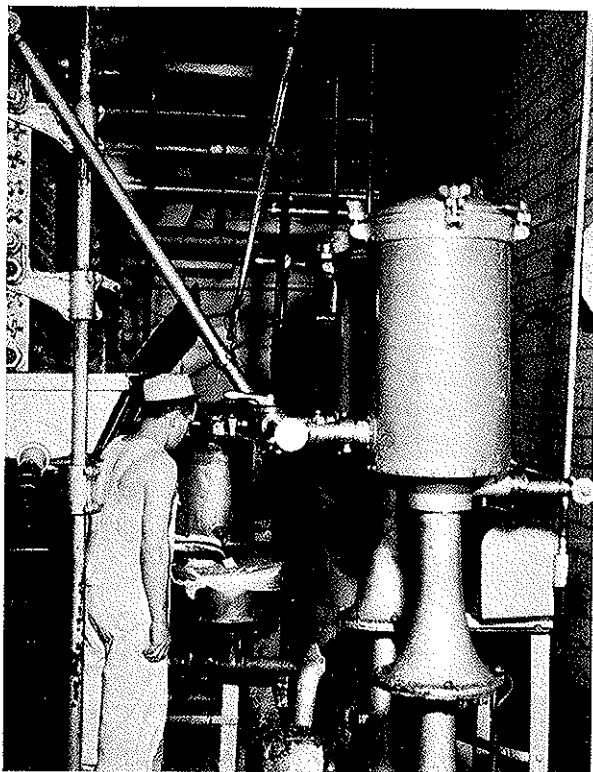
below 80 degrees. The cream kept at a temperature of 50 degrees was classified as sweet cream after three days, good cream after five days, and old cream after the sixth day. The cream kept at 80 degrees was graded as good sour cream after the first and second days, too high acid cream after the third and fourth days, and too sour and old after the fifth and sixth days. The uncooled cream is unfit for butter-making after the second day. A surprisingly great amount of cream in such condition, however, is still converted into butter. One of the greatest challenges confronting the dairy industry of Nebraska as well as of many other states is to improve the quality of marketed cream.

The Grading of Cream by Creameries. Cream deteriorates rapidly at the ordinary prevailing temperatures, particularly at temperatures of 50° F. and upward, and, as a result, many different grades or qualities of the product arrive at creameries daily. Feeding practices and methods of handling milk and cream further vary the standard of such cream. Large creameries therefore classify or grade cream before churning it because a direct relationship exists between the quality of the cream and the butter that is made from it. The unlike grades of cream are then processed somewhat differently so as to obtain the best butter possible from the various grades. The extent to which cream may be classified in a creamery depends largely on the size of the plant and the amount of butterfat handled. Small plants receiving modest amounts of different grades of cream cannot classify it as thoroughly as large plants can and do. Small plants, however, are usually located in closer proximity to cream producers, and for this reason may not obtain large amounts of poor-quality cream.

Neutralization of Sour Cream. After cream has been graded and strained, the sweet cream is immediately pasteurized, whereas sour cream is usually first neutralized. Neutralization consists of adding a given amount of alkali, usually lime, to the sour cream to reduce its acidity to an amount ranging from 1 to 3 percent.⁴ This process is necessary in order to assure effective churning, to guard against undesirable flavor in the butter, and to improve the keeping quality of the butter made.

Pasteurization. Cream that is to be made into butter is pasteurized to kill bacteria which are unhealthy and also to kill such organisms as impart an undesirable flavor to the butter. This means that sweet as well as neutralized (formerly sour) cream is pasteurized. Two methods of pasteurizing cream are generally approved. The more common method is to heat the cream to a temperature of about 145° F. with an exposure of about 30 minutes. A quicker method, known as the flash process, requires an exposure of less than one minute at a temperature of 180° F. These methods may be slightly varied to suit plant methods and plant equipment.

⁴ Hunziker, Otto F., *op. cit.*, p. 143.



Picture taken in the Beatrice Creamery Company plant, Lincoln

FIGURE 12.—Flash-system of pasteurizing cream for butter production. Heating of the cream takes place in the two upright cylinders on the right.

Cream Ripening. Cream coming from the pasteurizer is not ready for the churn, as the pasteurizer has indiscriminately killed nearly all the bacteria, including those which impart to the resulting butter the proper flavor, aroma, and texture. To reestablish these desirable bacteria, a starter of culture is added. This starter contains only those bacteria which produce the desired qualities. Ordinarily from 7 to 10 per cent of the volume of the cream is added in the form of starter. The added bacteria are then permitted to multiply in the cream at a favorable temperature, ranging from 65° to 70° F.⁵ After a number of hours, usually overnight, the cream becomes mildly sour and is ready to be churned. This process of slightly souring the cream is called "cream ripening".

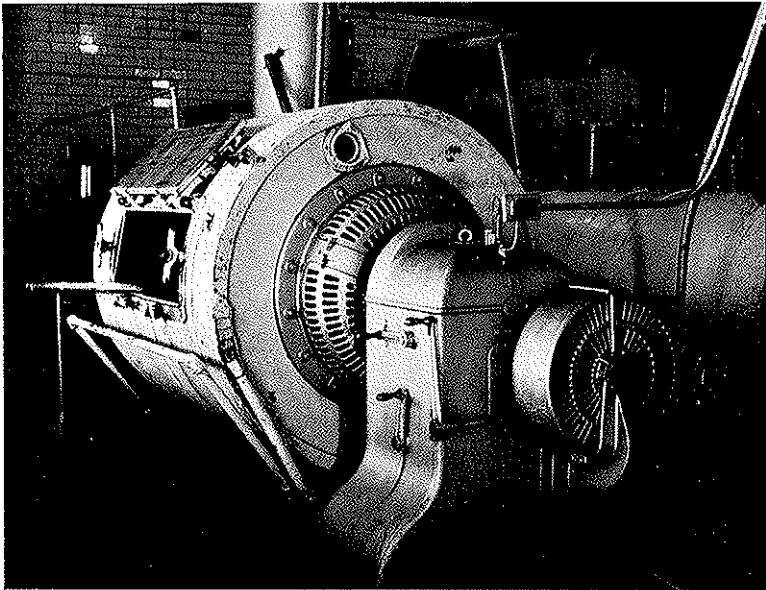
⁵ Hunziker, Otto F., *op. cit.*, p. 245.

Not all creameries ripen cream before churning it. Large and well-equipped creameries do so almost without exception, but smaller creameries do not follow the practice very generally. From the standpoint of producing quality butter, the practice is good.

Churning of the Cream. The churning temperature for cream may vary from a minimum of about 46° F. in summer to a maximum of about 56° F. in winter. Within these general limits, the temperature should be so regulated that the churning period approximates about 45 minutes.

After the butter is made it is rinsed with cool, fresh water, and worked while still in the churn. The latter operation removes excess water from the butter and improves its texture.

Salt may or may not be added to the butter. Butter used in the production of ice cream must not be salted. There is a considerable market in the East for unsalted table butter. Coloring matter is usually added to the cream in varying amounts. The amount added depends upon the native color of the butter, the section of the country where the food is to be sold, and the preference of various classes of people. Generally the southern market prefers a deeper shade of yellow in its butter than the northern market. The Jewish trade demands uncolored, unsalted butter.



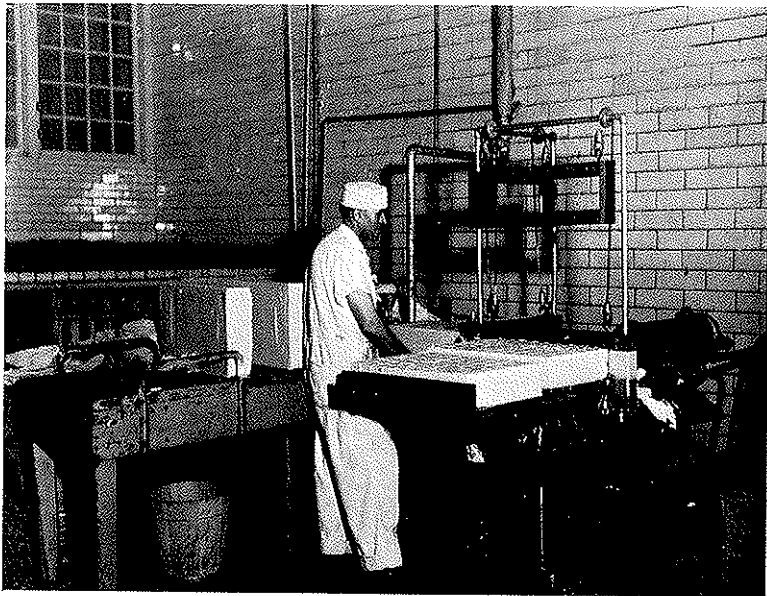
Picture taken in the Beatrice Creamery Company plant, Lincoln

FIGURE 13.—Churn in which 4,000 pounds of cream may be churned at one time. It is the largest churn in Nebraska at this time.

Churns vary greatly in size in various creameries and dairy plants in the state. In small dairy plants miniature churns which hold several hundred pounds of cream are often used; in large creameries, churns with a capacity ranging from 2,000 to 2,500 pounds are common. At present the largest churn in Nebraska has a capacity of 4,000 pounds of cream.

Packing the Butter. Creamery butter marketed in Nebraska is generally sold in the form of one-pound prints. Such prints are wrapped in parchment paper and sold in this manner or are further enclosed in paraffined cartons.

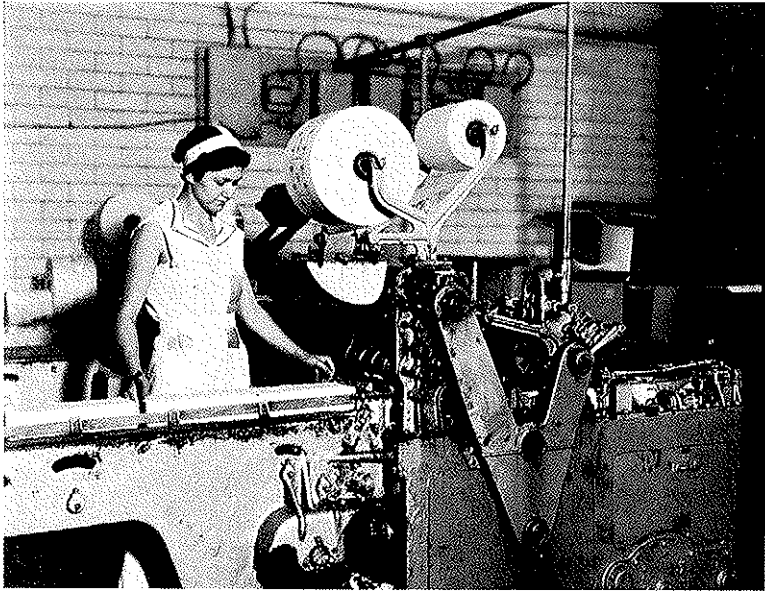
Most of the creamery butter produced in Nebraska is shipped to the large industrial centers in the eastern states. Some of the butter shipped to these markets is cut into one-pound prints, but most of it is shipped in tubs and boxes. The more common container is the tub with a capacity of 60 to 63 pounds. Next in popularity is a box container holding about 50 pounds of butter. These containers are lined with parchment paper before the butter is packed in them. Modern plants paraffin the containers before they are used. This practice arrests the growth of mold on the wood and thus minimizes the danger of its imparting undesirable flavors to the butter. A small percentage of the creamery butter shipped to



Picture taken in the Beatrice Creamery Company plant, Lincoln

FIGURE 14.—Cutting slabs of butter into one-pound prints.

eastern markets is shaped by hand into one-pound rolls and is known as country butter. These rolls are neatly wrapped in parchment paper and are then packed collectively in cardboard cartons. This method of packing butter serves as an interesting example of how butter producers in this section of the country must cater to the buying habits of eastern housewives.



Picture taken in the Beatrice Creamery Company plant, Lincoln

FIGURE 15.—A machine automatically wrapping one-pound butter prints in parchment paper.

Cost of Manufacturing Creamery Butter. No attempt has been made to determine the cost of producing butter by creameries of various sizes in Nebraska. Studies of this kind, however, have been made in other states, and their findings, no doubt, run somewhat parallel to production costs in this states. Table 2 shows the relationship between operating expense per pound of butter and the total annual output of butter per creamery as determined in a study made by the University of Minnesota.

Manufacturing cost figures for creameries of various sizes in Wisconsin were found to be similar to those in Minnesota, according to a publication of the University of Wisconsin in 1928.⁶ The Wisconsin study was based

⁶ *Agricultural Experiment Station Bulletin* 401, August, 1928, p. 18.

TABLE 2.—*Manufacturing Costs of Butter in Minnesota Creameries Grouped According to Output.*^a

Annual Output Group	Cost per Pound of Butter ^b		
	High (cents)	Low (cents)	Average (cents)
Under 100,000 pounds.....	8.1	4.6	5.75
100,000 to 150,000 pounds.....	6.6	3.7	5.05
150,000 to 200,000 pounds.....	5.2	3.5	4.31
200,000 to 250,000 pounds.....	4.6	3.3	4.05
250,000 to 300,000 pounds.....	4.1	3.3	3.77
300,000 to 400,000 pounds.....	3.7	2.8	3.55
400,000 to 500,000 pounds.....	3.4	2.6	3.20
Over 500,000 pounds.....	3.1	2.4	2.98

^a White, William, *Essentials for the Successful Operation of a Local Creamery*, Miscellaneous Publication No. 37, U. S. Dept. of Agriculture, Washington, 1920, p. 2.

^b Does not include transportation cost to market, jobbing expense, nor the cost of putting it in one-pound print forms.

on butter manufacturing costs for 1925. The average cost in Wisconsin ranged from 4.15 cents per pound in creameries producing under 150,000 pounds of butter annually to 2.1 cents per pound in creameries producing over 1,350,000 pounds. Cost data of this kind indicate that a creamery, to function relatively efficiently, should have an annual output of several hundred thousand pounds of butter.

It should be clearly understood that the average cost figures of manufacturing a pound of butter in the Minnesota and Wisconsin plants include only such expenses as are incidental to the operation of the creamery plant.

DISPOSITION OF NEBRASKA CREAMERY BUTTER

A total of about 110,000,000 pounds of creamery and country butter are produced in Nebraska annually. This means an average production of about 80 pounds of butter for each inhabitant of the state. If each inhabitant of this state consumed about 18 pounds of butter annually, which is the approximate annual consumption of butter per inhabitant of the United States, there would be more than 80 million pounds available for export from the state. It is reasonable to believe, however, that the average Nebraskan consumes considerably more than 18 pounds of butter each year. How much more is not known. In 1933 more than 60,000,000 pounds of butter were shipped from this state to the principal markets of the United States, viz., New York, Chicago, Philadelphia, Boston, and San Francisco (See Table 3). Other minor shipments from this state were also made, but no data concerning them are available. These figures do not give a complete answer as to how much butter each Nebraskan consumes because cream is shipped into and out of this state in considerable quantities and this distorts state butter-production records. Small quantities of butter are also shipped into the state.

TABLE 3.—*Receipts of Nebraska Butter in the Principal Markets of the United States, 1922-35^a (In thousands of pounds).*

Year	New York	Chicago	Philadelphia	Boston	San Francisco
1922	24,074	16,958	1,677	2,152	46
1923	20,359	17,433	1,757	3,274	25
1924	24,811	20,054	2,409	6,378	47
1925	25,088	19,361	3,510	8,086	349
1926	27,157	22,505	4,957	8,860	55
1927	28,457	17,090	4,341	10,335	77
1928	28,138	19,498	4,271	12,159	33
1929	26,803	17,450	5,038	12,315	81
1930	26,825	16,225	2,824	7,438	87
1931	29,877	15,136	4,083	4,746	37
1932	33,197	13,918	4,333	4,756	252
1933	33,871	18,281	6,292	4,547	61
1934	37,235	14,833	7,780	4,576	641
1935	26,625	11,089	5,370	3,327	620

^a Compiled from Yearbook of Agriculture, various years.

Since most of the Nebraska creamery butter is marketed outside of this state, the questions of method and cost of transportation are important. As has been stated, most of the product goes to the large industrial centers of the East. The problem of conveying the butter to market, however, varies from plant to plant, depending largely on the location of the creamery and the amount of its output. Large creameries, particularly the centralizers, usually have railroad tracks laid to their loading platforms. Refrigerator cars may thus be loaded at the plant and billed to any section of the country. In recent years, refrigerator trucks have inaugurated regular transportation service to the eastern coast. Some butter is shipped to distant points in this manner. Large centralizers frequently have distributing plants in eastern distributing centers and independent distributor's commission is saved.

Railroads usually do not reach the loading platform of small plants with outputs too small for shipment in carload lots. The butter, however, must be marketed frequently at the best obtainable prices and at a minimum handling and transportation charge. Some small plants ship their butter by truck or railroad to large packing concerns (the packing concern may also operate creameries) or creameries that market this butter under their own labels and through their distributing systems. This practice usually requires the transportation of the butter from the plant to Omaha. Nearly all butter shipped in less than carload lots is sent by truck. This method requires a minimum of handling, and the rates compare very favorably with railroad transportation charges. The railroad transportation charges from several Nebraska points to Omaha on less than carload lots were as follows in June, 1937:⁷

⁷ Courtesy of Burlington Railroad, Lincoln, Nebraska.

Source	Freight per 100 Pounds
Ord	\$0.83 ½
McCook	1.05
Scottsbluff	1.30 ½
Beatrice .....	.57
Hastings .....	.70
Chadron	1.29

Many small creameries of this state do not dispose of their butter to centralizers and packing concerns. Such plants sell all or part of their butter directly to wholesale houses or to retail establishments in or near Nebraska. These outlets, however, are greatly restricted. Eastern markets must still be relied upon to absorb most of the creamery butter. To market less than carload lots in eastern markets presents a problem, because freight charges are relatively high on small shipments. Furthermore, small creameries are usually interested in obtaining payment for butter as promptly as possible. These problems have largely been overcome by the formation of the Nebraska Co-operative Creameries, Inc., in Omaha. Butter in varying amounts may be billed to this firm. In Omaha less than carload lots are combined into carload lots and are then billed to eastern markets. Shippers to and through the Nebraska Co-operative Creameries may also promptly draw a draft upon this organization and the eastern receivers for a modest payment on their shipment. These services, as one may readily understand, are of great help to the small creameries.

Average Annual Butter and Butterfat Prices in Nebraska. Data on average annual butter and butterfat prices in Nebraska are available since 1895 (Figure 16). Prior to 1920, the figures represent the value of butter; butterfat prices are listed for 1920 and afterward. Since 1895, the lowest average annual price of butter was paid in 1896 when butter averaged 10 cents per pound. The highest annual average price for butter was paid in 1919 when it averaged 58 cents per pound in this state. The highest average annual price listed for butterfat was paid in 1920, when it sold for 53 cents per pound. Since 1920, the average annual price has fluctuated considerably. It reached the lowest level in 1932 and 1933, when butterfat averaged only 16 cents per pound.

Comparison of Price of Butter in New York and Chicago with Butterfat Prices in Nebraska, 1924-33. The average monthly price for butterfat is subject to considerable fluctuation. Figure 16 shows the average monthly price of butterfat for the 10-year period from 1924 to 1933. It will be noted that the highest average price for this product is paid in January; this high is followed by a decline of almost 2 cents per pound of butterfat for the month of February. A second high is reached in March, to be followed by the pronounced decline in price for the summer months. Following the seasonal low in June and July, prices again begin to rise.

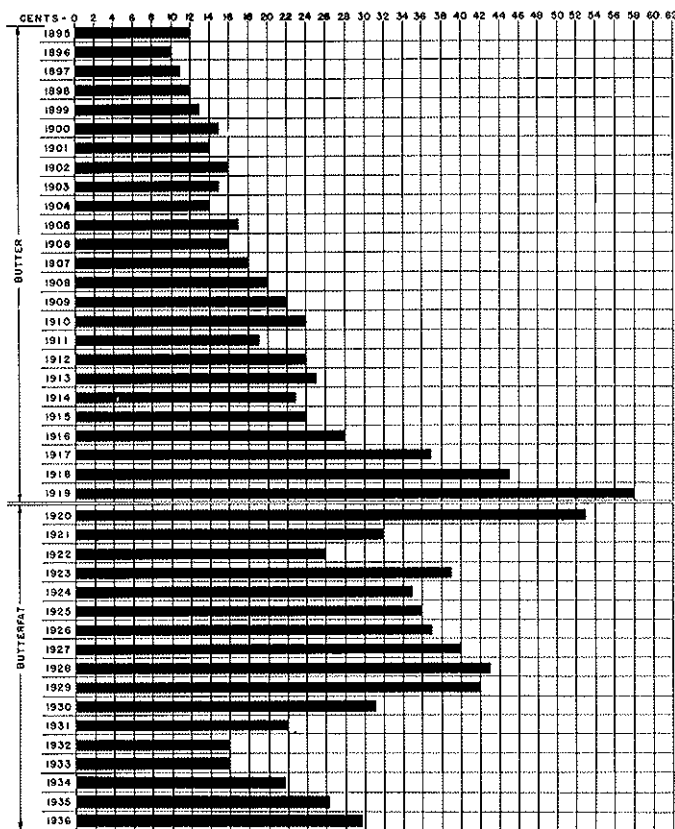


FIGURE 16.—Average annual butter and butterfat prices in Nebraska, 1895-1936. Average price indicated for 1936 is preliminary.

Source: H. C. Filley and Arthur M. Hauke, *University of Nebraska, College of Agriculture Experiment Station Bulletin 284, "Local Prices for Farm Products in Nebraska, 1895-1932"*, Lincoln, 1933. Data for more recent years from State-Federal Division of Agricultural Statistics, Lincoln.

The curve representing average monthly prices does not reflect a consistently reliable price tendency. Departures from this curve are frequent and traceable to a great variety of causes. During 1933, for instance, the plotted prices for butterfat appears in an almost inverted order (Figure 17); the highest average monthly price paid for butterfat during that year was paid during the month of July. A number of abnormal conditions combined to vary the customary price tendency.

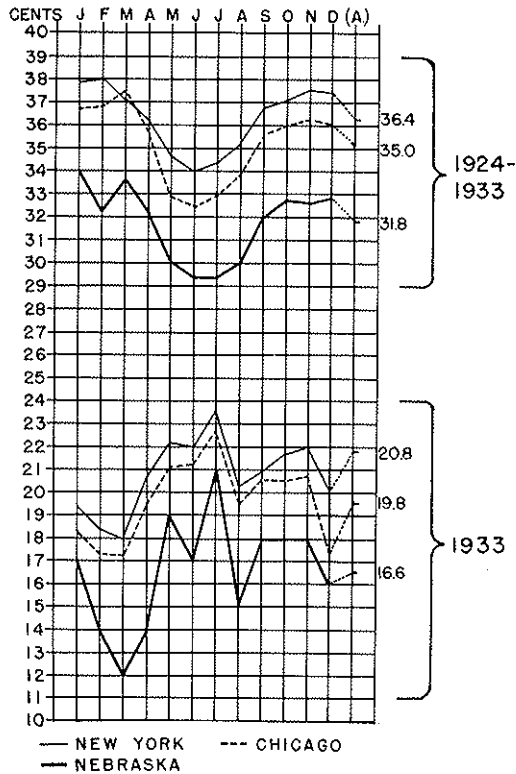


FIGURE 17.—Comparison of average monthly wholesale price of 90-score butter in New York and Chicago with average monthly butterfat prices in Nebraska, 1924-33 and 1933. Average price for year or years indicated on line "(A)".

Source: Butter prices taken from *Yearbooks of Agriculture*; Nebraska butterfat prices obtained from State-Federal Division of Agricultural Statistics, Lincoln.

The normal monthly variation in butterfat prices reflects to a considerable degree the seasonal variation in milk and cream production in this state and many other states. Pastures greatly stimulate the flow of milk. In the absence of pastures, many producers do not supplement the feed of cows sufficiently to sustain the milk flow.

The relationship between the average monthly butterfat prices in this state and the average monthly prices received for butter sold in the New York and Chicago markets is interesting. The price received for 90-score butter is used for this comparison, since this score approximates more nearly

than any other the quality of butter made in this state. Figure 16 shows the average monthly wholesale price received for 90-score butter from 1924 to 1933 in New York and Chicago. The average monthly butter-price curve on this figure approximates the butterfat curve in form. The difference between the average monthly Nebraska butterfat prices and the average monthly wholesale price of 90-score butter in New York was about 4½ cents. The same spread with reference to the Chicago market was slightly more than 3 cents.⁸ According to this figure, the New York market averaged about 1½ cents more than the Chicago market. If an allowance of 0.88 cents per pound is made for the difference in transportation costs (see below) the New York market is, generally speaking, the more profitable.

Freight Rates on Butter. Butter as a farm product is characterized by a high value in proportion to size and weight. It is a highly concentrated form of food which may be shipped great distances without unduly inflating its ultimate selling price. It is for this reason that New Zealand and Denmark, in the absence of tariff barriers, compete in this country with American butter.

Table 4 shows the cost of shipping butter from a number of points in the Middle West to Chicago and New York. The shipping cost on Nebraska butter to the Chicago market is considerably greater than on butter coming from Minnesota and Wisconsin because of greater distance.

The discrepancy in shipping costs to New York and other eastern cities is not so great and Nebraska butter, particularly that from eastern Nebraska, can be placed on these markets almost as cheaply as can butter coming from Minneapolis.

TABLE 4.—*Freight Rates on Butter and Cheese in Carload Lots, June 1937^a*
(Freight per 100 pounds)

Source	Chicago	New York	Difference
Omaha, Nebraska.....	\$0.48	\$1.36	\$0.88
Lincoln, Nebraska.....	.54	1.43	.89
Ord, Nebraska.....	.68	1.59	.91
Scottsbluff, Nebraska.....	1.00	1.86	.86
North Platte, Nebraska.....	1.00	1.71	.71
Chadron, Nebraska.....	.97	1.86	.89
Madison, Wisconsin.....	.31	.97	.66
Minneapolis, Minnesota.....	.44	1.27	.83
Wichita, Kansas.....	.91	1.56	.65

^a Courtesy of Burlington Railroad, Lincoln, Nebraska.

⁸ It should not be assumed that this spread between butterfat prices and wholesale butter prices indicates the creameries' share of income. Transportation cost must be provided for. On the other hand, it should be remembered that one pound of butterfat produces about 1.2 pounds of butter.

Relation of National Butter Production to Butter in Storage and Butter Consumption. The seasonal supply and demand for butter varies. During the better pasture season the supply is great and exceeds to a considerable extent the demand. During these months surplus butter is placed in storage. The amount of storage butter becomes large towards the end of the year, reaching its height during the months of September and October. During the first five months of the year, the storage stock is low, the surplus butter of June being the first supply to augment considerably the seasonal reserve.

While the amount of butter produced and stored varies considerably from season to season, the amount consumed does not vary so markedly. The peak consumption during 1933 is recorded for May. For the remaining months, consumption is fairly evenly sustained, being somewhat less in February and June.

Price of Butterfat in Nebraska and Other States. The price of butterfat is variable for different sections of the United States. Three considerations are almost entirely responsible for the relative difference in prices which exists in various sections, viz., distance to consuming centers, quality of butterfat produced, and the use made of cream. In each of these respects, Nebraska producers do not fare well. In the first place, Nebraska is in a surplus-butterfat area. This means that the butterfat, in its processed form, must largely be sold in more or less remote markets. The Nebraska cream producer must, therefore, bear the cost of transporting his butter to market. This transportation cost, however, represents but a fraction of the price differential which the average Nebraska cream producer suffers. This unfavorable price differential, beyond the transportation cost, is largely traceable to the quality of the cream and butter produced and the use which is made of the cream.

Dairying in Nebraska, as has been pointed out, is largely incidental to diversified and specialized forms of farming. As a result, milking herds are small and retarded, and unapproved methods of handling milk and cream are common—methods by no means restricted to this state. Much of the cream marketed, because of improper handling and age, cannot be converted into the best butter. This condition imposes a substantial loss upon the cream producers of this state as well as upon producers in certain other states.

Cream that is used for fluid consumption and for the making of ice cream usually brings a better price on the market, particularly in areas adjacent to urban centers. Such use, however, requires a fresh, quality cream. Higher prices, which may have to be offered for such cream, encourage better methods of handling the product.

Nebraska cream producers receive next to the lowest current prices in this country. Only northern Texas and parts of adjacent states receive a lower price for cream.

Prices of Different Scores of Creamery Butter in Chicago and New York. Other things being equal, the better the grade of cream, the better will be the grade of butter that can be made from it. Since butter which is sold on the open market is sold by score or grade, it is evident that the better butter will bring the greater return to the creamery and to the cream producer. This fact, aside from other considerations which bear on the subject, should encourage the production of better cream by all producers, so that they may realize the greatest profit from their work.

Butter is scored on various aspects of its quality or lack of quality. The standard scoring system used in the trade assigns specific values to the principal features of butter, such as flavor, 45; body, 25; color, 15; saltiness, 10; package, 5; total 100 points. A score of 92 is considered the standard grade for creamery butter, and other grades receive a premium above or discount below the price of this grade. The United States Department of Agriculture and various exchanges provide for the inspection of butter at the principal markets.

TABLE 5.—*Yearly Average Wholesale Prices of Different Scores of Creamery Butter in New York and Chicago, 1929-35.*^a

Year	Score of Butter							Difference between 93 and 89 Scores
	93	92	91	90	89	88	87	
New York								
1929	45.77	44.97	44.41	43.50	42.71	41.89	41.16	3.06
1930	37.38	36.52	35.87	34.97	33.98	32.78	31.90	3.40
1931	29.30	28.31	27.76	26.85	25.97	25.28	24.68	3.33
1932	21.97	21.00	20.62	20.08	19.58	19.11	18.03	2.39
1933	22.52	21.66	21.19	20.69	20.34	19.49	19.09	2.18
1934	26.46	25.70	25.35	24.92	24.33	23.91	23.38	2.13
1935	30.54	29.78	29.47	29.09	25.77 ^b	24.23		
1929-35 average ..	30.56	29.71	29.24	28.59	27.53	26.67		3.03
Chicago								
1929	44.39	43.73	42.98	42.25	41.45	40.48	39.76	2.94
1930	36.05	35.31	34.43	33.74	32.69	31.46	30.38	3.36
1931	27.80	27.05	26.24	25.56	24.67	23.83	22.96	3.13
1932	20.82	20.07	19.60	19.14	18.59	17.98	17.23	2.23
1933	21.52	20.79	20.19	19.67	18.98	18.77	17.84	2.54
1934	25.49	24.77	24.30	23.80	23.24	22.64	21.92	2.25
1935	29.43	28.81	28.36	28.02	27.52	24.54		1.91
1929-35 average ..	29.36	28.65	29.01	27.45	26.73	25.67		2.63

^a Compiled from Yearbook of Agriculture

^b Returns incomplete and so can't be included in last column.

Butter made by the best commercial methods rarely scores above 95. Small samples of butter with score above 95 can be made but it is not commercially profitable; that scoring 91 to 92 is considered good butter; lower scores are fair and poor.

Nebraska makes butter ranging in quality from poor to excellent. The determination of the average score for the bulk of Nebraska creamery butter is in part an arbitrary matter. It is the general consensus of opinion that the score for most Nebraska butter is about 90.

Table 5 shows the yearly average wholesale price of butter, ranging in score from 87 to 93 on the Chicago and New York wholesale markets from 1929 to 1935. The difference in price between the two grades ranges from about 2 to 3.5 cents. As most Nebraska creamery butter scores neither 87 nor 93 but about 90, the bulk of our creamery butter was sold for several cents less than the best scores or grades of butter. If we assume that this state sells about 50,000,000 pounds of "fair" butter annually, Nebraska cream producers lose about \$1,000,000 annually because of indifferent methods of handling cream.

THE PROBLEM OF PRODUCING GOOD-QUALITY BUTTER

The practice of producing butter of inferior quality results in a substantial loss to the producer not only in price received but also because the demand for butter is not increased as rapidly as it would be if only high quality butter were available to the purchaser. The practice of marketing various scores and qualities of butter, however, touches on considerations other than the mere market value of the products. Butter is a human food. This consideration should compel fully approved methods of production and handling in all its stages.

The fact that cream comes from a great number of producers makes it possible and probable that varying amounts of it are produced under unapproved methods. Various state laws have been passed in an attempt to keep undesirable cream from the market. A Department of Agriculture and Inspection has been created in Nebraska to execute and enforce laws with respect to dairy products. Current methods and ideas of handling dairy products have become so firmly established that newly created laws have done little to change them in direction and purpose. Unapproved methods of handling dairy products prevail so generally in this area of diversified farming that enforcement of strict laws meet with a formidable opposition and indifference.

In the first place, the enforcement of rigid standards with respect to the handling of dairy products clashes with the prevailing established methods of handling these products in this state as well as in many other states. The method of handling dairy products on the farm, from a sanitary standpoint, has changed but little in the last few decades in some

sections of the country. In the meantime, knowledge of bacteria and other forms of contamination in milk and other dairy products has increased tremendously. Experts have devised methods to keep milk and cream as wholesome as possible. Milk and cream producers in some areas, however, have adopted such measures very slowly. Hence, there has been a tremendous gap between common and ideal practice.

Rigid enforcement of dairy standards also clashes with the immediate interests of many creameries and cream stations. A private or corporate creamery, like every other business institution, operates to make dividends for its owners and stockholders. It is considered successful as long as it can show a profit. Its profits depend very largely upon its volume of business. Severe competition among creameries, however, constantly threatens to reduce the amount of available cream for the respective plants. This situation has encouraged practices, particularly in the field of cream procurement, which are not conducive to the production of quality butter. The cream-station method of cream procurement has played an important part in retarding better butter programs in the state and the nation. To date, the cream station is both a symptom and a cause of retarded methods of cream handling.

Federal Program of Butter Improvement. The Federal government under the Food and Drug Act of 1906 is charged with the obligation to assure the American consumer a pure and honest supply of food. It is empowered to seize, inspect, and if necessary, to condemn foods shipped in interstate commerce. To carry out this responsibility, it may enter the factories which process foods that may be shipped beyond state borders.

The Department of Agriculture, which is charged with the responsibility of enforcing the Food and Drug Act of 1906, has done commendable work. The butter industry, however, was singularly free from molestation from this department until 1933-34. This unmolested condition should not be interpreted as a full approval of the conditions existing in the butter industry of this country. The unwholesome quality of much of the butter shipped in interstate commerce was suspected and known. Preoccupation with other foods and problems and the widespread distribution of several million cream producers inclined the department to non-interference with the vast and scattered butter industry. Nor had the department fully perfected methods of revealing the extraneous matter in butter. A filter for this purpose has been perfected in recent years. During 1933-34, this Federal department made a surprise move by inspecting and condemning several carloads of butter shipped to eastern markets. These carloads of butter, each valued at about \$5,000, had to be sold at greatly reduced prices to soap factories. As might be expected, the creamery and butter interests of America were at first somewhat bewildered by

this unanticipated act. The results of the scientific analysis of the butter, however, were incontestable, and the interest of the industry dictated prudence and full cooperation with the government to rectify the conditions.

The condemnation of the butter seized was determined by the amount of extraneous matter or filth found in it. It should be clearly understood that creameries are directly responsible for little, if any, of the filth found in butter. In fact, they make every attempt to remove as much of such material as possible. In justice to the creamery interests, it should be said that, on the whole, their processing methods are very good. The fault lies with the raw product which they process. The creameries, however, are responsible in not having developed a concerted plan of buying cream on a quality basis and rigidly rejecting all old and filthy raw material.

The score of the butter does not necessarily indicate its extraneous content. Butter with a score of 92 may contain as much foreign matter as butter scoring only 87. Since the cream from which the butter with the higher score is made is usually sold in fresh condition, its exposure to sources of filth is usually less, and hence the butter is likely to be cleaner. It follows, therefore, that high-score butter as well as butter lower in score may be subject to an improvement program which considers extraneous content in the determination of quality.

At present the Federal Government and the various creamery interests of this country have instituted a National Cream Quality Improvement Program. The involved nature of this program precludes an elaborate consideration of this campaign in this publication. Suffice it to say that this program, if carried through, will revolutionize the old methods of handling cream on the farms and also some of the established methods of present-day marketing of the product.

The National Cream Quality Improvement Program, even under its present arrangement, does not confine itself to the determination of extraneous matters in cream and butter and to condemnation of impure butter. It also hopes to forestall the purchasing of cream which has deteriorated excessively. The objective is to compel all cream dealers to purchase butterfat by quality. Cream producers in all sections of the country will do well to rally to this movement, for better butter means greater consumption and better prices for the producers and processors.

The activity of the Federal government will go far to further the cause of supplying better butter on the market. It is reasonable to believe, however, that its activities will eventually be limited to maintaining certain standards in butter shipped in interstate commerce. The burden of maintaining adequate standards of handling and marketing cream will there-

fore be left largely to the states. Nebraska dairy interests should take full cognizance of the Federal cream-quality movement and insist on rigid enforcement of laws aimed at the improvement of dairy products.

THE CREAM STATION PROBLEM

Prior to the advent of the centralized creameries in Nebraska (about 1900), the butter factories of this state were strictly local plants, deriving their cream from surrounding farming areas. A low cow population and indifferent dairy methods resulted in an inadequate cream supply for constant operation of creameries and so caused the failure of practically all of the local plants. This situation gave rise to the centralized creameries, which obtained cream from large territories, several states in some instances, through scattered cream stations.

Much credit is due the centralizers and the cream stations for supplying a profitable outlet for Nebraska cream during a period when local creameries found it almost impossible to exist. Because of severe competition among local cream stations, they have offered a reasonably good price. By the mass-production method the centralizers have produced butter efficiently and of as good quality as the nature of the cream permitted. The large organization of the centralizers, in some instances national in scope, has made efficient marketing methods possible in the large centers of butter consumption.

In spite of the many advantages which this state and other states have reaped from the centralizers and the cream stations there are some disadvantages. The cream station, generally speaking, is an institution for the outlet of small quantities of cream in areas where dairying is a side line. This usually means that cream produced in such areas is improperly handled. Such practices result in the deterioration of cream prior to marketing.

The immediate profit motive of the centralizer and the local cream station operator has served to make volume their main consideration. The local station buyer, in most instances, purchases cream on a commission basis. The more cream he purchases, the greater is his income. An isolated cream buyer can ill afford to offend the pride of the cream producer by indicating unfavorable qualities in the cream offered for sale. Obviously, only a concerted move on the part of all creameries could improve this situation. Such a concerted move, however, failed to develop until the Federal government threatened interference.

The highly competitive nature of the creamery industry has served to forestall the institution of measures which would have materially improved conditions among cream stations. For instance, in recent years Nebraska has had from 2,300 to 2,900 cream stations in operation. On November 5, 1934 the number operating in the various towns ranged

from 1 to 18 (North Platte had 18 licensed stations on this date). The average number of stations in Nebraska towns having one station or more was 3.6. Towns having from 6 to 12 stations are not uncommon. This situation provides a highly competitive market for the local cream producer, and explains, in part, why the creamery industry could make little progress in purchasing cream of quality.

The cream station problem has attracted more and more attention in recent years. Hunziker, one of the foremost authorities on the butter industry, appraised the station problem in 1928 as follows:

The present status of cream-buying stations, especially as prevails in the great corn belt of the middle west, presents a deplorable situation from the standpoint of its effect on the quality of the cream. There is no question that the cream station is one of the outstanding causes of poor quality, and its competitive practices constitute a permanent obstacle to efforts toward cream improvement. It persists in demanding volume and volume only. It offers a ready market for all cream regardless of quality. It refuses to grade and pay on the basis of quality, and it thereby encourages the continued production of an inferior product.¹

The bulk of butter made by the centralized creameries operating on the station plan is not of the better grade. In a report to the President by the United States Tariff Commission on the costs of producing butter in this country and in the principal competing foreign countries, the quality of centralizer and cooperative creameries is spoken of as follows:

The typical centralizer butter scores about 89 to 91 points as compared with 92 points scored by the typical butter made by the cooperative and independent. The type of butter produced by the cooperatives and by the so-called independents is directly comparable with the imported Danish butter.²

It should not be assumed that the difference between centralizers and cooperatives or independents in quality of butter produced holds in each separate instance. The report obviously generalizes in the part quoted. Creameries, of whatever nature, that purchase cream more or less indiscriminately with respect to quality, must produce inferior butter. At present, many cooperatives and independents, in this as in other states, do not purchase cream on a quality basis. This lax method of cream buying may be the fault of the local plant, or it may be a practice forced upon it by competition.

The cream-station problem has been attacked in a number of ways in different sections of this country and parts of Canada. The serious nature of this problem in Nebraska suggests that it may be profitable to consider a few of the attempted solutions.

The Cream Station in Western Canada. During the period of the World War dairying became rapidly more popular in western Canada.

¹ Hunziker, *op. cit.*, p. 119.

² *Butter*, Report of the United States Tariff Commission to the President of the United States, Washington, D. C., 1926, p. 5.

Butter was, to a large extent, the end product of this industry. During this same period, a decided deterioration was noted in the quality of the butter made in this region.³ It was held that the cream station was largely responsible for the poor quality of the cream. As a result, the cream-buying stations were legislated out of existence in the various provinces in Canada, and compulsory cream-grading systems were adopted.

In the first few years under the new system, a resident government grader was placed in every creamery in Alberta and Manitoba and in some other provinces. Since 1932, resident graders have been dispensed with in Alberta, and the cream grading is now done by licensed employees of the creameries. The standards are rigidly supervised by competent dairy inspectors. The main reason for dispensing with resident graders in Alberta was the heavy cost of cream grading in relation to the low price of butterfat during the depression. The new system is reported to work reasonably well.⁴ The province of Saskatchewan has made modifications similar to those in Alberta. In Manitoba, on the other hand, resident government graders are still retained. The smaller number of creameries in the province, plus a greater concentration of dairying than in other provinces, has made it less expensive to retain resident graders.

In Winnipeg all creameries that receive over 3,500 pounds of butterfat a week have a government grader stationed at the plant. In winter, when the receipts of butterfat are low, one grader suffices for two or three creameries. In this province the cost of maintaining the government grader, which is borne by the industry, amounts to about $\frac{1}{4}$ cents per pound of butter made. The first duty of the cream grader is grading cream, and in the large plants that takes all of his time. In the smaller plants, he helps with any other work around the plant after his duties of grading cream are finished. Mr. L. A. Gibson,⁵ Dairy Commissioner of Winnipeg (1934), says, "there is no question about our system improving the quality of the cream purchased at the creameries".

The increase in the quality of Canadian butter, following the elimination of the cream station, was substantial. In one year the output of the highest quality butter in the province of Alberta increased from 8 per cent of the total butter produced to 26.8 per cent.⁶ Butter produced in the province at that time was classified into six groups as to quality. With the elimination of the cream station and the improvement of the quality

³ *Six Months of Reconstruction in the Dairy Industry*, leaflet issued by the Minister of Agriculture, Edmonton, Canada, 1922.

⁴ Letter from J. R. Sweeney, Dairy Commissioner, Dept. of Agriculture, Province of Alberta, Canada, August 13, 1934.

⁵ Letter from L. A. Gibson, Department of Agriculture and Immigration, Winnipeg, July 31, 1934.

⁶ *Six Months of Reconstruction in the Dairy Industry*, leaflet issued by the Minister of Agriculture, Edmonton, Canada, 1922.

of butter produced, cream producers realized a substantial increase in the price of butterfat.

The fact that Canada is compelled to export a large percentage of her butter in a large measure prompted the improvement program in the early 1920's. Butter from Denmark and New Zealand, reputedly good butter, is marketed at reasonable prices all over the world. No country with a markedly inferior product could long afford to compete with these countries in the international butter trade.

The United States is not an important exporter of butter. For this reason, it is not confronted with the problem of improving the quality of the butter for export. Butter, however, is shipped extensively in interstate commerce in this country, and it is this fact which enables the Federal government to urge and compel the adoption of higher butter standards.

Oklahoma's Attempt to Improve the Quality of Cream and Butter. Dairy conditions in Oklahoma are very similar to those in Nebraska. The cow population in Oklahoma is relatively small and a large percentage of the cows are of dual-purpose breeds. Specialized dairying is highly restricted. Milking herds are small, and cream cannot be sold in large quantities. It is impossible for a large number of creameries to exist under these conditions, and so a large percentage of the cream is marketed through the cream station.

After the World War, the legislature of Oklahoma passed a law which stipulated that cream must be graded and paid for according to grade. Severe competition among the cream stations of the state, however, resulted in open and consistent violation of the law. No pretense was made to enforce it. Without an efficient enforcing agency and little public support, a law is useless.

Late in the summer of 1933, when the Federal Government began to take notice of the quality of the butter arriving in the eastern market, a renewed attempt was made in Oklahoma to enforce the cream-grading law. The dairy commission enlisted the aid of all the large creameries of the state and held a cream-grading demonstration and quality-improvement program in every county of the state. A date was set at which time the cream-grading was to be observed.⁷ Needless to say, many difficulties have been experienced under the renewed program. Infractions are known to occur frequently between visits of state inspectors.

It is felt, nevertheless, that the program has accomplished a good deal. Many of the largest creameries of the state have contributed freely of their time and money to make it successful. Through continued cooperation

⁷ Letter from E. L. Fonts, Assistant Professor Dairy Manufacturing, School of Agriculture, Stillwater, Oklahoma, September 19, 1934.

of state and Federal agencies the program promises to improve materially the quality of butter produced in all creameries in the state.

Iowa Trade-mark Creameries. Iowa ranks second in the United States in butter production. The importance which this industry has assumed in this state in recent years has focused much attention on the matter of quality production. It was realized that the indiscriminate method used by stations in purchasing cream, unless remedied, would continually make for an inferior butter with consequent loss in prestige and money. To meet this situation, the legislature of the state created the Iowa Butter Control Board (Statute 3088) and established the trade-mark "Iowa Butter", which is to be reserved for creameries which meet specifications enumerated under the law. The Iowa Butter Control Board, composed of prominent members of the creamery and dairy industry of Iowa and two members of the Iowa State College, is charged with the responsibility of enforcing the provisions of the law for creameries desiring the benefit of the trade-mark "Iowa Butter", a mark of distinction. A number of standards must be met by a creamery which wishes to be known as an "Iowa Trade-mark Creamery". Sanitary and dairy laws of Iowa must be fully complied with. All butter sold under the trade mark must be manufactured from cream containing not more than two-tenths of one per cent acidity; in other words, the cream must be sweet and must produce butter with a score of at least 93. The requirements, are, to put it mildly, an indirect attack upon the cream stations. Cream stations, as we know them, do not and cannot operate within such a system.

In addition to the above program, the Department of Dairy Industry has also sponsored a cream-quality program. This department employs a number of extension specialists to visit creameries which are interested in the quality movement and score the cream delivered by each producer. Score cards are furnished, criticisms are offered to the customers, and diplomas are issued to those having an average score of 93 or above for the year. On September 18, 1934, Iowa had 37 creameries manufacturing butter from sweet cream. Both butter-improvement programs are considered successful.⁸

Difficulty of Legislating the Cream Stations Out of Existence in Nebraska. The attempted solutions by Canada, Oklahoma, and Iowa of the cream station problem and the conditions which the cream station generally represents may be suggestive of what may and what may not be attempted in Nebraska. Legislating the cream station out of existence, as Canada did, seems unwarranted under Nebraska conditions. Many sections of the state will continue to have so sparse a milk-cow population that no local creameries can exist. To compel all cream producers to ship

⁸ Letter from Mr. M. Mortensen, Department of Dairy Industry, Iowa State College, Ames, Iowa, September 18, 1934.

their cream directly to creameries is an abrupt departure from established ways. The very fact that the stations have continued to exist indicates that they fulfill a definite function of which many farmers take advantage. It is only reasonable to assume that diversified farming will continue to be practiced by a large percentage of Nebraska farmers, and that the average amount of cream sold by such farmers will be small. A ready and prompt market will be sought by them, and in the absence of a creamery, a cream station is precisely what such producers want.

RECENT BUTTER LEGISLATION IN NEBRASKA

Legislative Bill No. 499, passed by the Nebraska legislature in 1937, established certain new requirements with reference to the dairy industry of the state. The provisions of the act relating to the marketing of butter-fat are of particular interest in this study. The act requires, among other things, that:

All cream purchased for manufacture into butter shall be graded according to the following and each grade shall be segregated to indicate the grade thereof: (a) "First Grade Cream" shall consist of good cream that is either sweet or sour, smooth, free from undesirable odors, clean to the taste and practically free from sediment. (b) "Second grade cream" shall consist of cream that is too sour to grade as first or that contains undesirable flavors or odors in a moderate degree or that is slightly foamy, yeasty, stale, showing slight traces of sediment or too old to be first grade cream. (c) Unlawful cream shall consist of all cream that is not first grade cream or second grade cream, as herein defined; and unlawful cream shall also consist of cream that is old, rancid, mouldy, dirty, curdy or in which has been found any unsanitary article or utensil.

The act requires further that it shall be unlawful "to pay as much for second grade cream as is paid for first grade. The price differential shall not be less than one nor greater than two cents per pound between first grade cream and second grade cream."

To carry out the above provisions is clearly a step in the right direction. Students of the dairy industry in the state have been convinced for many years that the grading of cream and the payment of a differential price for various grades represented the minimum of an essential program of butter improvement. This approval of the act does not mean, however, that a really ideal objective has been reached or is about to be attained. It shall be remembered that a high percentage of Minnesota and Wisconsin, and, to a certain extent, Iowa butter is already sweet-cream butter, made only from No. 1 cream, the standards for which are higher than those called for in our recent act, and that many dairy men in these more prominent butter states are speaking confidently of the not distant day when all butter will be sweet-cream butter. The Nebraska act is largely a compromise with existing conditions.

The provisions for cream-grading in Legislative Bill No. 499 are not ideal. The requirements for first-grade cream are somewhat lax, and they are certainly most lax with reference to second-grade cream. Buyers of

quality butter will not purchase butter made from cream that "is slightly foamy, yeasty or stale" and characterized by undesirable flavors or odors—standards permitted in "second-grade cream".

The requirement that all cream purchased for manufacture into butter shall be graded, places the many hundred cream station men of the state in an unenviable position. This state produces an abundance of both first- and second-grade cream, as defined by the recent law (1937). Cream graders may readily detect the grade of much of this cream, even with the modest amount of training required of them. The number of buyers, however, gives rise to highly competitive situations, particularly among stations. Most buyers, operating on a commission and hence a volume basis, will seek to purchase a maximum amount of butterfat. To designate cream as second grade when it may have been produced in a similar manner for years is not likely to enhance the tester's popularity with the producers; in fact, the latter may well try other purchasers before being reconciled to the grading. This potential threat of loss of cream sellers and the small degree of arbitrariness which may be exercised by purchasers in grading leads to the fear that the generous classifications which are provided by law, will be even more generously applied. Among other things it is feared that not nearly enough cream will be designated as second grade and "unlawful cream."

The problem of the cream station is not an insurmountable one. It is a problem which should invite the attention of not merely the producers and processors of cream but the consumer as well. Each has an interest at stake. Each group should realize that the standards and practices of former years are greatly outmoded, particularly in the dairy industry. It should be realized that dairy products, which are potentially among our most wholesome foods, are also potentially the carriers of much filth and of disease, if not properly handled. Americans should have the privilege of knowing that the dairy products they consume are wholesome and clean. State and Federal governments have the responsibility of enacting legislation which will serve the interests of the citizens in this and other respects. Governmental action, however, needs to receive general support in order to be effective.

PROCESSING AND UTILIZATION OF SKIMMILK AND BUTTERMILK

It is estimated that in 1930 Nebraska milk cows produced 2,806,000,000 pounds of milk, all of which was milked by hand or mechanical devices.¹ Of this amount about 2,000,000,000 pounds were separated to produce about 100,000,000 pounds of farm and creamery butter. This means that nearly 70 per cent of the milk produced in Nebraska was used for butter

¹ Statistical Supplement No. 8 to "Milk Production Trends," U. S. Dept. of Agriculture, 1933.

production (11 per cent for farm butter and 59 per cent for creamery butter).

The production of 100,000,000 pounds of butter in Nebraska leaves as by-products about 1,750,000,000 pounds of skimmilk and 150,000,000 pounds of buttermilk. Ordinarily, these products do not receive due consideration in the agricultural literature of this state. Nebraska ranks second among the 48 states in the raising of hogs and fourth in the raising of cattle, enterprises in no small measure furthered by the generous use of skimmed milk. In some instances buttermilk is fed to pigs and calves.

The 100,000,000 pounds of butter produced in Nebraska during 1930 was valued at about \$30,000,000. During this same year Nebraska produced 239,100,000 bushels of corn at an average price of 51 cents per bushel and an aggregate value of about \$122,000,000. One hundred pounds of skimmilk or buttermilk are worth about as much as or even more than one-half a bushel of corn when only enough is fed to balance the rations.² With a feeding value of 25 cents per hundred pounds, 1,750,000,000 pounds of skimmilk and 150,000,000 pounds of buttermilk were worth \$4,750,000 in 1930. The butter by-products of the state were worth nearly 17 per cent of the butter itself. Skimmilk and buttermilk, in supplying a readily available type of feed rich in proteins, calcium, and phosphorous, all highly essential to the rapid growth of the animal skeleton, possess a money value even greater than that indicated above. In the absence of these dairy by-products or equivalent dietary supplements, pigs and calves would not fare so well, even if a much greater abundance of grains were fed. Few, if any, commercial feeds are as conducive to the growth of young stock as the by-products of butter manufacture.

BUTTERMILK

About 1.5 pounds of buttermilk are produced with each pound of butter made. Where churning is a daily operation, considerable amounts of this product are produced and must be disposed of. In the early days of the creamery, buttermilk was frequently run into the sewer system and streams. It was soon learned, however, that the product had considerable feed value, and so it was used in its natural state as a stock feed.

Buttermilk in its natural state, as well as in processed form, has been in use extensively only in recent years as a feed for chickens and hogs. The greater portion of the raw buttermilk marketed in this state is fed to hogs. Processed buttermilk, greater in cost, is generally fed to poultry. It makes excellent feed for growing chickens, excels for fattening them, and stimulates the laying of eggs.

The majority of creameries in the state do not have the facilities nor the equipment to process buttermilk and this by-product is sold to nearby

² Henry, W. A., and Morrison, F. B., *Feeds and Feeding*, pp. 664-45.

hog feeders and poultry ranchers. The sale price of the buttermilk varies somewhat and is roughly in keeping with the price of other feeds and the marketing value of the stock. During the summer of 1934, creameries received from $\frac{1}{2}$ to 2 cents per gallon for raw buttermilk.

Processed Buttermilk. Buttermilk ordinarily contains about 9 per cent milk solids. This means that about 91 per cent of the product is water. Concentrated or flaked buttermilk, therefore, may be stored and shipped at a considerable saving in bulk and money. Large plants frequently have a buttermilk condenser and perhaps also a roller or drier. According to Circular No. 329 of the U. S. Department of Agriculture (November, 1934) any creamery producing 1,000,000 pounds of butter annually can profitably condense or dry its buttermilk.

Semi-Solid or Condensed Buttermilk. Before buttermilk is condensed, its acidity is increased from about 0.25 to about 1.5 per cent, either by aging or by the addition of a starter. With the addition of a starter, the proper acidity is reached in about two days, whereas without a starter two to four days may be required. To obtain a smooth product, the buttermilk should be stirred occasionally while it is aging.

When the buttermilk has attained the proper acidity content, it is run into tanks known as "hot wells". Here live steam is introduced into the liquid, the temperature of which is raised nearly to the boiling point. From the hot well, the buttermilk is delivered into a vacuum pan, where it is boiled at a barometric pressure of about 26 inches. At this reduced pressure, the boiling point is reached at a temperature ranging from 150° to 160° F. The buttermilk remains in this vacuum pan until it is reduced to about one-fourth of its original volume. This requires about 8 hours of boiling. From the pan the condensed product is run into barrels which hold up to 300 pounds.

Dried Buttermilk. Dried buttermilk is rapidly gaining in favor as a constituent of poultry and stock feeds. It is the most highly concentrated form of buttermilk, and in this form is convenient to ship, store, and mix with other feeds. Its tendency to absorb moisture readily makes it advisable to store the product in a dry place.

Dried buttermilk may be made by the roller process, the spray process, or by a combination of the two methods. In Nebraska, all plants use the roller process.

In using the roller process, no condensing of the buttermilk previous to drying is necessary. The raw buttermilk is merely sprayed on a steam-heated revolving roller, which makes several revolutions per minute. The buttermilk on the roller forms a dried film which is automatically removed by a sharp knife. The flaked buttermilk is then conveyed by screw conveyors to receiving and sacking bins. The dried product contains about

4 per cent of moisture and ranges in color from a creamy white to dark brown.

Frequently the buttermilk is condensed before it is sprayed on the heated roller. The degree to which it is condensed may vary, since the product will promptly be dried on the roller. Most of the large Nebraska creameries producing dried buttermilk first condense the product.

Amount of Buttermilk Processed by Nebraska Creameries. In 1933, Nebraska produced 93,361,000 pounds of creamery butter. Since each pound of butter generally leaves one and one-half pounds of buttermilk as a by-product, it produced about 140,000,000 pounds of creamery buttermilk in that year. From this product Nebraska creameries produced 3,350,000 pounds of condensed buttermilk and 4,234,000 pounds of powdered buttermilk. As condensed buttermilk is concentrated to a ratio of about 4 to 1 and powdered buttermilk to a ratio of 11 to 1, it may be assumed that approximately 60,000,000 pounds of the creamery buttermilk in this state were processed into concentrated forms in 1933. This means that during this year less than half of the creamery buttermilk was processed, the remainder being disposed of in its raw state.

TABLE 6.—*Production of Condensed or Evaporated Buttermilk and Powdered Buttermilk in Nebraska and the Rank of the State in the Production of these Products, 1922-35.*^a

Year	Condensed or Evaporated Buttermilk		Powdered Buttermilk	
	Pounds	Rank	Pounds	Rank
1922	4,847,000	3	4,201,000	1
1923	4,998,000	5	4,568,000	1
1924	4,364,000	6	4,923,000	1
1925	7,554,000	3	4,053,000	2
1926	1,368,000	16	6,591,000	2
1927	3,718,000	10	6,407,000	2
1928	7,701,000	5	6,743,000	2
1929	8,735,000	4	6,556,000	3
1930	9,296,000	3	5,375,000	5
1931	5,262,000	3	1,860,000	8
1932	3,291,000	7	3,347,000	4
1933	3,350,000	6	4,234,000	4
1934	6,166,000	4	4,441,000	3
1935	6,274,000	6	3,054,000	5

^a Nebraska Agricultural Statistics, 1922-1929; Annual Dairy Reports by States, U. S. Dept. of Agriculture, 1930-1933.

Table 6 indicates that the production tendency of processed buttermilk is not highly consistent in Nebraska. A decline of more than six million pounds occurred in the production of condensed buttermilk from 1925 to 1926. In 1930, more than nine million pounds were produced; since then the production declined to about one-third in 1932 and since 1933 a sub-

stantial gain in production has again taken place. The production of powdered buttermilk, has, on the whole, been somewhat less erratic, although the decline in output from 1930 to 1931 is striking.

The production trend of processed buttermilk is largely determined by the relative price of feed, stock, and poultry. The erratic nature of these prices in recent years has caused pronounced disturbances to the producers of processed buttermilk. Since supply and demand for feed, livestock, and poultry must continue in an open competitive market, no certain clue to the future production tendency of processed buttermilk is discernible. The tendency to provide a more nearly balanced feed ration for livestock and poultry, however, indicates that processed buttermilk will be used in increasing amounts by feeders.

COMPARATIVE FEED COSTS

Nebraska's prominent position as fourth among the states in the production of butter suggests that this state has certain advantages which make the production of this food relatively profitable. It may even be assumed that the production of butter in Nebraska must be more profitable than the production of certain other products, since dairying entails considerably more work than some other types of farming. Generalizations not founded on substantial data, however, are dangerous. Attempts that have been made to ascertain comparative production prices of butter in different states are not particularly reassuring as to their validity. Such a study was made by the United States Tariff Commission and was published in 1926.¹

The present study will be confined to a presentation of some comparative feed-cost data and an analysis of how these aid or handicap dairying in certain selected states. Such data are available on corn, oats, barley, and tame hay.

THE PRICE OF CORN IN NEBRASKA AND OTHER SELECTED STATES

Considerable quantities of corn are used, particularly where this feed is plentiful, to supplement the feed of dairy cows. Table 7 shows the average price per bushel received by producers of corn in selected states for ten consecutive years, 1924-33, and also shows the average price for the whole period. The lowest average price for the decade prevailed in Minnesota, and Iowa and Nebraska follow in order in an ascending price scale. The highest price for corn prevailed in Wisconsin and New York. Neither of these states is prominent in the production of corn, but each is noted for its highly specialized form of dairying. The higher prices of feeds in these states are in part offset by greater returns for dairy products produced.

¹ *Butter*, Report of the United States Tariff Commission to the President of the United States, Washington, D. C., 1926.

TABLE 7.—*Estimated Yearly Price of Corn per Bushel Received by Producers in Selected States, 1924-33.*^a

State	1924 ^b	1925 ^b	1926 ^b	1927 ^b	1928 ^b	1929 ^b	1930 ^b	1931 ^b	1932 ^c	1933 ^d	Average for Period
Nebraska . . .	\$0.91	\$0.61	\$0.68	\$0.62	\$0.71	\$0.69	\$0.51	\$0.38	\$0.27	\$0.31	\$0.569
Kansas . . . . .	.87	.66	.70	.61	.65	.74	.59	.31	.27	.37	.577
Iowa . . . . .	.93	.56	.56	.69	.67	.70	.58	.35	.30	.31	.565
Minnesota . . .	.85	.56	.56	.64	.62	.65	.53	.37	.28	.32	.538
Wisconsin . . .	1.05	.72	.75	.84	.78	.83	.72	.47	.36	.42	.694
New York . . .	1.17	.97	.86	.96	.99	1.03	.90	.60	.52	.58	.858

a Compiled from Yearbooks of Agriculture.

b Price per bushel as of December 1.

c Weighted average price per bushel received by producers.

d Average price for three months.

THE PRICE OF OATS IN NEBRASKA AND OTHER SELECTED STATES

Table 8 shows the estimated price received by producers of oats in selected states for the decade 1924-33. Among the states listed the average price of oats for the decade was slightly less in Minnesota and Iowa than in Nebraska. The highest price for this feed is again listed for Wisconsin and New York, although the price differential is not as great as that for corn.

TABLE 8.—*Estimated Yearly Price of Oats per Bushel Received by Producers in Selected States, 1924-33.*^a

State	1924 ^b	1925 ^b	1926 ^b	1927 ^b	1928 ^b	1929 ^b	1930 ^b	1931 ^b	1932 ^c	1933 ^d	Average for Period
Nebraska . . .	\$0.43	\$0.36	\$0.40	\$0.40	\$0.38	\$0.38	\$0.28	\$0.24	\$0.13	\$0.26	\$0.326
Kansas . . . . .	.47	.44	.44	.45	.42	.46	.35	.20	.16	.31	.370
Iowa . . . . .	.44	.32	.35	.42	.37	.39	.38	.21	.13	.27	.318
Minnesota . . .	.43	.31	.34	.40	.35	.37	.25	.21	.13	.27	.306
Wisconsin . . .	.48	.38	.40	.47	.43	.44	.33	.27	.20	.33	.373
New York . . .	.62	.52	.50	.55	.54	.58	.44	.33	.29	.44	.481

a Compiled from Yearbooks of Agriculture.

b Price per bushel December 1.

c Weighted average price received by producers.

d Average price for 6 months.

THE PRICE OF BARLEY IN NEBRASKA AND OTHER SELECTED STATES

Barley, where plentiful, may also be fed to milk cows to good advantage. Of the states listed in Table 9, Minnesota raised a considerable amount of barley and smaller amounts are produced in Wisconsin, Iowa, and Nebraska. Kansas and New York raise very little of this cereal. For the decade 1924-33 the lowest average price for barley prevailed in Nebraska (43.8 cents). Kansas, Minnesota, and Iowa follow in order in an ascending price scale. The highest prices prevailed in Wisconsin and New York, the feed deficit in these states largely accounting for the prevailing higher feed prices.

TABLE 9.—*Estimated Yearly Price of Barley per Bushel Received by Producers in Selected States, 1924-33.*^a

State	1924 ^b	1925 ^b	1926 ^b	1927 ^b	1928 ^b	1929 ^b	1930 ^b	1931 ^b	1932 ^c	1933 ^d	Average for Period
Nebraska . . .	\$0.63	\$0.54	\$0.58	\$0.55	\$0.51	\$0.50	\$0.35	\$0.28	\$0.16	\$0.28	\$0.438
Kansas . . . . .	.65	.58	.61	.55	.50	.50	.37	.22	.15	.37	.450
Iowa . . . . .	.70	.57	.56	.66	.54	.52	.41	.34	.23	.42	.495
Minnesota . . .	.69	.52	.51	.65	.50	.48	.35	.34	.22	.43	.469
Wisconsin . . .	.78	.66	.65	.75	.65	.65	.51	.43	.35	.52	.595
New York . . .	.91	.77	.75	.80	.78	.84	.62	.45	.38	.54	.684

a Compiled from Yearbooks of Agriculture.

b Price per bushel December 1.

c Weighted average price received by producers.

d Average price for 6 months.

THE PRICE OF TAME HAY IN NEBRASKA AND OTHER SELECTED STATES

The prevailing price of hay is an important consideration in computing the relative cost of producing dairy products in different states. The pasture season is usually short in the important dairy sections of the country. If the local supply of hay is insufficient to sustain the stock needs, this feed must be transported several hundred miles to consuming centers. New York and Wisconsin annually import large quantities of hay for their dairy animals as well as for other stock, and hence high hay prices prevail in these states. Nebraska, on the other hand, is one of the foremost hay-producing states in the Union, and an ordinary surplus of this feed brings reasonable local hay prices.

Nebraska ranks first among the states in acreage devoted to wild hay and also to alfalfa. It ranks first in the production of wild hay and second to California in tonnage of alfalfa produced. The dairy industry of Nebraska profits greatly by the usual abundance of alfalfa.

The wild hay grown in Nebraska makes good horse feed, but it is not very satisfactory as a feed for milk cows. It is used in considerable quantities in certain sections of the state to winter cattle. Unless it is well supplemented by other feeds, it will not sustain the milk flow very satisfactorily.

With respect to the price of tame hay dairymen are very fortunate in Nebraska. It will be noted in Table 10 that Nebraska producers of tame hay have constantly received a relatively low, if not the lowest prices for their product among the states listed. These modest hay costs have done much to attract attention to the possibilities of dairying and feeding stock.

From the preceding tables on feed costs it may safely be assumed that Nebraska has certain actual and potential advantages for some forms of dairying. However, they do not in themselves indicate that dairying is necessarily the most profitable form of farm enterprise in this state. More statistical data than have been presented are necessary to prove this. Avail-

TABLE 10.—Average Price of Tame Hay per Ton Received by Producers in Selected States in Given Years.^a (Average Price as of December 1).

State	1909- 13	1914- 20	1921- 25	1925- 29	1930	1931	1932	1933	1930- 33
Nebraska	\$ 8.34	\$10.74	\$10.02	\$11.02	\$ 8.00	\$ 7.20	\$ 4.50	\$ 4.80	\$6.12
Kansas	8.76	11.80	10.24	10.98	9.70	6.50	4.70	6.10	6.75
Iowa	9.66	13.78	11.34	12.10	11.50	8.40	5.80	6.10	7.95
Minnesota	8.00	10.20	10.62	10.90	10.20	8.30	6.10	7.00	7.90
Wisconsin	12.70	15.77	14.20	13.28	12.70	11.20	9.80	10.10	10.70
New York	15.20	17.40	15.48	12.88	14.40	8.80	7.20	9.50	9.97

^a Compiled from Yearbooks of Agriculture.

able evidence indicates that dairymen in this state have prospered as much as and, in many instances, even more than farmers who have stressed other methods and systems of farming.

BUTTER, BUTTERFAT, AND GRAIN FEED PRICE RATIOS IN NEBRASKA, 1910-33

Greatly fluctuating prices and values constantly distress the agriculturist. In the midst of constantly changing values, the farmer needs to lay his plans, execute them, and hope that his operations will net him a living and perchance a profit.

In choosing between alternative types of farming, the farmer might well inquire which farm product has become relatively more valuable over a period of years. Other things being equal, the most valuable product or the product with the most sustained selling price would be the most profitable to produce. Figure 18 is an attempt to reflect the annual value ratio between butter, butterfat, and grain feed—corn, oats, and barley—from 1910 to 1933. The graph shows for each year the number of pounds of grain feeds one pound of butter or butterfat will buy. For instance, in 1910 the price value of one pound of butter in Nebraska was sufficient to purchase 30 pounds of feed grain composed of equal parts of corn, oats, and barley.

The value ratio between butter or butterfat and feed grains has fluctuated widely during the period represented—so much, in fact, that it seems pointless to speak of an average ratio. During the period of the World War the value of butter rose to relatively much higher levels than did that of the feed-grains. Since 1920, the value of butterfat has, on the whole, remained relatively more valuable than the collective price of the grains.

No generalized conclusion can be drawn from the chart but if the cost of producing butter, butterfat, and the feed grains remained constant, the upward trend of the chart shows that it became relatively more profit-

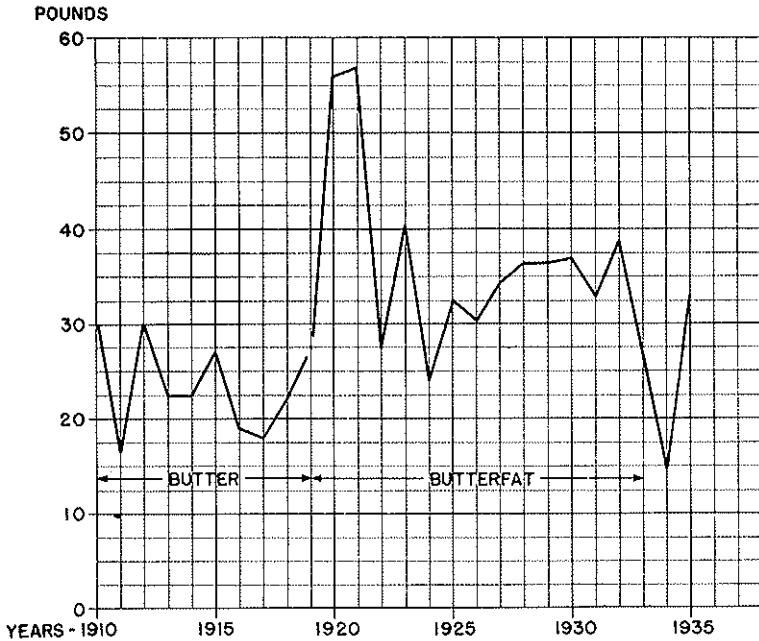


FIGURE 18.—Ratio-value of butter or butterfat and grain-feed in Nebraska, 1910-35. The ratio shows the average number of pounds of feed-grain, corn, oats, and barley one pound of butter or butterfat would buy in given years in Nebraska. The averages are computed from butter prices from 1910 to 1919 and on butterfat prices from 1920 to 1935. Figures for neither product are available for the entire period.

Source: Grain prices taken from *Yearbooks of Agriculture*; butter and butterfat prices from 1895 to 1932 taken from H. C. Filley and Arthur M. Hauke, *University of Nebraska, College of Agriculture Experiment Station Bulletin 284* "Local Prices of Farm Products in Nebraska, 1895-1932" Lincoln, 1933; recent prices of butterfat obtained from State-Federal Division of Agricultural Statistics, Lincoln.

able to produce butter and butterfat than to produce the grains listed in this study.

MARGARINE AND OLEOMARGARINE

The margarine industry, because of its relationship to the butter industry, is herein discussed briefly.¹ Increased consumption of butter substitutes suggests decreased consumption of butter although this decrease does not necessarily follow. The liberal use of other fat products in this country largely accounts for the modest consumption of butter and

¹ Editor's Note: Mr. Kollmorgen's original manuscript includes a detailed discussion of the margarine industry which has been summarized for brevity in publication.

butter substitutes. However, margarine is a substitute for butter and replaces it to some extent.

SOURCE OF INGREDIENTS

The substitutes for butter known as margarine or oleomargarine may be divided on the basis of the raw products from which they are made. Some substitutes are made predominantly from animal fats, whereas others are made largely from vegetable oil. The animal fats that are used extensively in the production of butter substitutes are oleo oil, oleo stock, and oleo stearin, similar forms of fat obtained from the caul, ruffle, intestines, and other organs of cattle when rendered at different temperatures.

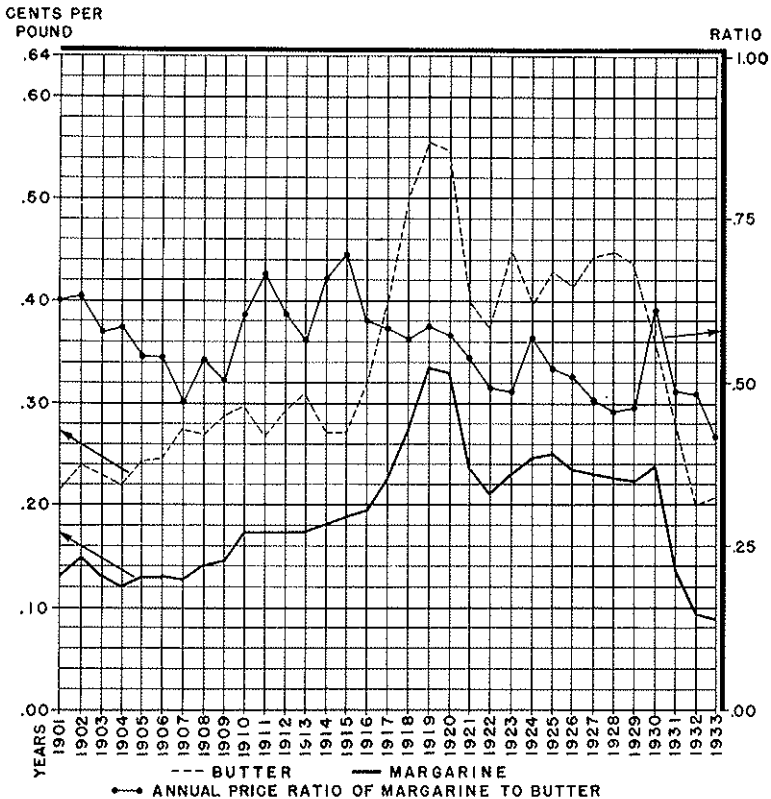


FIGURE 19.—Annual average wholesale price of margarine and butter and their price ratio in the United States, 1901-33. (For 1934 and 1935 the ratio was 33 and 48 per cent respectively.)

Source: 1901 to 1929 from Katherine Snodgrass, *Margarine as a Butter Substitute*, p. 248; data for more recent years taken or computed from tables in the *Statistical Abstract of the United States*, 1936.

Each is used in varying amounts in the production of oleomargarine. Strictly speaking, therefore, the word "oleomargarine" should be reserved for those forms of margarine in which "oleo" represents an important constituent. To comply with the laws of the United States, however, all margarine must be labeled "oleomargarine". Substitutes that are made strictly of vegetable products, in which coconut oil is usually the principal ingredient, are merely margarine. Margarine is the more inclusive of the two terms and may properly be used to refer to both animal-fat and vegetable oil butter substitutes.² Varying amounts of neutral lard and small amounts of cottonseed oil are usually mixed with oleo fats in the production of oleomargarine.

The vegetable oils used in varying amounts in the manufacture of margarine are coconut oil, cottonseed oil, peanut oil, and corn oil, coconut oil being by far the most important. The source of these various oils is of considerable importance, since much of the unfavorable attitude and legislation in this country towards margarine is prompted by this consideration.

Milk is used in considerable quantities in the production of margarine. The fats used in making margarine are refined to such a point that they have no flavor or taste. This absence of flavor is also characteristic of butter that is made from fresh butterfat in which no bacteria have been active. In order to impart a flavor to margarine a "starter" is added to pasteurized milk, which is then permitted to ripen or sour. The "ripened" milk and the fats and oils used in the production of margarine are then thoroughly mixed in emulsifiers or churns until a complete emulsion is formed. In this manner a butter-like taste and aroma are imparted to margarine. The emulsion is then chilled and worked in the same manner as butter.

The oleo fats, neutral lard, and cottonseed oil used in making oleomargarine are produced domestically in sufficient quantities to supply more than the needs of the margarine industry. Whatever competition the dairy industry experiences from the production and marketing of oleomargarine in this country entails competition between various forms of domestic agricultural products.

In recent years nut margarine has to a large extent replaced oleomargarine on the American market. Coconut oil is by far the most important ingredient of nut margarine, but small amounts of peanut oil are also used. Coconut oil is produced in all parts of the tropics, but the main regions of commercial development are in the islands of the Pacific, in India, and in Ceylon. The American supply of this oil comes mainly from the Philippine Islands.

1931, p. 1.

Peanut oil used in the production of margarine is also imported to a large extent. Domestic peanuts can be sold more profitably as nuts than as converted oil. Most of the peanut oil is imported from China and is subject to tariff duties. This makes the oil relatively expensive, and for this reason the use of peanut oil has been declining in the production of nut margarine.

COCONUT OIL, ITS PRODUCTION AND VALUE

Since the period of the World War, as previously stated, coconut oil³ has been used in increasing quantities in the production of margarine. Increased use of this oil has made it possible to place on the market a palatable butter substitute that is even cheaper than margarine containing a fair percentage of animal fat. This fact invites a critical attitude on the part of the dairy industry towards the use of coconut oil in making cheap margarine.

From 1916 to 1932, the use of this oil in the production of margarine increased from nearly 20,000,000 pounds to more than 134,000,000. This represents an increased use of nearly 600 per cent since the period of the World War. Another important consideration that interests the dairymen of the United States is the price for which the coconut oil can be imported. Coconut oil is shipped to the United States in the form of crude oil and copra (dried coconut meat); the former merely needs to be refined to be used for margarine production; the latter needs to be crushed and the oil refined.

Since 1910 the average annual price of copra has fluctuated from 1.2 cents to 6.6 cents per pound⁴ particularly has it declined in price during the depression years. During the years 1921 to 1930 inclusive it averaged 4.3 cents per pound. With an average import price of 4.3 cents per pound and a 60 per cent extraction factor, the value of coconut oil would be about 7 cents per pound, plus the small cost of extraction. Since 1930 the import price of coconut oil has dropped markedly. This decrease in price is now offset by the excise tax of 3 and 5 cents per pound. With the low average import price of 1.4 cents per pound of copra in 1933, it seems safe to assume that the manufacturers of margarine could still obtain coconut oil for about 7 cents per pound.

The increased use of low-priced coconut oil in margarine production has served to incline the cost ration between margarine and butter more and more in favor of the former product.

³ Mr. A. L. Haecker, Chief of the Nebraska Bureau of Dairies, Foods, and Drugs reports that cottonseed oil is now used extensively in place of coconut oil—Personal communication.

⁴ *Statistical Abstract of the United States*, U. S. Dept. of Commerce, 1936, p. 310.

THE ORIGIN AND THE PROBLEM OF MARGARINE

Margarine was first made in Europe during the time of Napoleon III when butter was a luxury, reserved for the more favored people. Under these conditions Napoleon III offered an award for the development of a fat which simulated butter in taste and quality.⁵ The perfection of a form of oleomargarine was the result.

Margarine was introduced into the United States in 1874.⁶ Because of the rapid expansion of the agricultural industry in the Middle West during these years, foodstuffs sold at rather low prices. Agricultural interests were, therefore, in a state of unrest. The advent of margarine on the American market served to arouse considerable criticism and opposition towards this food among the dairy interests. Attacks were made on three counts, namely (1) that the product was made from substances which could not properly be made into human food, (2) that ingredients were added which were detrimental to health, and (3) that the product was sold under false pretenses.

As early as 1883, two years prior to the charges quoted above, the Nebraska legislature passed "an Act for the protection of dairymen, and to prevent deception in sales of butter and cheese". The act provided that containers in which any article in resemblance of butter or cheese were packed and which were not the legitimate product of the dairy industry should be stamped with the word oleomargarine or butterine.⁷

Practices of the Margarine Industry. In the latter part of the 19th century compounded forms of butter substitutes, with little or no butter, were frequently sold as butter and for the price of butter. The substitutes were commonly colored like butter so that detection by appearance was impossible. The names stamped on the product could either not be differentiated from those common to the dairy industry or they simulated such terms as "dairy", "creamery", "butter", or "cow" so completely that detection or differentiation was difficult. No defense can be made for practices which fraudulently infringed on the sale of legitimate butter. Statutory regulations on this matter were timely and deserved.

The rather widespread impressions regarding the unwholesome constituents in margarine were not well founded. The charges that margarine was made from the fat of diseased animals and that it contained harmful chemicals were never proved.

The widespread opposition to the margarine industry towards the close of the 19th century induced the Division of Chemistry of the Department of Agriculture to investigate the adulteration of butter substitutes. The report of the department did not substantiate the popular notion about the

⁵ *Ibid.*, p. 123.

⁶ *Ibid.*, p. 12.

⁷ *Laws of Nebraska*, 18th session, 1883, chapt. LIII, p. 239.

unwholesome ingredients of margarine.⁸ The margarine industry was no more guilty of the use of adulterants in the manufacture of its product than were many of the other food manufacturers. Prior to the enactment of the Federal Pure Food and Drug Act in 1906 food adulteration was rather common, although such practice was in most instances not harmful.

FEDERAL LEGISLATION ON MARGARINE

By 1886, many states had adopted legislation designed to prevent fraudulent practices by the manufacturer and dispensers of margarine, as well as to impose some forms of taxes on the commodity. Concerted efforts by dairy states were also directed at Congress to legislate similarly on this industry. Congress complied by passing the act of 1886 which:

(1) Defined butter and margarine, (2) provided special taxes for manufacturers, wholesalers and retailers of \$600, \$480, and \$48 respectively, (3) stipulated that this food must be labeled "oleo-margarine" and (4) placed a tax of 2 cents on every pound of this product manufactured.⁹

The act of 1886 did not discriminate against colored margarine; consequently most of the margarine offered for sale was colored. The "butter-appearance" of the substitute facilitated misrepresentation, and in many instances retailers sold margarine, with perhaps varying amounts of butter added, as real butter. By the close of the 19th century, the National Dairy Union and other dairy interests were urging further national legislation to remedy alleged fraudulent practices. In 1902 an amendment was added to the Act of 1886 which contained, among other things, the following provisions:

(1) That margarine shipped from one state into another was subject to the laws of the state to which it was shipped; (2) that margarine colored in semblance of butter was subject to a manufacturing tax of 10 cents per pound, while the uncolored product was taxed $\frac{1}{4}$ cent per pound.¹⁰

The federal regulations for the margarine industry served to curtail somewhat the production and sale of the butter substitute. It is safe to assume that the tax of $\frac{1}{4}$ cent a pound on uncolored margarine did not serve to make the price of this product unreasonable and therefore reduce consumption. The 10 cent tax on colored margarine virtually prohibited the production and consumption of this product.

Coloring of Margarine by the Consumer. The practice of packing small quantities of coloring matter in the manufacturer's original package

⁸ Snodgrass, *op. cit.*, pp. 28-29.

⁹ *Ibid.*, pp. 33-35.

¹⁰ *Ibid.*, pp. 57-58.

of margarine began about 1918. Regulations were shortly adopted permitting the printing of instructions for coloring margarine on cartons or wrappers, provided that following such instructions a statement be printed indicating who may color the product. According to this act only private individuals preparing margarine for use within their own families or for institutions completely under state control may color such margarine.¹¹

Further amendments to the act of 1886 were adopted by Congress in 1930 and 1931, but these changed the previous provisions on margarine only slightly.¹²

Revenue Act of 1934. This act¹³ places a processing tax, or excise tax, of three cents per pound on coconut oil and certain other oil with respect to any of which there has been no previous domestic processing. The act applies to such oils as are imported from the Philippine Islands and any other possession of the United States. An additional tax of 2 cents per pound is placed on these oils imported from other countries.

The taxes collected under this section with respect to coconut oil wholly of Philippine production or produced from materials wholly of Philippine growth or production, is held as a separate fund and is paid to the treasury of the Philippine Islands. If at any time the Philippine government provides by any law for any subsidy to be paid to the producers of copra, coconut oil, or allied products, no further payments will be made to the Philippine treasury by the United States.

Effects of Legal Restrictions on Production and Sale of Margarine. The federal tax of $\frac{1}{4}$ cent a pound on margarine is merely regulatory and does not affect the sale to a marked extent, whereas the federal tax of 10 cents a pound on colored margarine may be considered discriminatory and protective. Other federal regulations serve to institute honest methods of labeling and selling margarine as a butter substitute and not as a dairy product. It is this form of regulation that has undoubtedly affected the sale of margarine. There was a marked decline in the production and consumption of the substitute in 1902 when colored margarine was largely taxed out of existence.

Laws passed by many states have imposed similar or even greater restrictions on the practices of the margarine industry. Many of these laws vitally affected the production and sale of butter substitutes. The Nebraska law places a 15-cent tax on certain forms of margarine. No margarine made from imported coconut oil has been sold in this state since the law has gone into effect.

¹¹ U. S. Bureau of Internal Revenue, *Regulation No. 9*, Section 44.

¹² 71st Cong., 2nd sess., chapt. 882, 1930, and 3rd sess., chapt. 520, 1931.

¹³ U. S. Bureau of Internal Revenue Regulation 48 relating to Processing Tax on Certain Oils, Washington, D. C., 1934.

PRODUCTION AND CONSUMPTION OF MARGARINE

In the fiscal year of 1886, about 20,000,000 pounds of margarine were produced and sold in the country, a per capita consumption of about 0.35 pounds. In 1901 about 121,000,000 pounds were produced and the per capita consumption was 1.54 pounds. The federal law of 1902, which was an amendment to the act of 1886, curtailed production and consumption considerably. In 1905 only 44,000,000 pounds of margarine were consumed in the United States, making a per capita consumption of about 0.51 pounds.¹⁴

The production of margarine declined from 1919 until 1921-22 and then increased to another high point in 1929. During the latter year the per capita consumption of margarine was 2.84 pounds. The increased consumption of margarine from 1925 to 1930 is traceable to the wide discrepancy between the price of butter and the price of margarine. The average wholesale price of butter during 1925 was 43.7 cents, whereas that of margarine was 20.5 cents. Following 1929 the consumption of margarine declined again, largely because of the low price of butter during the depression years. The drought of 1934 may cause the situation to

TABLE 11.—*Trend in Number of Retail, Wholesale, and Manufacturing Establishments for Margarine in Nebraska, from December 1, 1928 to November 30, 1936.*^a

Date	Establishments		
	Retail	Wholesale	Manufacturing
Dec. 1, 1928—Nov. 30, 1929	3,389	34	1
Dec. 1, 1929—Nov. 30, 1930	3,132	38	1
Dec. 1, 1930—Nov. 30, 1931	2,059	24	1
Dec. 1, 1931—Nov. 30, 1932	1,516	17	1
Dec. 1, 1932—Nov. 30, 1933	1,524	15	1
Dec. 1, 1933—Nov. 30, 1934	1,567	16	1
Dec. 1, 1934—Nov. 30, 1935	2,690	20	0
Dec. 1, 1935—Nov. 30, 1936	2,337	21	0

^a Department of Agriculture, Lincoln, Nebraska.

be reversed again. The high price of butter during the winter of 1934 again served to increase the consumption of butter substitutes.

No data on the consumption of margarine in the various states are available. Attempts have been made to determine consumption by states on the basis of number of dealers' licenses issued in proportion to popula-

¹⁴ It should not be presumed that statutory regulations alone are responsible for the varying amounts of margarine produced and consumed. The relative price of butter and butter substitutes is an important consideration which induces many housewives to select one or the other product. It must also be remembered that the price of margarine may be influenced by state as well as by national taxes.

tion. This method reveals that consumption is perhaps largest in Kansas, Indiana, Iowa, Oregon, Washington, California, Nebraska, Ohio, Michigan, Colorado, South Dakota, Illinois, Minnesota, and Missouri.¹⁵

This survey of dealers licenses was taken prior to 1930; hence the list is not necessarily correct at this time. Consumption of butter substitutes in Nebraska has decreased markedly since 1933, when a 15-cent tax per pound was placed on all margarine which did not contain 50 per cent animal fat or which contained imported oils. Table 11 shows the general change from 1928-29 to 1935-36.

SUMMARY

The first cheese factory in the United States was built in Oneida County, New York, in the eighteen-fifties and the first creamery was constructed in the same state in 1861. Prior to 1880 the making of butter in Nebraska was a home industry. A number of creameries were built in the eighties and the cream-gathering plan was developed. This plan lasted until the middle of the nineties when the centrifugal separator came into use at skimming stations located over the state. About 230 skimming stations were in operation from about 1895 to 1903. The introduction of the hand separators in 1892 resulted in the discontinuation of the skimming stations after 1900. The perfection of the Babcock butterfat test in 1890 was of invaluable aid to the butter industry.

In recent years about 85 per cent of the butter produced in Nebraska was manufactured by creameries. Nebraska's per capita production of butter increased from 12 pounds in 1860 to 43 pounds in 1900, to 80 pounds in 1930. The average annual per capita consumption of butter in the United States is about 18 pounds. The national production of butter per capita in 1860 was about 10 pounds and has ranged from 14 to 20 pounds since 1900. Nebraska ranks fourth in butter production being exceeded only by Minnesota, Iowa, and Wisconsin. During the nineteen-twenties production increased in central, western, and southern United States and decreased in New England and adjacent states.

The average production of butterfat per cow in Nebraska in 1933 was 160 pounds. The average butterfat content of milk produced in this state from 1929 to 1932 is estimated as 3.8 per cent. Nebraska farmers obtained a little more than 8 per cent of their income from the sale of butterfat in 1930. Butterfat production is the main commercial objective of Nebraska's milking enterprises. The largest individual cream producers are located in north-central and, to a lesser degree, in northwestern Nebraska. Each farmer reporting the sale of butterfat in 1929 produced an average of 144 pounds.

¹⁵ Snodgrass, *op. cit.*, pp. 190-191.

The peak production of farm butter in the state, 35 million pounds, was reached in 1899 when 12 million pounds of creamery butter was made. After 1910 creamery butter increased in importance and farm butter became less important, being used largely for farm and local consumption. Formerly the surplus farm butter was reprocessed by renovating plants, none of which exist in the state today.

Nebraska had 38 local cooperative and independent creameries in 1885, all of them being out of operation by 1912. About 400 creameries have been erected in the state, 316 having been built by 1912 although less than 40 were then in operation. In 1928 there were 113 operating creameries; in 1931 there were 154; and in 1933 there were 149. The limited milk-cow population is the main reason for failure of early creameries.

Several of the largest centralizer creameries in the world are in Nebraska. The average butter output per creamery in the state in 1929 was 1,200,000 pounds. Cream-gathering, assuring a constant supply of cream, was resumed in 1920 with the use of auto trucks. Cream stations and centralizer creameries have developed since 1900 and, since 1928, there have been between 2,300 and 2,800 cream stations in the state, the number per village or town ranging from 1 to 18 at the present time. A commission of from 2 to 4 cents per pound of butterfat purchased is commonly paid to the cream station attendants.

The first requisite for good creamery butter is wholesome milk and cream. The separator should be washed after each operation and should be set to produce a butterfat content between 35 and 45 per cent. Cream should be cooled to 50 degrees Fahrenheit or less after separation. The best butter is made from sweet, good-flavored cream, slightly soured before churning by the addition of a culture.

More than 60 million pounds of butter were shipped from Nebraska to the main markets of the United States in 1933. The Nebraska butterfat price was about 4½ cents below the wholesale price of 90-score butter in New York, from 1924 to 1933 and slightly more than 3 cents under the Chicago price. Most Nebraska butter scores about 90.

The cream station is a handicap in producing the best butter but it does not seem best to legislate it out of existence as has been done in Canada. More rigid laws can be passed and enforced.

The value of the skimmilk and buttermilk produced in this state was nearly \$5,000,000 in 1930, about 17 per cent of the value of the butter produced. Few commercial feeds are as good for young stock as skimmilk and buttermilk.

In recent years nut margarine has to a large extent replaced oleomargarine on the American market. Coconut oil is by far the most important ingredient of nut margarine. Coconut oil is produced in nearly all parts

of the tropics, but the main regions of commercial development are in the islands of the Pacific, in India, and in Ceylon. The American supply of this oil comes mainly from the Philippine Islands.

Margarine was introduced into the United States in 1874 and considerable criticism and opposition among the dairy interests was aroused. The state of Nebraska in 1883 and the United States government in 1886 began to legislate on practices in the margarine industry. The rather widespread impressions regarding the unwholesome constituents in margarine were not well founded.

At present an excise tax of 3 cents per pound is collected on coconut oil used in the United States which comes from the Philippines and other tropical islands under the jurisdiction of this country. On coconut oil imported from other countries the excise tax is 5 cents per pound. Nebraska has a tax of 15 cents per pound on margarine, unless this product contains more than 50 per cent animal fat or animal oil produced in the United States and contains no imported oil or fats.

In general, an increase in the consumption trend of margarine in this country may be noted. In 1929 the per capita consumption of margarine in the United States was 2.84 pounds. In the absence of legal restrictions and taxes, margarine may be purchased for about half as much as butter. The limited incomes of a large percentage of American families virtually compels them to purchase butter substitutes. The present excise tax on coconut oils and other related oils is merely a substitute for tariff protection.

ACKNOWLEDGEMENTS

The writer wishes to acknowledge the valuable assistance received from Mr. A. L. Haecker, Chief of the Nebraska Bureau of Dairies, Foods, and Drugs; Dr. H. P. Davis, Dr. P. A. Downs, Mr. Lawrence Crowe, and Mr. E. L. Reichert of the Dairy Husbandry Department, Dr. Nels A. Bengtson of the Department of Geography, and Dr. G. E. Condra, Dean of the Conservation and Survey Division, all of the University of Nebraska; and Messrs. A. H. Hoffman and Henry Nelson of the Beatrice Creamery Company, Lincoln. The late Dr. J. T. Link, Miss Grace Owens, Miss Johanna Kollmorgen, and Mr. E. C. Reed have read the manuscript and offered suggestions. Mr. J. D. Lytle drafted the charts and Mr. Richard Hufnagle took most of the photographs.