11-1-1970

The cheese industry in Nebraska

Evelyn Clark Burnett
University of Nebraska at Omaha

THE CHEESE INDUSTRY IN NEBRASKA

A Thesis

Presented to the

Department of Geography and Geology

and the

Faculty of the Graduate College

University of Nebraska at Omaha

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

Evelyn Clark Burnett

November 1970

Accepted for the faculty of The Graduate College of the University of Nebraska at Omaha in partial fulfillment of the requirements for the degree Master of Arts.

G B Ischiz
Chairman Department

Graduate Committee

Philip E. Vogel, Chairman
Name Department

Chris L. Jung Geography

Karl A Dahlstrom - History

_____

_____

ACKNOWLEDGMENTS

The writer is indebted to Dr. Philip E. Vogel for his cooperation and counsel throughout this undertaking; to Mr. Chris L. Jung for his practical suggestions toward its execution; to Mr. John P. Zipay for providing much needed guidance in map preparation.

A special note of thanks is due to Mr. T. A. Evans of the University of Nebraska College of Agriculture for his help in obtaining otherwise unavailable material, and for sharing his special knowledge of the dairy industry.

An expression of gratitude is extended to the members of my family for their steadfast support and encouragement in bringing this project to completion.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SOURCES FOR FIGURES

Figure

1. Study area.

2. Locations of cheese plants operating in 1969.

3. U.S. Department of Agriculture, Economic Research Service, Dairy Situation (Washington, D.C.: Government Printing Office), various issues.

4. Milk production data for year 1963 from Nebraska Department of Agriculture, State-Federal Statistics, Nebraska Agricultural Statistics Annual Report 1963 (Lincoln, Nebraska, 1965), p. 91; data for year 1969 from Nebraska Department of Agriculture, State-Federal Division of Agricultural Statistics, Nebraska--Milk Cows and Milk Production, 1969. (Mimeographed.)

5. Nebraska milk production data from Nebraska Department of Agriculture, State-Federal Statistics, Nebraska Agricultural Statistics Annual Report 1967 (Lincoln, Nebraska, 1969), p. 159; South Dakota milk data from South Dakota Department of Agriculture, Crop and Livestock Reporting Service, South Dakota Agricultural Statistics 1968 (Sioux Falls, South Dakota, n.d.), p. 42; Kansas milk data from Kansas State Board of Agriculture, Crop Reporting Service, Farm Facts 1968-1969 (Topeka, Kansas: Robert R. Sanders, State Printer, 1969), p. 82; Colorado milk data from Colorado Department of Agriculture, Division of Markets, Colorado Agriculture, A Statistical Profile (Denver, Colorado, 1969).

6. Division of Nebraska Resources, Department of Agriculture and Economic Development, "Cheese, Nebraska's Expanding Industry," (Lincoln, Nebraska, n.d. /after 1964/, Figure 7, p. 18. (Mimeographed.)

7. U.S. Department of Agriculture, Consumer and Marketing Service, Dairy Plants Approved for USDA Grading Service (Washington, D.C.: Government Printing Office,

January, 1970), p. 21; Nebraska Department of Economic Development, Directory of Nebraska Manufacturers 1968-69 (Lincoln, Nebraska, 1970), p. 132; also consulted, a list of active members of Nebraska Dairy Industries Association 1970. (Mimeographed.)

8. Information supplied by plant personnel during field interviews conducted during 1969 and early 1970.

INTRODUCTION

In recent years one of Nebraska's oldest industries has been revitalized. Cheese making, which began as a farm industry early in the state's history, is now in a period of growth and expansion. Nine cheese plants have come into existence in the state since 1960. Their importance is not only their direct contribution to the economy, but also their potential impact on dairying in the state. Milk production during the last few decades has steadily declined in Nebraska due, in part, to the falling demand for butter. Cheese manufacturing can possibly reverse this trend by providing a substitute market for milk. The location of a cheese plant can influence the milk production of its surrounding area as well as being influenced by it.

The purpose of this study is twofold: (1) to investigate the evolving conditions in the dairy industry which have contributed to the reappearance of the cheese industry in Nebraska and (2) to examine the plants singly and to appraise them collectively as a viable new industry in the state.

Analyses of industrial location have traditionally been the concern of economic geographers. Since Alfred Weber's[1] basic work on the subject was published in 1909,

[1]Alfred Weber, Theory of the Location of Industries, trans. by Carl J. Friedrich (Chicago: University of Chicago Press, 1929).

other theoretical and many empirical studies have contributed to the insight of locational processes. A survey of the literature of the field attests to the catholic interests of those writing: virtually every major industry from iron and steel to baking has been scrutinized in terms of location factors. In the narrowest sense, these have been: raw materials, markets, labor supply, transportation, fuel, and capital.

Location theories, as they have been applied to cheese manufacturing, have ranged over a broad and diverse spectrum. Both physical and cultural phenomena have been invoked: the presence of limestone soil, the absence of corn, the practice of summer dairying, the initiative of ethnic groups, the significance of freight rates, and more.[2]

Singly, or in combination, these theories have explained the presence of cheese making only in that they have accounted for, or assumed the presence of, a plentiful supply of whole milk. Cheese manufacturing is an example of a primary manufacturing industry whose raw material exerts a direct influence over locative decisions. Whole milk is both bulky and perishable. During the manufacturing process, ninety per cent of the raw material is reduced to a by-product of little or no value. That whole milk can be transported virtually any distance is unarguable; but to pay freight

---

[2]Gordon R. Lewthwaite, "Wisconsin Cheese and Farm Type: A Locational Hypothesis," Economic Geography, XL (April, 1964), 104.

charges on an inordinate amount of waste is untenable. Between a cheese plant and its source of raw material is a close bond only slightly loosened by transportation improvements.

The whole milk requirement for cheese making can be amended to specify manufacturing grade whole milk since economics favor and the law permits this grade of milk to be used by cheese plants.[3] Fluid grade milk is appreciably more expensive. Fluid grade can be used for manufacturing and is in areas where it is in surplus, but the general practice is to use the cheaper grade. Dairy areas oriented toward fluid grade production are not, then, economically hospitable to the cheese industry because of the displacement of manufacturing grade milk. For this reason, cheese plants are ideally located away from fluid milk sheds associated with urban areas, and are in regions of concentrated manufacturing grade milk production.

The present cheese industry in Nebraska has come into existence during the last decade. When an industry is new or reactivated in an area, temporal considerations deserve investigation as well as the fundamental question of location.

Part of the reason for the reestablishment of the cheese industry at the present time can be found in what has

---

[3]The distinction between fluid grade and manufacturing grade milk is based largely on bacterial count and sanitary regulations under which the milk is obtained (see below, p. 35.)

been called "the quiet revolution."[4] This term is intended to convey the significance of recent changes in the national and local dairy structure, both on the farm and in the factory. Outside of the industry, few people have recognized the personal and organizational adjustments that have been made in response to technological advances within the dairy industry. One of the innovations that has benefited the cheese industry is that whole milk rather than cream has become the product marketed from the farm. This alone does not account for the greatly increased production of cheese in the nation. A less tangible, but no less significant influence has been the decline in butter consumption coincident with the rising demand for cheese. Per capita consumption of butter in the United States decreased 70.5 per cent between 1940 and 1968, while that of cheese increased 68.3 per cent (see below, Table 6, p. 44).

In short, during the last few decades, an increasing amount of whole milk supply has made possible the change from butter to cheese manufacturing, and consumer preference has weighted the balance in favor of cheese. Dairy farmers and manufacturers have come to regard cheese as a suitable substitute for butter as the product into which milk may be made.

Although the cheese industry in Nebraska has shown a remarkable capacity for growth since the first plant opened

---

[4]T. A. Evans, "Cheese Takes Over," Cornhusker Economics, University of Nebraska College of Agriculture and Home Economics, Cooperative Extension Service, August, 1970.

in 1960, it is still small and just beginning to realize its potential. For this reason, locational studies by Durand and Lewthwaite of the large scale, compact cheese producing regions of Wisconsin and elsewhere have little relevance to the Nebraska experience.[5] Lewthwaite's postulation that areal intensity of dairying is a prerequisite to the success of a substantial cheese industry hardly applies to Nebraska cheese manufacturing at this stage of development.[6] The industry is not yet on a truly substantial scale, and several of the plants are located within areas of low milk density even by Nebraska standards. Lewthwaite's admonishment serves, nonetheless, to reaffirm the dependence of a cheese plant on its milk supply and the need to examine the relationship between the two.

The investigation of the plants and the relationship of each to its milk procurement area required that library research be supplemented with extensive field work. In order to standardize the information, a questionnaire was prepared and used during field interviews with plant management.[7] While all information which contributed to the general

---

[5]Loyal Durand, Jr., "Cheese Region of Southeastern Wisconsin," Economic Geography, Vol. XV (July, 1939), pp. 283-292; Lewthwaite, "Wisconsin Cheese and Farm Type: A Locational Hypothesis," pp. 95-112.

[6]Lewthwaite, "Wisconsin Cheese and Farm Type: A Locational Hypothesis," p. 104.

[7]A copy of the questionnaire used during field interviews is in Appendix I, p. 92.

knowledge of plant operation was sought, the focus of the inquiry was on milk procurement. It was decided that the relationship between a plant and its milk supply area was best established by four variables: (1) the amount of milk a plant used during a year (2) the number of farms required to supply this quantity of milk, (3) the areal extent of the milk supply region, and (4) the average distance the milk was transported from farm to plant.

Questions were also asked concerning general plant operations, the number of employees, the kinds of cheese and other products manufactured, the method of transportation, and first destination of products.

In some instances company policy understandably limited statistical responses to approximations rather than specifics. The questionnaire results, while not reaching the degree of uniformity or precision desired, were adequate in forming a generalized body of information around which to organize a basis for comparisons and analyses of Nebraska plant operations.

Field work was carried on during the year 1969 and early 1970. Each plant site was visited. In several instances manufacturing procedures were observed in addition to conducting the usual field interview.

The study area includes all of Nebraska and a few adjacent counties in South Dakota, Kansas, and Colorado. The milk procurement areas of several of the plants extend

into these neighboring states. An index map of the study area is shown in Figure I, and plant locations are shown in Figure II.

NEBRASKA AND ADJACENT COUNTIES

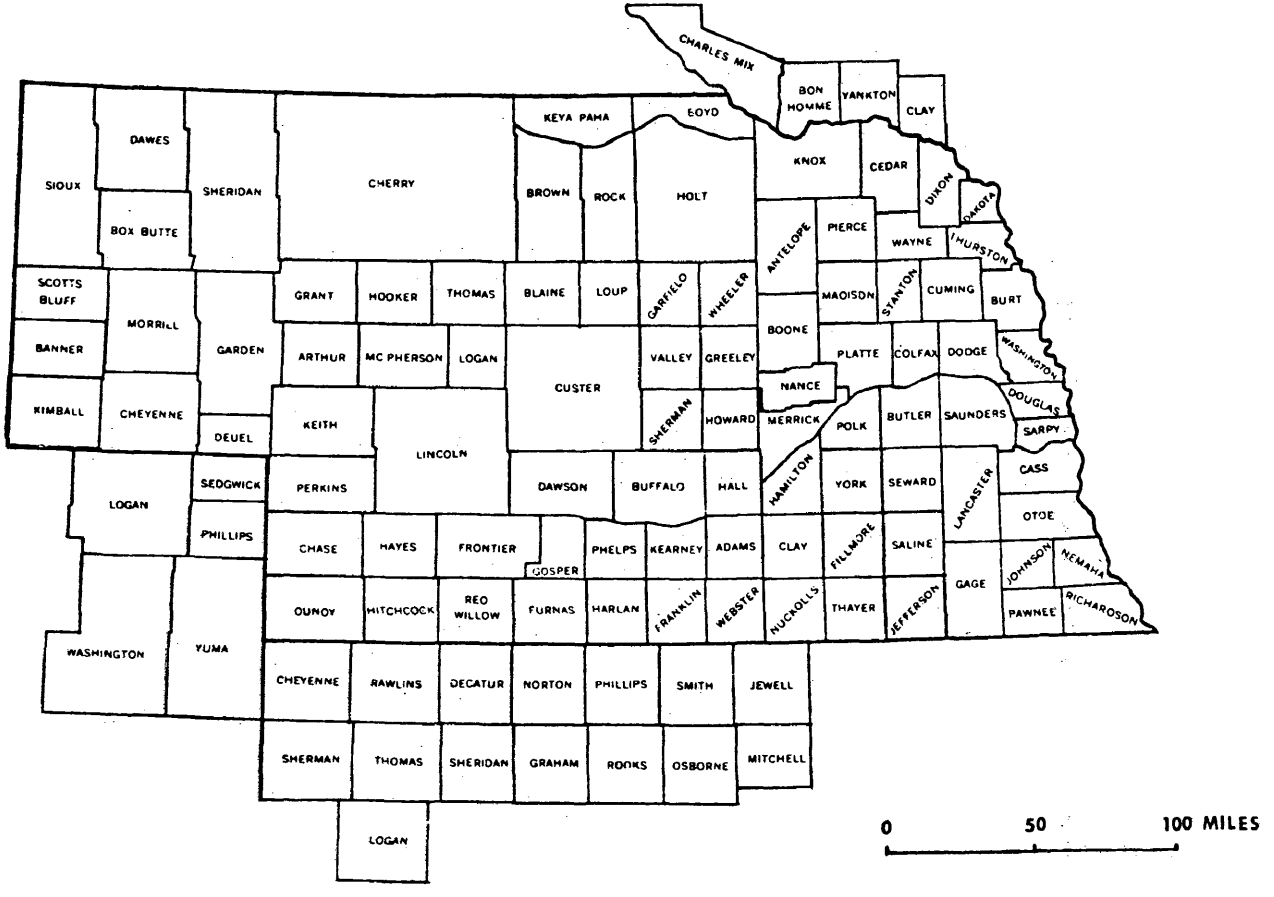


FIGURE 1

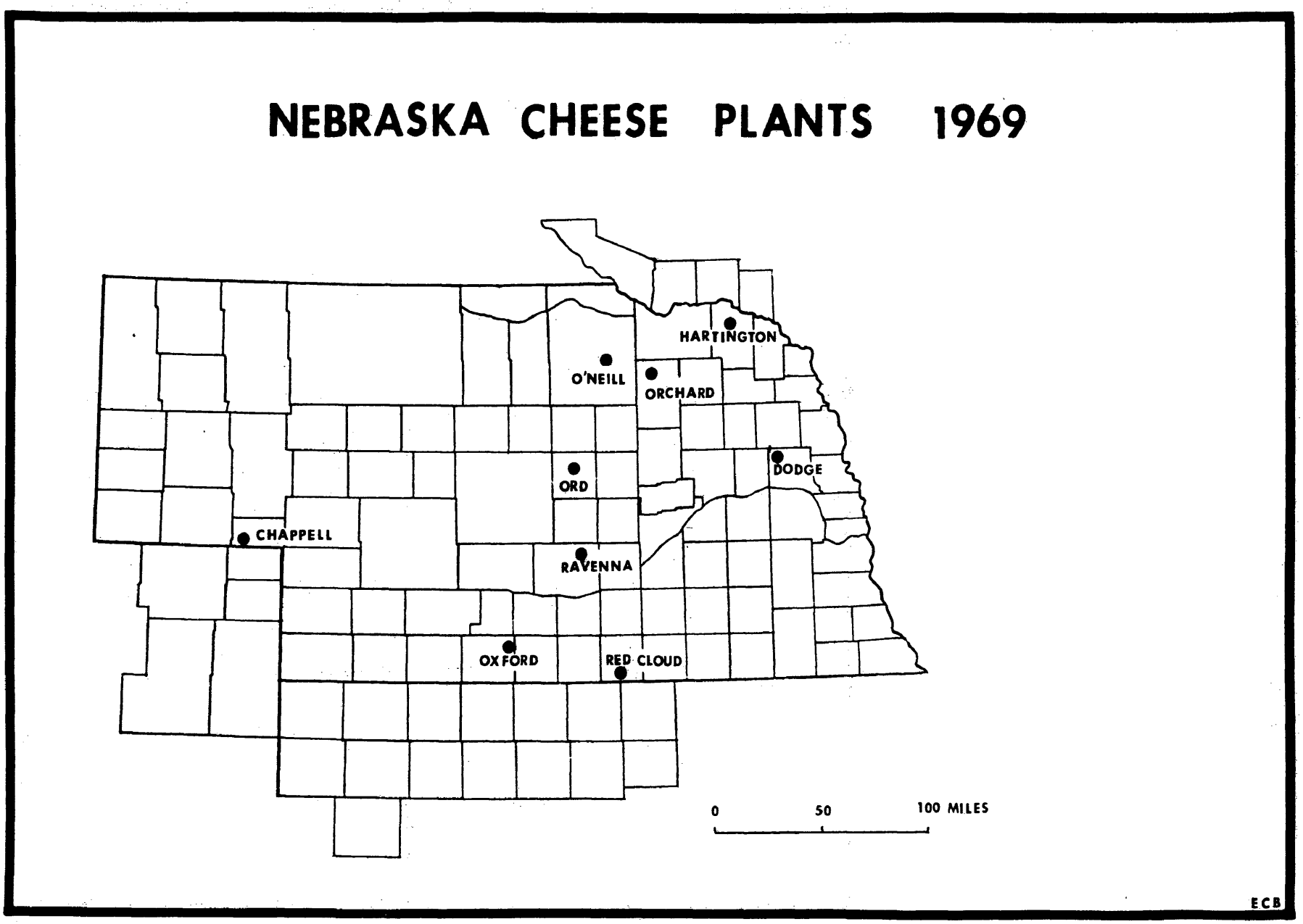

NEBRASKA CHEESE PLANTS 1969
HARTINGTON
O'NEILL
ORCHARD
DODGE
ORD
CHAPPELL
RAVENNA
OXFORD
RED CLOUD
0
50
100 MILES
ECB

FIGURE 2

CHAPTER I

CHEESE MAKING, ORIGIN AND DEVELOPMENT

The origin of cheese making is obscure but it is generally agreed that the discovery was accidental and that it occurred shortly after the domestication of milk producing animals in Southwest Asia over 10,000 years ago.[1] The availability of milk, the presence of a warm climate, and other fortuitous circumstances combined to produce a situation favorable to cheese making.

Most accounts of cheese making origin center on the theory that milk carried in a pouch made from the stomach of an animal coagulated naturally from the combined actions of heat and of enzymes present in the stomach lining. When opened, the pouch contained curd of cheese and a thin liquid, whey. A highly nutritious, versatile, and useful food had been discovered. The keeping qualities and compactness of cheese gave it natural advantages over fluid milk especially

---

[1] Carl O. Sauer, Agricultural Origins and Dispersals (New York: The American Geographical Society, 1952), pp. 84-87. An interesting account of the early domestication of cattle in Southwest Asia is also found in T. R. Pirtle, History of the Dairy Industry (Chicago: Mojonnier Bros. Company, 1926), p. 1. Pirtle describes the facade of a 6,000 year old building in Babylon depicting cows being milked into tall jars suggesting to the author a fairly advanced stage of dairying development.

to nomadic people or to populations removed from whole milk supply.[2]

Today, the initial, basic process of making cheese is virtually the same as that in the legend of cheese discovery; in the presence of heat, whole milk is coagulated by the action of the enzymes of rennet, a dried extract made from the stomach of calves or other ruminants, alone or combined with lactic acid which performs the same function. The hundreds of varieties of cheese are produced by slight differences in curd preparation, the addition of beneficial organisms such as bacteria or mold, and curing methods.[3]

The number of individual kinds of natural cheese is probably less than twenty, yet named varieties exceed 2,000. One variety may differ only slightly from another and still be known by a distinct name: "Christian IX is a Danish cheese that differs from Kuminost principally in size and shape."[4] Adding to the multiplicity of names is the common practice of calling a single cheese variety after the several

---

[2]An excellent account of cheese origin and dispersal with references to ancient historical records is J. G. Davis, Cheese, Vol. I, Basic Technology (New York: American Elsevier Publishing Company, Inc., 1965), pp. 3-7.

[3]Descriptions of the techniques used in making several different varieties of cheese are found in U.S. Department of Agriculture, Agricultural Research Service, Cheese Varieties and Descriptions, Agricultural Handbook No. 54 (Washington: Government Printing Office, 1969) and Newer Knowledge of Cheese, National Dairy Council (Chicago, 1967).

[4]Cheese Varieties and Descriptions, p. 29.

different localities which make it: "Eriwana cheese, also known by different local names such at /sic/ Karab, Tali, Kurini, Elisavetpolen, and Kasach. . . ."[5] The U.S. Department of Agriculture indexes over 800 cheeses by name and describes over 400--from Abertam to Zomma.[6] While there are hundreds of true cheese varieties, many others exist only in nomenclature.

Several systems of cheese classification are used but none is wholly inclusive or satisfactory. A basic grouping is to divide cheese into ripened, or cured, and unripened, or uncured, categories. Unripened cheese, which keeps poorly, includes such varieties as Cottage, Cream, and fresh Ricotta. All others, with varying degrees of keeping qualities, fall into the ripened, or cured, category. Another system classifies according to consistency: very hard, hard, semisoft, and soft. In this case, unripened cheese belongs to the soft group. Very hard cheeses are those commonly grated such as Parmesan and Romano. All other cheeses range between the extremes. The National Dairy Council uses a classification method which groups all natural cheeses into ten distinct kinds. Those of each category share common characteristics due to similar processing techniques.[7]

---

[5] Ibid., p. 43.

[6] Ibid., pp. 1-151.

[7] Newer Knowledge of Cheese, p. 10, reproduced in Appendix II, p. 94.

Of the ripened varieties of cheese made in the United States, over half is known as American. The next most important kinds by volume produced are the Italian types and Swiss.[8]

Until the middle of the nineteenth century cheese making was a farm operation performed by the women of the household. Milk not needed for fluid use was churned into butter or made into cheese. The cheese was usually inferior. It varied from farm to farm and different batches from the same maker were rarely identical. The quality of the milk used was frequently poor and the methods of preparation were nonscientific. The conversion of a perishable product into one which could be stored for future use was nevertheless a great advantage.

Farm production of cheese in this country in 1860 was 103,662,927 pounds. New York state produced nearly half the total. Nebraska was credited with a modest 12,342 pounds.[9]

---

[8]U.S. Department of Agriculture, Statistical Reporting Service, Crop Reporting Board, Production of Manufactured Dairy Products 1968, Da 2-1 (69) (Washington, D.C.: Government Printing Office, July, 1969), Table 7, pp. 14-15. The term American includes Cheddar, Colby, washed or stirred curd, high and low moisture jack, Monterey, and granular, n.1, p. 14. Cheddar accounts for 82 per cent (1968) of American cheese produced in the United States, calculated from Table 7, p. 15.

[9]X. A. Willard, "American Dairying: Its Rise, Progress, and National Importance," Report of the Commissioner of Agriculture for the Year 1865 (Washington, D.C.: Government Printing Office, 1866), pp. 453-454. (Hereinafter referred to as "American Dairying.")

The inception of the factory system which was capable of producing better and more uniform cheese is attributed to a cheesemaker in Oneida County, New York. In 1851 Jesse Williams began bringing milk from neighboring farms to a central location for the manufacture of cheese. While the practice had been adopted previously in parts of Switzerland, the idea is thought to have been original with Williams.[10] By 1866 there were 500 cheese plants in New York.[11] The factory system spread from New York into adjacent Pennsylvania and Ohio. As pioneer farmers with their cows moved west, factories often appeared where settlement produced milk in excess of fluid needs. An example of westward expansion was the establishment of a cheese factory in Iowa in 1866.[12] By the end of the nineteenth century over ninety-five per cent of the 300,000,000 pound cheese output of the United States was factory produced. New York and Wisconsin each had over 1,000 cheese plants and together accounted for three-fourths of the national output.[13] Signs of

---

[10] S. L. Goodale, "The Manufacture of Cheese," Report of the Commissioner of Agriculture for the Year 1863 (Washington, D.C.: Government Printing Office, 1863), pp. 403-404. The first creamery was established in the United States ten years later, 1861, also in New York, reported in Henry E. Alvord, "Dairy Development in the United States," U.S. Department of Agriculture Yearbook: 1899 (Washington, D.C.: Government Printing Office, 1900), p. 386. (Hereinafter referred to as "Dairy Development.")

[11] Willard, "American Dairying."

[12] Alvord, "Dairy Development," p. 386.

[13] Ibid., p. 400.

regional specialization had begun to emerge and the factory system of cheese production had superceded that of the farm. Europe adopted the factory system for cheese making somewhat later. The first English cheese factory began operation in 1870, and by 1900 the system was commonplace throughout the dairying countries of western Europe.[14]

During the last century, increased knowledge of chemistry and bacteriology has made cheese the product of carefully controlled scientific processes. Milk is inspected to insure high quality; plants, equipment, and final product are required to meet government standards.[15] The manufacturing process demands precise timing and checking at each step. Although dials and guages attest to the degree of automation present in a modern plant, the ultimate test of a batch of cheese in taste and texture still relies heavily on the judgment of an experienced cheese maker.

In order to operate successfully, a cheese plant must have a reliable source of fresh, clean, whole milk. Long distance hauling has somewhat reduced a plant's dependence upon its immediate area for its milk supply, but the industry as a whole remains directly tied to dairy farming. Any innovation in the dairy structure which affects

---

[14]Davis, Cheese, I, 8.

[15]U.S. Department of Agriculture, Consumer and Marketing Service, Laws and Regulations Affecting the Cheese Industry, Agriculture Handbook No. 265 (Washington, D.C.: Government Printing Office, July, 1966).

the supply of milk, the form in which it is marketed, or its quality, influences the cheese industry. In recent years changes in nearly every aspect of dairying have taken place. Of interest to this study are those changes on both local and national levels which have combined to permit and promote the establishment of a cheese industry in Nebraska.

CHAPTER II

RECENT CHANGES IN THE MAJOR CHARACTERISTICS OF DAIRY FARMING, UNITED STATES AND NEBRASKA

A significant trend in dairying which began decades ago and is expected to continue into the future is the reduction in the number of farms engaged in dairying. In the United States in 1910, over five million farms kept one or more milk cows, representing 80.3 per cent of all farms in the nation. By 1964 less than a million and a half farms kept cows, 36.2 per cent of all farms.[1] In 1969 the estimate was that 700,000 farms kept milk cows, and it is projected that by 1980 only 200,000 farms will supply the total milk production of the nation.[2] Nebraska has participated in this general reduction of farms engaged in dairying.

In Nebraska in 1954 there were 100,864 farms. Of these, 71,718 reported keeping milk cows. Of the 71.1 per cent keeping milk cows, 56,980 actually sold milk or cream. By 1964 there were 80,163 farms in the state and the number

---

[1]U.S. Department of Commerce, Bureau of the Census, Census of Agriculture: 1964, Vol. II, chapter 2, Livestock, Poultry, and Livestock and Poultry Products, p. 44.

[2]U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-329 (Washington, D.C.: Government Printing Office, March, 1970), pp. 30-31. (Hereinafter referred to as Dairy Situation-329.)

selling milk or cream had declined to 21,892.[3] While the total number of farms in the state decreased 20.5 per cent during the ten year period, the number of farms selling milk or cream declined at the more rapid rate of 61.5 per cent. The county range in percentage of farms reporting sale of milk and cream in 1964 displayed a wide variation from a high of 55.4 per cent in Sherman County in the central part of the state to a low of 5.2 per cent in Scotts Bluff County in the west.[4]

Nearly as remarkable as the decline in the number of farms engaged in dairying is the decrease in the number of milk cows kept on farms. In 1940 there were 23.6 million milk cows on farms in the United States. The figure for 1969 was 12.6 million, the lowest total reported since 1887.[5]

The rate of decline during the last decade has annually ranged from 3 per cent to 6 per cent, slackening to 2.8

---

[3]U.S. Department of Commerce, Bureau of the Census, Census of Agriculture: 1964, Vol. I, Statistics for the State and Counties, pt. 20, Nebraska, pp. 7-13. (Hereinafter referred to as Census of Agriculture, 1964, Nebraska.)

[4]Ibid., calculations were made from data in Table 1, pp. 210-219; Table 12, pp. 312-317.

[5]U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-327 (Washington, D.C.: Government Printing Office, September, 1969), pp. 4-5. (Hereinafter referred to as Dairy Situation-327.) In 1887 in Nebraska there were 334,000 milk cows, reported in Nebraska Department of Agriculture and Inspection, State-Federal Division of Agricultural Statistics, Nebraska Agricultural Statistics, Historical Record: 1866-1954 (Lincoln, Nebraska, n.d.), p. 79. (Hereinafter referred to as Nebraska Historical Records 1866-1954.)

per cent between 1968 and 1969. The 199,000 milk cows reported in Nebraska in 1969 was approximately one-third the number in 1940. Nebraska's current rate of decline of over 5 per cent between 1968 and 1969 is greater than the national average.[6]

Of the ninety-three counties in Nebraska, all show decline in milk cow numbers between 1950 and 1968, but seventy-two counties show a reduction of 50 per cent or more. No clear pattern emerges except that the three counties with the smallest decline are in the northeastern part of the state: Cedar County, 13 per cent decrease; Pierce County, less than 1.8 per cent decrease; Antelope County, 3.5 per cent decrease.[7]

Concurrent with the decrease in the number of farms engaged in dairying is the trend toward larger herds. The number of farms keeping milk cows in the United States is declining at the rate of 8 per cent a year.[8] This exceeds the current 2.8 per cent rate of decline in number of dairy cows and indicates that average herd size in the United States is growing larger. Although 62 per cent of the herds in 1964

---

[6]Dairy Situation-327, calculated from Table 4, p. 7.

[7]Calculations were made from Nebraska Historical Records: 1866-1954, p. 121; Nebraska Department of Agriculture, State-Federal Division of Agricultural Statistics, Nebraska Agricultural Statistics: Annual Report 1967 (Lincoln, Nebraska, 1969), p. 159.

[8]Dairy Situation-329, p. 30.

had ten or fewer cows, this was 9 per cent less than in 1959. During the same period herds of thirty or more milk cows increased from 6 per cent to 13 per cent of all farms reporting milk cows.[9] While most dairy farms remain essentially family operations, the tendency toward larger herds requires greater reliance on hired labor, labor-saving equipment, or both. Dairy herds of 100 or more cows are becoming more numerous and are expected to become increasingly so in the future. In this size range, capital costs per cow tend to grow less as herd size increases.

In Nebraska in 1964, 70 per cent of the dairy herds had ten or fewer cows; 18 per cent had ten to nineteen cows; 6 per cent twenty to twenty-nine cows; and only 4.7 per cent of the herds had over thirty milk cows.[10] There is a trend in the state toward larger dairy herds, but in 1964 Nebraska had advanced less far in this direction than the national average.

It follows that with larger herds, the sale of milk per farm has increased. In Nebraska in 1959 the average was 38,000 pounds per farm; in 1964, it was 69,000 pounds, an increase of 81.6 per cent.[11] At this rate of increase, the

---

[9]U.S. Department of Agriculture, Economic Research Service, Dairy Statistics 1960-67, Statistical Bulletin No. 430 (Washington, D.C.: Government Printing Office, July, 1968), calculated from data Table 25, p. 47. (Hereinafter referred to as Dairy Statistics 1960-67.)

[10]Ibid.

[11]Ibid., Table 22, p. 44.

average milk production per farm in Nebraska in 1969 would be 125,304 pounds.

The decline in milk cow numbers has tended to be offset by increased milk production per cow. Dairy herd improvement, feeding, and other management practices have succeeded in substantially increasing the volume of milk per cow per year. The national rate of increase in volume of milk per cow per year has varied from 3 per cent to 5 per cent since 1950.[12] Between 1967 and 1968 the rate of increase was 2.2 per cent.[13]

Nebraska has lagged behind the national average due, in part, to the practice of milking some dual purpose cows at least as late as 1954.[14]

The national average of milk production per cow in 1968 was 8,992 pounds.[15] An estimate for Nebraska for the same year was calculated to be 7,900 pounds of milk per cow, 12.1 per cent below the national average.[16]

---

[12] Ibid., calculated from Table 3, p. 3.

[13] Dairy Situation-329, calculated from Table 1, p. 5.

[14] Ernest Feder and Sheldon W. Williams, Dairy Marketing in the Northern Great Plains: Its Patterns and Prospects, South Dakota State College, Agricultural Experiment Station Bulletin 438 (Brookings, South Dakota, May, 1954), p. 6.

[15] Dairy Situation-329, Table 1, p. 5.

[16] Nebraska Agricultural Statistics: Annual Report 1967, calculated from data p. 159. This is double the 1926 figure of 3,970 pounds of milk per cow per year reported in Nebraska Historical Records 1866-1954, p. 102.

With the rate of increase in production of milk per cow (2.2 per cent) approaching the rate of decline in cow numbers (2.8 per cent) the total amount of milk produced in the United States remains fairly stable at the present time.

Between 1930 and 1964 milk production in the United States increased significantly from 100 billion pounds to 127 billion pounds. Since 1964, a peak year for the nation, there has been a downward trend. The largest decrease occurred between 1965 and 1966 when milk production fell from 124 billion pounds to 119 billion pounds. Since 1966 the decline has been more gradual with the production figure for 1969 set at 116 billion pounds, less than 1 per cent decline from the previous year.[17]

Regionally, 64.2 per cent of the milk produced in the United States in 1968 was from the Northeast, the Lake States, and the Corn Belt. The greatest decline in milk production between 1964 and 1968 was in the Corn Belt and the Northern Plains (of which Nebraska is a part). (See Table 1, p. 23 and Figure 3.)[18]

---

[17]Data for years 1930 through 1959 from U.S. Department of Agriculture, Economic Research Service, Dairy Statistics through 1960, Statistical Bulletin No. 303 (Washington, D.C.: Government Printing Office, February, 1962), pp. 333-335. Data for years 1960 through 1966 from Dairy Statistics 1960-67, p. 4. Data for years 1967 through 1969 from Dairy Situation-329, p. 8.

[18]The regional scheme shown in Figure 3 is used throughout Chapters II and III of this study. The regional delimitations are those of U.S. Department of Agriculture, Economic Research Service, Dairy Situation (Washington, D.C.: Government Printing Office) various issues.

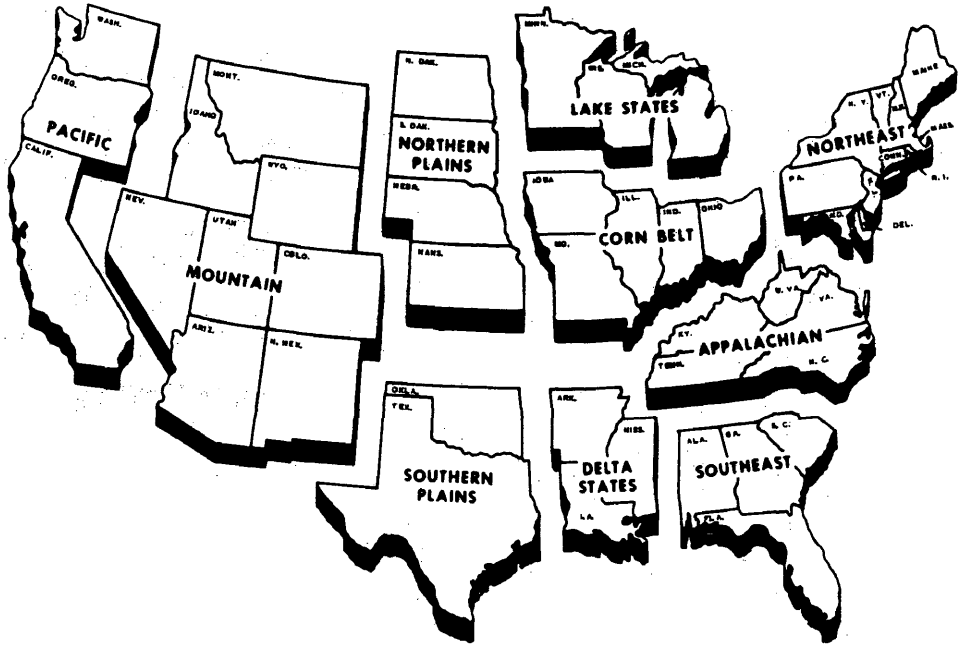
TABLE 1

MILK PRODUCTION BY REGIONS, 1964 AND 1968

Region	1964 Mil. lb.	1968 Mil. lb.	Per cent change 1968/64 Pct.	As a percentage of U.S. total 1968 Pct.
Northeast	25,747	23,862	-7.3	20.4
Lake States	36,271	33,061	-8.9	28.2
Corn Belt	22,566	18,292	-18.9	15.6
NORTHERN PLAINS	6,939	6,180	-10.9	5.3
Appalachian	8,500	8,288	-2.5	7.1
Southeast	3,648	3,917	+7.4	3.3
Delta States	2,810	2,814	+.1	2.4
Southern Plains	4,238	4,265	+.6	3.6
Mountain	4,601	4,576	-.5	3.9
Pacific	11,491	11,874	+3.3	10.1
Alaska & Hawaii	156	152	-2.6	.1
United States	126,967	117,281	-7.6	100.0

Source: U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-326 (Washington, D.C.: U.S. Government Printing Office, July, 1969), Table 17, p. 27.

DAIRY PRODUCTION REGIONS



ECB

FIGURE 3

Nebraska's milk production has decreased steadily since 1933 when the amount produced was 3,163 million pounds.[19] Between 1963 and 1969 milk production dropped from 1,851 million pounds to 1,630 million pounds, a decrease of 11.9 per cent.[20] Since this is the period during which the cheese plants were established in the state (1960 through 1967), it is of interest to this study to investigate the possible influence of a cheese plant on the milk production of its immediate area (Figure 4). The map shows that the counties which recorded an increase, and many of those which maintained the same production, are in the vicinity of one of the cheese plants. That some of the plants have succeeded in generating an increase in milk production in the counties near them seems a safe conjecture and is supported by the claims of at least one plant manager.[21]

The density of milk production in Nebraska in 1968 was 21,500 pounds per square mile, approximately the same as that of the other states in the Northern Plains Region: (North Dakota, South Dakota, and Kansas). Nebraska compares

---

[19] Nebraska Historical Records 1866-1954, p. 103.

[20] Data for 1963 from Nebraska Department of Agriculture, State-Federal Division of Agricultural Statistics, Nebraska Agricultural Statistics Annual Report 1963 (Lincoln, Nebraska, 1965), p. 91. Data for 1969 from Nebraska Department of Agriculture, State-Federal Division of Agricultural Statistics, Nebraska--Milk Cows and Milk Production, 1969. (Mimeographed)

[21] During field interview with the manager of the Leprino Cheese Manufacturing Company, spring, 1970, at Chappell, Nebraska.

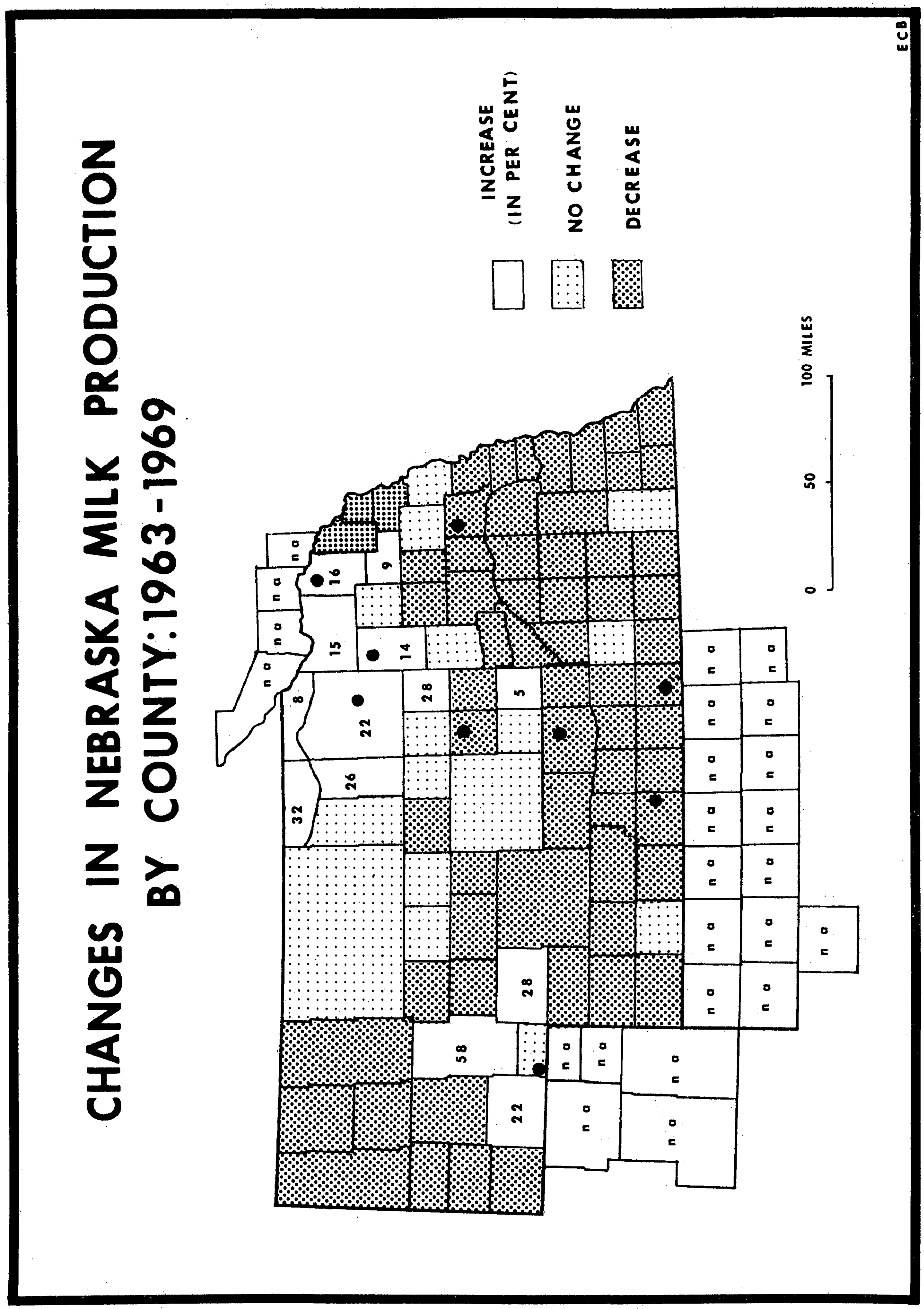

CHANGES IN NEBRASKA MILK PRODUCTION
BY COUNTY: 1963-1969
INCREASE
(IN PER CENT)
NO CHANGE
DECREASE
0
50
100 MILES
ECB

FIGURE 4

less favorably to states in which dairying is more intensively pursued. Milk production per square mile in Wisconsin was 324,400 pounds; New York, 205,000 pounds; Minnesota, 122,000 pounds; and Iowa, 99,000 pounds (1968).[22]

Within the state, the highest density of milk production is in the northeastern part of the state: Cedar, Pierce, and Wayne Counties individually produced over 100,000 pounds of milk per square mile (1968). If a dairy region can be said to exist in Nebraska it is in this part of the state (Figure 5).

In the past, the common practice was for much of the milk to be kept on the farm where it was produced. A small part of this amount was retailed by the farmers, the remainder was consumed by the family or fed to livestock. Today, because of the smaller number of families keeping milk cows, human consumption of milk on the farms has been reduced. In addition, fewer calves are being kept for herd replacement and feed substitutes for livestock are increasingly used. The result is that less milk is used on the farm and a larger proportion of the milk produced is marketed. Between 1930 and 1968 the percentage of milk sold in the United States increased from 77.6 per cent to 96 per cent.[23] While

---

[22]U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-324 (Washington, D.C.: Government Printing Office, March, 1969), calculated from Table 5, p. 10. (Hereinafter referred to as Dairy Situation-324.)

[23]U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-325 (Washington, D.C.: Government

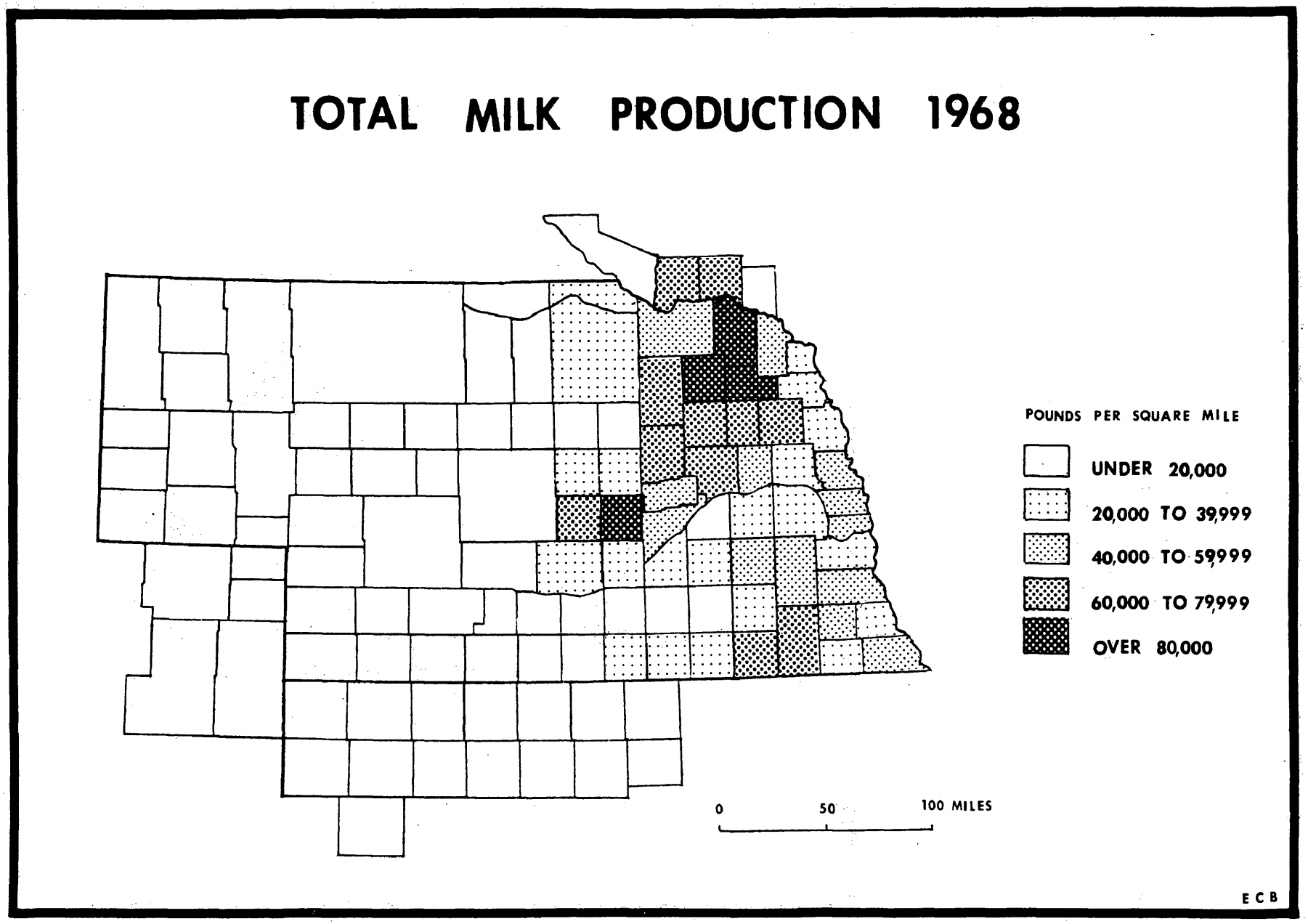

TOTAL MILK PRODUCTION 1968
POUNDS PER SQUARE MILE
UNDER 20,000
20,000 TO 39,999
40,000 TO 59,999
60,000 TO 79,999
OVER 80,000
0
50
100 MILES
ECB

FIGURE 5

total milk production gained only 17 billion pounds during this period, milk marketed increased 34 billion pounds. The Nebraska experience closely parallels that of the nation; by 1967, 93.4 per cent of the milk produced in the state was marketed.[24]

Although the noted modifications in dairying practices in Nebraska and the nation are important, none is more significant in demonstrating the dynamic nature of the dairy industry than the change in milk marketing which has occurred during the last decade.

Traditionally milk sold for other than fluid products was marketed in the form of cream. Milk was separated into cream and skim milk on the farm or, in the early days, at a skimming station. In Nebraska poor roads and severe climatic conditions during much of the year limited cream pickups to once or twice a week. The cream was hauled to a cream station or local creamery and made into butter. The skim milk was kept on the farm and fed to the livestock. In recent years farmers have become increasingly convinced of the advantages of whole milk marketing. Since 1960 the proportion of milk products sold has shifted substantially in favor of whole milk over cream.[25]

Printing Office, May, 1969), Table 2, p. 7. (Hereinafter referred to as Dairy Situation-325.)

[24]Calculated from Dairy Statistics 1960-67, Table 7, p. 18.

[25]T. A. Evans, "Shall I Sell Whole Milk?," University of Nebraska College of Agriculture and U.S. Department of

TABLE 2

MILK USED AND MARKETED BY FARMERS, NEBRASKA, SELECTED YEARS

Year	Total milk produced	Milk used on farms	Milk delivered to plants and dealers[a]	
	Bil. lbs.	Per cent of total	As whole milk	as farm cream[b]
	Bil. lbs.	Pct.	Mil. lbs.	Mil. lbs.
1930	2,806	25.2	216	1,754
1940	2,589	21.3	235	1,595
1950	2,250	17.8	390	1,401
1960	2,008	10.0	720	1,080
1964	1,941	7.8	1,150	630
1967	1,667	6.5	1,260	290

[a]In each year a small percentage was sold directly to the consumer by the farmer.

[b]Milk equivalent of cream.

Sources: Data for years 1930, 1940, and 1950 from U.S. Department of Agriculture, Economic Research Service, Dairy Statistics through 1960, Statistical Bulletin No. 303 (Washington: Government Printing Office, 1962) Table 7, p. 70. Data for years 1960, 1964, and 1967 from U. S. Department of Agriculture, Economic Research Service, Dairy Statistics 1960-67, Statistical Bulletin No. 430 (Washington: Government Printing Office, 1968), Table 7, p. 18.

Nebraska differs from the national average in that for the year 1967, only 75.6 per cent of Nebraska's total milk production was marketed as whole milk compared to 92.1 per cent for the United States as a whole; 17.4 per cent as farm separated cream compared to that of 2 per cent for the nation.[26] From the above information it is apparent that the conversion from cream to whole milk marketing in Nebraska is less complete than for the nation as a whole.

The consequence of this change to whole milk marketing and its relevance to this study lies in the fact that greatly increased amounts of nonfat solids are being sent to market. Under the old system they were fed to animals or wasted. Now they are becoming available for direct human consumption as nonfat dry milk, other skim milk products, or as cheese. Whereas butter making uses only the fat content of milk, cheese contains both fat and nonfat solids of whole milk. Cheese manufacturing, therefore, must have whole milk as its raw material.

Associated with the form in which milk is marketed, as cream or as whole milk, is the method by which the product

---

Agriculture Cooperating, Extension Service, n.p. [1959.] This pamphlet is addressed to the dairy farmers of Nebraska. The author's argument in favor of whole milk marketing emphasizes: the need for less labor, the decreased use of milk as an efficient animal feed, greater cash income, and the demand for creameries for whole milk to be skimmed at the plant, pp. 4-5.

[26]U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-325 (Washington, D.C.: Government Printing Office, May, 1969), Table 2, p. 7. (Hereinafter referred to as Dairy Situation-325.)

is handled on the farm and transported to the dealer. In the past both cream and milk commonly went to market in cans. Coincident with the shift from cream to whole milk marketing is the use of bulk storage tanks on the farm. These hold at least two days supply of milk and on alternate days bulk carriers collect the milk from the tank and transport it to the dealer. Because of reduced chances of contamination and improved cooling methods, milk handled in bulk is of consistently higher quality than that handled in cans.

Since there is a high initial investment, only those farmers who consider dairying a major and permanent part of their total enterprise are likely to install bulk tanks. Earlier this applied primarily to fluid milk producers. Now, because many manufacturing plants are set up to handle only bulk milk, the change has become virtually mandatory for manufacturing grade producers as well.[27]

In 1966 Nebraska had 5,481 bulk tanks in use.[28] This is 24 per cent more than reported in the Census of Agriculture 1964, the first year bulk tanks have been counted.[29] As the

---

[27]The subject of handling milk in cans or bulk tanks in Nebraska is discussed in: Evans, "Shall I Sell Whole Milk?," pp. 8-11; Clarence J. Miller and Sheldon W. Williams, Potential Adjustments in Dairy Marketing in the Northern Plains States, University of Nebraska College of Agriculture, Agricultural Experiment Station Bulletin 450 (Lincoln, Nebraska, July, 1959), pp. 33-35.

[28]"Trends in Farm Bulk Tanks," Manufactured Milk Products Journal, LVIII (May, 1967), 9.

[29]Census of Agriculture, 1964, Nebraska, Table 8, pp. 272-281.

trend toward whole milk marketing continues, the number of bulk tanks will likely increase.

The value of dairy products in Nebraska compared to those of other farm products is relatively small. The value of all livestock products in the state in 1968 represented 72.4 per cent of all farm commodities sold. Of this percentage, dairying was responsible for 3.8 per cent or $65,540,000.00, an increase over 1966 of approximately $5,000,000.00. Of the total value of dairy products sold, whole milk accounted for 90 per cent, and cream 10 per cent.[30]

The only conclusion that can be drawn from the above is that, considered in total, Nebraska is not a dairy state according to the usual connotation the phrase carries. That sixteen of the ninety-three counties in the state accounted for 47.8 per cent of the total value of dairy products sold in the state in 1964 suggests that dairying is more important in some areas than overall state figures suggest.[31]

It has been demonstrated that change is characteristic of dairying in many phases. A major trend of recent years has been toward greater specialization, fewer but larger dairy

---

[30]U.S. Department of Agriculture, Economic Research Service, Farm Income States Estimates, FIS-214 (Washington, D.C.: Government Printing Office, August, 1969), p. 103.

[31]These sixteen counties are: Custer, Holt, Knox, Cedar, Antelope, Pierce, Wayne, Madison, Cuming, Platte, Merrick, Washington, Seward, Lancaster, Jefferson, and Gage.

operating units. Commercialization is increasing as a greater percentage of the milk produced is being marketed. The use of bulk tanks and bulk hauling have contributed to higher quality milk.

These changes have affected directly or indirectly the amount and quality of milk available for manufacturing. In light of the need of a cheese plant for whole milk as a raw material, the most meaningful change has been the introduction and general acceptance of whole milk marketing.

In Nebraska and other similar areas where the traditional farm practice was to sell only cream, cheese plant operation would be difficult if not impossible. Whole milk marketing, therefore, is considered to be a basic contributory factor toward the establishment of Nebraska's present cheese industry.

CHAPTER III

MANUFACTURED DAIRY PRODUCTS

Milk is marketed as fluid grade (referred to in some states as Grade A), and manufacturing grade (Grade B). Both grades of milk must meet state government standards to insure safe production and handling, but those set for milk eligible for fluid use are more stringent. Bacterial count must be lower for fluid grade milk than manufacturing grade, and sanitary conditions for milking equipment and procedures are more exacting.[1] The trend in recent years has been toward a larger percentage of the total milk marketed to be graded as eligible for fluid use. Sixty-three per cent of the milk sold in 1955 was fluid grade; in 1968, the amount had risen to 70 per cent. The remaining 30 per cent (1968) was manufacturing grade, or Grade B.[2]

Regionally the production of fluid grade milk shows some correlation to the distribution of population. Manufacturing grade milk production is more concentrated. In

---

[1]State of Nebraska, Department of Agriculture, Bureau of Dairies and Foods, Nebraska Graded Milk Law (Lincoln, Nebraska, 1967), pp. 12-30.

[2]U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-330 (Washington, D.C.: Government Printing Office, May, 1970), Table 2, p. 7. (Hereinafter referred to as Dairy Situation-330.)

1968 over 75 per cent of the manufacturing grade milk was produced in the Lake States and the Corn Belt (Table 3).

The Northern Plains Region marketed 4,770 million pounds of whole milk in 1968. Of this, only 1,990 million pounds, or 41.7 per cent was fluid grade; 2,780 million pounds, or 58.3 per cent, was manufacturing grade milk, nearly double the percentage of manufacturing grade milk marketed by the nation as a whole. In addition, 1,025 million pounds of cream (whole milk equivalent) was sold, 52 per cent of the national total.[3]

The national average prices farmers received for the two grades of milk in 1968 was $5.67 per 100 pounds of milk eligible for the fluid market; and $4.06 per 100 pounds of manufacturing grade milk.[4]

At the present time higher standards are being set for manufacturing grade milk.[5] Expert opinion is that as production requirements between the two grades of milk are narrowed, producers will further improve their operations in order to qualify for the higher priced fluid grade or in

---

[3]U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-326 (Washington, D.C.: Government Printing Office, July, 1969), Table 20, p. 30. (Hereinafter referred to as Dairy Situation-326.)

[4]U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-328 (Washington, D.C.: Government Printing Office, November, 1969), Table 2, p. 8. (Hereinafter referred to as Dairy Situation-328.)

[5]State of Nebraska, Department of Agriculture, Bureau of Dairies, Foods and Drugs, Nebraska Manufacturing Milk Act (Lincoln, Nebraska, 1969), pp. 1-34.

TABLE 3

REGIONAL DISTRIBUTION OF POPULATION, PRODUCTION OF FLUID AND MANUFACTURING GRADES OF MILK, UNITED STATES, 1968

Region	Population	Fluid grade as a percentage of total	Manufacturing grade as percentage of total
	Pct.	Pct.	Pct.
Northeast	26.7	29.7	0.4
Lake States	8.3	17.8	55.4
Corn Belt	17.0	13.5	20.8
NORTHERN PLAINS	2.5	2.6	8.5
Appalachian	9.4	7.0	6.2
Southeast	8.5	4.6	.2
Delta States	4.1	2.9	1.0
Southern Plains	6.8	5.1	.3
Mountain	4.0	3.5	4.0
Pacific	12.3	13.1	3.2
Alaska and Hawaii	.6	.2	.[a]
United States	100.0	100.0	100.0

Note: [a]data not given.

Sources: Data for grades of milk from U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-326 (Washington, D.C.: Government Printing Office, July, 1969), Table 21, p. 30.

Data for population from U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-328 (Washington D.C.: Government Printing Office, November, 1969) Table 22, p. 39.

some cases, go out of business. The result could be that eventually all milk in the country will be sold as one grade at one price.[6] There is no known consensus of the effect that this would have in the long run on the amount of milk available for manufacturing.

The milk supply available for processing is that part of total production marketed by farmers and the milk equivalent of a small amount of imported dairy ingredients. The latter is relatively insignificant.

The two basic uses of the milk supply are in fluid products and manufactured dairy products. Between 1935 and 1968 the amount of milk used in manufactured products increased 13 billion pounds, but the percentage of the total milk supply for this utilization declined from 62.5 per cent to 52.7 per cent. The percentage used in fluid products rose from 35.5 per cent to 47.6 per cent of the milk supply.[7]

Since fluid grade accounts for 70 per cent of the milk supply, it follows that more of this grade is marketed than is needed for fluid products. This surplus fluid grade and the manufacturing grade milk produced are the two sources of milk used in manufactured dairy products. When milk was marketed primarily as cream there was less surplus fluid grade available

---

[6]U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-327 (Washington, D.C.: Government Printing Office, September, 1969), p. 30. (Hereinafter referred to as Dairy Situation-327.) See also, Dairy Situation-328, pp. 29-30.

[7]Dairy Situation-330, Table 7, p. 13.

for manufacturing. In 1949 fluid grade accounted for only 9 per cent of the total milk equivalent used in manufactured dairy products compared to 41 per cent in 1968.[8]

Milk used for fluid products is more highly valued and had first claim on the milk supply (above, p. 36). Manufacturing uses the balance. A decrease, then, in total milk supply, unless accompanied by a similar decrease in fluid demand, automatically means less milk available for manufacturing.

To summarize the present national situation: approximately 70 per cent of the total milk marketed is eligible for fluid use, slightly less than 50 per cent is needed for that purpose, leaving approximately 50 per cent of the milk supply available for manufacturing.

In reality, different regions of the country display wide variance in the way each utilizes its individual milk supply.[9] The Northeast region used only 31 per cent of its milk supply in manufactured dairy products in 1968, while both the Lakes States region and the Northern Plains region used over 74 per cent.[10] On the national level, as well as the local level, it seems to follow that areas not associated

---

[8] Dairy Situation-328, p. 35.

[9] In this case, milk supply refers only to that amount of milk produced and marketed within the region; the term does not take into account milk brought in from other areas.

[10] Dairy Situation-328, Table 21, p. 37.

with dense population utilize the major part of their milk supply in less perishable and more easily transported products.

The kind and quantity of manufactured dairy products is determined largely by consumer demand.[11] The amount of milk used in an individual product tends to fluctuate with change in consumer preference. The list of manufactured products is long and varied, but butter and cheese together account for the greatest percentage of the milk used in manufactured products.

In the years 1935 to 1968 the percentage of milk supply used in butter has dropped precipitously while that used in cheese has nearly doubled.

Until fairly recently the volume of butter produced has consistently exceeded that of cheese. Since 1960, on a pound to pound basis, more cheese than butter has been produced. Because one pound of butter requires approximately twice as much milk as one pound of cheese, butter remains the largest user of milk equivalent among the individual dairy

---

[11]This is not altogether true of butter and cheese which absorb some excess milk production and are purchased by the Commodity Credit Corporation under provisions of the Agricultural Act of 1949 reported in U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Dairy Price Support and Related Programs 1949-1968, Agricultural Economic Report No. 165 (Washington, D.C.: Government Printing Office, July, 1969), p. 1. Production of other manufactured dairy products is more nearly in line with commercial demand.

TABLE 4

UTILIZATION OF MARKET SUPPLY OF MILK IN FLUID AND MANUFACTURED DAIRY PRODUCTS, UNITED STATES, SELECTED YEARS[a]

Year	Milk supply used in fluid products	Milk supply used in butter	Milk supply used in cheese		Milk supply used in other factory products[b]
			American	Other[c]	
	Pct.	Pct.	Pct.	Pct.	Pct.
1935	35.5	44.6	6.5	1.9	9.6
1940	34.2	42.7	7.1	2.0	11.5
1950	43.1	28.2	9.2	3.0	15.8
1960	46.5	25.7	8.5	3.2	14.9
1968	47.6	22.1	11.3	4.2	15.2

[a]May not add due to rounding.

[b]Includes evaporated milk, condensed whole milk, frozen dairy products, and others.

[c]Includes Italian, Swiss, Muenster, other varieties.

Source: U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-330 (Washington, D.C.: Government Printing Office, May, 1970), Table 7, p. 13.

TABLE 5

TOTAL PRODUCTION OF BUTTER AND CHEESE, UNITED STATES, SELECTED YEARS

Year	Butter Mil. lb.	Cheese[a] Mil. lb.
1935	2,211	628
1940	2,240	785
1950	1,648	1,191
1960	1,436	1,478
1968	1,165	1,944

[a]Refers to all cheese other than cottage cheese.

Sources: Data for years 1935 through 1960 from U.S. Department of Agriculture, Economic Research Service, Food: Consumption, Prices, Expenditures, Agricultural Economic Report No. 138 (Washington, D.C.: Government Printing Office, July, 1968), butter data from Table 55, p. 121 and cheese data from Table 50, p. 116; data for year 1968 from U.S. Department of Agriculture, Statistical Reporting Service, Crop Reporting Board, Production of Manufactured Dairy Products 1968, DA 2-1 (69) (Washington, D.C.: Government Printing Office, July, 1969), butter data from Table 8, p. 17 and cheese data from Table 10, p. 19.

products.[12] Of the 59 billion pounds of milk equivalent used in manufactured dairy products in the United States in 1968, butter accounted for 42 per cent, and cheese, 29 per cent.[13]

The 1968 wholesale price of butter was 66.9 cents per pound; that of cheese, 47.6 cents per pound.[14] Given the greater volume produced, the value of cheese produced in 1968 was greater than that of butter: $925,344,000.00 compared to $799,395,000.00.

The per capita consumption of butter parallels the decline in butter production that began during World War II and continues to the present. Margarine consumption during the same period has increased appreciably. The improved quality of margarine and the greater than two to one price advantage over butter are largely responsible for this shift in consumer buying. The average retail price in 1968 of margarine was 27.9 cents per pound; that of butter, 83.6 cents per pound.[15] Together the 1968 butter and margarine per capita consumption was less than that of butter alone in

---

[12]To make one pound of butter requires approximately twenty pounds of milk; to make one pound of cheese requires approximately ten pounds of milk.

[13]U.S. Department of Agriculture, Statistical Reporting Service, Crop Reporting Board, Production of Manufactured Dairy Products 1968, DA 2-1 (69) (Washington, D.C.: Government Printing Office, July, 1969), p. 3. (Hereinafter referred to as Manufactured Dairy Products 1968.)

[14]Dairy Situation-328, p. 4.

[15]Ibid.

1940. The decline is possibly due to the public's recent concern with weight control and cholesterol count.

TABLE 6

PER CAPITA CONSUMPTION OF BUTTER, CHEESE, AND MARGARINE, UNITED STATES, SELECTED YEARS

Year	Butter	Margarine	Cheese	
			American	Other
	Pounds	Pounds	Pounds	Pounds
1940	17.0	a	4.4	1.6
1950	10.7	6.1	5.3	2.2
1960	7.5	9.4	5.4	2.9
1964	6.8	9.7	6.2	3.2
1968	4.9	10.8	6.1	4.0

[a]Data not given

Sources: Butter and cheese data for years 1940 through 1964 from U.S. Department of Agriculture, Economic Research Service, Food: Consumption, Prices, Expenditures, Agricultural Economic Report No. 138 (Washington, D.C.: Government Printing Office, July, 1968), Table 11, p. 52; data for 1968 from U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-325 (Washington, D.C.: Government Printing Office, May, 1969), Table 11, p. 20. Data for margarine from U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-328 (Washington, D.C.: Government Printing Office, November, 1969), Table 6, p. 14.

The per capita consumption of cheese (all kinds) increased 68.3 per cent between 1940 and 1968. The trend seems inconsistent compared to that set by butter, but cheese is not handicapped by the presence of a cheaper substitute, nor a "fat image." Butter is likely to be eliminated from the diet of those wishing to limit their intake of fat, whereas cheese is generally regarded as a protein food and is less affected.[16]

The impressive gain in cheese consumption is due to several factors. The most basic, it appears, is that the industry is making a good product at a price the public is willing and able to pay. There are many varieties of cheese suited to individual tastes, it is conveniently packaged and actively promoted. Whether at family gatherings, cocktail parties, or pizza parlors, cheese has become an accepted part of the American diet.

An innovation in cheese manufacturing begun in this country in 1920 has contributed to the growth of cheese popularity: the development of pasteurized process cheese. Natural cheese has inherent disadvantages. It is not a

---

[16]The following fat requirements for butter, cheese, and margarine are reported in U.S. Department of Agriculture, Consumer and Marketing Service, Federal and State Standards for the Composition of Milk Products and Certain Non-Milkfat Products, Agriculture Handbook No. 51 (Washington, D.C.: Government Printing Office, July, 1968): butter, a minimum milkfat content of 80 per cent, p. 15; Cheddar cheese, a minimum milkfat content of 50 per cent in solids, p. 16; margarine, a minimum of 80 per cent fat content, either animal or vegetable, p. 24.

perfectly uniform product in that slight variations in preparation and curing can result in one lot having a different taste and texture from another. In addition, the ripening process does not stop when the cheese reaches its prime condition. Deterioration and drying occur and considerable loss results. Pasteurized process cheese is made according to formula by blending natural cheeses from various lots in order to achieve the desired flavor. Emulsifying salts are added and the mixture is heated to pasteurization temperatures. No further curing takes place. The final product is insured to be uniform and can bear a brand name making it easily identifiable. Because process cheese melts readily, it lends itself well to cooking. Further, it can be packaged in small amounts without rind or waste. Detractors claim it lacks the character and distinctive quality of natural cheese, yet its production has increased steadily. In 1961 over 731 million pounds of pasteurized process cheese was produced and in 1968 this had risen to over 971 million pounds.[17]

Among manufactured dairy products, butter and cheese production tends to be regionally concentrated. The Lake States make nearly half the total butter, over half of the

---

[17]This total includes process cheese, cheese foods, spreads, and cold pack reported in Manufactured Dairy Products 1968, Table 3, p. 9. For a description of process cheese products see U.S. Department of Agriculture, Consumer and Marketing Service, Cheese Buying Guide for Consumers, Marketing Bulletin No. 17 (Washington, D.C.: Government Printing Office, May, 1961), pp. 14-15.

American cheese, and nearly half of the cheese other than American. More dispersed is the production of cottage cheese and frozen desserts including ice cream. These are the preferred products made from excess fluid grade milk. For this reason and because of their greater degree of perishability, their production tends more nearly to coincide with the manufacture of fluid products. As a by-product of butter making, non fat dry milk correlates closely to butter production.

Table 7 shows the percentage of total output of various manufactured products by region.

Proportionally there has been little change over the past two decades in regional cheese production. Most noticeable is the decline of American cheese production in the Corn Belt, although the production of cheese other than American has increased. The Northern Plains region has increased production in both cheese categories, although the proportion of each is small. (Table 8.)

Among the states making significant amounts of cheese (over 10 million pounds annually) only five made less cheese in 1968 than in 1960. These were Indiana, Michigan, Arkansas, Oregon, and California. The others remained virtually the same or increased production. During the same period, Wisconsin increased production from 641.1 million pounds to 847 million pounds, 32.1 per cent.[18]

---

[18]Data for 1960 from U.S. Department of Agriculture, Economic Research Service, Dairy Statistics 1960-67, Statistical Bulletin No. 430 (Washington, D.C.: Government Printing

TABLE 7

MANUFACTURED DAIRY PRODUCTS OUTPUT AS A PERCENTAGE OF UNITED STATES TOTAL, 1968

Region	Milk used[a]	Butter	American Cheese	Other Cheese	Cottage Cheese	Nonfat dry milk	Ice Cream
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Northeast	12.1	5.2	3.7	21.5	22.9	10.8	33.6
Lake States	40.3	49.9	54.4	44.1	14.8	53.4	10.9
Corn Belt	18.2	18.1	16.5	21.4	23.6	14.2	18.6
NORTHERN PLAINS	7.3	10.7	8.8	1.9	3.7	8.3	2.7
Appalachian	5.3	2.5	7.9	2.0	4.1	1.2	6.8
Southeast	1.3	.1	[b]	[b]	2.2	[b]	5.8
Delta States	1.5	.5	1.5	1.3	1.5	[b]	2.0
Southern Plains	2.2	2.0	1.4	[b]	3.5	1.8	4.4
Mountain	4.0	3.9	3.9	5.0	5.1	3.6	3.2
Pacific	7.6	7.1	1.6	2.8	18.3	6.2	11.7
Alaska & Hawaii	.1	[b]	[b]	[b]	.3	[b]	.3
United States	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: [a]Milk equivalent used in manufactured dairy products

[b]No data given.

Source: U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-328 (Washington, D.C.: Government Printing Office, November, 1969), Table 22, p. 39.

TABLE 8

MILK USED FOR CHEESE PRODUCTION, BY REGIONS, 1949, 1964, AND 1968

Region	American Cheese As a percentage of U.S. total			Other Cheese As a percentage of U.S. total		
	Pct. 1949	Pct. 1964	Pct. 1968	Pct. 1949	Pct. 1964	Pct. 1968
Northeast	4.5	3.8	3.7	23.1	22.6	21.5
Lake States	54.5	52.8	54.4	52.2	46.4	44.1
Corn Belt	21.0	20.2	16.5	16.4	21.0	21.4
NORTHERN PLAINS	1.3	5.6	8.8	a	.1	1.9
Appalachian	7.5	8.6	7.9	1.2	1.9	2.0
Southeast	.3	a	a	a	a	a
Delta States	2.5	1.9	1.5	a	1.1	1.3
Southern Plains	1.7	1.0	1.4	.3	a	a
Mountain	3.2	3.7	3.9	3.9	3.3	5.0
Pacific	3.5	2.1	1.6	2.9	3.6	2.8
United States	100.0	100.0	100.0	100.0	100.0	100.0

Note: [a]Less than 0.05 per cent.

Source: U. S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-328 (Washington D.C.: Government Printing Office, November, 1969), Table 23, p. 40.

Since World War II dairy manufacturing plants have grown larger and fewer in number. The decrease in number of plants between 1944 and 1961 was 33 per cent although the amount of milk made into products increased 15 per cent.[19] The change in number and average output of butter and cheese plants is shown in Table 9.

During the same period (1944 to 1961) the trend from single product to multi-product plants was accelerated. In 1944, 72 per cent of all plants were single product; in 1961, only 44 per cent.[20] The marketing of whole milk instead of cream has contributed to plant diversification. As a raw material, whole milk is less limited in the variety of products which can be made from it. Improved transportation of bulk milk and milk products has encouraged both plant expansion and plant diversification. By using tank trucks which can haul thousands of pounds of milk over long distances vast amounts of milk are accumulated at large multi-product plants. Because of economies of scale, expensive equipment can be used efficiently, and product priority more easily assigned to meet demand.

Office, July, 1968), Table 42, p. 10. (Hereinafter referred to as Dairy Statistics 1960-67.) Data for 1968 from Manufactured Dairy Products 1968, Table 10, p. 19.

[19]U.S. Department of Agriculture, Economic Research Service, Agricultural Markets in Change, Agricultural Economic Report No. 95 (Washington, D.C.: Government Printing Office, July, 1966), p. 156.

[20]Ibid.

TABLE 9

NUMBER OF PLANTS PROCESSING DAIRY PRODUCTS AND AVERAGE VOLUME PROCESSED PER PLANT, SELECTED YEARS, 1948-1968

Products	Processing Plants				Average output per plant			
	1948	1957	1968	Change 1948 to 1968	1948	1957	1968	Change 1948 to 1968
	No.	No.	No.	Pct.	Thou. lb.	Thou. lb.	Thou. lb.	Pct.
Butter	3,224	2,062	818	-75	375	685	1,423	+279
American Cheese	1,749	1,194	750	-57	486	853	1,701	+250
All Cheese	2,295	1,603	1,048	-54	479	878	1,855	+287

Source: U. S. Department of Agriculture, Economic Research Service, Dairy Situation DS-327 (Washington D.C.: Government Printing Office, September, 1969), Table 21, p. 36.

Cheese plants have demonstrated less propensity to diversify than other products plants. In 1961, of the 1,023 American cheese plants in the United States, 66 per cent were one product plants.[21] From a survey of Wisconsin cheese plants, it was determined that of approximately 265 plants making cheese, 235 made cheese alone.[22] Thirty plants produced cheese in combination with butter or they marketed whole milk.

So greatly do cheese plants throughout the country vary in size and manufacturing procedure that an attempt to typify them has little justification. A few characteristics, nevertheless, tend to apply to the majority. As noted before, whole milk is the major raw material requirement. Manufacturing grade milk is usually used by preference since it is cheaper than fluid grade and its use is permissible by law. Cheese plants tend to locate near the source of raw material because whole milk is both bulky and perishable. The finished product is, by contrast, more compact and has more value by weight. Since the production of manufacturing grade milk is associated with areas removed from urban concentrations

---

[21] Ibid.

[22] U.S. Department of Agriculture, Consumer and Marketing Service, Dairy Division, Dairy Plants Surveyed and Approved for USDA Grading Service (Washington, D.C.: Government Printing Office, January, 1970), pp. 29-38. This survey is known not to include all the cheese plants in Wisconsin. Manufactured Dairy Products 1968 reports 542 cheese plants in Wisconsin, p. 19.

served by fluid grade milk, cheese plants tend to be located in rural areas.

A problem common to all cheese plants is the disposal of whey, the by-product of cheese manufacturing. It is usually separated at the plant, and the fat portion sold for butter making. The remaining liquid whey may be given away or sold locally to feed animals. Where production warrants cheese plants dry the whey for use in animal feed or food products. Unfortunately at present, a substantial part of the whey is simply wasted.[23] This practice creates a grave pollution problem for the industry.

In summary, milk used in fluid products commands a higher price than that used in manufactured dairy products and has first claim on the available milk supply. Manufacturing can thus be considered the residual market for surplus milk. In any given year the amount of milk used in manufacturing depends upon the total milk supply and the demand for fluid products.

The Lake States Region is the largest user of milk in manufactured dairy products--approximately 40 per cent of the United States total. By contrast, the Northern Plains Region uses only 7.3 per cent.

Of the milk used in manufacturing, the amount going into an individual product depends largely upon consumer

---

[23]U.S. Department of Agriculture, Economic Research Service, Dairy Situation, DS-332 (Washington, D.C.: Government Printing Office, September, 1970), p. 26.

demand. Over the last thirty years the trend has favored a greater proportion used in cheese and other dairy products, and less in butter. This shift reflects the increased per capita consumption of cheese and the decline in that of butter.

Since manufacturing accounts for nearly three-quarters of the milk supply of the Northern Plains Region, manufacturers in this area must necessarily remain sensitive to changes in product demand in order to provide an economically satisfactory outlet for surplus milk. During most of the region's history, butter making served adequately in this role. Marketing conditions favored butter and the practice of selling cream was well suited to the general operation. In recent years two developments have combined to contest butter's traditional priority: the shift from marketing cream to whole milk; and the increased demand for cheese while that for butter has declined.

The recent establishment of the cheese industry in Nebraska is seen as a rational adjustment to these changing conditions. Whole milk meets the raw material requirements of cheese plants, and an enviable marketing record makes cheese an attractive alternative to butter in the dairy products industry.

CHAPTER IV

NEBRASKA'S CHEESE INDUSTRY

Walter Kollmorgen, writing in 1938, concluded that several conditions considered inhibiting to successful cheese manufacturing generally prevailed in Nebraska. In particular, he cited the low density of the cow population. This handicap required that milk for manufacturing be gathered from many producers and hauled over roads of uncertain condition. Dairying was usually a minor sideline in the established system of diversified farming. This situation did not produce milk of consistently good quality, and the quantity varied seasonally as well as from year to year. Because the practice of feeding skim milk to young animals was well entrenched, farmers were reluctant to part with whole milk. In addition, manufacturers often had difficulty selling their product at the standard price because of an alleged prejudice against Nebraska made cheese.[1]

Time has not totally removed these obstacles, but evidence suggests that they have been sufficiently altered to permit a potentially promising cheese industry to emerge

---

[1]Walter Kollmorgen, Cheese Production in Nebraska, University of Nebraska Conservation Department of the Conservation and Survey Division Bulletin 17 (Lincoln, Nebraska, 1938), p. 14.

in this state. Fewer and larger units indicate greater specialization among dairy farmers. Transportation has been improved by new roads and the use of bulk milk tank trucks. Most basically, milk marketing has shifted from cream to whole milk, and rising demand for cheese coupled with an improved product has created a stable market.

The pessimistic outlook projected by Kollmorgen for a viable cheese manufacturing industry in Nebraska is supported by history. At various times in the past cheese plants came into existence, operated for undetermined lengths of time, and fell into disuse. Before the separator was introduced into the state, skimming milk was a time consuming process; therefore, some farmers were willing to sell whole milk to manufacturing plants. For this and other reasons, a small industry was launched during the early years. In 1885 for example, five or six plants operated and made approximately 660,000 pounds of cheese.[2]

After the separator was in general use on the farms, less whole milk was sold and cheese production declined. Sporadic attempts were made at various times by promoters to establish the industry. Information of individual cheese plants, their locations and outputs, is meager, but collectively the degree of their success as an industry through

---

[2]Proceedings of the First Annual Convention of the Nebraska Dairymen's Association (Lincoln, Nebraska: Journal Company, State Printers, 1886) bound within the volume Transactions of the State Board of Agriculture: State of Nebraska (Lincoln, Nebraska: Journal Company, State Printers, 1884 /sic/), p. 180.

the years can be read from production records (Table 10). The output of cheese has fluctuated markedly and, until recently, has never been of major importance. Butter has been the overwhelmingly preferred product into which milk, not used in fluid products, has been converted. In 1970, for the first time in the state's history, cheese production, on a pound to pound basis, is expected to exceed that of butter.[3] In light of Nebraska's traditional role in dairying as a butter producing state, this is dramatic evidence of the change that is occurring in the state's dairy products industry.

An examination of the state's cheese industry as a whole, or any of the plants singly, revolves around the recurring question of milk procurement. During field interviews with plant operators, the majority stated that milk procurement was the most pressing problem with which they had to contend. Whole milk is the only raw material required by cheese plants in significant quantity; its cost represents an estimated 88 per cent of the total cost of production.[4]

---

[3]T. A. Evans, "Cheese Takes Over," Cornhusker Economics, University of Nebraska College of Agriculture and Home Economics, Cooperative Extension Service, n.p., August, 1970; in a personal letter, September 1, 1970, Mr. Evans expressed the opinion that the production of butter and cheese would each be approximately 30,000,000 pounds in Nebraska in 1970, with cheese possibly exceeding this amount slightly.

[4]This percentage was calculated from information in a study by Leonard Benning, The Economic Feasibility of a Cheese Manufacturing Facility at Sisseton, South Dakota,

TABLE 10

FACTORY PRODUCTION OF BUTTER AND CHEESE, NEBRASKA, SELECTED YEARS

Year	Cheese[a] Thou. lbs.	Butter Thou. lbs.
1921	61	66,653
1931	1,883	86,084
1941	2,167	91,262
1951	656	74,566
1955	b	75,071
1956	438	78,585
1957	b	70,408
1958	b	61,478
1959	b	58,020
1960	b	56,500
1961	b	59,000
1962	2,500	54,600
1963	5,600	50,800
1964	9,200	52,900
1965	10,600	48,500
1966	14,400	44,100
1967	20,882	42,496
1968	26,030	39,391

[a]All cheese, excluding cottage cheese.

[b]Production not shown when volume is not consistently significant or when less than 3 plants were in operation.

Sources: Data for cheese and butter production for years 1921 through 1951 from Nebraska Department of Agriculture and Inspection, State-Federal Division of Agricultural Statistics, Nebraska Agricultural Statistics, Historical Record 1866-1954 (Lincoln, Nebraska, n.d.), p. 114; for years 1955 through 1959 from U.S. Department of Agriculture, Economic Research Service, Dairy Statistics through 1960, Statistical Bulletin No. 303 (Washington, D.C.: Government Printing Office, February, 1962) cheese data pp. 208-210 and

TABLE 10--Continued (Sources)

butter data, pp. 205-207; years 1960 through 1966 from U.S. Department of Agriculture, Economic Research Service, Dairy Statistics 1960-67, Statistical Bulletin No. 430 (Washington, D.C.: Government Printing Office, July, 1968) cheese data, p. 66 and butter data, p. 65; years 1967 and 1968 from U.S. Department of Agriculture, Statistical Reporting Service, Crop Reporting Board, Production of Manufactured Dairy Products 1968, Da 2-1 (69) (Washington, D.C.: Government Printing Office, July, 1969), cheese data, p. 19 and butter data, p. 17.

Given today's market, the availability of whole milk in the amount needed to operate at capacity is the overriding concern for a cheese plant's successful operation. For this reason, the focus of investigation is seen to center primarily on the plants' relationships to milk procurement. A brief overview of Nebraska's 1968 milk production and disposition is offered as background and introduction to the problem.

The total amount of milk produced in Nebraska in 1968 was 1,659 million pounds.[5] Of this, 1,553 million pounds was marketed to plants and dealers, the remainder being kept or retailed by the farmers. Of the amount sold to plants and dealers, 82 per cent, or 1,275 million pounds, was sold as whole milk and the equivalent of 278 million pounds as farm separated cream.[6] Forty per cent, or 510 million pounds, of the whole milk sold was fluid grade milk.[7]

South Dakota State University Agricultural Extension Service (Brookings, South Dakota, 1965), p. 17. Mr. Benning's estimate is for a cheese plant processing 36.5 million pounds of milk annually. At this size the manufacturing cost of cheese per hundred-weight of milk would be 40 cents, and the price of the milk was given as $3.20 per hundred-weight. The cost of the milk represents 88 per cent of the combined costs of manufacturing and the raw material.

[5]U.S. Department of Agriculture, Statistical Reporting Service, Crop Reporting Board, Milk Production, Disposition, and Income 1967-68 Da 1-2 (69) (Washington, D.C.: Government Printing Office, April, 1969), Table 9, p. 10.

[6]Ibid., Table 10, p. 11.

[7]Ibid., Table 11, p. 12.

Manufacturing grade whole milk represented the remaining 60 per cent, or 765 million pounds.

The amount of milk equivalent that went into manufactured dairy products in Nebraska in 1968 was 1,266 million pounds.[8] This amount included surplus fluid grade milk and manufacturing grade milk, both whole milk and cream. The total amount represented milk originating within the state as well as that imported, although the precise proportion of the latter is not known.

Based upon the total production of butter and cheese in Nebraska in 1968 (Table 10), and using the formulas that to make one pound of butter requires twenty pounds of milk; one pound of cheese, ten pounds of milk the rough calculations can be made that butter manufacturing accounted for 787,820,000 pounds of milk and cheese manufacturing, 260,300,000 pounds of milk.

Because of long established custom, it can be safely assumed that the 278 million pounds of milk equivalent still marketed as cream moved into butter production. Until the change to whole milk marketing is completed this part of the milk supply is not a potential source of raw material for the cheese industry. The remaining 500 million pounds of milk used in butter making was whole milk, most of it manufacturing

---

[8]Personal letter, October 15, 1970 from Robert D. Rawson, Agricultural Statistician, State-Federal Statistics Division, Lincoln, Nebraska.

grade, and this milk could be diverted to cheese if such a change was thought practicable and economically advantageous by manufacturers.[9] The cheese industry in 1968 accounted for an estimated 20.5 per cent of all milk used in manufactured products. As more milk becomes available for manufacturing, or butter production continues to decline, the prospect of a larger percentage of milk being channeled into cheese production seems assured.

Depending upon their annual cheese production, the requirements of Nebraska cheese plants are estimated to range between 13,000,000 and 45,000,000 pounds of manufacturing grade whole milk a year (Table 11). Plant management strives to meet raw material requirements as efficiently as possible by limiting the areal extent of the milk procurement area and the number of farms needed to supply the required amount of milk. Although bulk hauling and improved roads have facilitated the movement of milk over great distances, it remains mutually advantageous to supplier and manufacturer to limit the number of pickups and the distance the milk is transported.[10] The degree of efficiency attained is related,

---

[9]Two plants which have begun producing cheese in 1970, one at Superior, Nuckolls County and one at Newman Grove in Madison County, were previously substantial butter producing plants in Nebraska. Since cheese making has been introduced, they produce both butter and cheese.

[10]Milk hauling charges are paid by the milk supplier. During an interview in Chappell, Nebraska, spring, 1970, the manager of the Leprino Cheese Manufacturing Company stated that hauling charges range from 20 cents to 70 cents per hundredweight of milk. The charge is in relation to two

TABLE 11

NEBRASKA CHEESE PLANTS, LOCATIONS, DATE OF BEGINNING OPERATIONS, PRODUCTION, 1968

Company Name	Location in Nebraska Town	County	Year Cheese Production Began	Production 1968 Pounds Estimate
Orchard Cheese Company	Orchard	Antelope	1960	4,500,000
Breakstone Sugar Creek Foods	O'Neill	Holt	1962	3,000,000
Oxford Cheese Corporation	Oxford	Furnas	1962	3,500,000
Neu Cheese Company	Hartington	Cedar	1963	4,000,000
Continental Cheese Company	Red Cloud	Webster	1963	3,000,000
Leprino Cheese Manufacturing Company	Chappell	Deuel	1964	1,500,000
Dodge Dairy Products	Dodge	Dodge	1966	1,500,000

TABLE 11--Continued

Company Name	Location in Nebraska Town	County	Year Cheese Production Began	Production 1968 Pounds Estimate
Ravenna Cheese Company	Ravenna	Buffalo	1967	2,000,000
Ord Cheese Company	Ord	Valley	1967	1,300,000

Source: Field Interviews with Plant personnel conducted 1969.

in part, to the concentration of milk in the surrounding area and the presence of competing users.

Federal and state dairy statistics unfortunately do not distinguish between grades of milk in their published reports. The most complete and reliable data available is an estimate made in 1964.[11] From this estimate, the density of manufacturing grade whole milk has been calculated as shown in Figure 6. Although the total amount of milk produced in Nebraska declined 15 per cent between 1964 and 1968, in the writer's opinion, the general pattern of distribution and the relative density would not have changed appreciably during this period.

Figure 6 shows a marked concentration of manufacturing grade whole milk in the northeastern part of the state. A comparison between this map and Figure 5 shows that concentration of manufacturing grade milk does not necessarily correlate with that of total milk produced. Some counties in the southeastern part of the state produce as much milk per square mile as those in the north, but market proportionally less as manufacturing grade. To illustrate this

---

variables: the amount of milk picked up and the distance it is hauled. A recommended study of this topic is by Sargent Russell, Hauling Rates for Direct Farm to City Plant Milk Producers, University of Massachusetts Cooperative Extension Service (Amherst, Massachusetts, 1967).

[11] Division of Nebraska Resources, Department of Agriculture and Economic Development, "Cheese: Nebraska's Expanding Industry," Lincoln, Nebraska, [after 1964], Figure 7, p. 18. (Mimeographed.)

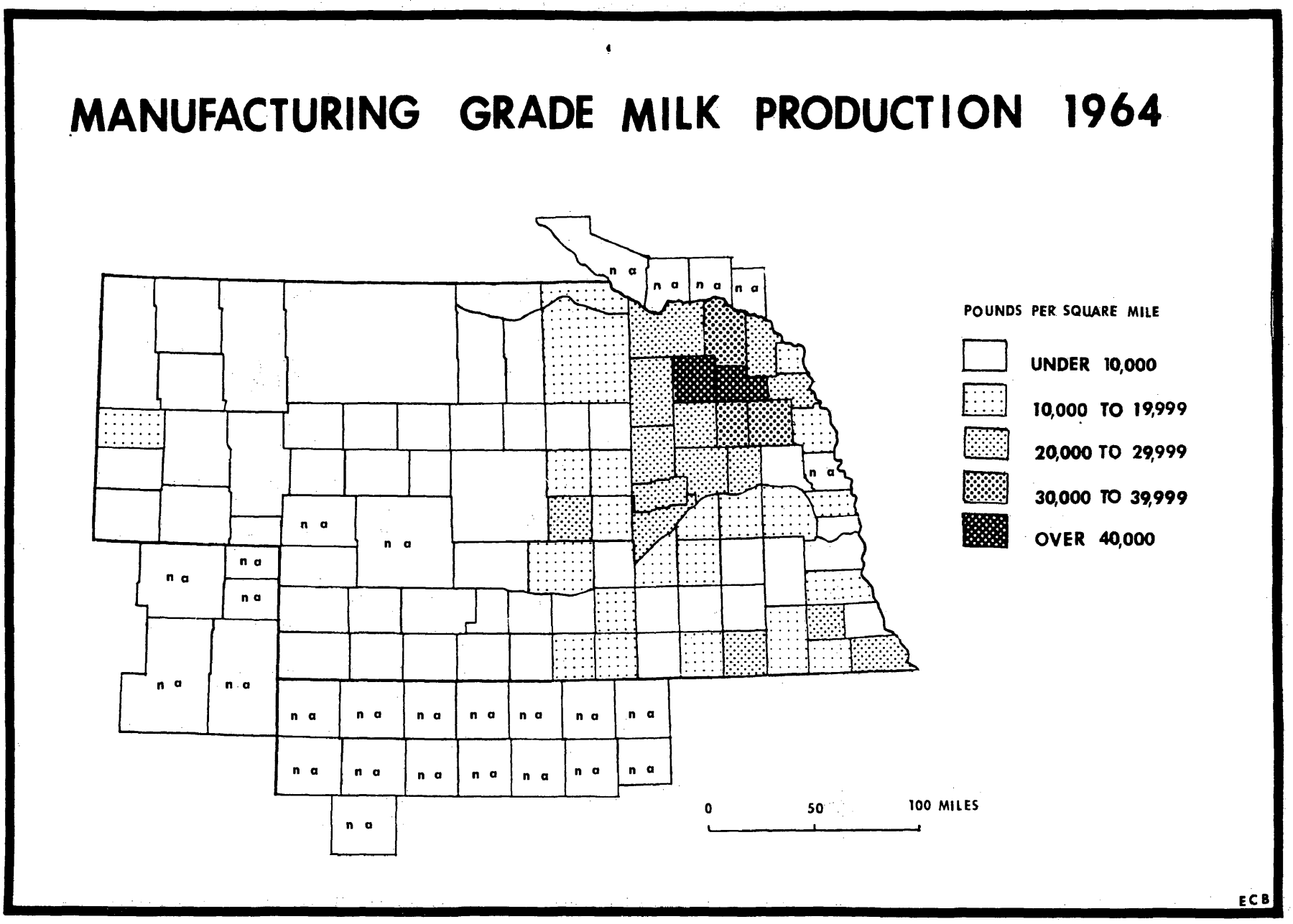

MANUFACTURING GRADE MILK PRODUCTION 1964
POUNDS PER SQUARE MILE
UNDER 10,000
10,000 TO 19,999
20,000 TO 29,999
30,000 TO 39,999
OVER 40,000
0
50
100 MILES
ECB

FIGURE 6

point: both Gage County in the south and Cuming County in the north produced between 60,000 and 80,000 pounds of milk per square mile (1968), yet Gage County marketed only 10,000 to 20,000 pounds of manufacturing grade milk per square mile compared to over 30,000 pounds per square mile in Cuming County (1964).

Conclusions may be drawn that northeast Nebraska is an area of relatively intensive dairying with milk production oriented toward manufacturing rather than fluid use. The southeastern part of the state, also a major milk producing area, tends to market proportionally more of its total as fluid grade. The western two-thirds of the state compares unfavorably to the east in total dairy activity. On a county basis total milk production does not exceed 20,000 pounds of milk per square mile. The production of manufacturing grade milk is similarly low throughout the area.

Manufacturing whole grade milk is sold directly by the producing farmers to the manufacturers, or it is marketed through cooperatives.[12] Because the Nebraska cheese plants buy milk only from independent, non-cooperative members, the cooperatives are, in a sense, competitors in that they remove milk from the total supply.

The largest cooperative in the state is Central States Dairy Cooperative. In 1968 Central States, operating

---

[12]For a list of cooperatives and their plant locations see Appendix III, p. 96.

in seventy-eight of the ninety-three counties, handled 360,201,356 pounds of manufacturing grade whole milk.[13] This amount was 47 per cent of the total 765,000,000 pounds of manufacturing grade whole milk sold (above, p. 61). Milk collected by Central States is taken to receiving stations and then distributed, or hauled directly to one of the cooperating factories. Three such plants are located in Nance, Nuckolls, and Madison Counties. These plants accept whole milk and make butter and nonfat dry powder. Figure 7 shows the distribution in the state of cheese plants, milk receiving stations, and butter-powder plants. Plants making butter from farm separated cream or surplus fluid grade milk are not shown since they do not compete for manufacturing grade whole milk.

Nebraska's present generation of cheese plants has come into existence since 1960. At the time field work was completed, early 1970, there were nine plants operating within the state (Table 11). Since April, 1970, three other plants have begun making cheese. These three are not included in the study because operations have recently begun and production and other data are not available at this time.

The nine plants upon which this study is based share certain characteristics. Each is situated in a small rural

---

[13]Statistical information of the milk handled in Nebraska by Central States Dairy Cooperative was provided by Mr. Robert Koehler, the local manager. Effective April 1, 1970, Central States Dairy Cooperative merged with Mid-America Dairymen, Inc., and is known since that date by the latter name.

MANUFACTURING GRADE MILK USERS

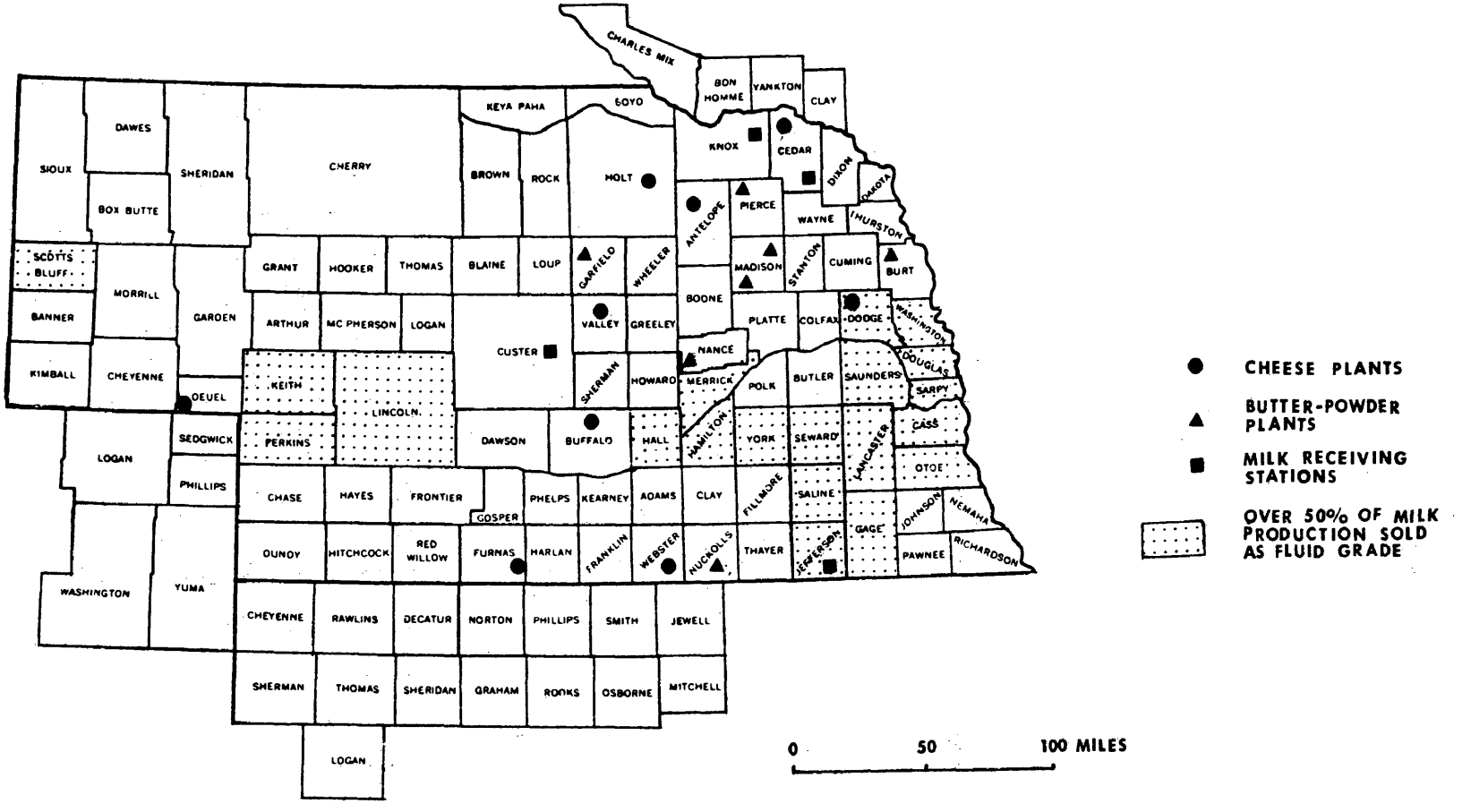


FIGURE 7

town. Their locations tend to form an arc partially circumscribing the major population centers of the eastern part of the state (Figure 7). The predominance of fluid grade milk production in several of the counties, primarily in the eastern part of the state, precludes an abundant supply of manufacturing grade milk. The general pattern of cheese plant location is understandably peripheral to the counties which form the fluid milk sheds of cities in the state.

The plants vary in the amount of cheese each produces annually, but on the average they compare favorably to the national average of 1,845,000 pounds a year.[14]

Many of the plant operators had experience in cheese making in other midwestern states (Iowa and Wisconsin) before coming to Nebraska. The consensus seems to be that in Nebraska cheese making was recognized to be an expanding industry whereas in the older, more established cheese producing areas, plant mergers and other conditions had tended to limit economic opportunity.

Employment needs are moderate; each plant hires fewer than thirty people including drivers, office staff, and production workers.[15] In a rural town, with a small industrial

---

[14]U.S. Department of Agriculture, Statistical Reporting Service, Crop Reporting Board, Production of Manufactured Dairy Products 1968, DA 2-1 (69) (Washington, D.C.: Government Printing Office, July, 1969), Table 10, p. 19.

[15]Employment information was obtained during field interviews with plant personnel during the year 1969; also, Nebraska Department of Economic Development, Directory of Nebraska Manufacturers and Their Products 1968-69 (Lincoln, Nebraska, 1970), pp. 30-100, passim.

base, a payroll of this size has economic significance to the community. In Oxford, Nebraska (population 1,090) the annual payroll from the cheese plant is $83,000.00;[16] in Chappell, Nebraska (population 1,280), $150,000.00.[17]

All of the plants are proprietary firms, either individually or corporately owned. All are one-product plants except that the majority process whey, the by-product of cheese making, and sell it for feed or for human consumption. Manufacturing is continuous throughout the year, but during the spring and early summer when milk is most plentiful, cheese production is increased. During this period equipment is used two or three times a day instead of once, and work may continue on a seven days a week basis.

Most of the cheese made in Nebraska is American type: Cheddar, Colby, or Monterey Jack. Except for a small amount retailed by the plants locally, all cheese is shipped out of the state. The first destination is often a storage center operated by a company with national distribution such as Kraftco or Safeway.[18]

The nine plants have much in common, yet each has individual traits. Chief among these is the uniqueness of

---

[16]James Denny, "Wisconsin, Look Out!," Omaha World-Herald, April 20, 1969, Sunday Magazine of the Midlands, p. 10.

[17]Ibid., p. 11.

[18]List of cheese storage centers in Appendix IV, p. 97.

location and consequent relationship of a plant to its milk procurement region (Figure 8). This and other atypical characteristics warrant separate investigation of each plant.[19]

As an aid in comparing each plant's relative advantage in regard to location and milk supply, an average Nebraska cheese plant has been developed. The method used was to calculate the nine plant averages of the following variables: (1) the annual production of cheese, (2) the amount of milk used annually, (3) the number of farms needed to supply that amount of milk, (4) the distance the milk is transported from farm to plant (an estimate based on the average distance the milk is hauled).

From the above, the average Nebraska cheese plant in 1968: (1) produced 2,700,000 pounds of cheese, (2) used 27,000,000 pounds of milk, (3) was supplied by 186 farms, (4) received milk from an approximate distance of 50 miles.

From the number of farms needed to supply a given amount of milk, further calculations can be made of the average amount of milk supplied by each farm, and the approximate size of the farm's dairy herd (using the 1968 Nebraska state statistic that each cow produced 7900 pounds of milk, see above, p. 21). Accordingly, the average Nebraska cheese

---

[19]All information directly related to individual plants was obtained during field interviews, conducted at the plant sites during the year 1969. A copy of the questionnaire used is in Appendix I, p. 92.

CHEESE PLANTS AND MILK SUPPLY AREAS

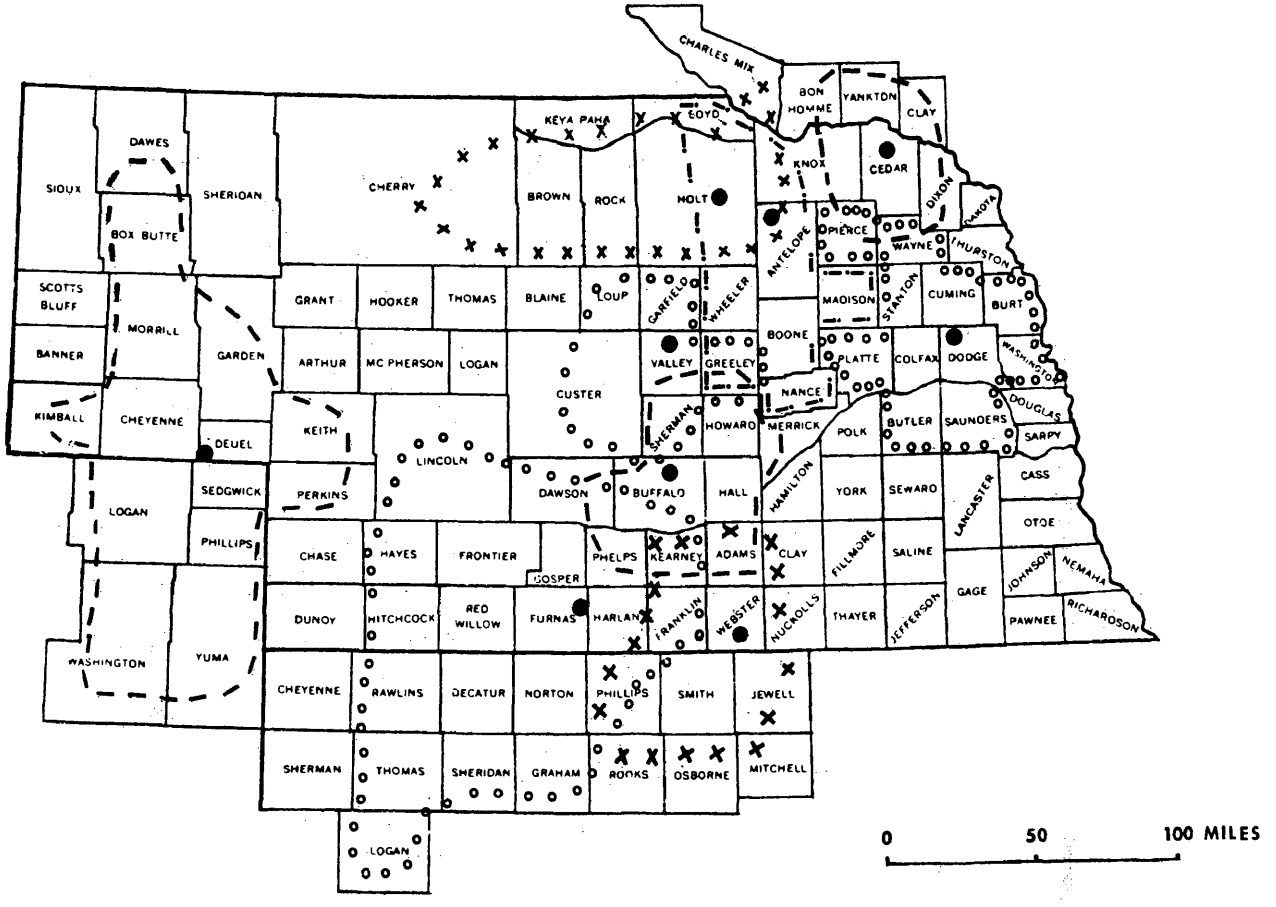


FIGURE 8

plant received 145,161 pounds of milk per farm which had, in turn, a herd of approximately 18 milk cows (Table 12).

The Orchard Cheese Company, located at Orchard in the northwestern corner of Antelope County is the largest cheese producer in the state, an estimated 4,500,000 pounds a year. Its milk procurement area encompasses all or part of nine counties: Boyd, Holt, Antelope, Knox, Wheeler, Nance, Greeley, Boone, and Madison. Most of these counties produce between 20,000 and 30,000 pounds of manufacturing grade whole milk per square mile. Holt, Wheeler, and Greeley on the western margins of the area produce less. The Orchard plant faces competition for its milk supply from two cooperative butter-powder plants in Madison County, and another in Nance County. The milk procurement areas of the cheese plants at O'Neill, Hartington, and Ord tend to overlap that of Orchard.

The 45,000,000 pounds of milk the Orchard plant uses a year is supplied by 240 farms averaging 187,500 pounds of milk each. This amount is greater than that of the Nebraska average. The milk travels approximately fifty miles from farm to plant. Compared to the Nebraska plant average, the Orchard plant is favorably located in relation to its milk supply.

Whey is dried at this plant and sold for use in edible products. The type of cheese made is Monterey Jack, formed into forty pound blocks. Ninety percent of the total output

TABLE 12

NEBRASKA CHEESE PLANTS, NEBRASKA AVERAGE CHEESE PLANT STATISTICAL INFORMATION, 1968

Location	Amount of Milk Used Annually (Estimate)	Number of Farms Supplying Milk	Average Amount of Milk per Farm per Year	Average Size of Herd per Farm	Distance Milk is Transported (Estimate)
	pounds		pounds		miles
Orchard Antelope Co.	45,000,000	240	187,500	24	50
Hartington Cedar Co.	40,000,000	340	117,647	15	20
Dodge Dodge Co.	15,000,000	160	93,750	12	35
O'Neill Holt Co.	30,000,000	190	157,894	20	70
Ord Valley Co.	13,000,000	110	118,181	15	40
Ravenna Buffalo Co.	20,000,000	190	105,000	13	20
Red Cloud Webster Co.	30,000,000	135	222,000	28	25

TABLE 12--Continued

Location	Amount of Milk Used Annually (Estimate)	Number of Farms Supplying Milk	Average Amount of Milk per Farm per Year	Average Size of Herd per Farm	Distance Milk is Transported (Estimate)
	pounds		pounds		miles
Oxford Furnas Co.	35,000,000	190	184,200	23	80
Chappell Deuel Co.	15,000,000	125	120,000	15	100
Average Nebraska Plant	27,000,000	186	145,161	18	48

Source: Field interviews with plant management conducted during 1969.

is shipped by truck to Safeway in Carthage, Missouri. The remainder goes to Green Bay, Wisconsin.

The Neu Cheese Company is located in Hartington in central Cedar County, northeast of Orchard. Its milk procurement area includes all or part of Cedar, Knox, Dixon, Pierce, and Wayne Counties in Nebraska; Bon Homme, Yankton, and Clay Counties in South Dakota. The counties in Nebraska are among the heaviest producers of manufacturing whole grade milk in the state. The density of milk production in Bon Homme and Yankton Counties exceeds 60,000 pounds per square mile; the percentage that is manufacturing grade is not known. Competition is from two milk receiving stations, one in Knox County and one in Cedar County, butter-powder plants in Pierce and Madison Counties and a small cheese plant in Bon Homme County.

An inordinately large number of farms, 340, are required to supply the 40,000,000 pounds of milk used each year. Their average of 117,647 pounds of milk per farm is considerably less than the Nebraska average, but this disadvantage is partially compensated for by the shorter distance the milk is transported, some twenty miles.

Cream, separated from the whey, is sold for butter making. The whey is dried for use as animal feed. Cheddar cheese is made, packed into 500 pound barrels and shipped by truck to Kraftco in New Ulm, Minnesota for further processing.

Dodge Dairy Products is located at Dodge in the northwest corner of Dodge County, south of Hartington. This is one of the two plants whose milk supply area extends into a fluid milk shed: Saunders, Washington, and Dodge Counties. The rest of the supply area is comprised of Burt, Cuming, Stanton, Colfax, Platte, Wayne, Pierce, and Butler Counties. The greatest concentration of manufacturing grade milk is to the north and west of Dodge, but in these directions there is competition from the Hartington cheese plant, two butter-powder plants in Madison County, and one in Pierce County. There is also a butter-powder plant in Burt County to the northeast.

The Dodge plant, like Hartington, is supplied by a large number of farms relative to its annual milk intake: 15,000,000 pounds of milk from 160 farms, averaging 93,750 pounds per farm. But again, the average distance the milk is transported is less than the Nebraska average, only thirty-five miles. The deviation from the average in the number of farms needed to supply the milk is taken as evidence that manufacturing grade milk producers in this area tend to be mixed farmers with small herds.[20]

Cream is separated from the whey and sold for butter making. The liquid whey is sent to a local hog farm. There

---

[20]During a field interview, summer, 1969, Dr. E. J. Berans, part owner of Dodge Dairy Products suggested that there is a high percentage of tenancy among manufacturing grade producers in the Dodge area, possibly accounting for the small dairy herds.

are plans for drying whey at the plant, but at present this process is not done.

Cheddar cheese is made and sent by truck in 500 pound barrels to Kraftco in New Ulm, Minnesota for further processing.

Breakstone Sugar Creek Foods is a division of Kraftco. This plant is located in O'Neill in central Holt County, northwest of Orchard. Its milk procurement area includes all or part of Holt, Knox, Antelope, Rock, Brown, Boyd, Keya Paha and Cherry Counties in Nebraska and Charles Mix County in South Dakota. O'Neill's supply area extends 75 to 100 miles west and 70 miles north into regions of low milk density, but no competition. The distance the milk is transported is greater than the average, yet the number of farms tends to compensate for this disadvantage. One hundred ninety farms supply the annual milk intake of 30,000,000 pounds. Their average of 157,894 pounds is appreciably higher than that of the Hartington and Dodge plants.

The whey cream from this plant is sold, the whey dried for use in feed. Most of the cheese production is Cheddar with some Colby and Monterey Jack. The cheese is formed into blocks and longhorns and shipped by both rail and truck. Part of the output goes to Kraftco in Pocatello, Idaho and part to an unknown destination in California.

The Ord Cheese Company is located in Ord in Valley County, south and slightly west of O'Neill. Its milk

procurement area is made up of Valley, Loup, Garfield, Custer, Sherman, and Greeley Counties. To the south and east, manufacturing milk production is fairly dense; to the north and west, less so. Ord's milk supply area overlaps those of the cheese plants in Orchard and Ravenna. There is also competition for milk from a butter-powder plant in Garfield County and a milk receiving station in Custer County. At its present level of production, Ord requires 13,000,000 pounds of milk a year. This amount is currently supplied by 110 farms averaging 118,181 pounds of milk per farm. While lower than the state average, this amount is approximately the same as that of the farms supplying Hartington, and greater than those of the Dodge area. The average distance the milk is transported is approximately forty miles.

The whey cream is sold to the butter-powder plant in Garfield County. The whey is dried for animal feed and shipped to a dealer in Monticello, Iowa. All of the cheese produced at the plant is Cheddar which is made into 50 pound longhorns and shipped by truck to the Clearfield Cheese Company in Clinton, Missouri.

The Ravenna Cheese Company is located in Ravenna, the northeast corner of Buffalo County, and south of Ord. All or part of ten counties make up its milk supply region: Buffalo, Hall, Adams, Kearney, Merrick, Howard, Phelps, Valley, Sherman, and Dawson. Hall and Merrick counties are

part of the Grand Island milk shed. Except for the south and west borders, this is a region of fairly dense manufacturing milk production. There is some competition from the cheese plants at Ord, Oxford, and Red Cloud. There is also a butter-powder plant in Nuckolls County which is a large user of manufacturing grade whole milk.

Ravenna's milk requirement of 20,000,000 pounds a year is met by 190 farms averaging 105,000 pounds per farm. The average distance the milk travels is only 20 miles. Ravenna's situation is similar to that of Hartington, Dodge, and Ord in that to fill the plant's milk needs requires a greater than average number of farms, but distance the milk is transported is less than the state average.

Cream separated from the whey is made into butter at the plant, the only one in the state to do so. Whey is dried for animal feed and sent to Monticello, Iowa. Cheddar cheese is made, packed into 500 pound barrels and shipped by rail to Kraftco in Springfield, Missouri for further processing.

Continental Cheese Company is located in Red Cloud in south central Webster County, southeast of Ravenna. Its milk supply area encompasses all or part of Franklin, Webster, Adams, Kearney, and Clay Counties in Nebraska; Smith, Jewell, Phillips, Rooks, Osborne, and Mitchell Counties in Kansas. Compared to northeastern Nebraska, none of this area has great concentration of manufacturing grade milk. There is

competition for milk from the cheese plants in Oxford and Ravenna, and the butter-powder plant in Nuckolls County. In Kansas there is a large cooperative which handles milk in the area, and two small cheese plants which remove milk from the general area. In spite of the low density of milk and formidable competition, this plant compares more favorably to the state average than any of the other plants. One hundred thirty-five farms, averaging 220,000 pounds of milk each, supply the Red Cloud plant with 30,000,000 pounds of milk a year. The average distance the milk is transported is only 25 miles. The evidence suggests that in spite of the low milk density in the general area, there are a few large manufacturing grade milk producers in the near vicinity who market their milk independently to the Red Cloud plant.[21]

The whey cream is sold for butter manufacturing. The liquid whey is sold locally to hog farmers. Both Cheddar and Monterey Jack cheese are produced here. The cheese is formed into blocks or longhorns and sold to a large grocery chain (not identified) which slices and packages it. The cheese leaves the Red Cloud plant by truck and may go to any one of a wide variety of destinations: Oklahoma, Arizona, New Mexico, Kansas, Missouri, Illinois, or Nebraska.

---

[21]During a field interview, fall, 1969, the manager of the Continental Cheese Company in Red Cloud stated that among his milk producers, a substantial number derived the major part of their income from dairying.

Oxford Cheese Corporation is located in Oxford in east central Furnas County near the Harlan County line. This plant receives its milk from a vast area extending 120 miles southwest into Kansas, ninety miles to the northwest, and seventy miles east. The area encompasses twenty-one counties. Those in Nebraska are all or part of: Hitchcock, Hayes, Lincoln, Frontier, Red Willow, Furnas, Gosper, Dawson, Buffalo, Kearney, Phelps, Harlan, and Franklin. In Kansas they are: Rawlins, Thomas, Logan, Sheridan, Decatur, Norton, Graham, and Phillips. In the eastern part of the supply region, milk production is somewhat more dense than in the rest of the area. Oxford's milk procurement region, like that of O'Neill, protrudes perceptibly into the low density area.

The competition for milk is predictably in the eastern part of the supply area. The cheese plants at Red Cloud and Ravenna, the butter-powder plant in Nuckolls County, and the receiving station in Custer County all draw milk from the general area. The milk supply areas of the two small cheese plants in Kansas tend to encroach upon this region.

The Oxford plant uses 35,000,000 pounds of milk a year supplied by 190 farms. Their average of 184,200 pounds is somewhat larger than that of the state average. The milk is hauled an estimated 80 miles.

The cream is separated from the whey and sold to a butter plant. The whey is simply thrown away. Colby cheese

is made into 40 pound blocks for later cutting and packaging. It is shipped by truck to Kraftco in Toulon, Illinois.

Leprino Cheese Manufacturing Company is located in Chappell, Deuel County in the western part of the state. This is the only plant which uses some fluid grade milk in addition to manufacturing grade, and it buys from a cooperative as well as from independent farmers.

Milk is delivered from a hundred miles away. The milk procurement area includes Dawes, Box Butte, Morrill, Garden, Kimball, Cheyenne, Keith, and Perkins Counties in Nebraska,[22] Logan, Sedgewick, Phillips, Washington, and Yuma Counties in Colorado. Milk production is low throughout the region, but there is no competition for milk from other manufacturers.

The number of farms supplying the 15,000,000 pounds of milk a year is approximately 125, averaging 120,000 pounds of milk a piece. Judging from what is known, the Chappell plant is the most disadvantaged among the plants in the distance the milk is transported, but the number of farms needed to supply the milk does not deviate greatly from the state average.

Whey cream is sold to a creamery to make butter. The whey is dried at the plant and sold for animal feed.

---

[22]During a field interview, spring, 1970, the manager of the Leprino Cheese Manufacturing Company stated that Deuel County, in which Chappell is located, is not a part of the plant's milk procurement area.

This is the only plant making Italian style cheese. All the cheese is shipped by truck to Leprino Cheese Company in Denver for later distribution.

The nine plants can be grouped according to location: six of them are in the northeastern part of the state where the greatest density of manufacturing grade whole milk is produced. These are located in Hartington, Dodge, Orchard, O'Neill, Ord, and Ravenna. Within this northeast area, density of milk tends to diminish from east to west. There is competition among the plants where milk procurement areas tend to overlap. There are also milk receiving stations and butter-powder plants drawing manufacturing grade whole milk from the area.

Two plants are in south central Nebraska and one in the western part of the state where all dairying activity declines and manufacturing grade milk production tends to be small compared to the northeast. Farthest to the west, the plant at Chappell is virtually without competition while Oxford, in the south central part of the state faces somewhat more. The lack of milk in the area, however, makes problems of its own for these two plants to meet. Red Cloud, east of Oxford, is in an area of greater milk density and more competition.

Examined in regard to their milk procurement situations, some of the plants display similarities to one another that location would not suggest. Orchard in the northeast

and Red Cloud in the south central part of the state seem to have the most favorable milk procurement conditions. While the distance milk is hauled to the plants is approximately that of the state average, the number of farms needed to supply the milk is below. Red Cloud's record is all the more remarkable since it is located in a region of low milk density.

The remaining seven plants tend to fall into two categories: (1) those which procure milk from a larger number of farms, but transport it fewer miles than the state average, and (2) those which procure milk from fewer farms, but transport it a greater distance than the state average.

Four plants are in the first group: Ravenna, Dodge, Ord, and Hartington. The proximity of Ravenna and Dodge to urban centers (Grand Island and Omaha respectively) suggests that dairy farmers who wish to do so and are economically able, could market their milk as fluid grade. Those who do not, the manufacturing grade producers, are either committed to a mixed farming practice or are without the means to upgrade. In either case, herd size would be small accounting for the low milk average each farm delivers to the cheese plant.

Farmers supplying Hartington and Ord, being farther removed from major urban centers, presumably do not have the option for fluid grade marketing. The average amount of milk each delivers indicates herd size of fifteen cows, slightly

larger than those supplying Dodge and Ravenna, but not big enough to indicate a high degree of specialization.

The evidence suggests that these four plants are in areas of fairly dense milk production, but that the producers from whom they receive their milk tend to keep smaller than average herds either from choice or economic feasibility.

O'Neill in the north and Oxford in the south seem to have much in common in their milk supply situations. Both plants must cope with the problem of hauling their milk over great distances. To the east of each, milk production is greater than to the west, and competition from other users tends to intrude. To the west, both milk procurement areas extend at least 100 miles into low milk producing regions, and no competition. The distance traveled to pick up milk suggests widely scattered farms, but the amount of milk supplied by each indicates the herd size to be approximately twenty cows in the O'Neill area and twenty-three cows in that of Oxford, both larger than the herds supplying the average plant.

The Chappell plant has to contend with the vast distance milk is transported as well as a greater than average number of farms needed to supply the plant's annual intake of milk. Perhaps the most hopeful sign in regard to the relationship between this plant and its milk supply area is that three counties in the immediate vicinity have increased their production of milk since the

plant started operating in 1964: Cheyenne County by 22 per cent, Garden County by 58 per cent and Keith County by 28 per cent (see above, Figure 4, p. 26).

While it is no more relevant to compare a Nebraska cheese plant to one in Wisconsin than to compare the cheese industries of the two states, it is interesting to do so when the information is at hand.[23] The Lake to Lake Dairy Cooperative plant at Kiel, Wisconsin is reported to be one of the largest in the nation. It has an annual cheese output of 17,500,000 pounds, requiring approximately 175,000,000 pounds of milk. This quantity is delivered by 450 farms averaging 388,000 pounds each. The milk supply area encompasses four counties with a radius of twenty-five miles. The average distance the milk travels to the plant is thirteen miles.

If the Wisconsin example is regarded as a near ideal, it is clear that prevailing conditions in Nebraska between the cheese plants and their milk procurement areas can be vastly improved. For maximum efficiency in cheese plant operation, the implication remains that concentration of milk production within reasonable distance is one of the greatest assets a plant can have. While this condition does not guarantee success, its absence makes success more difficult to achieve.

---

[23] A copy of the questionnaire used during field interviews in Nebraska was sent to the Lake to Lake Dairy Cooperative cheese plant in Kiel, Wisconsin. The completed questionnaire was returned by mail April 22, 1970.

CHAPTER V

SUMMARY AND CONCLUSION

Milk which is produced in excess of fluid needs seeks an outlet in manufactured products. These products generally reduce the bulk of the raw material and lessen its high degree of perishability. When the choice of product to be manufactured is between butter and cheese, the decision has been shown to depend in recent years upon two unrelated phenomena: (1) the form in which surplus milk is marketed (as cream or whole milk); and, (2) the public demand for one product over the other.

Until fairly recently, both conditions favored butter making over cheese. Surplus milk was marketed as cream, thereby tending to exclude cheese which requires whole milk as its raw material, and in the United States per capita consumption of butter far exceeded that of cheese. During the last twenty years the situation has been nearly totally reversed. Whole milk marketing now accounts for virtually all of the milk supply of the nation, and the demand for cheese has increased while that for butter has declined. The result is that manufacturers have increasingly come to regard cheese as the preferred product over butter.

The establishment of the cheese industry in Nebraska during the last ten years is concrete evidence that manufacturers of this state are taking advantage of these changes in the national dairy structure. The degree of success of the industry now launched depends, in part, upon the amount of milk available to supply it.

The heaviest concentration of manufacturing grade milk used by the cheese plants has been shown to be in the northeastern and central part of the state. Here, too are the competing users, principally butter-powder plants. While some of the cheese plants have opted for this situation of combined milk concentration and heavy competition, others have located in areas of the state where milk production is less dense, and competition reduced. Whatever its location, a plant strives to optimize its efficiency in the manner in which it secures its milk.

While a few of the plants in Nebraska have effected a reasonable balance in regard to the areal extent of their milk procurement regions and the number of pickups they must make, others have had to make concessions in order to meet their milk requirements. Either they pick up milk from a great number of producers, or they haul the milk vast distances, or both. If such demands on time and operating expense are excessive, the general efficiency and profitability of plant operation will be diminished. The plants which are disadvantaged in this regard will be benefited

to the degree that they are able to generate increased milk production in their immediate vicinity. Whether or not a plant can be considered mislocated might well depend, therefore, on the ingenuity and persuasiveness of its management.

If one bears in mind the past successes and failures of the cheese industry in Nebraska one can only question if the latest effort may not be one in a long line of such endeavors. Walter Kollmorgen sagely reminds us that "The failure of the cheese industry to establish itself more thoroughly in this state has not noticeably daunted the advocates of this activity."[1]

No one can predict with certainty the stability and permanence of the cheese industry in Nebraska, but certain encouraging developments have occurred since Kollmorgen's article appeared in 1938. Whole milk marketing is an accomplished fact. Butter production is declining and a new outlet for milk is needed. Cheese demand is high, making cheese the reasonable substitute. Although cheese production has increased in Wisconsin and other states, plant consolidations have provided Nebraska with experienced personnel. For these and other reasons the conclusion is that now, more than ever before in Nebraska, conditions are receptive for the successful establishment of a cheese industry in this state.

---

[1]Kollmorgen, Cheese Production in Nebraska, p. 26.

APPENDIX I

QUESTIONNAIRE

Plant Name_____
Location_____
Contact_____
Date_____

What year did plant begin cheese production?_____

Has operation been continuous since that date?_____

Was building a former creamery?_____

Does plant operate twelve months a year?_____Seasonal?_____

Is plant operated as a proprietary firm?_____Other?_____

Average number of people employed?_____

Disposal of whey cream?_____

Is whey dried at the plant?_____

Disposal of dried whey?_____

Pounds of milk used annually?_____

Number of farms supplying milk?_____

Approximate radius of milk procurement area?_____

Average distance milk is transported to plant?_____

Milk supply area includes all or part of which counties?

_____

_____

Among milk suppliers, is dairying a specialty?_____

What kind(s) cheese is made?_____other products?_____

Mode of transportation, refrigerated trucks?_____rail?_____

First buyer?_____ First destination?_____

Annual production of cheese, various years?_____lbs.

Did operator-manager have cheese making experience before coming to Nebraska?_____

Does plant site and situation seem to favor cheese manufacturing?_____

Is milk procurement the overriding problem?_____

Is all milk used manufacturing grade?_____

Is milk handled in bulk?_____cans?_____

Are suppliers independents?_____Co-op members?_____

Are there competing milk users drawing milk from the milk procurement area of this plant?_____

What possible effect will the state's new manufacturing grade milk law have on milk producers in the area?_____

APPENDIX II

TABLE 13

THE TEN DISTINCT TYPES OF NATURAL CHEESE CLASSIFIED BY DISTINGUISHING DIFFERENCES IN PROCESSING

Distinctive Processing	Distinctive Characteristics	Typical Varieties of Cheese
Curd coagulated primarily by acid[a]	Delicate, soft curd	Cottage cheese, Cream, Neufchatel
Curd particles matted together	Close texture;[b] firm body	Cheddar, Cheshire
Curd particles kept separate	More open texture	Colby, Monterey, Edam, Gouda
Presence of small amount of copper from copper cheese kettle or vat	Granular texture, brittle body	Grana--hard grating types: Parmesan, Reggiana, Romana or Sardo
Stretched curd	Plastic curd; thread-like or flaky texture	Provolone, Caciocavallo, Mozzarella
Bacteria ripened throughout interior with formation of eyes[c]	Gas holes or eyes throughout cheese	Emmentaler or Swiss (large eyes) Gruyere, Asiago (small eyes)

TABLE 13--Continued

Distinctive Processing	Distinctive Characteristics	Typical Varieties of Cheese
Mold ripened throughout interior	Visible veins of mold Typical piquant, spicy flavor	Blue, Roquefort, Stilton, Gorgonzola
Surface ripened principally by mold	Edible crust; soft, creamy interior. Typical pungent flavor.	Camembert, Brie
Surface ripened principally by bacteria and yeast	Surface growth; soft, smooth, waxy body Typical mild to robust flavor	Bel Paese, Brick, Limburger, Muenster, Port du Salut
Protein of whey or whey and milk coagulated by acid and high heat	Sweetish flavor of whey	Whey cheese; Gjetost, Sap Sago, Mysost, Primost, Ricotta

[a]In contrast to coagulation by acid and enzymes or, in whey cheese, by acid and high heat.

[b]Close texture means no mechanical holes within the cheese; open texture, considerable mechanical holes.

[c]In contrast to ripening by bacteria throughout interior without eye formation.

Source: Newer Knowledge of Cheese, National Dairy Council (Chicago, 1967), p. 10, Table 1.

APPENDIX III

NEBRASKA COOPERATIVES 1970

Name of cooperative	Plant Location
Central States Dairy Cooperative	Fairbury, Jefferson County
Central States Dairy Cooperative	Broken Bow, Custer County
Central States Dairy Cooperative	Fullerton, Nance County
Central States Dairy Cooperative	Norfolk, Madison County
Central States Dairy Cooperative	Superior, Nuckolls County
Cooperative Marketing Association	Laurel, Cedar County
Crofton Cooperative Creamery	Crofton, Knox County
Lyons Cooperative Creamery	Lyons, Burt County
Newman Grove Cooperative Creamery	Newman Grove, Madison County
Plainview Farmers Cooperative Creamery	Plainview, Pierce County

Source: U.S. Department of Agriculture, Consumer and Marketing Service, Dairy Division, Dairy Plants Surveyed and Approved for USDA Grading Service (Washington, D.C.: Government Printing Office, January, 1970), p. 21.

APPENDIX IV

DIRECTORY OF SELECTED STORAGE CENTERS

Cheese

Atlanta, Georgia
Boston, Massachusetts
Buffalo, New York
Carthage, Missouri
Chicago, Illinois
Clintonville, Wisconsin
Detroit, Michigan
Fremont, Wisconsin
Green Bay, Wisconsin
Los Angeles, California
Lowville, New York
Marshfield, Wisconsin
Milwaukee, Wisconsin
Minneapolis-St. Paul, Minnesota
Monroe, Wisconsin
Mosinee, Wisconsin
Nashville, Tennessee
Neosho, Missouri
New Ulm, Minnesota
New York, New York
Oakland, California
Philadelphia, Pennsylvania
Plymouth, Wisconsin
Pocatello, Idaho
Portage, Wisconsin
San Francisco, California
Sheboygan, Wisconsin
Springfield, Massachusetts
Springfield, Missouri
Syracuse, New York
Tillamook, Oregon

Source: U.S. Department of Agriculture, Consumer and Marketing Service, Dairy Marketing Statistics 1968, Statistical Bulletin No. 434 (Washington, D.C.: Government Printing Office, April, 1969), Appendix, p. 19.

SOURCES CONSULTED

Books

Davis, J. G. Cheese. Vol. I: Basic Technology. New York: New York: American Elsevier Publishing Company, Inc.

_____. Cheese. Vol. II: Annotated Bibliography with Subject Index. New York: American Elsevier Publishing Company, Inc., 1965.

Pirtle, T. R. History of the Dairy Industry. Chicago: Mojonnier Bros. Company, 1926.

Sauer, Carl O. Agricultural Origins and Dispersals. New York: The American Geographical Society, 1952.

Weber, Alfred. Theory of the Location of Industries. Translated by Carl. J. Freedrech. Chicago: University of Chicago Press, 1929.

Periodicals

Durand, Loyal, Jr. "The Migration of Cheese Manufacture in the United States." Annals of the Association of American Geographers, XLII (December, 1952), 263-282.

_____. "Cheese Region of Southeastern Wisconsin." Economic Geography, XV (July, 1939), 283-292.

_____. "Cheese Region of Northwestern Illinois." Economic Geography, XXII (January, 1946), 24-37.

_____. "Recent Market Orientations of the American Dairy Region." Economic Geography, XXIII (January, 1947), 32-40.

_____. "The Lower Peninsula of Michigan and the Western Michigan Dairy Region: A Segment of the American Dairy Region." Economic Geography, XXVII (April, 1951), 163-183.

_____. "The Major Milksheds of the Northeastern Quarter of the United States." Economic Geography, XL (January, 1964), 9-33.

Lewthwaite, Gordon R. "Wisconsin Cheese and Farm Type: A Locational Hypothesis." Economic Geography, XL (April, 1964), 95-112.

"Trends in Farm Bulk Tanks." Manufactured Milk Products Journal, LVIII (May, 1967), 9.

State Documents

Colorado Department of Agriculture. Division of Markets. Colorado Agriculture, A Statistical Profile. Denver, Colorado, 1969.

Kansas State Board of Agriculture. Kansas Crop Reporting Service. Farm Facts 1968-1969. Topeka, Kansas: Robert R. Sanders, State Printer, 1969.

Nebraska Department of Agriculture and Inspection. State-Federal Division of Agricultural Statistics. Nebraska Agricultural Statistics, Historical Record: 1866-1954. Lincoln, Nebraska, n.d.

Nebraska Department of Agriculture. State-Federal Division of Agricultural Statistics. Nebraska Agricultural Statistics Annual Report 1963. Lincoln, Nebraska, 1965.

Nebraska Department of Agriculture. State-Federal Division of Agricultural Statistics. Nebraska Agricultural Statistics Annual Report 1967. Lincoln, Nebraska, 1969.

Nebraska Department of Economic Development. Directory of Nebraska Manufacturers and Their Products 1968-69. Lincoln, Nebraska, 1970.

Proceedings of the First Annual Convention of the Nebraska Dairymen's Association. Lincoln, Nebraska: Journal Company, State Printers, 1886.
These proceedings are bound within the volume Transactions of the State Board of Agriculture: State of Nebraska. Lincoln, Nebraska: Journal Company, State Printers, 1884.

South Dakota Department of Agriculture. Crop and Livestock Reporting Service. South Dakota Agricultural Statistics 1968. Sioux Falls, South Dakota, n.d.

State of Nebraska. Department of Agriculture. Bureau of Dairies and Foods. Nebraska Graded Milk Law. Lincoln, Nebraska, 1967.

State of Nebraska. Department of Agriculture. Bureau of Dairies, Foods, and Drugs. Nebraska Manufacturing Milk Act. Lincoln, Nebraska, 1969.

U.S. Government Documents

U.S. Department of Agriculture. Agricultural Research Service. Cheese Varieties and Descriptions. Agriculture Handbook No. 54. Washington, D.C.: Government Printing Office, 1969.

U.S. Department of Agriculture. Dairy Economics Handbook, by Max K. Hinds and William F. Johnstone. Agriculture Handbook No. 138. Washington, D.C.: Government Printing Office, November, 1958.

U.S. Department of Agriculture. Agricultural Stabilization and Conservation Service. Dairy Price Support and Related Programs 1949-1968. Agricultural Economic Report No. 165. Washington, D.C.: Government Printing Office, July, 1969.

U.S. Department of Agriculture. Consumer and Marketing Service. Cheese Buying Guide for Consumers. Marketing Bulletin No. 17. Washington, D.C.: Government Printing Office, May, 1961.

U.S. Department of Agriculture. Consumer and Marketing Service. Dairy Marketing Statistics 1968. Statistical Bulletin No. 434. Washington, D.C.: Government Printing Office, April, 1969.

U.S. Department of Agriculture. Consumer and Marketing Service. Dairy Plants Surveyed and Approved for USDA Grading Service. Washington, D.C.: Government Printing Office, January, 1970.

U.S. Department of Agriculture. Consumer and Marketing Service, Federal and State Standards for the Composition of Milk (and Certain Non-Milkfat Products). Agriculture Handbook No. 51. Washington, D.C.: Government Printing Office, July, 1968.

U.S. Department of Agriculture. Consumer and Marketing Service. Laws and Regulations Affecting the Cheese Industry. Agriculture Handbook No. 265. Washington, D.C.: Government Printing Office.

U.S. Department of Agriculture. Economic Research Service. Agricultural Markets in Change. Agricultural Economic Report No. 95. Washington, D.C.: Government Printing Office, July, 1966.

U.S. Department of Agriculture. Economic Research Service. Dairy Situation. DS-324. Washington, D.C.: Government Printing Office, March, 1969.

_____. DS-325. May, 1969.

_____. DS-326. July, 1969.

_____. DS-327. September, 1969.

_____. DS-328. November, 1969.

_____. DS-329. March, 1970.

_____. DS-330. May, 1970.

_____. DS-331. July, 1970.

_____. DS-332. September, 1970.

U.S. Department of Agriculture. Economic Research Service. Dairy Statistics through 1960. Statistical Bulletin No. 303. Washington, D.C.: Government Printing Office, February, 1962.

U.S. Department of Agriculture. Economic Research Service. Dairy Statistics 1960-67. Statistical Bulletin No. 430. Washington, D.C.: Government Printing Office, July, 1968.

U.S. Department of Agriculture. Economic Research Service. Economics of Size in Farming. Agricultural Economic Report No. 107. Washington, D.C.: Government Printing Office, February, 1967.

U.S. Department of Agriculture. Economic Research Service. Farm Income State Estimates. FIS-214. Washington, D.C.: Government Printing Office, August, 1969.

U.S. Department of Agriculture. Economic Research Service. Food: Consumption, Prices, Expenditures. Agricultural Economic Report No. 138. Washington, D.C.: Government Printing Office, January, 1970.

U.S. Department of Agriculture. Economic Research Service. Government's Role in Pricing Fluid Milk in the United States. Agricultural Economic Report No. 152. Washington, D.C.: Government Printing Office, December, 1968.

U.S. Department of Agriculture. Statistical Reporting Service. Crop Reporting Board. Agricultural Prices. Pr 1 (1-69). Washington, D.C.: Government Printing Office, January, 1969.

U.S. Department of Agriculture. Statistical Reporting Service. Crop Reporting Board. Milk Production, Disposition, and Income, 1967-68. DA 1-2 (69). Washington, D.C.: Government Printing Office, April, 1969.

U.S. Department of Agriculture. Statistical Reporting Service. Crop Reporting Board. Production of Manufactured Dairy Products 1968. DA 2-1 (69). Washington, D.C.: Government Printing Office, July, 1969.

U.S. Department of Commerce. Bureau of the Census. Census of Agriculture: 1964. Vol. I, Statistics for the State and Counties, pt. 20, Nebraska.

U.S. Department of Commerce. Bureau of the Census. Census of Agriculture: 1964. Vol. II, chapter 2, Livestock, Poultry, and Livestock and Poultry Products.

Yearbooks

Alvord, Henry E. "Dairy Development in the United States," U.S. Department of Agriculture Yearbook 1899. Washington, D.C.: Government Printing Office, 1900.

Goodale, S. L. "The Manufacture of Cheese." Report of the Commissioner of Agriculture for the year 1863. Washington, D.C.: Government Printing Office, 1863.

Willard, X.A. "American Dairying: Its Rise, Progress, and National Importance." Report of the Commissioner of Agriculture for the Year 1865. Washington, D.C.: Government Printing Office, 1866.

Pamphlets and Bulletins

Benning, Leonard. The Economic Feasibility of a Cheese Manufacturing Facility at Sisseton, South Dakota.

South Dakota State University Agricultural Extension Service. Brookings, South Dakota, 1965.

Downs, P. A. The Manufacture of Expert-Type Cheddar Cheese from Pasteurized Milk. University of Nebraska College of Agriculture. Agricultural Experiment Station Bulletin No. 390. Lincoln, Nebraska, 1948.

Evans, T. A. "Cheese Takes Over." Cornhusker Economics. University of Nebraska College of Agriculture and Home Economics, Cooperative Extension Service, 1970.

_____. "Shall I Sell Whole Milk?" University of Nebraska College of Agriculture. U.S. Department of Agriculture Cooperating. n.d. [1959?].

Feder, Ernest and Sheldon W. Williams. Dairy Marketing in the Northern Great Plains: Its Patterns and Prospects. South Dakota State College. Agricultural Experiment Station Bulletin No. 438. Brookings, South Dakota, 1954.

Gildersleeve, Charles R. and John T. Wilhelm. Milk, Grain and Livestock Source Areas. Omaha Trade Area Study No. 4. Omaha Urban Area Research Project. University of Nebraska at Omaha, Urban Studies Center, 1968.

Hines, Fred K. and Leo V. Blakley. Changes, Cost, and Potential of the Cheese Industry in Oklahoma. Oklahoma Agricultural Experiment Station Bulletin No. B-649, 1966.

Kollmorgen, Walter. Cheese Production in Nebraska. University of Nebraska Conservation Department of the Conservation and Survey Division Bulletin 17. Lincoln, Nebraska, 1938.

Miller, Clarence J. and Sheldon W. Williams. Dairy Marketing Conditions and Practices in the Northern Plains States. University of Nebraska College of Agriculture Bulletin 457, 1960.

_____. Potential Adjustments in Dairy Marketing in the Northern Plains States. University of Nebraska College of Agriculture. Agricultural Experiment Station Bulletin 450. Lincoln, Nebraska, 1959.

Newer Knowledge of Cheese, National Dairy Council, Chicago, 1967.

Russell, Sargent. Hauling Rates for Direct Farm to City Plant Milk Producers. University of Massachusetts Extension Service. Amherst, Massachusetts, 1967.

The World of Cheese. Kraft Foods, Chicago, 1966.

Newspaper

Denney, James. "Wisconsin, Look Out!" Sunday Magazine of the Midlands. The Omaha World Herald, April 20, 1969.

Unpublished Works

Cartwright, Donald Gordon. "Cheese Production in Southwestern Ontario." Unpublished master's thesis, The University of Western Ontario, London, Canada, 1965.

Central States Dairy Cooperative. Milk marketing statistics for Nebraska, 1968. (Mimeographed.)

Division of Nebraska Resources. Department of Agriculture and Economic Development. "Cheese, Nebraska's Expanding Industry." Lincoln, Nebraska, [after 1964]. (Mimeographed.)

Lake to Lake Dairy Cooperative. Questionnaire completed by plant manager, April 22, 1970.

Nebraska Dairy Industries Association. A list of active members, 1970. (Mimeographed.)

Nebraska Department of Agriculture. State-Federal Division of Agricultural Statistics. Personal correspondence between Robert D. Rawson, Agricultural Statistician, and the writer, October 15, 1970.

Nebraska Department of Agriculture. Department of Agriculture. State-Federal Division of Agricultural Statistics. Nebraska-Milk Cows and Milk Production, 1969. (Mimeographed.)

University of Nebraska. College of Agriculture and Home Economics. Personal correspondence between Mr. T. A. Evans, Extension Economist, and the writer, September 1, 1970.

U.S. Department of Commerce. Food Industries Division. The Cheese Industry in the United States. Bibliography. Washington, D.C., March, 1966. (Mimeographed.)

Personal Interviews

Breakstone Sugar Creek Foods. O'Neill, Nebraska. Field interview with plant manager, spring, 1969.

Continental Cheese, Inc. Red Cloud, Nebraska. Field interview with plant manager, fall, 1969.

Dodge Dairy Products. Dodge, Nebraska. Field interview with owner, summer, 1969.

Leprino Cheese Manufacturing Company. Chappell, Nebraska. Field interview with plant manager, spring, 1970.

Neu Cheese Company. Hartington, Nebraska. Field interview with owner-manager, spring, 1970.

Orchard Cheese Company. Orchard, Nebraska. Field interview with plant manager, spring, 1969.

Ord Cheese Company. Ord, Nebraska. Field interview with plant manager, spring, 1970.

Oxford Cheese Corporation. Oxford, Nebraska. Field interview with plant manager, fall, 1969.

Ravenna Cheese Company, Inc. Ravenna, Nebraska. Field interview with plant manager, spring, 1970.