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Dairy Marketing in the Northern Great Plains: Its Patterns and Prospects

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DAIRY MARKETING

IN THE NORTHERN GREAT PLAINS

Its Patterns and Prospects

Agricultural Experiment Stations of Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin, and the United States Department of Agriculture cooperating.

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Foreword

THE NEED *for further research into problems affecting the dairy industry of the Northern Great Plains states—the Dakotas, Nebraska and Kansas —was pointed out by a recent study of the North Central Regional Committee on Dairy Marketing Research (NCM-12) entitled "Butter Pricing and Marketing at Country Points in the North Central Region" (North Central Publication No. 26). The Plains states lie on the fringe of the best known dairy states of the Nation; butter has been the major dairy product for several decades; the dairy industry is now facing needed adjustments because of rapidly changing production and utilization patterns.*

A series of studies attacking the region's dairy marketing problems has been planned.

A Plains states subcommittee consisting of Ernest Feder, (subcommittee chairman) Louis Fourt, Paul L. Kelley and Clarence Miller, has primary responsibility for this research. In October 1953, Irving Dubov replaced Louis Fourt on the subcommittee. During 1953, Henry Tucker replaced Paul L. Kelley (then on leave). He acted as statistical consultant and made many of the tabulations.

The present report, which is the first of the proposed series, was prepared with the cooperation of the six above named subcommittee members and Sheldon Williams, cooperative agent. Ernest Feder and Sheldon Williams prepared the manuscript and a separate appendix, "Great Plains Dairy Data," and incorporated valuable suggestions of the Technical Committee members.

The subcommittee also acknowledges the assistance of the Bureau of Agricultural Economics (now Agricultural Marketing Service), USDA, for various special tabulations and suggestions.

In its general content this report is sponsored by all members of the NCM-12 Regional Committee and the representatives of the cooperating federal agencies.

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Dairy Marketing in the Northern Great Plains

Its Patterns and Prospects

ERNEST FEDER and SHELDON W. WILLIAMS[1]

Introduction

EXCEPT for limited areas in Kansas and Nebraska, dairying in the four Northern Plains states (North Dakota, South Dakota, Nebraska and Kansas) has been and still is primarily concerned with the production and sale of farm-separated cream. Milk production per square mile is low, and road and climatic conditions, which frequently impede transportation, make much of the area not well suited for the sale of whole milk.

Though dairying is, on the whole, a minor farm enterprise, a large surplus of butter is produced in the area. Moreover, dairying has had a stabilizing influence on the agriculture of the region.

Because of the importance of butter in the area, its dairy industry is strongly affected by the recent decline in the demand for butter. Milk production has declined as a result of the relatively low price for butterfat and of the comparatively high prices and favorable conditions for beef cattle and grain. Some observers feel that if the income from competing enterprises falls, dairying may regain its former place in the agriculture of the area.

In order to consider intelligently the economic problems of the dairy industry of the area, an understanding of its character and development is essential. The purpose of this publication is:

1. To describe the general importance and economic role of the dairy industry in the agriculture of the four states;
2. To point out significant differences between marketing in this area and other areas of the United States;
3. To analyze variations in dairying within the area for the purpose of examining whether general trends apply with equal effect to all parts;
4. To appraise the future of the industry with particular emphasis on the problem of shifting from farm-separated cream sales to whole milk sales.[2]

[1]Associate Economist, South Dakota Agricultural Experiment Station, and Federal-State Cooperative Agent, respectively.

[2]An Appendix, "Great Plains Dairy Data," containing supplementary data in mimeographed form is available from the NCM-12 Committee on Dairy Marketing.

See also a mimeographed report: Cream Assembly in Dairy Area VII: 1. Conditions of Cream Assembly, Agric. Economics Dept. Univ. of Nebraska, October 1953 (to be published later).

The Dairy Industry of the Northern Great Plains

AN EXAMINATION of the history and the characteristics of the dairy industry of the four Northern Plains states—the Dakotas, Nebraska and Kansas—provides valuable insight in delineating its present economic problems. Consideration will be given to its past and present importance, the disposition and utilization of milk, marketing agencies, and its production and consumption balance.

Past and Present Importance

Dairying in the Dakotas, Nebraska and Kansas has been, and still is, a minor farm enterprise as measured by total cow numbers, number of cows per farm, number of large herds and percent of farm income from dairying.

Number of Milk Cows. In 1952 the number of milk cows on farms in the four Northern Plains states area was approximately 1,650,000, with Kansas having the largest share (Fig. 1). This was the smallest number in three decades. The number was largest in the early thirties, at the peak of the depression and before the most severe drought years. It then declined until the beginning of World War II, but increased to a secondary peak during the war. Since the war, the decline in number of milk cows has been sharper in the Northern Plains states than in the rest of the West North Central states and in the United States.

The rise in the number of milk cows in the early depression has been explained variously; the need for cash by farmers to purchase groceries was urgent as income from other sources dwindled. Also, small and intermittent cash returns usually did not have to be turned over to creditors. Surplus labor encouraged farmers to milk. A large number of cows milked were dual purpose animals and could be used either for raising beef cattle or for milking,[3] a situation which still prevails in the four states. For instance, in South Dakota only about 35 percent of all milk cows reported in 1950 were cows belonging to dairy breeds, while 65 percent were Shorthorn, Hereford, or other beef or dual purpose breeds (Table 1).

Table 1. Types of Milk Cows on South Dakota and Kansas Farms, in Specified Years

Type	South Dakota		Kansas
	1944	1950	1952
	Percent of all Milk Cows		
Dairy breeds	20	35	53
Dual purpose and beef breeds	80	65	47

Source: S. D. Dairying, Crop and Livestock Reporting Service, Jan. 1953. Kansas Dairy Breeds, Report of the Kansas State Board of Agriculture, Dec. 1953.

Production Per Cow. Milk production per cow in the Northern Plains states is well below the United States average.[4] This reflects the large number of small herds (see below), and the relatively large number of dual purpose cows milked. Although continuing at a lower level, production per cow has increased over the past 30 years at

[3]Lyle M. Bender, "A Study of Production and Marketing of Butterfat and Butter in South Dakota," M.S. Thesis, South Dakota State College, 1937, pp. 13-17.

[4]4533 pounds per cow against 5328 pounds in the United States (1952).

about the same rate as in the United States as a whole, but at a lower rate than in the more specialized dairy states. From 1930 to 1934, milk production per cow decreased sharply, particularly in the Dakotas, as a result of lack of feed and, probably, an increased proportion of beef cows milked.

Proportion of Farms Reporting Milk Cows and Size of Herds. In 1950, 77 percent of the farmers in the four Northern Plains states reported milk cows (Table 2). The proportion had declined from 84 percent in 1940. In comparison, in 1950, the proportion of all farmers reporting milk cows was 84 percent in Iowa, 81 percent in Minnesota, and 68 percent in the United States.

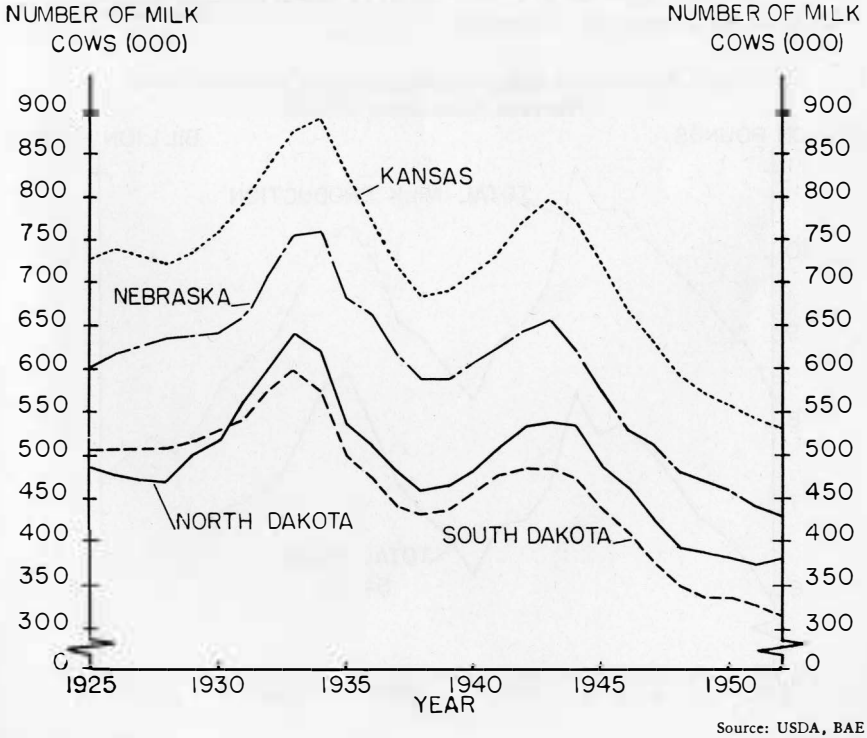
Table 2. Number and Proportion of Farms Reporting Milk Cows, Four Northern Plains States, 1939, 1944, 1949

Census Year	Farms Reporting Milk Cows	All Farms	Percent of All Farms
	(000)	(000)	%
1939	356	424	84
1944	335	391	86
1949	284	370	77

Source: U. S. Census of Agriculture

In 1950, by far the largest proportion of the farmers in the Plains states (81 percent) had small herds of less than 10 cows. Almost one-half (46 percent) reported "herds"

Fig. 1. Number of milk cows in four Northern Plains states, 1925-52



Source: USDA, BAE

Table 3. Distribution of Herds by Size, Four Northern Plains States, 1940 and 1950

Number of Milk Cows	Number of Farms, by Herd Size			Percent of All Herds	
	1940	1950	Percent Change 1940 to 1950	1940	1950
	(000)	(000)	%	%	%
1–4	155.0	132.9	—14	44	46
5–9	150.3	100.4	—33	42	35
10–19	46.9	47.5	+1	13	17
20 or more	3.7	6.8	+84	1	2
Total	355.9	287.6	—19	100	100

Source: U. S. Census of Agriculture

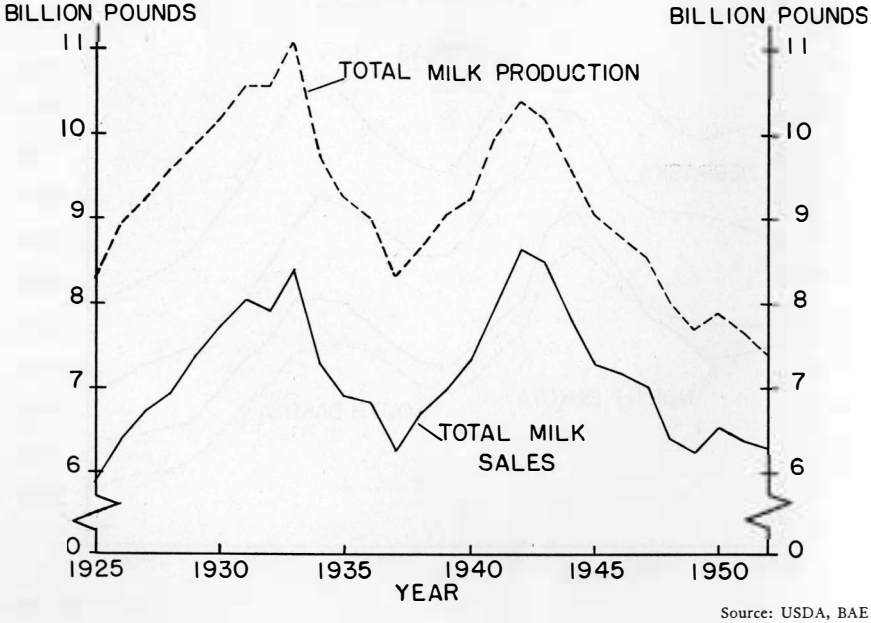
of one to four cows.[5] Since 1940, the proportion of 5- to 9-cow herds has declined. In the same period, herds of 10 or more cows increased both in number and in relative importance (Table 3).

Total Milk Production and Sales. Total milk production in the area is now at 7½ billion pounds per year. This is about 30 percent of production in the West North Central region[6] and 6 percent of that in the United States.

The area and the four states individually reached the peak of production in the early thirties and a second high in the early forties; since then output has declined. In

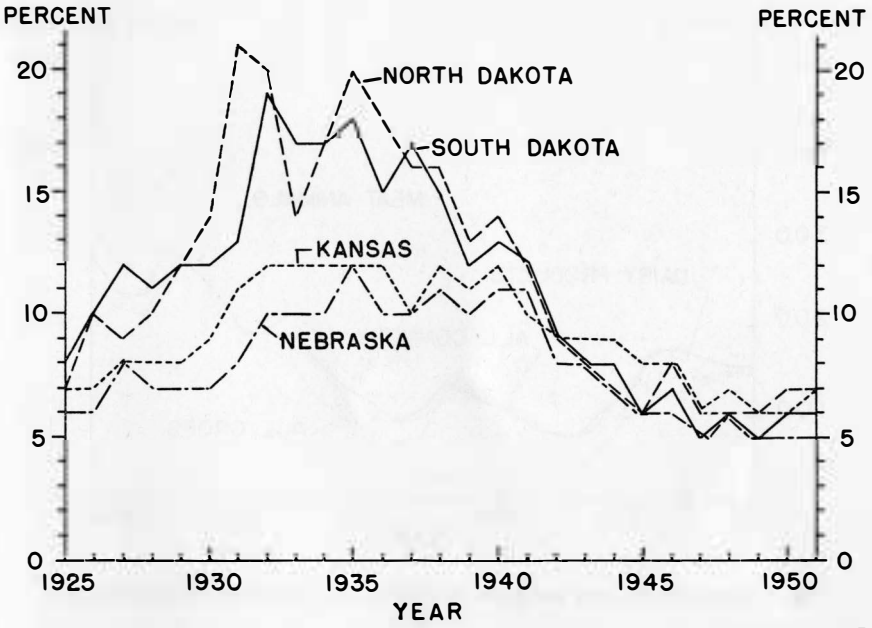
[5]Herds of less than five cows were relatively more common in Nebraska and Kansas than in the Dakotas.
[6]The four Northern Plains states plus Minnesota, Iowa and Missouri.

Fig. 2. Total annual milk production and sales by farmers in four Northern Plains states, 1925-52



Source: USDA, BAE

Fig. 3. Cash receipts from dairy products as percent of total cash income from farm marketings, four Northern Plains states, 1925-51 (excluding government payments)



Source: USDA, BAE

1952, production was about 72 percent of the World War II peak and 68 percent of the 1933 high of 11 billion pounds (Fig. 2). The long-run decline has been sharpest in South Dakota, which now produces the least milk of any of the four states.

Over the years, sales of milk equivalent by farmers in the Plains States decreased less than production, as the quantity of milk used on farms has declined (Fig. 2). However, North Dakota was the only state in which sales of milk equivalent in 1952 exceeded sales in 1925-29.

In contrast to the situation in the Northern Plains area, milk production in the rest of the West North Central region and in the United States as a whole has declined relatively little since World War II, and now is greater than it was a quarter of a century ago.

Importance as Source of Farm Income. From 1925 to 1951, the percentage of cash farm income from the sale of dairy products has fluctuated widely (Fig. 3), particularly in the Dakotas. For the four Plains states it has been around 7 percent during the past decade, but was about 14 percent in 1935. In the Dakotas, it was between 15 and 20 percent in the early and mid-thirties.

During the early thirties, the increase in the share of farm receipts from dairying reflected increasing sales of cream and milk at relatively

Fig. 4. Price indexes for dairy products and other farm commodities, four Northern Plains states area, 1925-51 (unweighted average of indexes of individual states)

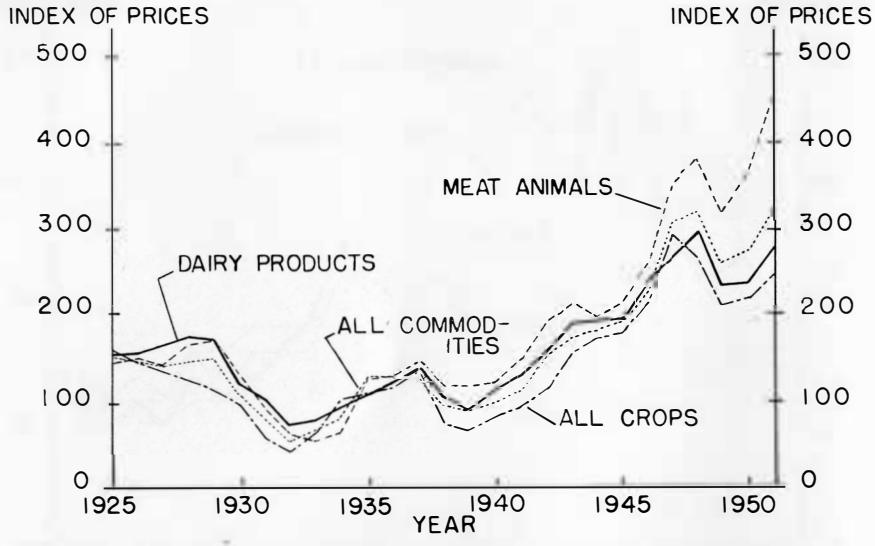
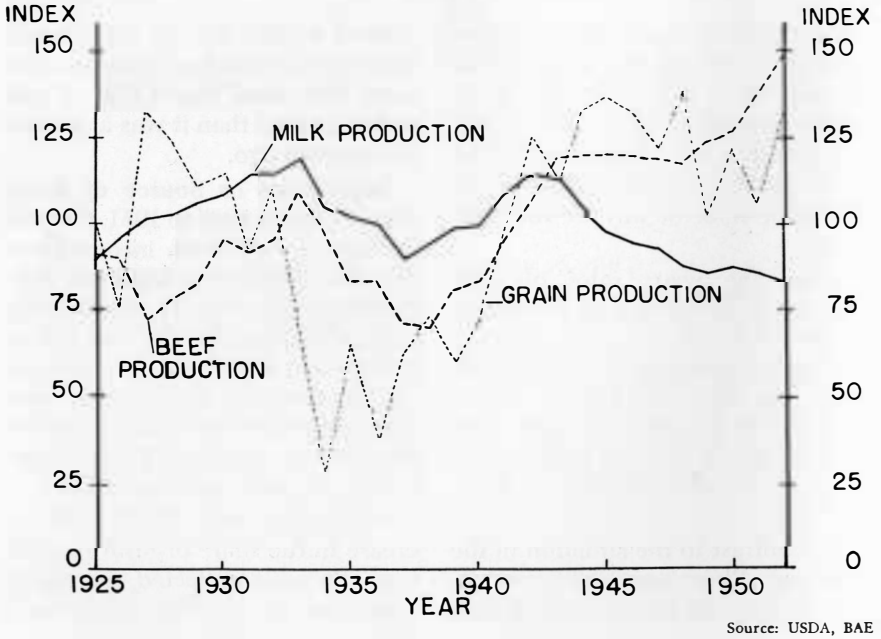


Fig. 5. Index of milk, beef and grain production, four Northern Plains states area, 1925-52



Source: USDA, BAE

Table 4. Cash Receipts from Milk and Cream Marketed by Farmers and Percent of Total from Each Source, Four Northern Plains States, 1952

State	Milk Sold to Plants and Dealers	Cream Sold to Plants and Dealers	Milk and Cream Retailed by Farmers	Receipts from All Milk and Cream
	Cash Receipts—Thousand Dollars			
North Dakota	3,838	35,888	2,136	41,862
South Dakota	4,922	24,579	2,760	32,261
Nebraska	17,746	34,128	5,018	56,892
Kansas	40,656	26,474	7,562	74,692
Four states	67,162	121,069	17,476	205,707
	Percent of Total from Each Source			
North Dakota	9	86	5	100
South Dakota	15	76	9	100
Nebraska	31	60	9	100
Kansas	55	35	10	100
Four states	33	59	8	100

Source: USDA, BAE

favorable prices in a period in which prices of most other farm products and crop production declined sharply (Fig. 4). Though production and sales of milk declined after 1934, income from dairying continued to be a relatively large share of total farm income for several years. This was a result of the severe drought from 1933 to 1936 which greatly reduced the production of crops and other livestock and the income therefrom.[7] In many instances, the small supply of feed available was fed to milk cows rather than being fed to beef cattle or sold for cash (Fig. 5).

Cash incomes from dairying continued to be of importance to farmers into the forties as they had accumulated a heavy debt burden. Thus dairying appears to have had a stabilizing influence on the region's agriculture.

Since the early forties, favorable weather and high prices have resulted in heavy production of grains and meat, particularly beef, and income from these sources has risen sharply and the dairy share has declined.

In monetary terms, the largest income received from milk and cream sales in 1952 was obtained in Kansas and the smallest in South Dakota (Table 4). Receipts from milk sales were far more important in Nebraska and Kansas than in the Dakotas where cream sales predominated. Cash income from milk also exceeded income from cream sales in Kansas. The data in Table 4 are evidence of important differences existing within the area in methods of sale of milk off farms and of higher prices received for milk disposed of as whole milk than as cream.[8]

[7] As an example, production of three major crops—wheat, corn, oats—declined from 60 billion pounds in 1928 to 11 billion in 1934, in the area. In 1934, production of hay was one-fourth of 1928.

[8] In 1952, the 23 percent of all milk equivalent sold by Plains states farmers as whole milk to plants produced 32 percent of the cash receipts from the sale of dairy products.

Disposition and Utilization of Milk

Milk Marketed Largely as Farm-Separated Cream. In the four Northern Plains states, the bulk of the milk sold by farmers is marketed in the form of farm-separated cream. Seventy-four percent was sold in this way in 1952 (Fig. 6a). Within the area, Kansas sold the smallest proportion (52 percent) and North Dakota the largest proportion (91 percent) as cream.

In the area as a whole, sales of whole milk to plants and dealers almost tripled in the 20-year period 1925-29 to 1945-49. This trend accelerated during the forties, particularly in Kansas where whole milk sales now about equal cream sales. Despite this shift, the volume of whole milk sold to plants has remained relatively small.[9]

In the rest of the West North Central region, as in the United States as a whole, the shift toward whole milk sales has been more rapid than in the Plains states. In the combined Minnesota - Iowa - Missouri region, the decline in the percent of all milk sold that was marketed as cream was from 84 percent in 1925-29 to 48 percent in 1952 (Fig. 6b). In the United States, cream sales were 18 percent of all milk equivalent sales in 1952.

In 1952, farmers in the Plains states sold only 15 percent of all the whole milk sold in the West North Central region, but 37 percent of the farm-separated cream.

Cream Sales by Size of Herd. As could be expected, cream is sold primarily by farmers with small herds. Nevertheless, in 1949 the percentage of the milk disposed of as cream was nearly as high on farms with herds of 10 to 14 cows as on those with smaller herds, though it fell off rapidly on farms with 15 cows or more (Table 5).

According to the census, average sales per farm, on farms selling cream, were lower than on farms

[9] In the four states 1.4 billion, as against 8 billion in the Minnesota-Iowa-Missouri area.

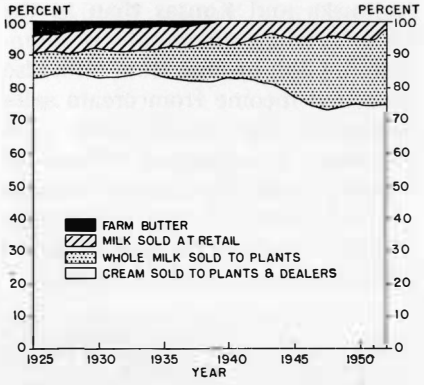


Fig. 6a. Milk disposition in the four Northern Plains states, 1925-52 (farm level)

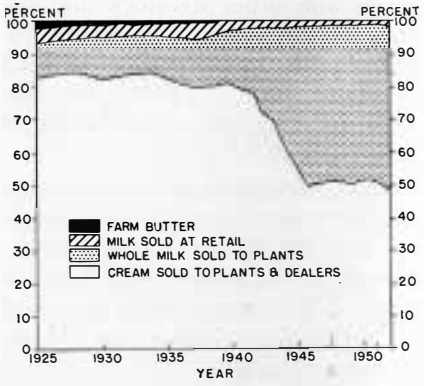


Fig. 6b. Milk disposition in the Minnesota-Iowa-Missouri area, 1925-52 (farm level)

Source: USDA, BAE

Table 5. Percentage of Milk Sales Marketed as Farm-Separated Cream, by Size of Herd, Four Northern Great Plains States, 1950

Size of Herd								
1	2	3-4	5-9	10-14	15-19	20-29	30-49	50+
Percent Sold as Cream								
78	84	86	80	72	57	40	20	10

Source: U. S. Census of Agriculture

Table 6. Relative Importance of Farms with Herds of Various Sizes as Sources of Cream and of Milk, Four Northern Plains States, 1950*

	Percent of Farms and of Sales by Size of Herd					
	Farms Selling Cream†			Farms Selling Whole Milk†		
Size of Herd	Percent of Farms‡	Percent of Cream Sales	Milk Equivalent Sold per Farm (1000 Lbs.)	Percent of Farms‡	Percent of Whole Milk Sales	Milk Sold per Farm (1000 Lbs.)
1-4	37	18	9	26	8	11
5-9	42	44	19	40	26	24
10-19	19	33	31	27	39	51
20 or more	2	5	42	7	27	136
Total	100	100	—	100	100	—

Source: Census of Agriculture, Sample Census

*Excludes farmers with no milk cows on census date, and their sales.

†Some farms in all size groups sold both milk and cream, but this was most common among those with large herds.

‡Number of farms selling cream: 189,701. Number of farms selling milk: 38,832.

selling whole milk for a given herd size. Likewise, sales did not seem to increase as fast with an increase in herd size, as on farms selling whole milk (Table 6). This suggests that production per cow is lower and does not increase as fast with increase in herd size on farms selling cream as on farms selling whole milk.[10]

Plant Utilization. The large proportion of cream sales is reflected in the large proportion of creamery butter and the very small proportion of manufactured dairy products which are made from whole milk. Most of the milk that farmers sell as whole milk is used for fluid consumption.

In 1952, creamery butter production in the four states absorbed 89 percent of the whole milk equivalent used in manufactured dairy products. The proportion was highest in North Dakota (98 percent) and lowest in Kansas (72 percent). This is in contrast to the 80 percent thus used in the Iowa-Minnesota-Missouri area, the 31 percent and 35 percent used in the South Central and in the East North Central states, and the 48 percent in the United States.

Some cheese and some condensed and evaporated milk are manufactured. For the Plains area, about 5 percent of the whole milk equivalent of all manufactured dairy products is used in these products, most of it in Kansas.[11]

[10]Available data do not permit more accurate conclusions with respect to yield per cow on farms selling cream. See however: "Cream Assembly in Dairy Area VII," (Mimeo) Great Plains Subcommitee study to be published later.

[11]Ice cream is a minor product in the area because of the relatively small consuming population. It cannot be determined to what extent it was manufactured from locally produced dairy products or from dairy products brought in from outside the area.

Prices Received by Producers. Because of the large share of the milk sold as farm-separated cream, the average return per unit of milk sold in the area is lower than if more of it were sold as whole milk. For instance, in the Dakotas, average returns per pound of butterfat sold off farms in all forms have, for the past 15 years, persistently been the lowest in the United States. In part, of course, this reflects the fact that farmers who sell cream obtain no direct cash return for their skim milk.

Low average returns do not, however, necessarily mean that prices received for butterfat in farm-separated cream are lower in the Plains area than in the rest of the Nation. For instance, in 1952, the average price received per pound of butterfat in cream sales by Plains states cream producers was about 72.5 cents. This compared with the United States average of 74.1 cents and was well above prices received in some other areas in the Nation.[12]

[12]Prices received by farmers in the four Plains states per unit of milk sold (as cream or milk) have held their own in relation to United States average prices. In other states, the relative price situation has improved most where the shift toward whole milk sales has been vigorous.

Marketing Agencies

Dairy Industry Butter Oriented. Few plants in the area produce dairy products other than butter, and the quantities of these other products are small. For instance, in 1952, there were 320 creameries in the area, but only about 26 plants, mostly in Kansas, producing American cheese from whole milk, and approximately 11 plants, mostly in Kansas, producing non-fat dry milk solids for human consumption. This is in sharp contrast to the situation in other states in the West North Central region (Table 7). Since World War II, the number of American cheese plants in the area has decreased more rapidly than in other states in the West North Central region and in Wisconsin. Figure 7 shows the location of manufacturing plants other than creameries in Nebraska and Kansas.

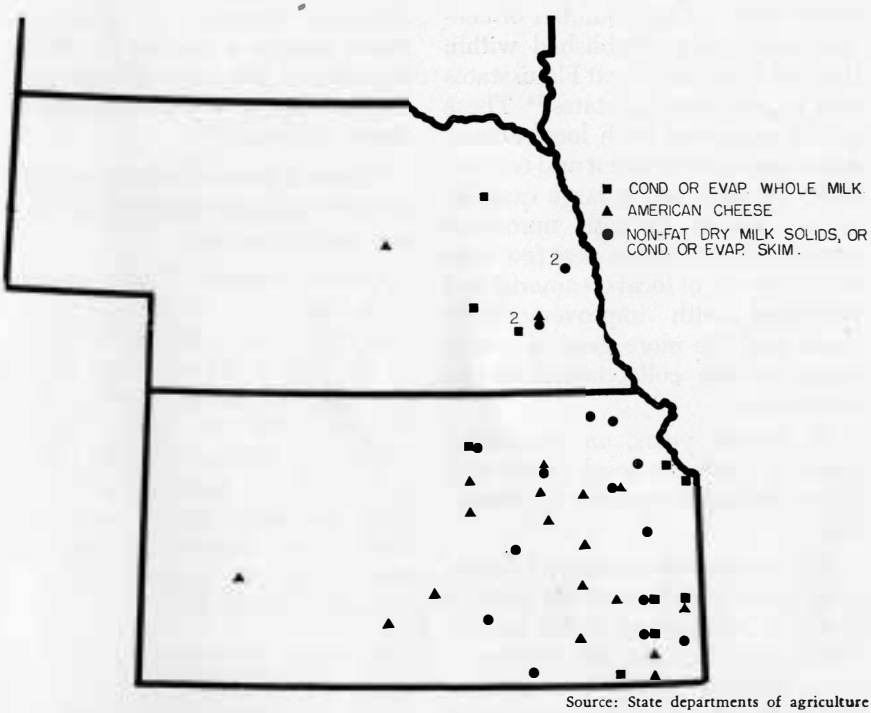
Output of American cheese is higher now than 20 years ago, though the increase has been much less than in the rest of the West North Central region. During the 20-year period, production of condensed and evaporated milk and of non-fat dry milk solids, which was

Table 7. Approximate Number of Plants Manufacturing Specified Types of Dairy Products in Four Northern Plains States, the West North Central Region and Wisconsin, 1946 and 1952

Type of Plant	Four Plains States		West North Central Region		Wisconsin	
	1946	1952	1946	1952	1946	1952
Creameries	385	320	1612	1376	349	264
American cheese (whole milk)	40	26†	172	139	1105	900
Evaporated milk*	†††	†††	13	12	35	25
Dried whole milk	††	—	11§	‡	31	16
Non-fat-dry-milk solids (spray)	**	11‖	44	61	40	59
(roller)	**	††	95	62	75	40

Source: Production of Manufactured Dairy Products, USDA, BAE.
*Whole, unsweetened, case goods.
†None in North Dakota.
‡Small number in Minnesota.
§In Minnesota, plus small numbers in Missouri, Iowa and Kansas.
‖In Kansas and Nebraska.
**Small number not specified.
††Small number in Kansas.

Fig. 7. Location of dairy plants manufacturing cheese, whole milk and dried milk products, Kansas and Nebraska, 1952-53



Source: State departments of agriculture

relatively small and limited almost entirely to Kansas, also increased. The Northern Plains states play a larger part in the production of dried buttermilk for animal feed, turning out about one-fourth of total output in the West North Central region. Since World War II, the production of American cheese, evaporated and condensed milk has declined (Table 8).

Table 8. Approximate Production of Specified Dairy Products other than Butter in Four Plains States, Minnesota-Iowa-Missouri and United States, 1945-49 and 1952

Product	4 Plains States		Minnesota-Iowa-Missouri		United States	
	1945-49 Average	1952	1945-49 Average	1952	1945-49 Average	1952
	(Million Pounds)					
American cheese (whole milk)	14	10	115	120	880	850
Condensed milk (all types)	43‡	41‡	115	70	1298	996
Evaporated milk	60†	53†	268	234	3235	2840
Non-fat-dry-milk solids (human cons.)	11	14*	214	235	718	863
Dried buttermilk	5	8	27	23	45	47

Source: Production of Manufactured Dairy Products, USDA, BAE.
*All in Nebraska and Kansas.
†All in Kansas.
‡Plus additional amounts not specified.

Creameries. With the introduction of farm-separated cream in the early 1900's, a large number of centralizers[13] were established within the four Northern Great Plains states and in neighboring states.[14] These plants competed with local creameries, both independent and cooperative, by purchasing large quantities of cream through numerous cream stations. In the past few decades, the role of local creameries has increased with improvement in roads and the more general use of trucks in the collection of cream from farms.

In recent years, an increasing share of both the local plants and the centralizers have been cooperatives.

The number of creameries fluctuated quite widely over the past 30 years: it was highest in the middle 1930's but since the late thirties it has dropped sharply, except in North Dakota. Now there probably are about as many plants as in the 1920's. From 1939 to 1952 the biggest decline occurred in Kansas. Centralizers and independently owned local plants appear to have taken the brunt of the decline; in the Dakotas the number of cooperatively owned local plants has increased or remained at about the same level (Table 9). Whether the apparent decrease in centralizer plants reflects a decline in the importance of this type of creameries for the area as a whole cannot be stated definitely.[15]

Figure 8 shows that the majority of the plants are located in the eastern part of the area.

Cream Stations. Cream stations were extremely numerous in the four Plains states during the middle of the 1930's. There were, at one time, approximately 1800 in North Dakota, 1450 in South Dakota (1931-32), 2300 in Nebraska (1939) and 3100 in Kansas (1935). By 1952, however, there were only 2500 cream stations in the four states, with the largest number in Nebraska (Table 10).[16]

[13]Large creameries which procure the major part of their supply through cream stations or direct rail shipments.

[14]See G. A. Kristjanson, "Economic History of North Dakota's Dairy Marketing Institutions," M.S. Thesis, North Dakota Agricultural Economics Dept. N.D.S.C., Fargo, N. Dak., (Typed) June 1953, pp. 24, 50. Lyle M. Bender *op. cit.*, p. 44, (History of the Centralizer Cream Station System).

[15]In South Dakota, 14 creameries out of 82 reported cream stations as their "primary" procurement method in 1950, i.e., as their largest source of cream. Not all these plants however fell into the definition of a "centralizer." See also G. A. Kristjanson, *op. cit.*, p. 44.

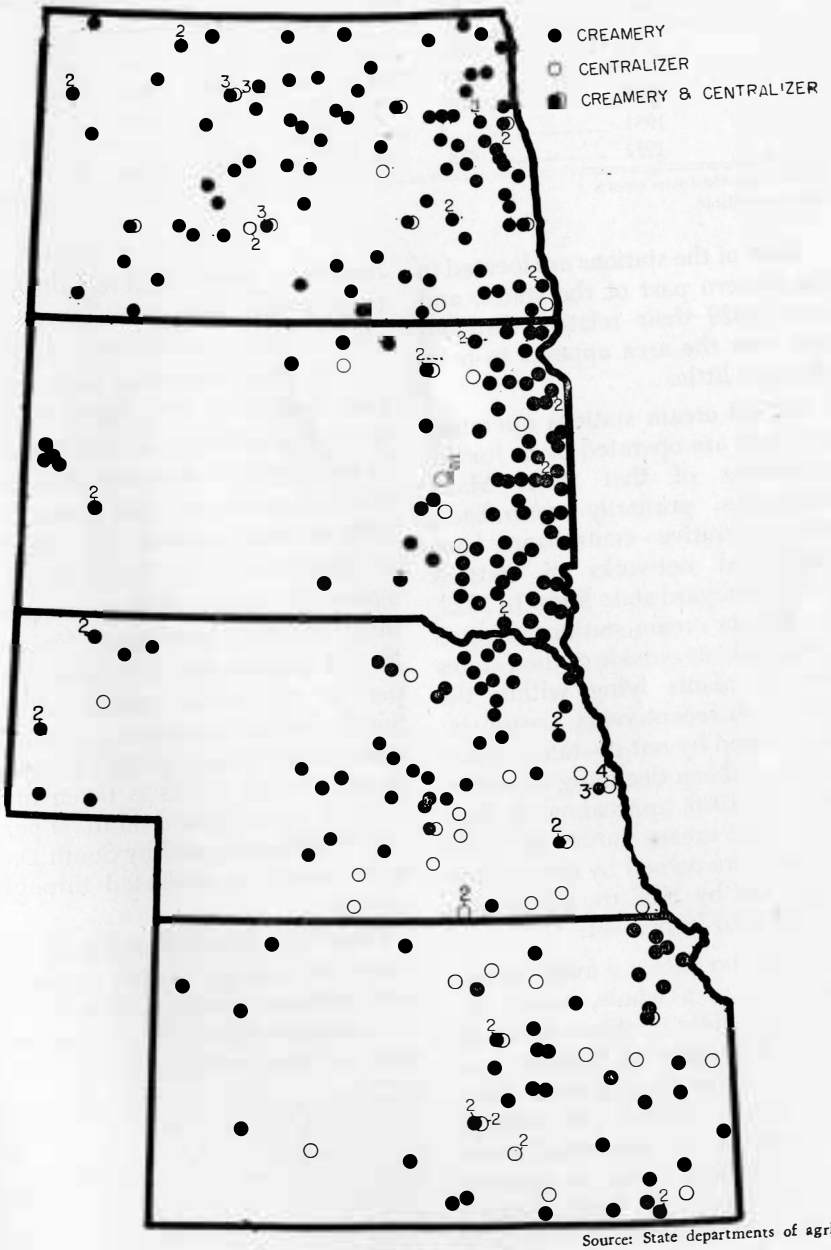
[16]In South Dakota, 43 percent of the stations were listed as centralizer stations in 1953, i.e., stations owned and operated under the name of a South Dakota or out-of-state centralizer plant.

Table 9. Approximate Number of Cooperatively Owned Local Plants and Centralizers* in North Dakota, South Dakota, Nebraska and Kansas, 1939, 1944, 1949, and 1952

	Cooperative Locals				Centralizers*				Total Number of Creameries			
	1939	'44	'49	'52	1939	'44	'49	'52	1939	'44	'49	'52
North Dakota	26	31	32	30	23	14	14	14	101	105	103	107
South Dakota	37	48	49	42	13	11	9	8	116	116	99	85
Nebraska	†+	†+	†+	24	†+	†+	†+	20	120	111	103	80
Kansas	16	13	11	9	21	22	18	14	130	78	67	61

Source: Information furnished by individual states. Data furnished by State Departments of Agriculture vary slightly from those furnished by BAE.
*Includes cooperative centralizers.
†Data unavailable.

Fig. 8. Location of creameries in four Northern Plains states, 1952 (Information furnished by state departments of agriculture differs slightly from USDA, BAE statistics)



Source: State departments of agriculture

Table 10. Number of Cream Stations in North Dakota, South Dakota, Nebraska and Kansas, 1940-52

Year	North Dakota	South Dakota	Nebraska	Kansas	Total Four States
1940-44 av.	885	810	1824	1445	4964
1945-49 av.	646	500	1361	1001	3508
1950	596	407	1303	880	3186
1951	*	389	1129	749	*
1952	478	355	1011	694	2538

Source: Individual state reports
*Data unavailable.

Most of the stations are located in the eastern part of the states, and since 1929 their relative distribution over the area appears to have changed little.

Not all cream stations operating in a state are operated by or for the creameries of that state. Many creameries, primarily centralizers and cooperative - centralizers, have established networks of stations which disregard state lines. In 1929, the Dakota cream stations shipped to more plants outside of their states than to plants lying within the states.[17] In recent years, cream stations owned by out-of-state centralizers have been declining in importance. In 1936, approximately one-third of the cream stations in South Dakota were owned by out-of-state plants, but by 1952 the proportion had fallen to 16 percent.

Though no data are available for the region as a whole, cream stations apparently continue to be an important method of procurement of cream, even though their number is on the decline. The stations are apparently an economical means of concentrating cream in sparsely producing areas. In South Dakota for instance, as density of farm sales decreases, plants tend to shift from truck routes and door delivery to cream stations and railroad receipts as their most important methods of procurement. A 1953 study in the sparsest producing area of Nebraska and South Dakota revealed that of 590 farmers, 255 sold cream directly to cream stations, 238 directly to centralizers.[18] In South Dakota, again, the cream station procurement method accounted for the largest amount and proportion (36 percent) of cream purchased by South Dakota creameries in 1949; when cream going through stations to out-of-state plants is taken into account, an estimated 40 to 50 percent of all cream sold by South Dakota farmers is marketed through stations.[19]

Plant Size. Generalizations about trends in average output in these four states are deceptive if one does not examine trends in the importance of creameries of various sizes.

[17] "Assembling of Butterfat Through Cream Stations," 15th Census of the United States, Census of Distribution, No. A-201, 1932.

[18] "Cream Assembly in Dairy Area VII I. Conditions of Cream Assembly," Great Plains Subcommittee of the NCM-12 Committee of Dairy Marketing, (mimeo), October 1953.

[19] In 1929 farmers in the four Plains states marketed 64 percent of their cream through stations. See: "Assembling of Butterfat Through Cream Stations," *op. cit.*

The butter plants of the Northern Plains states vary widely in size, ranging from small local plants to large centralizers. In 1950, 25 percent of the plants in the region were plants of less than 100,000 pounds annual output. Ten percent produced from 1 million to 2 million pounds of butter per year and 6 percent produced 2 million pounds per year or more (Table 11).

Nebraska and Kansas have more very large plants than the Dakotas, where the proportion of local creameries is as high as in Minnesota and Iowa. There are, however, proportionally more very small creameries in the Dakotas than in the more intensive dairy states to the east.

During the past quarter century, an increasing share of the region's butter has been made in plants with annual output of 250,000 to 2 million pounds. In 1925, plants in that volume range comprised 19 percent of all creameries in the region and produced 22 percent of the butter. In 1950, they comprised 42 percent of the plants and produced 51 percent of the butter. From 1925 to 1945 plants of 2 million or more pounds annual output fell off sharply in importance; but since 1945, the number of plants in this size group has increased slightly in the three southern states though that increase was offset by continued decline in North Dakota. It is possible that problems of procurement and quality have been a factor in the long-run decline in importance of the very large plants.[20] Over the 25-year period, plants of

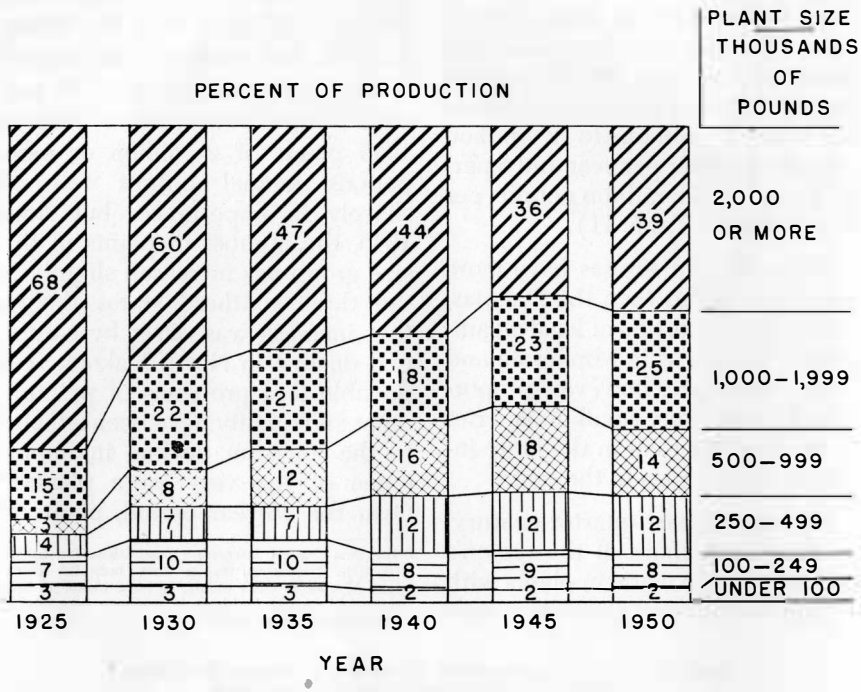
[20]The data suggest interesting possibilities for further research. Numerous studies have indicated economies of scale in dairy plants. In large plants procurement and quality problems in this area may tend to offset economies of scale.

Table 11. Relative Importance of Creameries of Various Sizes, Four Northern Plains States, Minnesota, and Iowa, 1950

State	Annual Butter Production—Thousand Pounds					
	Under 100	100-249	250-499	500-999	1,000-1,999	2,000 or more
	Percent of Plants					
North Dakota	17	34	32	7	8	2
South Dakota	27	32	21	14	4	2
Nebraska	31	23	8	16	9	13
Kansas	24	16	16	10	24	10
Four states	25	27	20	12	10	6
Minnesota	11	36	34	13	5	1
Iowa	9	28	34	15	9	5
	Percent of Butter Production					
North Dakota	2	13	26	12	27	20
South Dakota	4	16	22	28	17	13
Nebraska	2	5	3	15	16	59
Kansas	1	3	7	8	43	38
Four states	2	8	12	14	25	39
Minnesota	2	16	32	24	17	9
Iowa	1	9	22	21	22	25

Source: USDA, BAE

Fig. 9a. Trends in relative importance of creameries of various sizes, four Northern Plains states, 1925-50



less than 100,000 pounds annual output have declined sharply in number (Figs. 9a and b).

Actual and Potential Output of Creameries. There is evidence that in Plains states creameries the ratio of actual to potential plant output is low. For instance, most of the managers or owners of dairy plants located in the James River Valley—a proposed irrigation district—estimated that they could easily double their output of butter without major changes in their capital equipment (Table 12). Most of the plants in the study had been in operation for many years.

Table 12. Butter Production and Estimated Capacity of Eight Dairy Plants Located in James River Valley, South Dakota, 1949

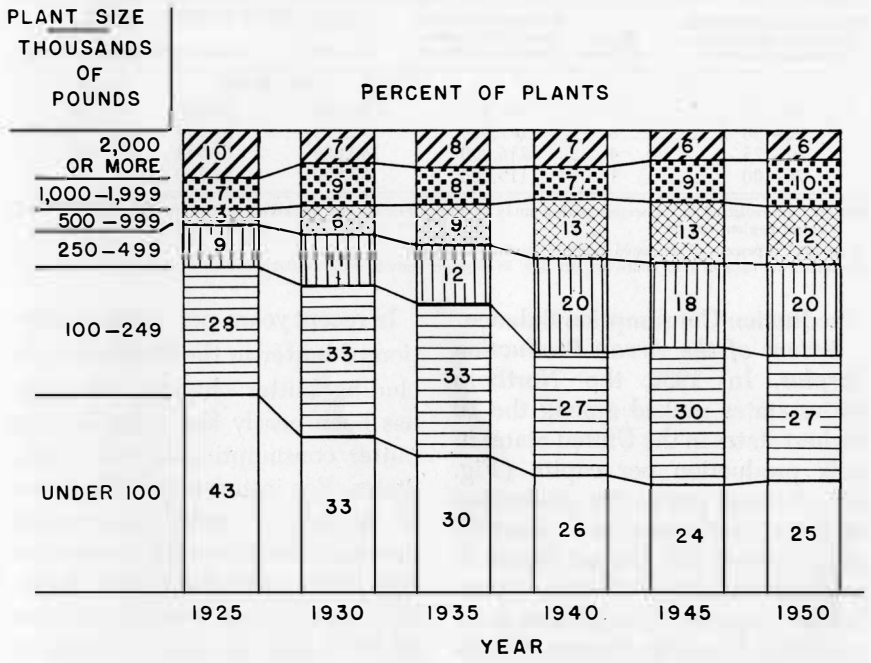
No. of Plants	Volume of Butter Production, 1949	Estimated Capacity*	Average No. Years in Operation
	Lbs.	Lbs.	
8	3,221,000	6,307,000	22

Source: Unpublished material, South Dakota Experiment Station

*Estimated by owner or manager. Two plants primarily in fluid milk business operated at full capacity.

The amount of excess capacity of a creamery should be determined in the season of flush production, when cream supplies and butter output are at their peak. A recent South Dakota study showed that in June, usually the peak month, many

Fig. 9b. Trends in relative importance of creameries of various sizes, four Northern Plains states, 1925-50



Source: USDA, BAE

plants produced less than half the butter they could churn under normal working conditions and with available churning equipment (Table 13). Only 1 of the 20 plants in the study operated at more than three-fourths of capacity in June, and a third of them operated at less than 25 percent of capacity. Among these plants it was generally true that the smaller the output, the lower the percentage of capacity at which they operated.

Conditions like those in South Dakota are likely to be found in the other Plains states as well. The problem of excess capacity will, of course, be aggravated if the number of creameries does not adjust itself rapidly to a decline in cream supply. On the other hand, an increase in butterfat marketings by farmers could very easily be taken care of by the existing plants, probably without any significant new investments in plants and equipment.[21]

[21] The considerable under-utilization of plants in South Dakota raises the question how creameries can continue to exist. In part the answer may lie in the fact that many plants have relatively small capital investments in buildings and equipment and low costs of upkeep. Sanitary laws impose relatively few restrictions and few changes, so that expenditures on new sanitary equipment or renovations are not obligatory. During recent years creameries have also increased their poultry and egg departments.

Table 13. Frequency Distribution of Plants by Utilization of Churning Capacity, 20 Creameries, South Dakota, 1949

Percent June Production of Estimated Monthly Churning Capacity*	Number of Plants	Estimated Maximum Monthly Churning Capacity per Plant†	Average Monthly Production per Plant		
			June 1949	February 1950	Percent February of June
%		Lbs.	(Lbs. Butter)		%
0– 25	7	131,657	26,110	10,980	42
26– 50	8	177,600	70,794	39,554	56
51– 75	4	216,000	140,886	64,954	46
76–100	1	115,200	87,590	54,780	63

Source: Data collected in connection with a study on Butter Pricing and Marketing at Country Points in the North Central Region, *op. cit.*

*June 1949 as percent of estimated monthly churning capacity.
†Estimated on basis of four churnings per day, 24 days per month, with available churns in plant (rated capacity).

Production-Consumption Balance

Extent of the Area's Production Surplus. In 1952, the Northern Plains states ranked among the 10 highest states in the United States in milk production per capita (Fig. 10). Average per capita production in these four states was about 2¼ times that of the United States. It was highest in North Dakota (nearly four times the United States average) and lowest in Kansas. Therefore, unless per capita consumption of dairy products in the four states is materially above United States averages, more than half of the milk produced in the region is available for shipment to larger consuming centers outside the four states.[22] [23]

In recent years, per capita production of butter in the four states, including butter churned on farms, has been nearly five times average butter consumption in the United States. For instance in 1952, it was 43 pounds. If butter consumption per capita had been the same in the four states as in the United States, there would have been about a total of 157 million pounds of butter for

[22]In 1952, total consumption of milk equivalent per capita in the United States was approximately 700 pounds (The Dairy Situation, USDA, BAE, July-August 1953, p. 15), which was approximately 43 percent of average per capita milk production in the four Northern Plains states, (1627 pounds).

[23]The area's per capita production of many other dairy products, such as cheese, is below national averages. To the extent that this is true, equivalent amounts of milk may be considered as available to move out of the area in butter.

Table 14. Estimated Export Surplus of Butter* from Four Plains States and Export Surplus as Percent of Total Production, 1945-49, 1950-52

Year	North Dakota	South Dakota	Nebraska	Kansas	Four States	Percent Export Surplus of Total Production
			Million Pounds			%
1925-29	37	31	82	35	185	70
1930-34	48	37	77	52	214	72
1935-39	44	33	62	51	190	72
1940-44	61	39	78	54	232	79
1945-49	47	30	70	36	183	81
1950	42	28	67	34	171	78
1951	42	30	66	28	166	79
1952	43	27	63	24	157	80

*Total butter churned in states (plant and farm) minus estimated consumption, assuming consumption per capita in the four states equals United States averages.

export in 1952.[24] The highest estimated quantity of butter available for export was in 1943 (248 million pounds) when population was low and farm production of milk high (Table 14).

Contribution of the Area to Total United States Production. In 1952, creamery butter production in North Dakota, South Dakota, Nebraska and Kansas was 15 percent of production in the United States and 28 percent of production in the West North Central region. Of the four states, Nebraska produced the most butter and South Dakota the least.

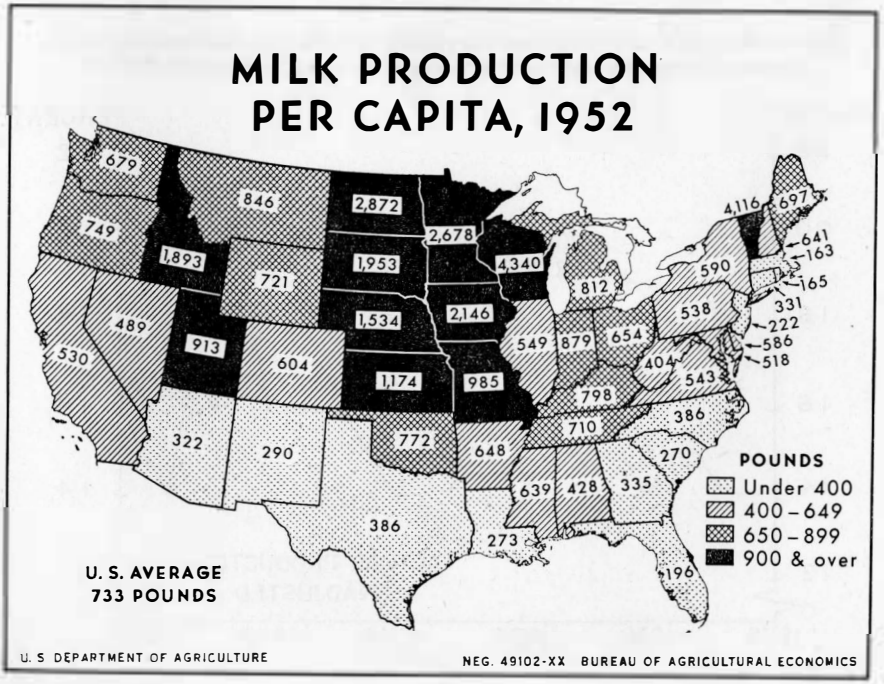
The contribution of the area to the Nation's butter supply may be expressed in terms of the amount of butter made in the area or in terms of the quantity of butterfat sold as farm-separated cream. The share of the Nation's butter made in the area has been slightly higher since 1940 than it was in the late twenties and thirties. In the years 1950-52 it ranged from 15 to 16 percent (Table 15, Fig. 11).

The estimated quantity of butterfat sold by Plains states farmers as farm-separated cream somewhat exceeds[25] the amount of butterfat used by Plains states creameries for

[24] Butter consumption in the Plains states is believed to be somewhat higher than in the United States as a whole, though it may have fallen off as rapidly in recent years as it did in the United States.

[25] While this situation has prevailed for the region as a whole, it has not applied to Nebraska: in Nebraska, with its large centralizers, the quantity of butterfat used in making butter usually has exceeded the quantity marketed by farmers of that state.

Fig. 10. Milk production per capita in the United States, by states, 1952



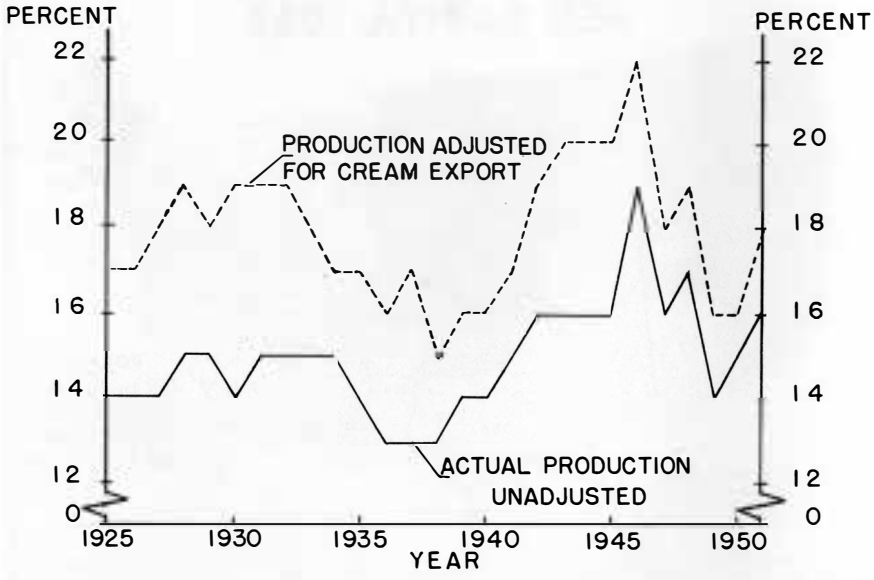
Courtesy: USDA, BAE

Table 15. Percent of Creamery Butter in the United States Actually Manufactured by Creameries in the Four Northern Plains States and Percent Made from All Farm-Separated Cream Sold by Farmers in Those States, 1925-52

Year	Percent of all Creamery Butter in the United States	
	Actually Manufactured by Creameries in the Four States	Made from All Farm-Separated Cream Sold by Farmers in the Four States
1925-29	14	17
1930-34	15	19
1935-39	13	16
1940-44	15	18
1945-49	16	19
1950	15	16
1951	16	18
1952	15	18

creamery butter (Fig. 12). This is primarily the result of large interstate shipments of cream. In the past the amount of the excess has varied considerably, tending to increase in periods of rising production of farm-separated cream, and vice versa (Fig. 13). In 1950-52, 16 to 18 percent of the Nation's butter was made from farm-separated cream that originated from the 4 states. On this basis the area's proportionate contribution to the Nation's butter supply has changed very little over the past 30 years.

Fig. 11. Share of United States creamery butter actually manufactured in the four Northern Plains states and adjusted share including cream exports, 1925-51



Source: USDA, BAE

Fig. 12. Estimated exports (+) or imports (—) of farm separated cream for butter manufacturing, four Northern Plains states, 1925-51

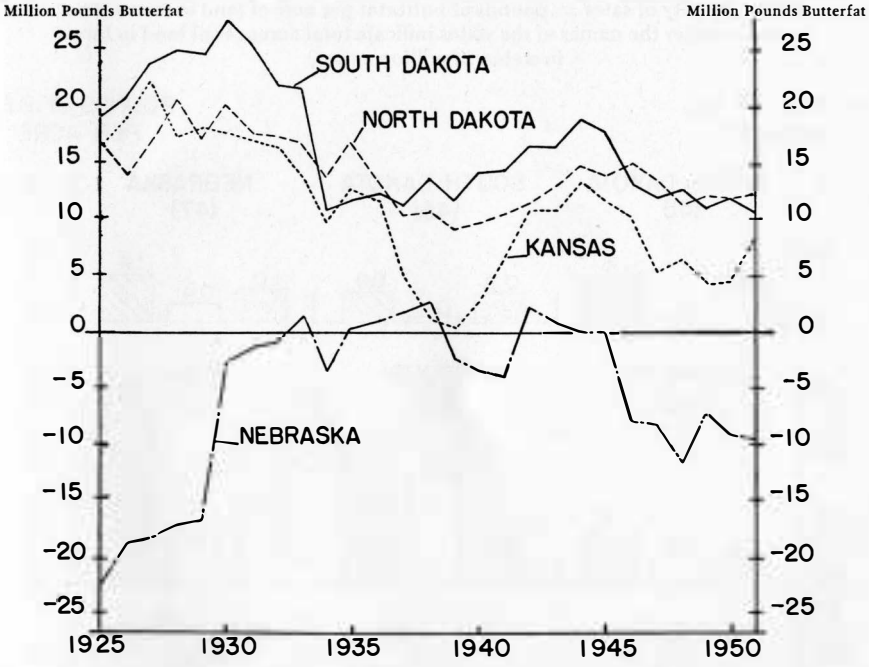
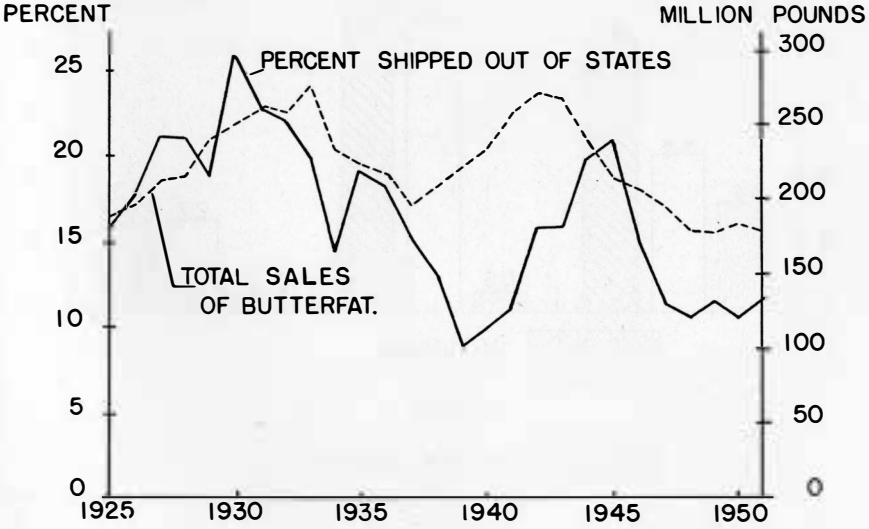
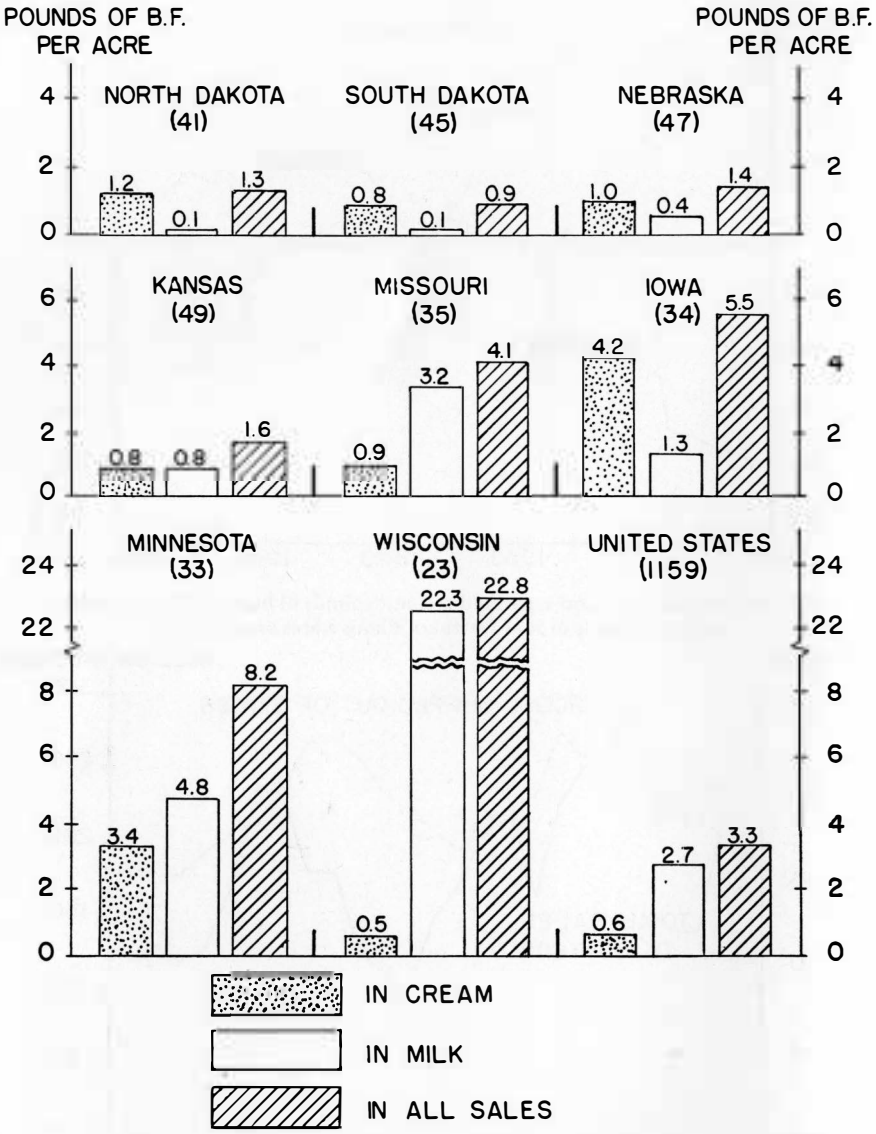


Fig. 13. Total sales of farm-separated cream (pounds of butterfat) and percent shipped outside of four Northern Plains states area, 1925-51



Source: USDA, BAE

Fig. 14. Density of sales of butterfat in farm-separated cream, in whole milk, and in total milk equivalent, seven West North Central states, Wisconsin and United States, 1952 (Density of sales = pounds of butterfat per acre of land in farms. The numbers under the names of the states indicate total acreages of land in farms in states, in million acres.)



Source: USDA, BAE

Conditions Affecting the Marketing of Milk

Density of Production and Sales

In 1952, the total amount of butterfat sold in milk and cream per acre of land in farms was 1.3 pounds in the four Northern Great Plains states, as compared to 3.3 pounds in the United States. Corresponding averages for Minnesota, Iowa and Wisconsin were 8.2 pounds, 5.5 pounds, and 22.8 pounds respectively (Fig. 14). Among the four Plains states, total butterfat sales per acre ranged from 0.9 pounds in South Dakota to 1.6 pounds in Kansas.

In 1949, sales of butterfat in both milk and cream exceeded 2.0 pounds per acre in only 75 of the 319 counties in North Dakota, South Dakota, Nebraska and Kansas (Fig. 15). Most of these counties were in the eastern parts of Nebraska and Kansas. In contrast, all but 5 of the 186 counties in Minnesota and Iowa had total butterfat sales of more than 2.0 pounds per acre of land in farms.

In Iowa, where large amounts of butter are made primarily from farm-separated cream, cream sales alone amounted to more than 2.0 pounds of butterfat per acre in all except 9 of the 99 counties. On the other hand, in the Plains area sales of butterfat in cream exceeded 2.0 pounds per acre of farm land in only 29 of the 319 counties. In 1952, sales of butterfat in cream averaged 1.0 pound per acre in the four Northern Plains states as against 3.4 pounds in Minnesota and 4.2 pounds in Iowa.

Since the four states cover an area about six times as large as Minnesota and sell an amount of milk roughly equivalent to what is sold in that state, a given volume of milk or cream must, on the average, be gathered from an area about six times as large.

Road System and Climatic Conditions

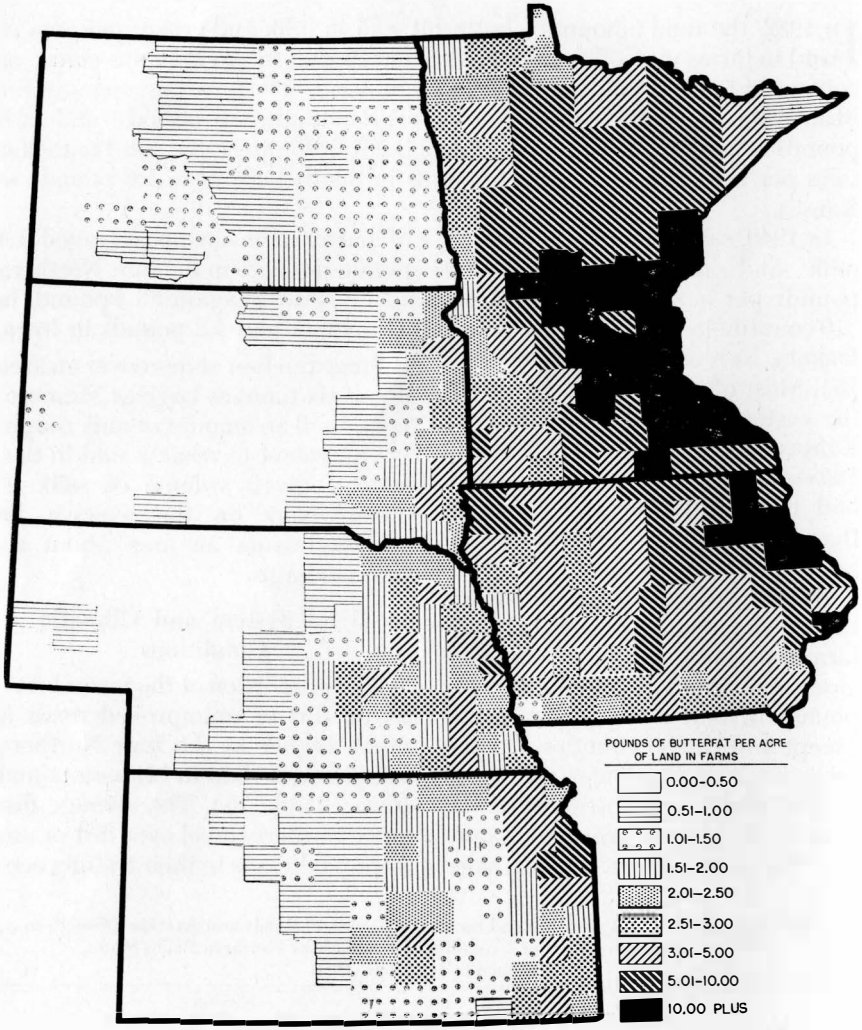
The proportion of the farms located on dirt or unimproved roads is much higher in the four Northern Plains states than in Minnesota and Iowa (Table 16). The average distance farmers travel over dirt or unimproved roads to their trading cen-

Table 16. Proportion of Farms Located on Various Types of Roads and Average Distance to Trading Center Over Dirt or Unimproved Roads, Four Northern Plains States, Minnesota and Iowa, 1950

	North Dakota	South Dakota	Nebraska	Kansas	4 Plains States	Minnesota	Iowa
	Percent of Farms Located on Roads of Each Type						
Hard surface	5	10	9	17	11	17	13
Gravel, shell or shale	45	59	44	49	49	66	66
Dirt, unimproved	50	31	47	34	40	17	21
	Average Distrance to Trading Center Over Dirt or Unimproved Roads						
Miles	3.2	2.0	2.2	1.6	2.2*	1.3	0.7

Source: U. S. Census of Agriculture, 1950
* Simple average of the four state averages.

Fig. 15. Total butterfat density (cream and whole milk) in North Dakota, South Dakota, Nebraska, Kansas, Minnesota and Iowa (county unit basis), 1949



ters also is greater. These inadequacies in the highway system at times hinder frequent delivery of cream. What data are available indicate that the problem is more serious in the very sparsely settled western portions of these states.[26]

Mud and snow prevent travel by trucks or cars on unsurfaced roads during part of the year, and blizzards may block large numbers of

[26] "Cream Assembly in Dairy Area VII," *op. cit.*

farms for several days at a time. As an illustration, in the area of sparsest cream sales, 32 percent of a representative group of farmers selling cream reported that the roads leading to their farms were blocked by snow and mud for 28 days or more in 1952 (Table 17).[27] This problem apparently is more serious in the Dakotas than it is in Nebraska and Kansas.

Problems in farm-to-plant delivery are not limited to the areas of sparsest production. Severe weather conditions and the resulting transportation problems have a serious effect on the quantity and the quality of cream or milk and the output of plants even in more densely producing regions. The experience of a relatively large cheese plant in the eastern part of the Dakotas in an area with a density of sales of about 2 pounds of butterfat per acre may serve as an illustration.

The impact of blizzards on daily deliveries during February and March 1952, is shown in Fig. 16. The daily supply of whole milk from truck routes was reduced by one-third or more on three occasions during that two-month period. During February and March, about half of the producers who normally shipped their milk on truck routes had to deliver the milk themselves at least once (Table 18). There also occurred a loss in whole milk supply to the plant which in one week of February 1952, for instance, amounted to the equivalent of one day's supply of milk.[28] Moreover, the quality of the milk declined during these periods, making it unfit for high quality cheese. Consequently, the plant had to separate the milk and use it for butter and skimmilk cheese.

Table 17. Distribution of 387 Farms in Area VII* According to Number of Days Roads Leading to Them Were Blocked by Snow or Mud, South Dakota and Nebraska, 1952

Days Roads Blocked	Percent of Farmers Reporting†		
	Total	South Dakota	Nebraska
	%	%	%
Less than 14	45	20	59
14-27	23	16	26
28-41	10	16	7
42-45	2	4	1
56 and over	20	44	7
Total	100	100	100

*See below, pp. 34.
†In South Dakota 139 farmers, 248 in Nebraska.

Table 18. Percent of Farmers on Truck Routes Who Had to Deliver Milk to Plant Themselves One or More Times During February and March, 1952, Dakota Cheese Plant

Number of Days Producers Delivered Their Milk to Plant	Percent of Producers	
	February	March
1 day	26	27
2 days	9	11
3 or more days	7	22
Total	42	60

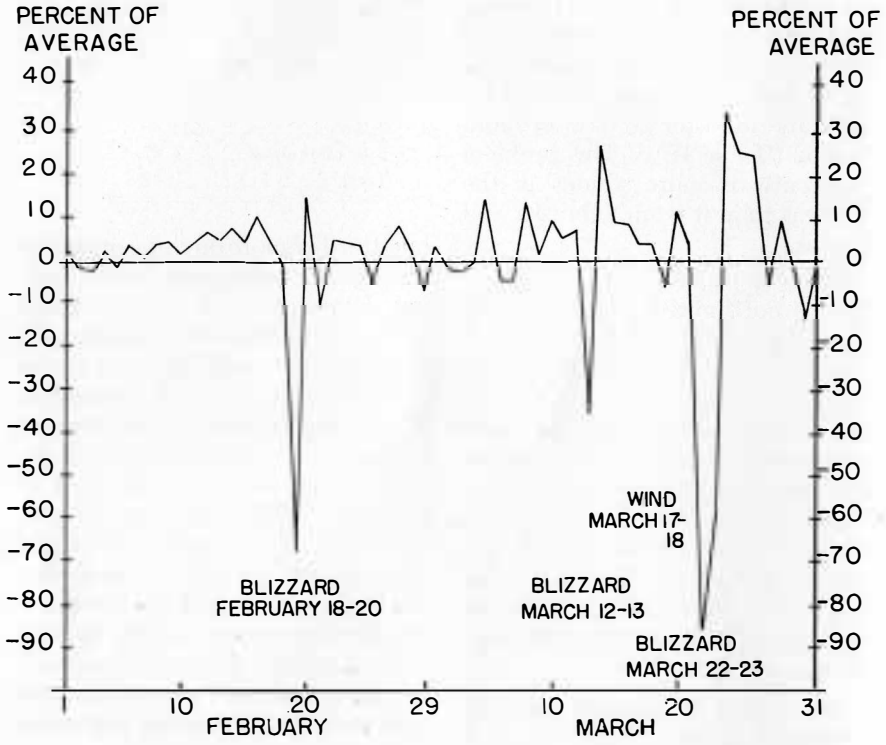
Seasonality of Production

As a result of wide seasonal fluctuations in the production of milk on farms, plant production of butter in the four states varies widely from season to season: from 1944 to 1950, production in June, the high month, was about two times production in November, the low month. The amount of seasonal variation was greatest in North Dakota and least in Kansas. In the Dakotas and Nebraska, it was considerably larger

[27] See: "Cream Assembly in Dairy Area VII," *op. cit.*

[28] Some of the milk may be marketed a few days later as farm-separated cream.

Fig. 16. Daily supplies of whole milk to a cheese plant in the eastern Dakotas, February and March 1952 (shown as percent above or below months' average)



than in Minnesota and Iowa[29] (Figs 17 a and b).

Extreme seasonal variation, as found in the Plains area, can be expected to increase costs of procurement and processing. Plant operators must have labor and facilities adequate to handle operations in the months of maximum production. Consequently, even though it may be possible to adjust the labor force to some extent as volume declines, sharp seasonal reductions in output are likely to result in inefficient use of plant labor, and are certain to cause incomplete use of facilities.

Obviously, plants would benefit from a more even flow of supplies. However, it is understandable that, with existing road and climatic conditions, farmers may be reluctant to plan for heavier milk production during winter and spring months.

[29]In states such as Minnesota and Wisconsin, where much of the butter is made in diversified dairy plants that receive whole milk, the seasonal production pattern may vary widely from one year to another. In contrast, in the four Plains states and Iowa, where butter is made primarily from farm-separated cream, the seasonal pattern varies little from one year to the next.

Fig. 17a. Seasonality of creamery butter production, four Northern Plains states

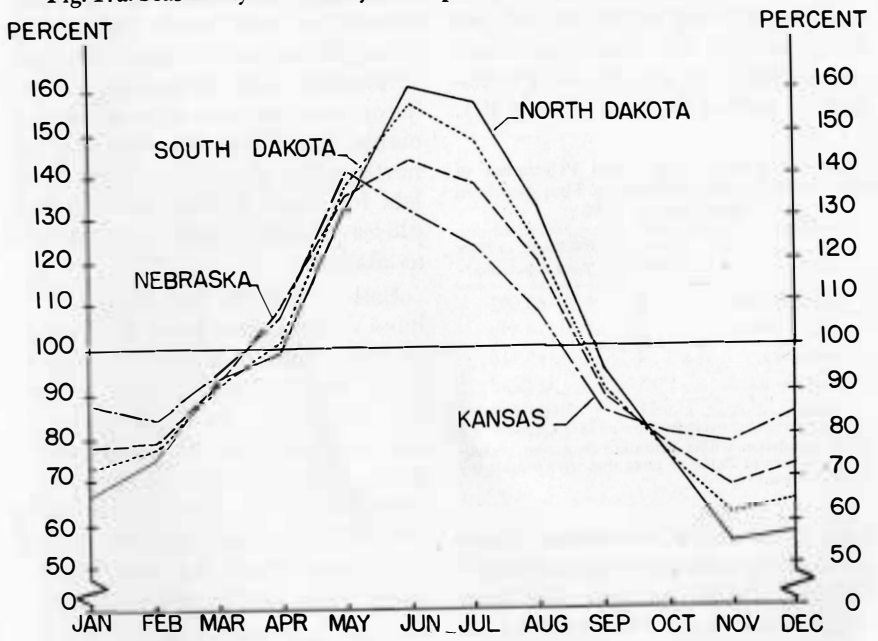
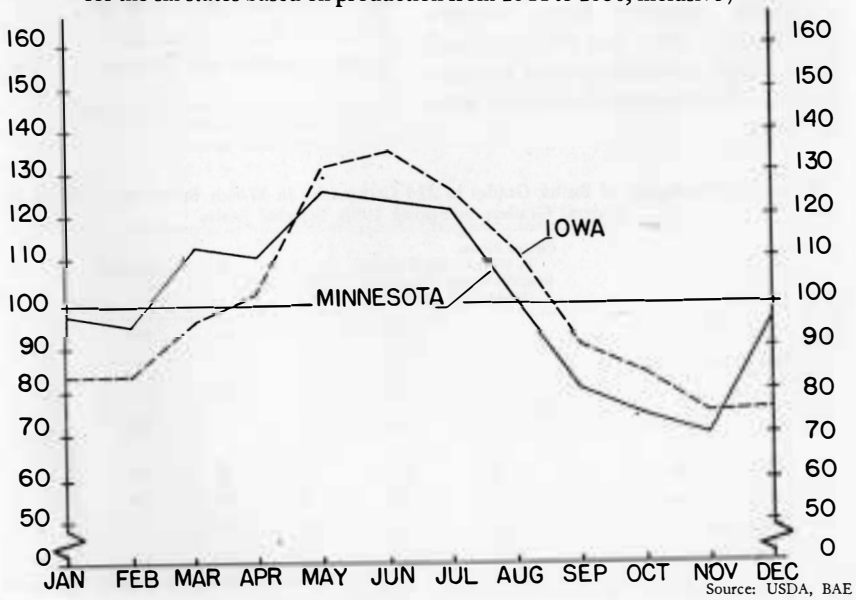


Fig. 17b. Seasonality of creamery butter production, Minnesota and Iowa (Indexes for the six states based on production from 1944 to 1950, inclusive)



Source: USDA, BAE

Outlets for Fluid Milk

There are few large markets for fluid milk in the Northern Plains states, and those are primarily in the eastern part of the area (Table 19).

Table 19. Number and Total Population of Cities of 25,000 People or More, Four Northern Plains States, 1950

State	Cities of 25,000 People or More	
	Number	Total Population*
North Dakota	2	65,092
South Dakota	2	78,559
Nebraska	2	368,216
Kansas	5	522,292
Total	11	1,034,159

*Total population within urbanized areas plus population in places of 25,000 or more that were outside urbanized areas.

Also, with a few exceptions, there are no large cities in adjacent states which provide markets for fluid milk.[30] Such large cities to the east as St. Louis, Des Moines and Minneapolis - St. Paul have generally adequate supplies from sources nearer them than the Plains states. Only a few smaller markets in nearby states have drawn fluid milk from the area.

On the other hand, Kansas, Nebraska and even South Dakota, are closer to markets in Texas than are Minnesota and Wisconsin. These Texas markets have obtained appreciable quantities of milk from the north and might offer potential outlets for these Plains states, if surpluses of fluid milk ever became available.[31]

Some cities in the Plains states have at times not been adequately supplied with milk from local milksheds. Until recently, many of these cities regularly had fall shortages during which they imported emergency supplies from Minnesota or Wisconsin. Since the end of World War II, these shortages have tended to disappear and the area has become more nearly self-sufficient.

Quality of Dairy Products

One of the problems facing butter manufacturers in the Plains states is that of quality. With the large amount of cream marketed

[30] In recent years some fluid milk from western Nebraska has been shipped to Denver, Colorado.

[31] See however below, p. 48.

Table 20. Distribution of Butter Grades in 224 Creameries in Which Butter Was Graded by Federal Graders in Spring 1950, Selected States

States	No. of Plants in Which Samples Were Graded	Total Pounds Graded (000 Lbs.)	Percent in Grades			
			AA	A	B	C
South Dakota	20	150	—	—	85	15
Nebraska	7	262	—	—	91	9
Kansas	20	247	11	25	40	24
Three States	47	659	5	9	70	16
Minnesota	76	341	22	39	38	1
Iowa	32	190	3	36	59	2
Wisconsin	69	795	78	17	5	—*
Three States	177	1326	53	25	21	1*

*Including very small amount of cooking grade butter in Wisconsin.

Table 21. Relation Between Major Method of Receiving Cream and Score of Butter, 20 South Dakota Plants, 1950

Major Method of Cream Receipts*	Number of Plants	Percent Cream Receipts				Percent of Butter Graded	
		Truck Routes	Stations	Door Delivery	Rail	B	C
Truck Route	7	94	—	6	—	94	6
Stations	8	4	76	10	10	78	22
Door Delivery	5	—	5	84	11	73	27
Total	20	—	—	—	—	81	19

*Receiving 50 percent or more of the cream by one method.

through cream stations and by railroads it is difficult to maintain adequate control over the frequency and regularity of cream shipments by farmers and stations. Likewise, the enforcement of sanitary regulations encounters grave difficulties in the face of the large number of small marketing agencies.

As a result, the proportion of low grade butter is much larger in the Plains states than in other important butter producing states in the North Central region. Among 47 sample plants in the Plains area (except North Dakota) in which butter was scored by federal graders in spring 1950, 16 percent was scored grade C butter and 70 percent grade B. Only in Kansas was butter graded A or better. At the same time, in 177 plants in Minnesota, Iowa and Wisconsin, 78 percent of the butter graded A or better, 21 percent graded B, and only 1 percent graded C (Table 20).[32]

There is evidence that the method of cream procurement materially influences the quality of butter manufactured. Among the sample plants in South Dakota in 1950, those receiving cream primarily by truck routes had only 6 percent grade C butter. In contrast, in plants which obtained the major share of their supply through cream stations and/or door delivery, 22 percent and 27 percent, respectively, of the butter was graded C (Table 21).

Some creameries possess the equipment and processing skill to convert relatively low quality cream into butter of relatively high quality fully acceptable to large numbers of consumers. It in no sense minimizes the importance of quality in the cream delivered to the plant to point out the obligation of the creamery operator to employ the best techniques known in making the cream that is received into butter of the highest possible grade. Aggressive use of such techniques is especially needed in the Northern Plains states, where the sparsity of cream supplies and handicaps to transportation raise serious obstacles to the adoption of some of the practices that result in the delivery of cream of the highest quality.

[32]Data obtained in the regional study on "Butter Pricing and Marketing at Country Points in the North Central Region," *op. cit.*

Variations in Dairying Within the Northern Great Plains States

CLIMATIC CONDITIONS and differences in population density are the main reasons why dairying varies in the Northern Great Plains. These variations are reflected in the patterns of production and of marketing.

In order to show these patterns, the region was divided in this study into relatively homogeneous sub-areas as to (1) density of supplies and (2) the form in which milk is sold—whether as whole milk or as cream.[33] In these homogeneous sub-areas, dairy marketing problems can be assumed to be similar (Fig. 18).

Dairy Areas

Counties in which 45 percent or more of all the milk sold by farmers was marketed as whole milk were grouped as milk areas. There were 50 such counties in 1950. They were subdivided into milk area I and II: Milk area I includes 26 counties in which milk sales were relatively dense, i.e. where 1.5 pounds of butterfat or more were sold in whole milk per acre of farm land. Milk area II is composed of 24 counties with a density below 1.5 pounds of butterfat in whole milk sales.[34] Most of the counties belonging to milk areas I and II are located along the eastern border of Nebraska and Kansas where the largest cities are to be found.

Counties in which 55 percent or more of butterfat sold off the farm was disposed of as farm-separated cream were classified as cream areas. Altogether 269 of the 319 counties in the four states fell into this category. As with the milk areas, these 269 counties were further subdivided into five sub-areas, (areas III-VII) according to density of cream sales. More than one-third of all counties in the cream areas fell into area VII in which density of sales was less than 0.50 pounds of butterfat per acre sold in farm-separated cream (Table 22).[35]

[33]These dairy areas should not be confused with Census Economic Areas.

[34]An exception was made for four counties in the Black Hills area of South Dakota (Meade, Fall River, Shannon-Washington) in which the share of the butterfat sold in whole milk was larger than 45 percent, but where the area selling milk was only a small part of the entire counties. These counties are in area VII.

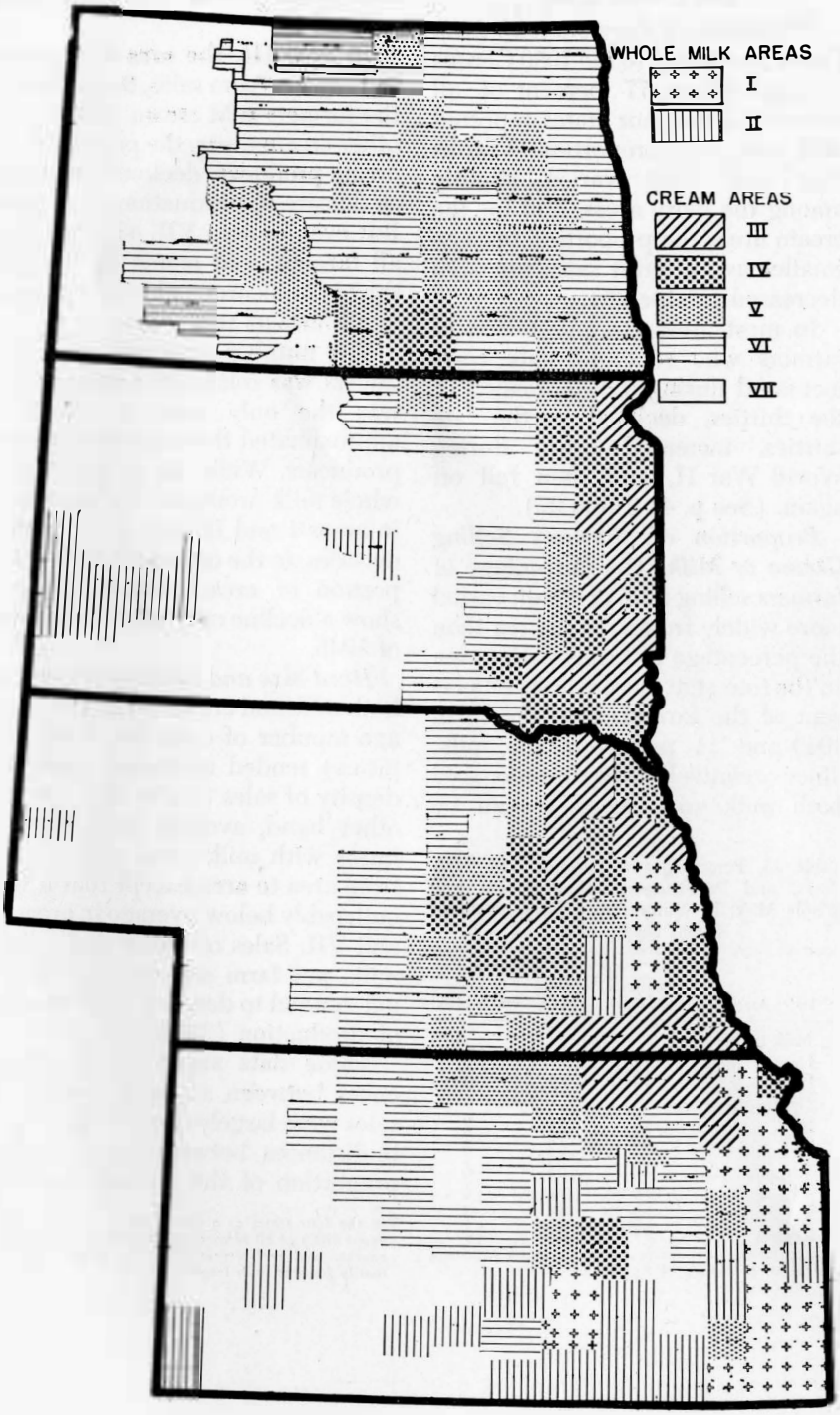
[35]For dairy areas within states, see Statistical Appendix.

Table 22. Distribution of Counties in Four Plains States by Percent of Milk Sold as Whole Milk or Cream and Density of Sales, 1949

Dairy Area	Percent of Milk Equivalent Sold as Cream	Pounds of Butterfat Sold per Acre of Land in Farms	Number of Counties
Milk Areas	**In Whole Milk Only**		
I	Less than 55	1.50 or over	26
II	Less than 55	Less than 1.50	24
Cream Areas	**In Cream Only**		
III	55 or over	2.00 or over	27
IV	55 or over	1.50 to 1.99	28
V	55 or over	1.00 to 1.49	44
VI	55 or over	0.50 to 0.99	65
VII*	55 or over	0.00 to 0.49	105

*See footnote 34 above.

Fig. 18. Homogenous dairy areas in the four Northern Plains states, 1949



Major Characteristics of Milk and Cream Areas

Proportion of Farmers with Milk Cows. According to the 1950 Census of Agriculture, 77 percent of all farmers in the four states reported milk cows. The proportion of farms that had cows varied slightly among the dairy areas, and for the cream areas the proportion became smaller as butterfat sales per acre decreased (Table 23).

In most areas the porportion of farmers who reported milk cows increased during the depression of the thirties, declined in the late thirties, increased again during World War II, and then fell off again. (See p. 41 Table 27).

Proportion of Farmers Selling Cream or Milk. The percentage of farmers selling milk or cream varied more widely from area to area than the percentage of farms with cows. In the four states as a whole, 52 percent of the farmers sold cream in 1949 and 11 percent whole milk. Since relatively few farmers sold both milk and cream, it can be assumed that approximately 60 percent of the farmers sold either milk or cream.[36]

Table 23. Percentages of Farmers with Milk Cows, and Percentages Selling Cream and Whole Milk, by Dairy Areas, Four Northern Plains States, 1949

Dairy Area	Percent of All Farmers		
	Keeping Milk Cows	Selling Cream	Selling Whole Milk
Milk areas			
I	77	27	32
II	74	35	19
Cream areas			
III	83	68	7
IV	82	62	8
V	80	64	6
VI	76	58	6
VII	69	43	5
Region	77	52	11

Source: U. S. Census of Agriculture

In area III, the area of greatest density of cream sales, 68 percent of the farmers sold cream. Among the other cream areas, the proportion of cream producers declined gradually as density of production decreased. But even in area VII, 43 percent of all farmers sold cream in 1949. In the two milk areas, about 30 percent of all farmers sold cream.

The number of whole milk producers was relatively small. Area I was the only area in which it approximated the number of cream producers. While the proportion of whole milk producers has increased in areas I and II over the past two decades, in the cream areas the proportion of cream sellers did not show a decline until after the census of 1945.

Herd Size and Sales per Farm. In both milk and cream areas, the average number of cows per farm (all farms) tended to decline with the density of sales (Table 24). On the other hand, average herd size on farms with milk cows varied little from area to area except that it was noticeably below average in areas II and VII. Sales of cream and whole milk, per farm selling either product, tended to decrease with density of production (Table 24).

These data suggest that differences between areas in density of sales were largely due to differences in distances between farms, in the proportion of the farmers keeping

[36] In the four states as a whole, about 2 percent (i.e. about 4700) of all farmers selling milk in one form or another sold both cream and milk. These were primarily farmers with larger herds.

Table 24. Average Herd Size on All Farms and Farms with Milk Cows, and Average Sales of Butterfat in Milk or Cream per Farmer Selling Milk or Cream, by Dairy Areas, 1949

Dairy Area	Average Number of Cows per Farm		Pounds of Butterfat Sold in*	
	All Farms	Farms With Milk Cows	Cream— per Farmer Selling Cream	Whole Milk— per Farmer Selling Milk
Milk areas				
I	4.8	6.3	636	1459
II	3.8	5.1	522	1221
Cream areas				
III	5.5	6.6	808	1446
IV	5.3	6.5	738	1176
V	5.4	6.8	734	1166
VI	4.7	6.3	629	1206
VII	3.4	4.9	529	1065
Region	4.7	6.1	673	1309

*Whole milk converted to butterfat equivalent assuming 3.8 percent butterfat in milk.

milk cows, and in production per cow, rather than to differences in herd size among farms with milk cows. It is noteworthy that among farmers keeping milk cows, average herd size has increased in all areas except area VII since 1929. It cannot be determined whether this has resulted from a tendency of farmers with small herds to drop out of production or from increases in herd size on farms with cows.

Average Sales and Income. Table 24 showed that in the cream areas, sales of butterfat in cream per cream producer ranged from a high of 808 pounds in area III to a low of 529 pounds in area VII. In general, sales of butterfat per farm were about twice as large on farms selling whole milk as on farms selling cream. The difference was greatest in the milk areas and smallest in the intensive cream areas.

Outside of area I and VII, the estimated share of the farm income derived from the dairy enterprise in 1949 was fairly uniform and ranged from 5 percent to 7 percent (12 percent in area I, 2 percent in area VII) (Table 25).

Table 25. Estimated Average Income per Farm Selling Cream or Whole Milk and Proportion of Farm Income from Sales of Dairy Products, by Areas, Four Northern Plains States, 1949

Dairy Area	Butterfat at 60 cents*	Milk at $3.68*	Proprotion of All Farm Sales in Dairy Areas Derived from Sale of Dairy Products
			%
Milk areas			
I	$382	$1413	12
II	313	1182	5
Cream areas			
III	485	1400	6
IV	443	1139	6
V	440	1129	7
VI	377	1168	5
VII	317	1031	2
Region	$404	$1301	5

*Weighted average price for the four Plains states.

Size of Dairy Areas as Related to Dairy Marketing. The relative importance of the dairy areas as sources of dairy products cannot be judged without reference to land area covered. The five cream areas, which cover 89 percent of the territory, accounted in 1949 for 90 percent of all cream sales. Over 55 percent of the entire cream supply was marketed in areas III, IV and V which cover approximately 25 percent of the region's farm acreage. Area VII covers by far the largest acreage in farm land but despite its large size, it was the least important of the cream areas.

The two milk areas, which cover 11 percent of the territory, furnished over one-half of all the whole milk sold in the four Plains states.

Areas I, III, V and VI each supplied between 16 and 20 percent of all butterfat sold in the region in both milk and cream. Area II supplied only 7 percent and area VII supplied 11 percent (Table 26).

Table 26. Percent of Farm Land in Each Dairy Area and Its Relative Importance as a Source of Dairy Products, Four Northern Plains States, 1949

Dairy Area	Percent of Total			
	Acres of Farm Land	Cream Sales	Sales of Whole Milk	Total Sales of Cream and Milk
Milk areas				
I	4	6	44	17
II	7	4	14	7
Cream areas				
III	6	20	9	16
IV	5	14	7	12
V	13	22	8	17
VI	23	23	12	20
VII	42	11	6	11
Total	100	100	100	100

Prospective Adjustments in Dairying

BECAUSE of the rapid changes in national milk consumption and utilization patterns, Plains states farmers and handlers as well as policy making agencies are asking: What will be the future milk or cream supply in the four states, and how will it be utilized? Answers to these questions are needed to determine adjustments on the local level[37] and in government dairy programs.

While complete answers cannot be given to these questions at this time, this chapter will examine the following topics on the basis of available information:

1. Dairy production prospects in the light of the agriculture prevailing in the area;
2. Prospective needs for dairy products from the region;
3. Shifts from cream to whole milk.

Dairying on Plains States Farms During Prosperity and Depression

Dairying in General a Sideline Enterprise. Although the four states contribute a relatively large proportion of butter to the Nation, on most farms dairying is a minor enterprise. Excluding periods of low farm income, receipts from the sale of dairy products represent only a small share of the area's cash farm income.

A large proportion of Plains states farmers keep milk cows and sell milk or cream, but physical and economic conditions have not favored dairying as a major farm enterprise. Over much of the area, relatively low rainfall and the resulting absence of succulent pastures are a deterrent to intensive dairying. This partially explains the small number of specialized dairy farms; the large proportion of beef and dual-purpose cows milked; the small share of aggregate agricultural income usually obtained from dairy products.

From 1948 to 1952, 38 percent of the cash income from farm marketings was derived from the sale of grains; 45 percent from the sale of meat animals. Level topography and climate favor wheat[38] and other small grains; extensive grazing and haying acreages favor feeder livestock. In some corn producing eastern counties and irrigated areas, the fattening of livestock is profitable.[39] Favorable weather and prices have resulted in high production of grain and meat, especially beef, during most of the past decade.

That farmers will place more emphasis on dairying in periods of comparatively high farm incomes seems unlikely. Conditions favorable to specialization may result in the elimination of dairying on many farms where it is a side-line and increasingly favor farm enterprises best adapted to the area. Many Plains states farmers now milking

[37] Such as in the recent plan of several South Dakota cooperative creameries to establish a large solids-not-fat drying plant. See Sioux Falls (South Dakota) Daily Argus Leader, October 27, 1953.

[38] See for instance: "A Summary of Kansas Agriculture," Agricultural Economics Report No. 55, July 1953, Kansas State College, Manhattan, pp. 35-6.

[39] R. R. Renne, "Land Economics," 1947, p. 248. See also: "Generalized Types of Farming in the United States," Agricultural Information Bulletin No. 3, USDA, BAE, February 1950, pp. 10-13.

cows will be at an increasing disadvantage in relation to farmers in intensive dairy areas where production per cow is high. It is still an unsettled question whether irrigation farming in the Missouri Valley will appreciably affect the importance of dairying in the region.

Effect of Low Farm Income on Dairying. If there are no important structural changes in the agriculture of the region, a review of the past may give important guides for estimating possible future relationships between low farm income and the place of dairying. However, there are reasons to believe that certain basic changes have occurred which might cause a future low farm income period to produce a different effect on dairying.

In past periods of reduced income, an increased share of the cash farm receipts was obtained from the sale of dairy products.[40] In the late twenties and early thirties, when prices for dairy products were high in relation to prices of most other farm products, sales of cream and milk expanded considerably. In the drought of the thirties, cream and milk sales fell off much less than sales of grain and other livestock products.[41] [42] During the years of greatest distress, income from dairying became a fairly large proportion of total income. Sales of dairy products declined sharply as income from other sources rose since the middle of World War II.

Some of the conditions which favor a repetition of this experience under similar circumstances of depression or drought are (1) that Plains states farmers have been subjected to greater fluctuations in income than farmers in the rest of the Middle West, and might therefore seek farm enterprises, during periods of low farm income, which introduce stability into their total farm incomes; (2) the increased need for cash on mechanized farms where out-of-pocket expenses have become a large share of total costs; (3) the easy transition from raising beef calves to selling milk or cream; (4) the relative certainty of income from dairying which has caused lenders to extend credit for dairying in preference to other types of farm operations during bad times.

However, a number of basic changes have occurred since the thirties: they include (1) the drastic falling-off in the demand for butter; (2) the reduction in farm family labor in cream producing areas, as farms have been consolidated and as farms have become more specialized; (3) the gradual long-run rise in prices of beef cattle relative to butterfat.[43] These changes may prevent a strong increase in dairy production even during periods of distress.

Outlook by Dairy Areas. The previous discussion was related to the four-state region as a whole. However, changes in dairy farming varied among the seven dairy areas.[44]

[40] There existed a negative supply response for milk production and sales to changes in income from livestock and grain.

[41] See page 10, Fig. 5.

[42] See for instance: "Agricultural Production Trends in South Dakota, 1925-51," Agricultural Economic Pamphlet No. 50, January 1954, pp. 65, 68, South Dakota Agricultural Experiment Station, Brookings, South Dakota.

[43] Dairy Statistics and Related Series, USDA Statistical Bulletin 134, p. 46, Washington, D. C., October 1953.

[44] See above p. 34.

Table 27. Trends in Dairying by Dairy Areas, Four Plains States, 1925–1950 (Census Years)

Census Year	Whole Milk Areas		Cream Areas				
	I	II	III	IV	V	VI	VII
Number of Milk Cows (Thousands)							
1925	243	145	259	207	385	522	398
1930	258	155	287	228	401	556	431
1935	313	183	342	266	477	631	496
1940	239	140	273	212	365	493	324
1945	255	136	282	222	374	478	299
1950	231	112	257	201	328	391	225
Percent of Farms with Milk Cows							
1925	88	89	92	91	91	90	82
1930	86	86	92	91	90	89	79
1935	87	92	92	92	89	86	82
1940	84	84	89	88	86	84	77
1945	83	85	90	89	90	86	80
1950	77	74	83	82	80	76	69
Butterfat Sold in All Cream (Million Pounds)							
1925	13.4	9.8	19.8	15.3	29.3	38.2	26.8
1930	15.4	12.2	29.4	23.2	40.9	53.3	38.9
1935*							
1940	13.7	10.8	28.1	20.1	35.5	45.6	26.1
1945	10.8	8.5	429.2	21.4	36.0	44.1	24.1
1950	8.3	5.4	25.6	17.5	28.3	29.9	14.8
Butterfat Sold in Whole Milk (Million Pounds)							
1925	8.8	1.9	1.3	0.7	1.1	1.8	0.9
1930	15.3	3.6	2.9	1.9	2.5	4.4	2.4
1935*							
1940	15.5	4.7	3.0	2.2	2.7	4.6	2.4
1945	22.8	6.8	4.0	3.1	3.8	6.7	3.2
1950	22.2	7.0	4.6	3.7	4.1	6.3	3.3

Source: U. S. Census of Agriculture
*Data not available.

Large fluctuations occurred in all of these areas. In the late twenties and early thirties, sales of cream and numbers of cows expanded in all areas now classified as cream areas (areas III-VII). Though information about the relative expansion in the various areas is limited, available census data suggest that the *increase* was as great, or possibly slightly greater, in the denser cream areas than in the sparse ones (Table 27, Figs. 19a and b).

Since the middle of the thirties, the largest absolute and relative *declines*, both in cow numbers and in sales of cream occurred in the areas of sparsest production in the western part of the region (areas VI and VII), while in the counties with comparatively dense cream production (areas III and IV) which include many counties with diversified farming systems, cream sales have been maintained at a fairly high level.

In terms of physical quantities, whole milk sales have increased strongly only along the eastern border (area I).

On the whole, total quantities of butterfat sold by farmers in whole milk and cream have fluctuated somewhat less in the milk areas (ar-

Fig. 19a. Trends in cow numbers by dairy areas, four Northern Plans states, 1925-50 (1925 = 100)

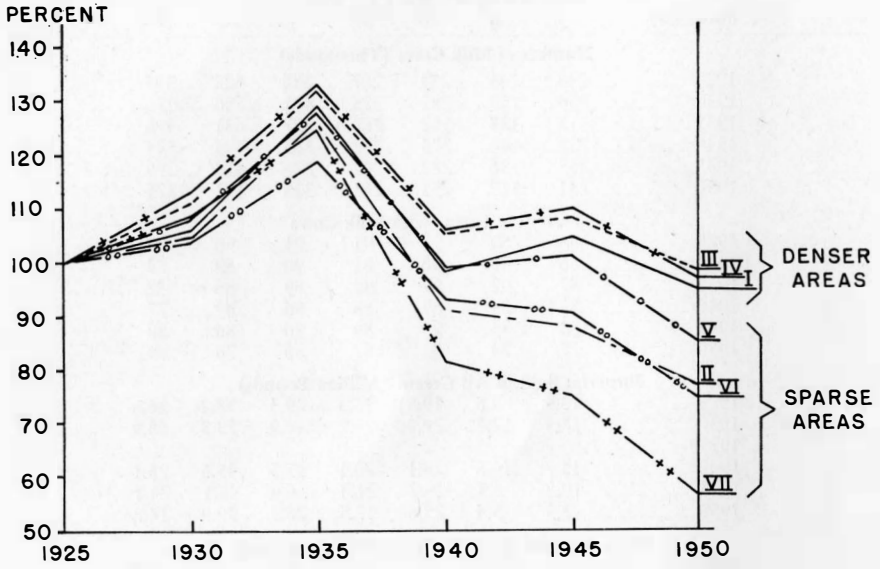
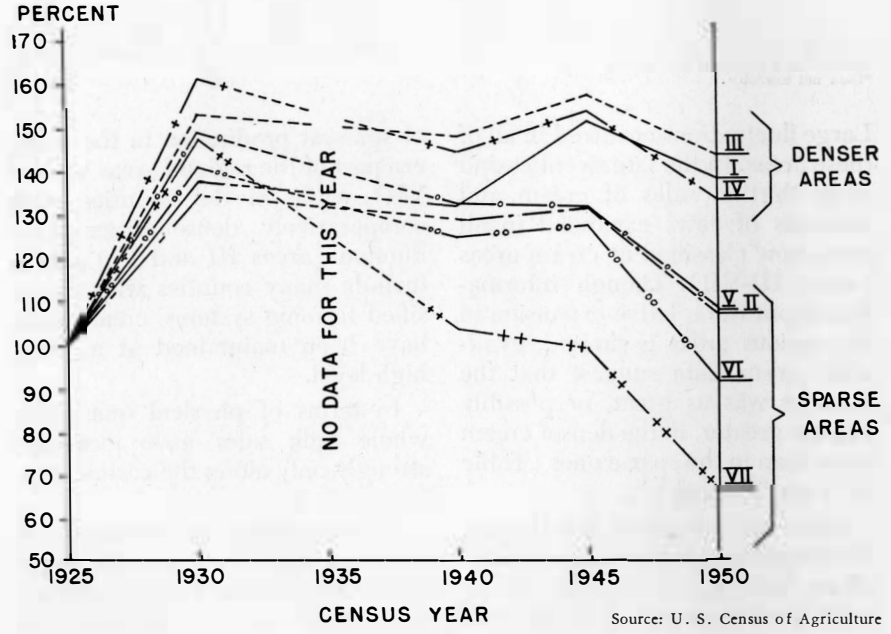


Fig. 19b. Trends in total milk sales (whole milk and cream) by dairy areas, four Northern Plains states, 1925-50 (1925 = 100)



Source: U. S. Census of Agriculture

eas I-II) than in cream areas. During the forties, these total sales in area I fluctuated in much the same manner as sales in the most dense cream areas.

On the basis of these historical trends, it appears that, if income from other farm enterprises, such as livestock or grain, is maintained at a relatively high level, dairying may decline gradually in the most dense cream producing areas (areas III and IV), while milk and cream supplies from the areas of sparser production (areas II, V–VII) appear likely to continue to decline more rapidly, as they have in the past decade. However, future declines appear somewhat less likely in milk area I because of the gradual expansion in fluid milk markets.

If reduced income from other farm enterprises should stimulate an expansion in dairying, the areas of sparse production might conceivably respond more sharply than the denser areas, because sales in these sparse areas are now considerably below the levels of a quarter of a century ago. This is particularly relevant for the cream areas. Since the sparsest cream areas (VI and VII) cover approximately two-thirds of the region and have the largest number of farmers reporting milk cows, an increase of 10 million pounds of butterfat or more from those areas is not beyond the realm of possibility. This is indicated by the fact that the proportion of farmers reporting milk cows has not declined faster in these areas than in areas of dense production, and therefore the potential for sharply increased sales of cream in response to changes in income remains. However, it seems likely that even in a serious depression cream production will remain in those areas at considerably lower levels than in the early thirties.

Long-Run Trends in Consumption of Dairy Products and Their Effect on Plains States Dairying

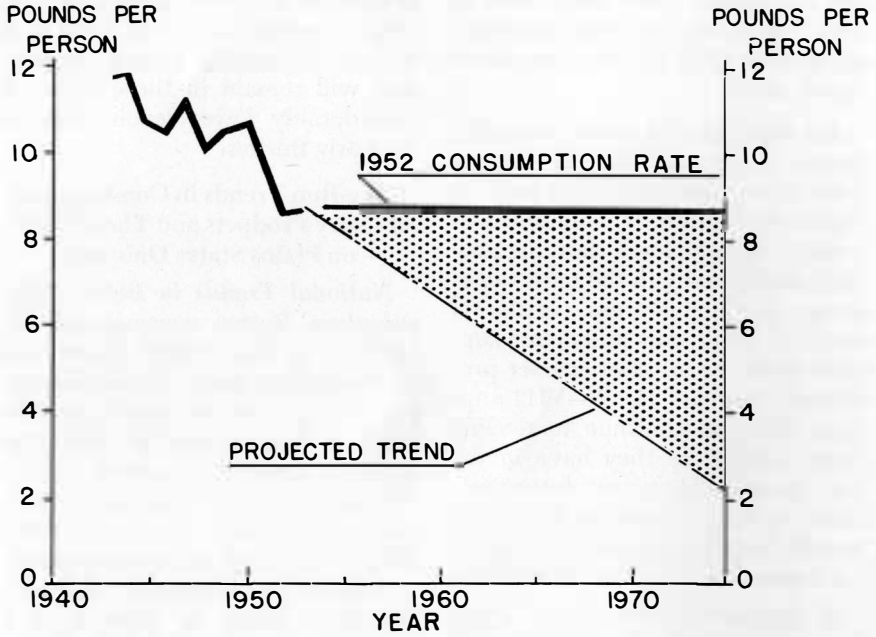
National Trends in Butter Consumption. Butter consumption by civilians in the United States has declined from about 17 pounds per person in 1940 to approximately one-half that amount in 1952. The sharpest decline occurred during the war, between 1942 and 1943; a moderate decline continued until 1952. If the trend of the past decade continues, a consumption of 6 to 7 pounds is likely in 1960; 3 to 4 pounds in 1970 (Fig. 20). If the price of butter should decline in relation to other spreads, or real per capita income increase, the future consumption rate may decrease at a slower rate, or even increase.[45]

Total butter consumption has declined relatively less (from 2.2 billion pounds in 1940 to about 1.3 billion pounds in 1952) because of the rapid increase in population. Con-

[45] See: "Changes in the Demand for Meat and Dairy Products in the U. S. Since 1910," Research Bulletin 368, Iowa State Agricultural Experiment Station, November 1949, p. 399, for price elasticity of butter 1920—1948 (—1.3). Waite and Trelogan, "Agricultural Market Prices," p. 41 give an income elasticity for butter of .487 for 1948. See also: "Competition Between Butter and Margerine," Bulletin 417, University of Minnesota Agricultural Experiment Station, June 1953, p. 8, for the relation between family income and consumption.

It should be pointed out that these last two studies show the relationship between income and butter-consumption at a given time. This does not prove that, over time, an increase in income would necessarily raise butter-consumption. Consumers who have recently left the butter market may show little response to declines in prices or increases in income.

Fig. 20. Per capita consumption of butter, 1943-52 and projected trend



tinued sharp population increases may result in comparatively small future declines in total consumption, and if consumption per person were to decline at a slow rate, total consumption could be maintained. For example, if population reaches 175 million by 1960, total butter consumption could range from about 1.1 billion at 6 pounds per capita to 1.4 billion pounds at 8 pounds per capita (Table 28).

How Much Butter from the Plains States? In recent years, about 16 percent of the creamery butter manufactured in the United States was made in the four Plains states.[46] If this proportion is maintained, the volume produced in the region in 1960 would be approximately 168 million pounds, if consumption per capita were 6 pounds, and 197 million pounds if consumption per capita were 7 pounds (Table 29). On the same basis, the region's production in 1975 would be approximately 134 million pounds if consumption were 4 pounds per capita, 168 million pounds if it were 5 pounds per capita. Production within these limits is about what would be expected if the region's output follows the trend established since World War II (Fig. 21). (Total production in 1952 was 184 million pounds in the four-state area. Estimated production for 1953 was 210 million pounds.)

[46]See, however, p. 23.

The Nation's Over-all Needs for Milk Fats and Solids-Not-Fat. The outlook for dairying in the area should also be considered in the light of the prospective over-all milk needs of the Nation.[47] On the basis of *milk-fat consumption,* approximately 122 billion pounds of milk would be needed in 1960, and 146 billion pounds in 1975 for human consumption if 1952 per capita consumption rates of milk-fats were to continue (Fig. 22).[48] If lower rates are assumed in recognition of the downward trend in the consumption of certain dairy products containing fat, the quantity of milk needed for human use, assuming medium population growth would be approximately 116 billion pounds in 1960 and 125 billion pounds in 1975 (Table 30). If present consumption rates of milk fats were to continue, present milk production would be adequate to meet proba-

[47]The data presented hereafter are estimates for 1975 made by the Bureau of Agricultural Economics, USDA, published in the Dairy Situation, September-October 1953, pp. 13-14. Data for 1960 were obtained by interpolation.

[48]These figures are exclusive of milk used for livestock feed and other non-food uses. In 1952, these other uses accounted for 3 to 4 billion pounds of milk.

Table 28. Estimated Total Butter Consumption in 1955, 1960 and 1975 Under Various Assumptions of Per Capita Consumption Rates and Population Growth in the United States

Year	Per Capita Consumption	Total Consumption Under Various Population Estimates*		
		Low	Medium	High
	lbs.		(million lbs.)	
1955	9.0	———	1485	———
	8.5	———	1403	———
	8.0	———	1320	———
1960	8.0	1392	1404	1416
	7.0	1218	1229	1239
	6.0	1044	1053	1062
1975	8.0	1592	1680	1768
	6.0	1194	1260	1326
	4.0	796	840	884

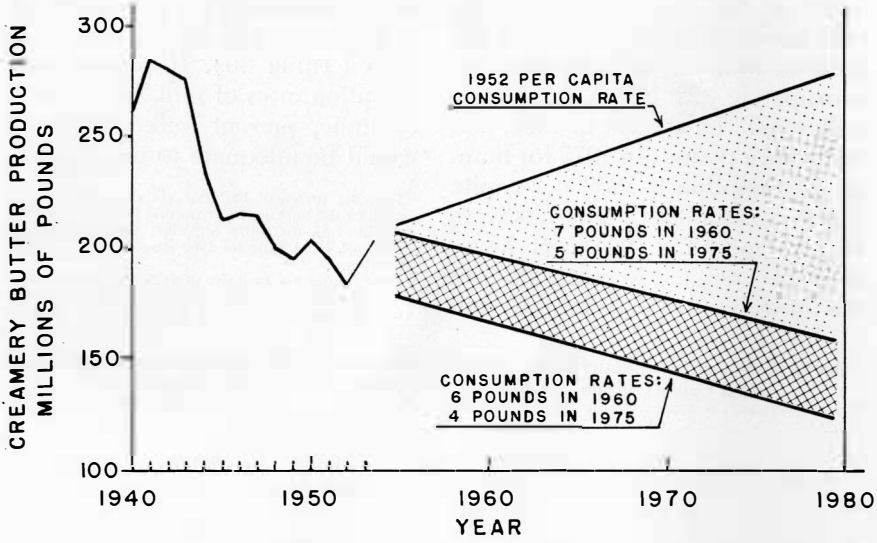
*1955: 165 million; 1960: low 174, medium 175.5, high 177 million; 1975: low 199, medium 210, high 221 million. Estimates by the Bureau of Census.

Table 29. Estimated Volume of Creamery Butter Supplied by the Four Plains States in 1960 and 1975, Under Assumptions of Various Per Capita Consumption Rates and Population Growth (Based on 16 Percent Contribution of the Plains States)

Year	Per Capita Consumption	Total Supply Coming from the Plains States (Based on 16% of Total National Consumption) Under Various Population Estimates		
		Low	Medium	High
	lbs.		(million lbs.)	
1960	8.0	223	225	227
	7.0	195	197	198
	6.0	167	168	170
1975	8.0	255	269	283
	6.0	191	202	212
	4.0	127	134	141

Source: Preceeding table

Fig. 21. Creamery butter production in four Northern Plains states area, 1940-53 (1953 preliminary) and estimated production in 1960 and 1975, (assuming medium population growth in the United States, various national per capita butter consumption rates, and Plains states production equal 16 percent of total United States production).



ble 1975 needs for *milk-solids-not-fat* because of the relatively large proportion not now used for human consumption which could be more fully utilized.

On the other hand, total future milk needs can be estimated on the basis of *consumption rates of milk-solids-not-fat.* With present patterns, about 110 billion pounds of milk would be needed in 1975 (Fig. 22); at higher consumption rates, 134 billion pounds (Table 30). In the last case, the demand for solids-not-fat would be assumed to become more important than that for

Table 30. Estimated Milk Requirements for Human Consumption, Based on Milk-Fat or Solids-Not-Fat Needs, in 1960 and 1975 (Exclusive of Milk for Animal Feed or Other Non-Food Uses) in the United States

Estimates Based on Consumption of:	At 1952 Consumption Rates		At Consumption Rates Based on Projected Trends	
	1960	1975	1960	1975
	(Milk Production in Billion Pounds)			
Milk-fats	122	146	116	125
Milk-solids-not-fat	92	110	99	134

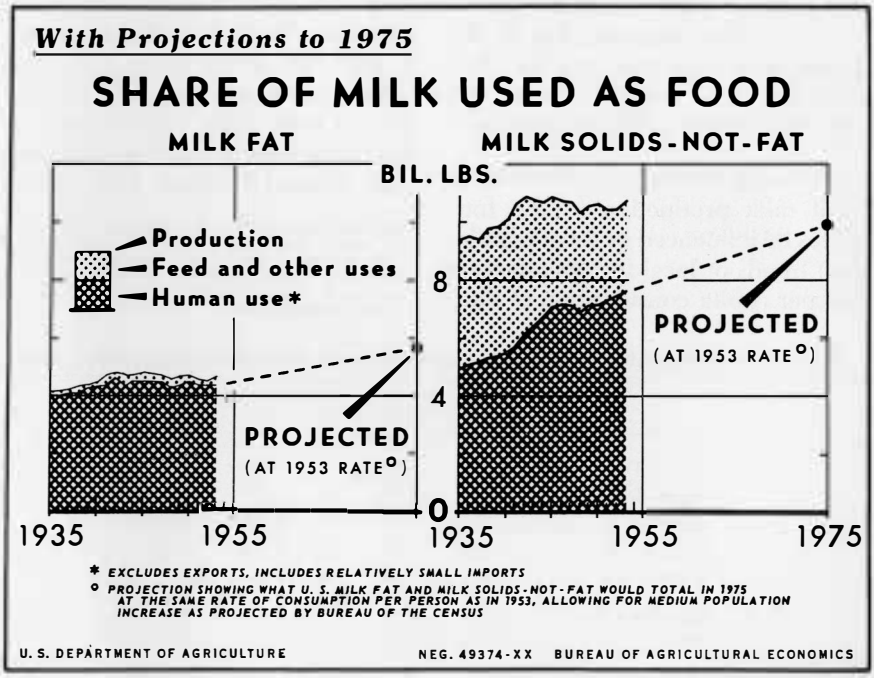
Estimates are based on medium population growth. The per capita consumption rates are based on Table 4, Col. C and E and Table 5, Col. C and D of the Dairy Situation, USDA, BAE, September-October 1953. The 1960 estimates are obtained through interpolation.

milk-fat in determining the quantity of milk needed for human consumption and as a result may leave a substantial surplus of milk-fat for uses other than human consumption, though at present this appears to be an unlikely occurrance.

The calculations suggest however that unless the decline in butterfat consumption is arrested, no sharp increase in milk production will be needed in the next 20 years to meet the Nation's demand for dairy products in peace time, particularly if fuller utilization is made of the solids-not-fat for human consumption. This would continue the 1945 to 1952 trend during which population was increasing while total milk production remained relatively stable and apparently adequate.

How Much Milk from the Plains States? During the past decade, total farm sales of milk equivalent in the Northern Plains declined by approximately one-fourth. As a proportion of total sales in the Nation they declined from about 9 percent to 6 percent. As long as no large increase in the Nation's milk production is needed, demand for increased supplies from the Plains appears unlikely and the proportion supplied by the area may continue to decrease.

Fig. 22. Production and use of milk-fat and milk solids-not-fat, 1935-53, and projected consumption for 1975 (in billion pounds), United States



Source: USDA, BAE

Table 31. Estimated Milk Supply from the Four Northern Plains States in 1960 and 1975 at Different Levels of National Consumption and with Various Proportions Obtained from the Plains Area (Exclusive of Milk for Animal Feed and Other Non-Food Uses)

Year	National Consumption Levels	Milk Supply Needed from Northern Plains States, at Indivated Percentages of National Consumption		
		6 percent	5 percent	4 percent
		(Billion Pounds of Milk Equivalent)		
1960	116	7.0	5.8	4.6
	122	7.3	6.1	4.9
1975	125	7.5	6.3	5.0
	146	8.8	7.3	5.8

In 1952, the milk supply of the Northern Plains states, exclusive of the amount fed to livestock, was 7.1 billion pounds. If the Nation's milk consumption in 1960 amounts to 115 or 120 billion pounds, and 5 percent of the total comes from the Northern Plains states, the region's supply will amount to about 6 billion pounds (Table 31). Five percent of the projected national consumption in 1975 would amount to 6 or 7 billion pounds, but if the Plains states portion had by then declined to 4 percent, its supply could be below 6 billion pounds.

Potential Markets for Fluid Milk. Will milk production in the four states be influenced by local population trends or local factors affecting the per capita consumption of fluid milk or by new, direct outlets for fluid milk products outside of the region?

With the exception of central and eastern Kansas and eastern Nebraska, there are few large markets for milk for fluid consumption within or near the region. What is the outlook for growth in these markets? Between 1940 and 1950, the increase in urban population in the four states has been about 33,000 per year (Table 32). If it continues to increase at the same rate, and with a per capita consumption of 1 pint of milk daily (in the form of fluid milk, cream and miscellaneous milk drinks)[49] about 130 million

[49]Estimate based on 1950 per capita consumption data in several mid-western cities, from "Handbook of Dairy Statistics," North Central Regional Fluid Milk Marketing Project, Department of Agricultural Economics, Ill. Agricultural Experiment Station, Urbana, Illinois (mimeographed).

Table 32. Rural and Urban Population in Four Plains States, Minnesota and Iowa, 1940, 1950

	Urban*			Rural	
	1950	1940	Increase	1950	1940
			(000)		
North Dakota	165	132	33	455	510
South Dakota	216	158	58	437	485
Nebraska	607	514	93	719	802
Kansas	903	754	149	1,002	1,047
Total	1,891	1,558	333	2,613	2,844
Minnesota	1,607	1,390	217	1,375	1,402
Iowa	1,229	1,084	145	1,392	1,454

Source: U. S. Census of Agriculture
*Old census definition.

pounds of whole milk would be consumed in 1960 by urban residents[50] in the four states over and above the amount consumed in 1950. This increase of 13 million pounds of milk per year represents 0.2 percent of farmers' total 1952 milk sales (as whole milk and cream), or 0.9 percent of whole milk sales only. Most of it would be supplied by Kansas and Nebraska. Thus it seems unlikely that expansion of fluid milk markets will materially affect the dairy situation in the region as a whole.[51]

This gradual expansion in fluid milk markets will not affect the total production of milk in the area as estimated in the preceding section (since population growth had already been accounted for in these estimates). Nor will it increase the proportion of milk that the Plains states contribute to the Nation's supply of milk unless one allows for the possibility of heavy sales of fluid milk to markets outside of the four Plains states at the expense of other states now supplying these markets; however, such an occurrence appears unlikely at present because in states such as Wisconsin and Minnesota, conditions appear to be better suited to intensive dairying than in most of the Plains states.

Economic Opportunities and Market Developments

Because of the drastic shift from cream to whole milk sales in most other surplus producing states, dairymen in the Plains states who intend to stay in the dairy business and who want to "keep up" with recent developments are constantly faced with the alternatives: whether to stay with farm-separated cream, and consequently the butter business (since there are no alternative uses for cream), or to shift to whole milk sales and diversified operation of plants.

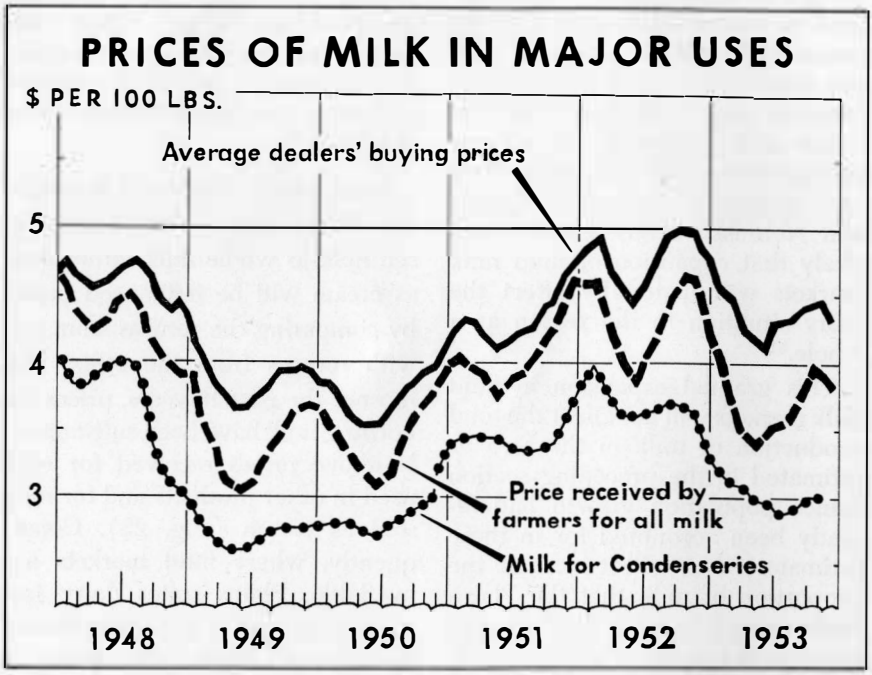
Comparative Prices for Butterfat and Whole Milk. The decision to sell milk as whole milk rather than as cream will be influenced partly by comparing the returns from one with returns from the other. For most of the past 15 years, prices for bottling milk have been substantially above prices received for milk used in other products and for milk sold as cream (Fig. 23). Consequently, where fluid markets are available, Plains states dairy farmers have had a relatively strong incentive to shift from cream to whole milk for fluid consumption. However, farmers over a large part of the region did not have access to such markets (Table 33).[52]

[50]Excluding sales to military installations.

[51]Outer-market distribution of milk in paper containers (see North Central Publicaiton No. 39) appears to have expanded the markets for bottled milk products in the region. Particularly small communities in the western part of the area formerly had little access to an adequate amount of bottled milk. However this does not necessarily indicate that total sales of whole milk for fluid consumption in the region have increased in proportion: first of all, many small milk sheds which formerly supplied small communities with milk have been displaced, so that milk now originates in fewer milksheds; secondly, even if per capita consumption of fluid milk has increased, it was offset to some extent by the decrease in rural population (Table 32). A modest increase in fluid milk sales however will be possible if local milksheds supply seeasonal deficits, which formerly necessitated importing milk from producing areas outside the Northern Plains states.

[52]The census does not show whether farmers selling whole milk since 1939 are new in the dairy business or have shifted from cream sales. Also it does not distinguish between sales for city consumption or for manufacturing. However, for a more detailed analysis of these shifts, see below, p. 54.

Fig. 23. Monthly prices received by farmers from plants and dealers for milk for all uses, for milk used for city distribution and for milk delivered to condenseries, 1948-53, West North Central Region (prices are f.o.b. plant)



Source: USDA, BAE. Figure adapted, Dairy Situation May-June, 1953

Would the sale of whole milk for manufacturing purposes have been more profitable than the sale of cream?

From 1948 to 1952 the average price paid by manufacturing plants in the West North Central region for milk with an average butterfat content of 3.8 percent[53] was approximately $3.50 per hundred pounds (f.o.b. plant). In contrast, the 5-year average price received by farmers in that region for farm-separated cream was 71.5 cents per pound of butterfat or $2.72 per 100 pounds of 3.8 percent milk equivalent (Table 34): a "gross" difference of about $0.80 per hundredweight. The price differential varied from year to year from a low of $0.52 to a high of $1.05. Also in general the differential was larger when milk prices were high and smaller when low.[54]

It is believed that these differentials exaggerate the difference in "net" returns for most producers: the value of skim milk fed on farms must be deducted from the differentials, and the costs of hauling

[53]As reported by the Bureau of Agricultural Economics, USDA.

[54]Adequate price quotations for whole milk used in manufactured dairy products are not available for the four Plains states individually.

whole milk on daily routes presumably exceed the costs of hauling cream from farms to plants.[55] The value of skim milk depends on the ration in which it is fed; the type and age of the livestock to which it is fed; the prices of the feeds for which it substitutes. It could have reached approximately 60-70 cents per hundred pounds at 1952 prices,[56] but often skim milk may not be fed under ideal conditions and a considerably lower value would be placed upon it.

Obviously most farmers will bear more expense in getting whole milk to the plant daily than in getting cream to the "first point of sale" at less frequent intervals. There are no reliable estimates of the difference in hauling costs which should be taken into account in interpreting the "gross" differentials discussed

[55]Prices quoted for whole milk and for farm-separated cream are not strictly comparable. Prices quoted for whole milk are assumed to represent plant prices (f.o.b. plant); cream prices represent prices paid to farmers "at the point of first sale."

[56]See Morrison's Feeds and Feeding, pp. 586, 590 etc. (21st ed. 1949).

Table 33. Number of Farmers Selling Milk and Cream in Four Northern Plains States, 1939, 1944, and 1949

State	Number of Farmers Selling Milk			Number of Farmers Selling Cream		
	1939	1944	1949	1939	1944	1949
			(000)			
North Dakota	2	2	3	54	53	41
South Dakota	3	3	3	48	48	38
Nebraska	10	10	10	82	78	60
Kansas	18	23	23	90	73	54
Total	33	38	39	274	252	193

Source: U. S. Census of Agriculture

Table 34. Prices Paid for Whole Milk for Manufacturing Purposes and for Farm Separated Cream, West North Central Region, 1948-52

Year	Average Prices Paid f.o.b. Plants for 100 Lbs. of 3.8% milk for:*†‡				Average Prices Paid for Farm-Separated Cream		"Gross"
	American Cheese	Butter and Creamery By-Products	Evaporated Milk	Average	Per Lb. of Butterfat	Per 100 Lbs. of Milk Equivalent (3.8%)	Difference per 100 Lbs. of Milk and Milk Equivalent
1948	$3.93	$3.87	$4.08	$3.96	$80.5	$3.06	$0.90
1949	2.91	3.00	2.92	2.94	63.6	2.42	0.52
1950	3.00	3.05	3.10	3.05	64.0	2.43	0.62
1951	3.64	3.63	3.74	3.67	73.3	2.79	0.88
1952	3.91	3.87	4.07	3.95	76.3	2.90	1.05
5-year average	3.48	3.48	3.58	3.51	71.5	2.72	0.79

Source: USDA, BAE

*Annual prices are simple averages of monthly prices.

†Approximate average butterfat content of milk produced in the four Northern Plains states. Quoted prices were adjusted to this basis assuming a butterfat differential of one-tenth the average price per pound received by farmers in the West North Central region for butterfat in cream.

‡See footnote 54.

above.[57] Obviously, hauling charges vary with the density of milk supplies, the amount of duplication in collection routes,[58] plant location, road conditions, wages and other factors.

Thus the "net" difference, if any, depends on the farmers' proximity to the plant and the use made of the skim milk on the farm. In some recent years, Plains states farmers who lived far from the plant and made effective use of their skim milk, may have received as large a net return by selling cream as they would have received by selling whole milk to manufacturing plants. Where additional buildings or equipment are required before converting to whole milk sales, the additional returns should be high enough to warrant the investment.

Supply Area Needed to Provide Milk for Manufacturing Operations. For the plant operator, the possibility of obtaining enough milk for efficient plant operation within a reasonably limited supply area is important in determining whether or not whole milk operations are feasible. One of the strongest—though not unsurmountable—obstacles to the establishment of plants using whole milk in the Plains states region is the low density of supplies.[59] A large area of farm land has to be tapped to provide sufficient quantities of milk for relatively efficient plant operation.

Data are not available which accurately document the minimum amount of milk needed for efficient operation of various types of dairy plants, under varying conditions of density, when hauling costs as well as processing costs are considered. Such information would enable us

[57]No representative data for hauling costs of cream and manufacturing milk are available for the Plains states. In Sioux Falls, South Dakota, hauling charges averaged between 35 and 40 cents for milk per 100 pounds for city consumption in recent years. In areas of sparser production, hauling costs would tend to be higher. Some plants subsidize trucking costs out of their own returns. For studies in other markets see for instance: Baum, E. L. and D. E. Pauls, "A Comparative Analysis of Costs of Farm Collection of Milk by Can and Tank in Western Washington, 1952," Washington Agricultural Experiment Station, Technical Bulletin 10, 1953, p. 35. Cowden, Joseph M., "Farm-to-Plant Milk Hauling Practices of Dairy Cooperatives," Farm Credit Administration, Bulletin 69, p. 33, 1952. Kirtley, M. B. and C. C. Erwin, "Marketing Dairy Products in Southwest Missouri," Missouri Agricultural Experiment Station, Bulletin 567, 1952, p. 24. Pritchard, N. T. and W. H. Cope, "Milk Assembly in the Fort Wayne Milkshed," Purdue Agricultural Experiment Station, Bulletin 559, 1951, pp. 12-13.

[58]The potential savings from a rational location of plants and layout of collection routes are discussed in the Columbia Basin study, *op. cit.*, pp. 16-31.

[59]In this connection it should be remembered that the density of cream sales has been declining in almost all the counties of the four Plains states since 1945. A future shift to whole milk sales is best calculated on the basis of cream sales density.

Table 35. Approximate Supply Area Needed for A Single Dairy Manufacturing Plant for Various Scales of Operation and Under Various Conditions of Density of Supply

Scale of Operation			Approximate Radius in Miles (and Square Miles of Farm Land) if Yearly Butterfat (or Milk Equivalent) Sales per Acre of Farm Land Are:			
Daily Milk Supply Lbs.	Yearly Milk Supply Lbs.	Yearly BF Supply Lbs.	0.5 Lb. BF (13.2 Lbs. Milk)	1.5 Lbs. BF (39.5 Lbs. Milk)	2.5 Lbs. BF (65.8 Lbs. Milk)	3.5 Lbs. BF (92.1 Lbs. Milk)
25,000	9,125,000	346,750	19 (1084)	11 (361)	8 (217)	7 (155)
50,000	18,250,000	693,500	26 (2167)	15 (722)	12 (433)	10 (310)
75,000	27,375,000	1,040,250	32 (3251)	19 (1084)	14 (650)	12 (464)
100,000	36,500,000	1,387,000	37 (4334)	21 (1445)	17 (867)	14 (619)

Note: This table assumes an average butterfat content of 3.8 percent. A lower butterfat content would result in a slightly smaller radius for the same amount of whole milk, required by the plant.

"Acres of farm land" excludes land-not-in-farms. If total land area was used in the table, the radius needed to supply a plant would increase slightly. For the four Plains states, acreage of land in farms is about 93 percent of total land area. On the whole the counties lying in the eastern halves of the four states have a higher proportion of land in farms.

to discern at what point of density the collection of milk becomes impractical.[60] Obviously, minimum requirements of daily deliveries of whole milk depend on the type of plant: a cheese plant can operate relatively efficiently with a smaller daily supply of raw material than a butter-powder plant (using the spray process) or a plant producing evaporated or dried milk. About 50,000 pounds may be sufficient for a relatively efficient cheese plant, 50,000 to 100,000 pounds for a butter-powder, 100,000 for a canned milk plant. These would not be large-sized operations, but satisfy minimum average requirements of efficiency.[61]

The approximate supply area needed can be estimated theoretically for various densities of supplies. For example, a plant in a county in which a year's butterfat sales equal 2.5 pounds per acre of farm land (i.e., 65.8 pounds of milk equivalent at 3.8 percent average butterfat test)—assuming that it would have no competition from other plants or cream stations and that milk sales would be distributed evenly within the county—would have to draw its daily supply of, say, 50,000 pounds of whole milk from an area with a radius of 12 miles (433 square miles of farm land). With a density of 1.5 pounds, the radius would increase to 15 miles[62] (Table 35). In actuality, the supply area needed by a specific plant depends on the competition, as well as the distribution of dairy farmers within the area adjoining the plant and the size of their dairy operation. Therefore, a plant located in a county in which butterfat sales are shared by several other plants and cream stations, would have to estimate its supply area on the basis of a much smaller amount than the total amount of butterfat per acre. On the other hand, plant managers have some grounds for expecting that an increase in the density of production in the supply area will occur as the result of their operations.[63]

Obviously, no hard and fast line can be drawn between areas in which density of supplies is sufficient to support whole milk operations and those in which it is not. Offhand, it would seem that an available yearly supply of whole milk equal to roughly 1.0 pound of butterfat per acre is about the minimum that will support an efficient cheese or butter-powder plant in the region. Among the cream areas of the Plains states, such a density of available supplies seems likely only in area III, and possibly in a few parts of area IV. Even if all counties in those two areas were to shift to whole milk, cream sales would still be the dominant method of farm disposal of milk in approximately two-thirds of the counties in the four states.

[60]This problem will be the subject of further detailed studies.

[61]Plant studies indicate that on the average, per unit costs of operation can be reduced by increasing output. According to Columbia Basin, Joint Investigations Agricultural Processing Industries, Problem 24, USDI, Bureau of Reclamation, (pp. 5-25), "manufacturing costs per pound of butter decrease materially as the volume of plant production increases to around 8,000 pounds of butter per day volume or 3,000,000 pounds per year." For cheese plants, 1,500,000 pounds of cheese per year appear desirable.

[62]Columbia Basin Study, *op. cit.*, p. 5.

[63]It should be pointed out that the radius of the needed supply area does not double if the density of supply is halved. (See Table 35.)

Some Institutional Factors Affecting the Utilization of Milk. In considering the likelihood of a shift to whole milk sales in the Northern Plains states, certain considerations which cannot strictly be assessed in money terms must be taken into account.

Snow and mud seriously impede the farm collection of milk during part of the year. Climate coupled with the difficulties in getting the product to market causes wide seasonal variation in sales. While seasonality presumably reduces the efficiency of creameries using farm-separated cream, the effect probably would be more serious in plants involving larger investments (in relation to the volume of milk equivalent handled) and more complex operations.

Over much of the area prevailing marketing practices have not stimulated producers to deliver high quality cream. More work will be needed to develop quality conciousness than was needed, for example, in Minnesota where high quality cream was sold before the shift to the sale of whole milk. But increased returns from improving quality and shifting to whole milk sales will be weighed against the extra effort required. At present, there are no quality regulations on manufacturing milk over and above those on cream and butter,[64] except those imposed by the plants themselves. If the shift to whole milk sales is not accompanied by improvements in quality, the plant's task to maintain quality products may be increased.

The present framework of local and out-of-state creameries and cream stations suggests that new plants established within the region might find it difficult, in competing with existing facilities, to obtain enough milk for efficient operation. Existing plants probably could make the shift more easily. In many instances, however, it may be more convenient and in the short run more profitable, for creamery operators to continue to receive cream than to start whole milk operations.

Shift to Whole Milk—A Case Study. The most rapid shift to whole milk sales in the Plains states has occurred in Kansas and Nebraska. The development in these two states may serve as a possible guide in evaluating the future of the Plains states dairy industry.

In 1949, 26 counties in these two states were in milk area I; 20 in milk area II, as defined previously.[65] Fourteen counties in the first and two counties in the second group would have been classified in 1939 already as belonging to areas I and II respectively. In the 14 counties in area I, milk sales increased by approximately 75 million pounds between 1939 and 1949, while cream sales declined by 52 million pounds of milk equivalent. Consequently, the proportion of milk equivalent sold as whole milk increased from 68 to 81 percent. In the two counties of milk area II, sales of whole milk declined by 16 million pounds (Table 36A).

[64] Laws and regulations covering adulterated foods.
[65] See above p. 34.

Table 36. Milk and Cream Sales in 1939 and in 1949 in Kansas and Nebraska Counties which (A) Were Primarily Milk-Selling Counties in Both Periods and (B) Shifted from Cream Sales to Whole Milk Sales in the Interim*

Dairy Area	Number of Counties	Sales: Whole Milk	Sales: Cream (Milk Equiv.)	Percent Sold as Whole Milk	Pounds of Butterfat Sold per Acre Land in Farms in: Whole Milk	Cream
		Million Pounds			Lbs.	
A. Counties Which Were Primarily Milk Selling Counties in 1939 and 1949						
1939						
I	14	304	140	68	2.6	1.2
II	2	22	8	73	1.0	0.4
1949						
I	14	381	88	81	3.3	0.8
II	2	6	5	55	0.2	0.2
Change Between 1939 and 1949						
I		+77	—52			
II		—16	—3			
B. Counties Which Shifted from Cream to Whole Milk Sales Between 1939 and 1949						
1939						
I	12	103	220	32	1.0	2.1
II	18	91	262	26	0.4	1.2
1949						
I	12	202	131	61	2.0	1.3
II	18	164	126	57	0.7	0.5
Change Between 1939 and 1949						
I		+99	—89			
II		+73	—136			

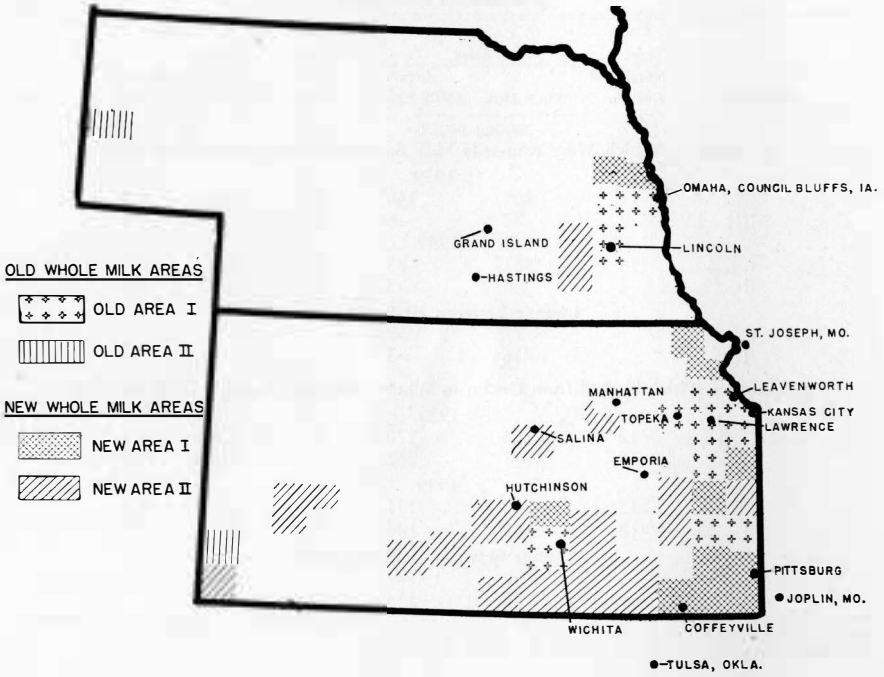
Source: U. S. Census of Agriculture
*For list of these counties, see appendix: Great Plains Dairy Data, *op. cit.*

The more significant shift from cream sales occurred, however, in the 30 counties which have become part of milk areas I and II since 1939. The 12 counties in area I, with a moderately high density of butterfat sales in 1939, shifted to whole milk sales during the decade, and increased their sales of whole milk by 99 million pounds. There was an almost equal decrease in cream sales. Consequently, sales of whole milk increased from 32 to 61 percent of total sales of milk equivalent. The 18 counties now in area II, with relatively low density of butterfat sales, increased their sales of whole milk by 73 million pounds; and their proportion rose from about 26 to 57 percent of total sales as result of a sharp loss in cream supplies (Table 36B).

Thus the physical increase in whole milk was sharpest in those counties which became primarily whole milk supply areas since 1939. Moreover, a large proportion of the additional fluid milk was drawn from counties in which production was relatively sparse. The annual increase in whole milk sales in these two dairy areas was approximately ½ percent of total milk equivalent sales in the two states.

The 30 counties which have undergone the shift lie primarily near large urban areas (Fig. 24). This suggests that the increase in

Fig. 24. Old and new whole milk areas, Kansas and Nebraska, 1939-49, and location of cities of 15,000 inhabitants or over



population in the larger cities and in per capita consumption of fluid milk and cream were an important—though not the only—factor in the expansion of the milksheds surrounding these cities.[66]

It is noteworthy that the shift to whole milk sales was accompanied by a decline in total sales of milk equivalent in the two milk areas of 47 million pounds. Thus, even with increased fluid milk markets total milk production may not expand when prices and weather are favorable to competing farm enterprises.

Outlook for the Butter Industry. Considerable quantities of farm-separated cream will be sold in the four Plains states for many years to come. Therefore, adjustments other than shifts to whole milk operations may become necessary to strengthen the dairy industry.

Improvements can be achieved mainly in the quality of cream and butter, as well as in greater efficien-

[66]The increase in whole milk sales by 233 million pounds in areas I and II could well have been absorbed in large part (i.e. 70 percent) through (1) increased per capita consumption of fluid milk and cream, and (2) the additional consumption resulting from increased urban population. If this were true, the surplus available for other uses (i.e. 30 percent) could have caused dairy plants in the area to expand their operations so as to include the manufacture of whole and skim milk products. In 1953, the majority of the condenseries and dried milk plants were located directly in, or near, counties belonging to areas I and II. This would suggest a relationship between enlargements of milk sheds, primarily resulting from population increase, and the establishment of new operations involving these dairy products. However, further analysis is necessary to substantiate this hypothesis.

cies in procurement and processing.[67] Quality improvements would help maintain per capita consumption of butter by competing with other spreads primarily on a quality basis; greater efficiencies in procurement and processing in turn would enable the industry to compete more vigorously in inter-state commerce.

Quality improvements may be achieved by improving methods of storing and marketing of cream by farmers, cream stations, railroads and plants; by paying adequate price differentials for various grades of cream; and through stricter sanitary control and law enforcement.

A reorganization of creamsheds and truck routes could result in greater efficiencies of procurement. Lower per-unit costs in processing can be achieved through the consolidation of plants and pooling of marketing and purchasing activities in order to gain advantages of larger scale operation.[68] Such economies would enable Plains states creameries to pay higher prices for farm-separated cream.[69]

The high degree of excess capacity of South Dakota plants—and probably many Plains states plants—suggests that they have not adapted rapidly enough to changing economic trends. On the other hand, if butterfat sales should increase as a result of low farm incomes, the existing plants will be in a position to increase their output without increasing their investment.

[67]To what extent and how such improvements can be achieved, and the costs of improving quality and of increased efficiencies in marketing cream will be the subject of further studies.

Government Farm Programs and Plains States Dairying

Government farm programs can be expected to have an influence on American agriculture for many years to come. Their impact on Plains states dairying can, however, not be documented adequately at this time. Therefore, the following discussion is limited to a broad appraisal of the possible effects of programs, using a reduction of supplies as a means to support farm incomes, on the production and disposal of milk in the area, as well as their relation to farm income.

Dairying can be affected indirectly by *programs affecting commodities other than dairy products.* For instance, the introduction of acreage restrictions—such as wheat quotas—may increase the output of feed grains and roughage and, as a result, increase the production of livestock and livestock products. To what extent acreage restrictions actually release resources for the production of feed grains and roughage, cannot, of course, be accurately predicted.[70] However, it can be assumed that the longer the restrictions are in force, the greater may be the effect on the output of alternative farm products. To what use can the released resources be put? If the number of beef cattle

[68]"Dairy Cooperatives and Large Scale Plants," Misc. Report 155, USDA, FCA, Washington, D. C., July 1951, p. 26 ff. See also Columbia Basin Report, *op. cit.*, p. 6 ff.

[69]For price differentials received by Nebraska and South Dakota farmers in area VII, see: "Cream Assembly in Dairy Area VII: 1. Conditions of Cream Assembly." (Mimeo) Great Plains Subcommittee of the NCM-12 Technical Committee of Dairy Marketing, October 1953.

[70]A North Dakota survey by the Extension Service in 1953 on the estimated use of diverted acres in 1954 indicated approximately 10 percent going into grass and legumes.

increases in the Plains area, these resources would probably be claimed first for the production of beef. Only if beef cattle numbers remain the same or are reduced, may there result a diversion of feeds and roughage into dairy production.

The recent lowering of *support prices on dairy products* was directed towards reducing surpluses through adjustments in prices. The role of prices in the allocation of resources to the dairy industry is a complex problem; but presumably dairying will be less attractive if dairy products are supported at relatively low prices in relation to other farm products.

Of specific interest to Plains states dairy producers and dealers are proposals which, in addition to setting specific support levels, would include provisions for (1) regional price differentials, (2)seasonal adjustments, and (3) quality differences in butter.[71] Regardless of their merits, if future programs were to incorporate such proposals and if lower prices would discourage the production of milk in the area, the manufacture of butter in the Plains area might be reduced more rapidly because of the area's location, large seasonal variation and the large proportion of lower quality butter.

However, there is evidence that the response of dairy output to changes in prices is much slower than that for many other farm commodities. As pointed out above, Plains states dairy sales appear to have responded more strongly to changes in farm income than to changes in prices. If this were to be true in the future, then the effect of lowered support prices would depend, in large part, on the income that farmers obtain from other sources. If, in periods of reduced farm incomes, farmers expand dairying for the purpose of supplementing dwindling incomes, unfavorable cream prices and price relationships may cause little, if any, reduction in the supply of cream for butter manufacturing or even increase it. Likewise, the introduction of regional, seasonal and quality price differentials might, by lowering prices still further, have the effect of providing an extra stimulus to increase cream sales. On the other hand, if farm income is maintained, a low support price may be an additional, but relatively minor, factor, in the gradual decline in dairying in the Plains states.

The effects of butter price programs on the price relationships among the various dairy products are somewhat obscure. Moreover, the extent to which wide or narrow price differentials between farm-separated cream and whole milk affect dairy producers' plans to shift from cream sales to whole milk sales is unknown. Presumably a narrow differential would provide little incentive for such a shift. However, it is possible that the effect of changes in price differentials between milk and cream resulting from dairy programs may be less important than the effect of the availability of markets and the other factors previously described.

[71] "Agricultural Price Policy with Special Reference to the Dairy Industry," by Hugh Cook, *et. al.*, Agricultural Economics 9 (Mimeo), University of Wisconsin, College of Agriculture, Department of Agricultural Economics, Madison, Wisconsin, July 1953.

Conclusions

The major conclusions with respect to the future of dairying in the four Plains states are:

1. Unless there are major changes in technology, dairying is likely to remain a side-line enterprise on a high proportion of farms in the area. Physical and economic conditions favorable to the production of grain and beef are likely to result in further long-run declines in milk production, particularly in areas of sparse production.
2. Periods of low farm income may result in increased sales of milk and particularly of cream.
3. The four states will continue to produce an appreciable proportion of the creamery butter output of the Nation. Unless offset by strong population increases, the gradual decline in per capita butter consumption will result in a gradual reduction in the quantities of butter originating from the area, even if the share of the Nation's butter output produced there is maintained.
4. Further shifts by farmers from farm-separated cream sales to whole milk sales will be limited, and will continue to be slow.
5. Present government farm programs are not likely to alter markedly the dairy industry of the region.