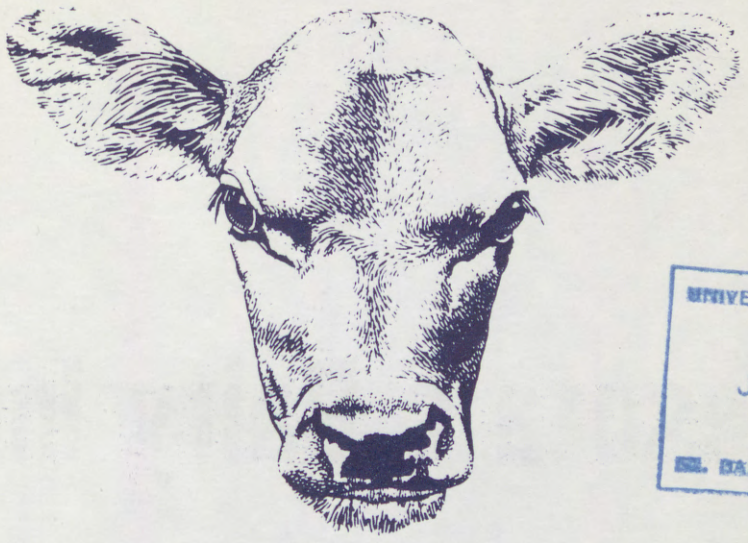
Special Report 52-1975



Minnesota's Dairy Industry

PRESENT & FUTURE

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UNIVERSITY OF MINNESOTA

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By V. S. Packard, Jr.

Recently, a group of extension personnel from the University of Minnesota, together with several people from the dairy industry, reviewed Minnesota trends in Dairy.[1] The review was intended to help Minnesota extension more effectively program dairy education efforts.

The dairy industry is a major agricultural industry in Minnesota; 8 percent of the nation's milk supply comes from this state, and 20 percent of Minnesota's agricultural income is from dairy.

The data gathered in this study will help the University of Minnesota Agricultural Extension Service perform its educational responsibilities to the dairy industry. However, the report will also interest those in the dairy industry and other related groups.

PART I

Cow numbers

Cow numbers continue to decline. To a great extent, the reduction reflects the continued exodus of small, part-time dairymen and the demise of inefficient dairy enterprises. Increasingly, however, discontent is voiced by viable dairy operators who dislike the 7-day-a-week milking requirement. A need exists to establish herd sizes allowing two-man comanagement or hired herdsmen at competive labor costs.

Between 1971 and 1973, cow numbers declined by 30,000 to a state total of 912,000 (table 1). By 1974, numbers had dropped to 898,000.

It has become increasingly important to explain the role of animal agriculture in today's food-short world. Ruminants are the only animals that can produce human food from otherwise unusable forage. Much land in Minnesota is suited only to animal agriculture and dairying particularly. Any policy that detracts from this industry does so at the expense of overall land utilization and food production. This concept must be understood to assure a sound national food production policy. An important coneed, then, is improved forages, an area

[1] Martin Christiansen (extension specialist, agricultural policy); Joe Conlin (extension dairyman); William Mudge (extension dairyman); Vernal Packard (extension dairy products specialist); Vern Oraskovich (county extension agent Carver County); David Radford (county extension agent Carlton County); Arnie Sandager (District Supervisor, Southwest District) were the personnel from the University of Minnesota Agricultural Extension Service.

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of research that has been de-emphasized during the years of grain surpluses and food abundance.

Production per cow

Milk production per cow steadily increased throughout the years. However, it stabilized at slightly over 10,200 pounds between 1972 and 1973. Many factors can influence this trend, but in an era of general instability, one critical need is month-by-month summary data. This allows an individual to quickly adjust to changes in feed cost, availability, and quality. Competition for use of feed grains as food and for feed for other animal industries will become an increasingly important concern for dairymen.

Table 1. Minnesota dairy production and marketing statistics, 1971-1973

	1971	1972	1973
Milk cows on farms	942,000	932,000	912,000
Milk production per cow (lbs.)	10,210	10,279	10,273
Total milk production (mil. lbs.)	7,618	9,580	9,369
Price/100 lbs.	$5.28	$5.16	$6.25
Cash receipts, farm marketings	$461,500,000	$477,300,000	$567,640,000

Total milk production

Total milk production is slowly declining. The causes and implications are many. Minnesota dairymen produce about 8 percent of the nation's milk supply. Together with Wisconsin, New York, and California, these four states account for 41 percent of the milk produced in the United States.

Minnesota is an important dairy state, but it differs from most states in its heavy ratio of manufacturing grade milk to fluid milk production and utilization. Over 60 percent of Minnesota milk is manufacturing grade. This supply has the greatest need for upgrading.

Price per hundredweight of milk

Milk prices have been highly volatile in recent years. The average price of milk in 1971 was $5.28 per hundredweight; in 1973, the value was $6.25. A sharp price increase and almost as sharp a price drop occurred during 1972 and 1973. Price instability is a major obstacle to long range planning for dairy farm enterprises. Domestic supply-demand forces and government import/export policies on dairy products and feed grains help create unstable, fluctuating prices. In 1973, cash receipts for dairying amounted to $567 million, about 20 percent of the production income for agriculture in Minnesota. Such an important industry should not be abandoned by de-

fault. Table 2 indicates the relative importance of dairying in Crop Livestock and Reporting Service Districts for 1972 and 1973.

Herd size

Minnesota is unique among dairy states in its large number of relatively small dairy herds. Even "Dairy Belt" counties—those committed to dairying by topography that limits alternatives—averaged only 26 cows per dairy farm in 1972. In January 1973, DHI herds averaged 42 cows. Industry representatives appear divided in their views on trends. Some suggest that herd size has leveled off and that increases are minimal. Others suggest that their surveys indicate continued growth. However, growth probably will continue, though perhaps more slowly than history would indicate.

In 1965, 12 percent of Minnesota dairy farms had herds of over 30 cows. By 1971, this figure had increased to 28 percent. At this rate, 40 percent of herds would be over 30 by 1975. By 1980, over half the farms (50-55 percent) would fall into this category. They may number some 4,000-5,000 farms (table 3).

As evidence of interest in efficiency and/or increasing potential for growth, industry representatives reinforced extension opinion that a dramatic increase in pipeline milkers is taking place. If trends in DHI herds indicate the direction for the majority of non-DHI producers, pipeline numbers will markedly increase over the next few years. In 1968, 49 percent of DHI herds were milked through some form of pipeline (table 4). By 1974, 78 percent of the farms were pipeline designs. There has also been a shift from transfer-type systems to rigid-line installations.

Thus, we may expect significant increases in pipeline milkers in the near future, with concurrent challenges and opportunities. Dairy farmers will need information to help them choose equipment and design arrangements. A further need exists for a more critical regulatory review process on all designs submitted for state approval. Many potential problems can be intercepted at this point, and constructive evaluation and suggestions can be made to help dairymen make selections. Since mastitis is directly related to pipeline design and function, education and regulation effort in this area is highly important. Also, milk quality is related to equipment design and function, and strong programs of quality improvement—especially in manufacturing grade milk—are needed. With increases in pipeline milkers, clean-in-place (CIP) procedures take on proportionately greater importance.

The dynamics of dairy production in Minnesota

Significant changes are taking place in geographic dairy areas within the state. A profile is illustrated in figure 1. Thirty-three counties have limited alternatives to dairy; one or two may be considered "swing" counties, i.e., counties with potential other than dairy agriculture.

The strength of this dairy region becomes self-evident in a review of statistics (table 5). Nearly two-thirds of the dairy farms and cows, and slightly over two-thirds of the state's milk production, comes from this region. Over the years, dairying has concentrated in the "dairy belt," and this trend continues. Further subdivision, as shown in table 6 and figure 2, reveal additional pockets of "dairy" concentration, with possible additional constriction around the periphery and at the center (where metropolitan expansion encroaches on agricultural land). Figure 3 shows the trend in cow population density. Superimposing figure 4 (operating dairy firms in the state) over figure 3 provides clear evidence of the shrinking concentration of dairying. The viability of any dairy farm depends exclusively on a processing plant close enough to

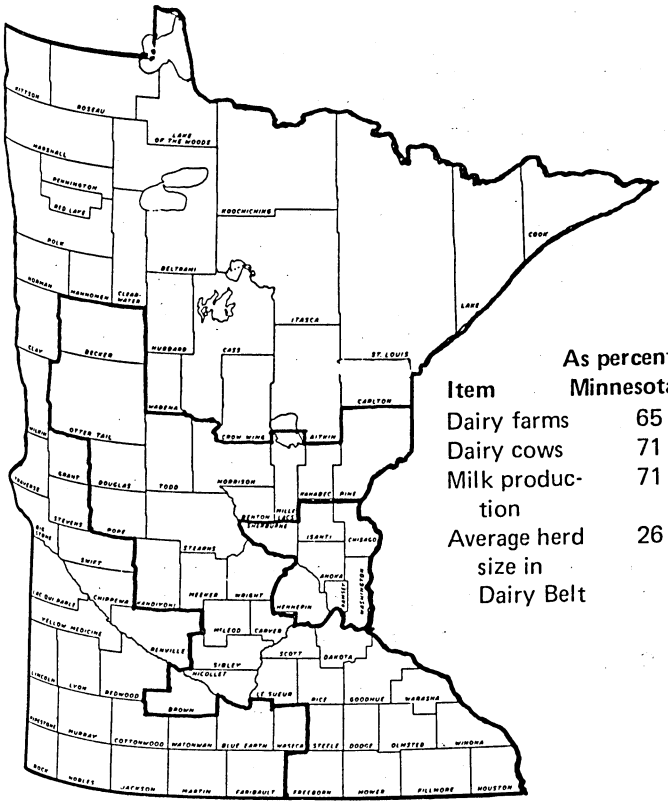
Table 2. Numbers of cows, production per cow, and total milk production by Crop Reporting District, 1972-1973

	1972			1973		
District	Cows on farm	Production per cow (lbs.)	Production (Mil. lbs.)	Cows on farm	Production per cow (lbs.)	Production (Mil. lbs.)
N.W.	61,500	9,920	610	59,000	9,910	594
N.C.	15,900	9,290	148	15,600	9,290	145
N.E.	4,600	9,720	45	4,600	9,720	45
W.C.	111,800	10,290	1,150	109,600	10,280	1,126
C.	302,900	10,180	3,084	296,100	10,180	3,014
E.C.	88,600	10,150	899	86,800	10,140	880
S.W.	64,300	10,220	657	63,100	10,210	644
S.C.	110,900	10,580	1,173	108,600	10,570	1,148
S.E.	171,500	10,580	1,814	167,700	10,570	11,773

Table 3. Present and projected herd sizes for Minnesota dairy farms

	Number of farms					
	Cows in herd					
Year	1-9	10-19	20-29	30-49	50 and over	State total
1965	17,236	25,502	16,147	7,305	1,060	67,250
1970	8,329	11,895	11,238	9,123	2,120	42,705
1971	6,107	9,895	10,200	8,748	2,117	38,757
1972	–	–	–	–	–	38,704
1973	–	–	–	–	–	36,603
1975	4,000	7,000	8,000	10,000	4,000	33,000
1980	1,100	3,800	5,500	8,400	4,200	23,000

Figure 1. Counties in Minnesota where dairy farming is concentrated



Item	As percentage of Minnesota total
Dairy farms	65
Dairy cows	71
Milk production	71
Average herd size in Dairy Belt	26

Figure 2. Subdivisions of "Dairy Belt" counties by Regional Development classification

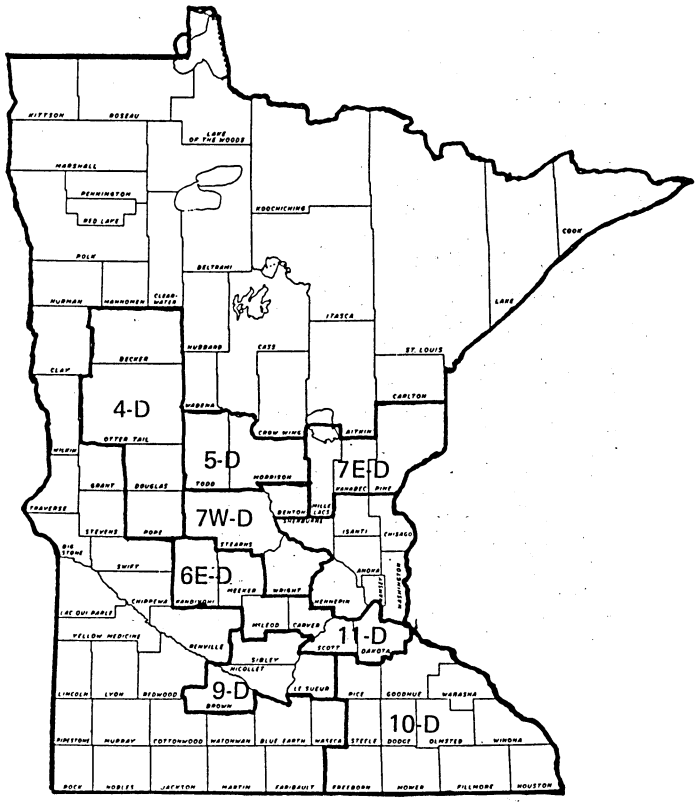


Table 4. Percentage of pipeline milker installations among DHI members for January 1968 and 1974

Type of installation	Percentage of DHI members 1968	1974
Stanchion pipeline	10	35
Milking parlor	10	15
Transfer (step-saver) systems*	29	28
Total	49	78

*Transfer systems peaked at 35 percent in 1970 and have since declined in percentage as rigid lines have been substituted.

Table 5. Summary of "Dairy Belt" statistics[1]

	Dairy Belt	As percent of Total	Other than "Belt"	As percent of Total
Number of dairy farms (1971)	24,777	65	13,400	35
Milk cows on farms	664,300	71	266,500	29
Average herd size	26	–	20	–
Milk production (mil. lbs.)	6,676	71	2,704	29
Estimated income (mil. $)	331.19	70	138.5	30

[1]Dairy farm numbers are for 1971, remaining figures are of 1972 origin.

Table 6. Dairy Belt summary statistics by Regional Development Classification

	4-D	5-D	6E-D	7W-D	7E-D	9-D	10-D	11-D
Number of dairy farms	4,035	2,776	2,307	3,958	1,753	2,087	6,275	1,586
Number of milk cows	91,500	60,200	59,300	106,800	36,700	50,700	208,000	51,100
Average herd size	23	22	26	27	21	24	29	32
Milk (mil. lbs.)	942	563	598	1,126	273	542	2,079	553
Income (mil. $)	47.5	29.0	30.8	58.1	14.3	27.9	94.9	28.7

Figure 3. Dairy cows on Minnesota farms, Jan. 1, 1973

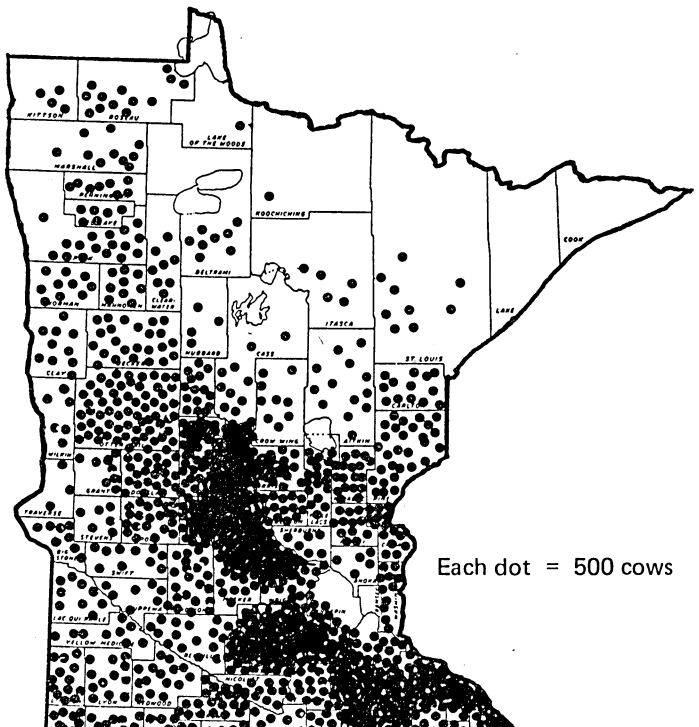
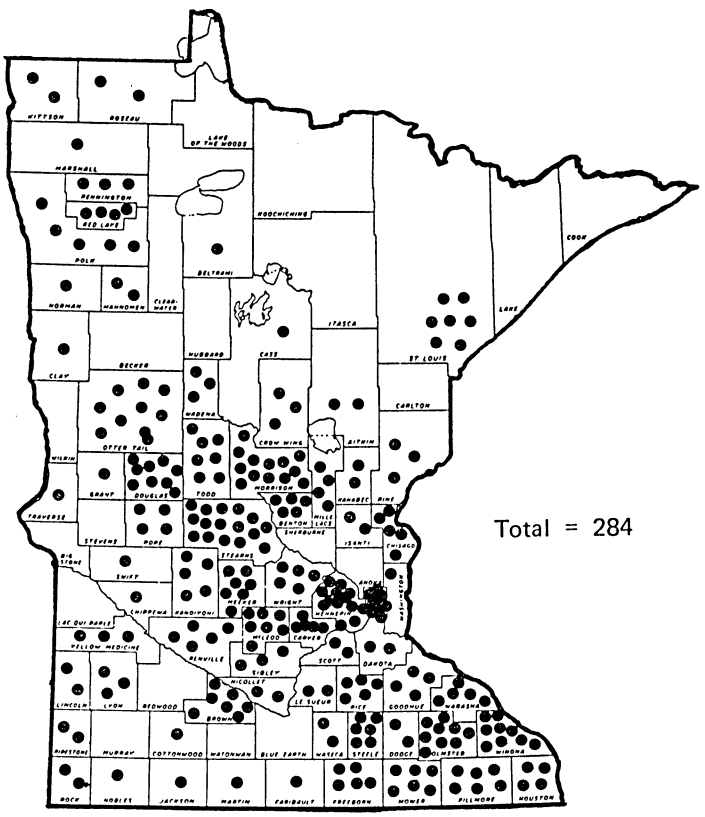


Figure 4. Dairy firms operating in Minnesota in 1974

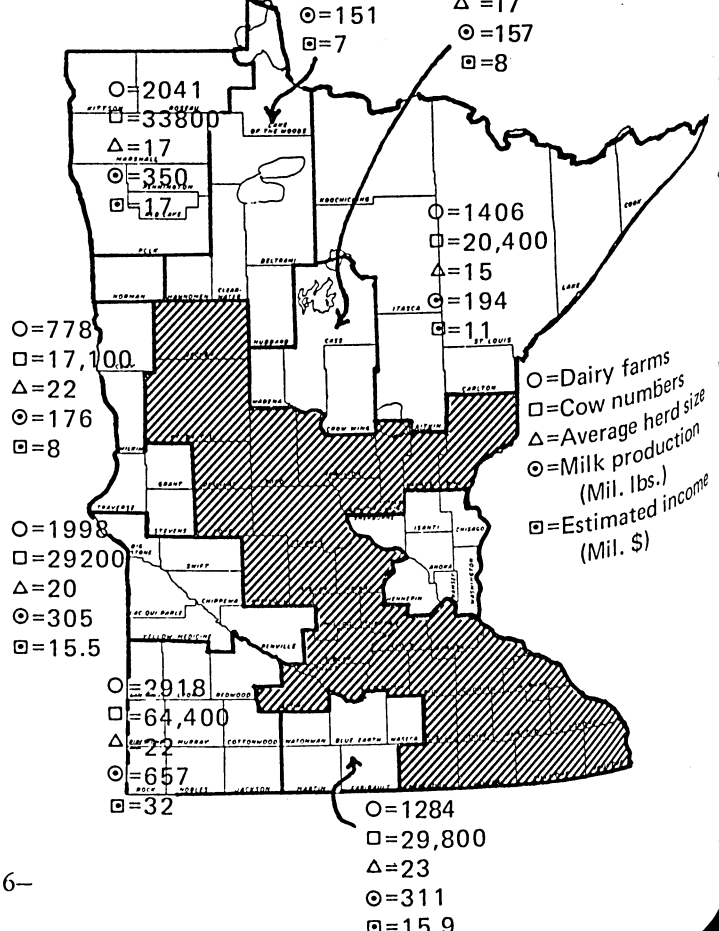


maintain reasonable hauling costs. The fuel shortage and rising fuel costs make this even more imperative. Processing firms have aligned themselves along the dairy belt. Three large cooperatives receive about 40 percent of Minnesota dairy farmers' milk. However, because these cooperatives also purchase milk from other dairy plants, about 80 percent of processing in Minnesota takes place primarily within these three cooperatives. Moreover as receiving stations are closed and more milk is shipped directly to manufacturing plants (a trend industry representatives strongly emphasize), additional pressures will further constrict the supply profile. Of 284 plants operating in 1974, 104 were receiving stations solely. Therefore, a large proportion of existing operations serve to collect milk only for further shipment to a processing plant. All these receiving stations are vulnerable. Many may shut down within the next 5-10 years. Pressures for narrowing the dairy belt and/or isolating pockets of dairying will be great.

Because of declining numbers of dairy farms and plants, the magnitude of this industry to the state's agricultural economy must be reemphasized. One fifth of cash receipts of Minnesota agriculture are dairy-related. Of equal, if not greater importance, is the lack of suitable alternatives for many farmers. Policymakers must be told that dairying is an all or nothing proposition for many Minnesota farmers. Likewise, this is not a spontaneously reversible proposition even for dairymen with other agricultural alternatives. Movement out of dairying is essentially a one-way street. The movement in Minnesota continues despite a relatively favorable market; milk production continues to backslide.

Figure 5 provides a profile of dairying outside the dairy belt. About one-third of the production comes from these areas. Two pockets of fairly concentrated dairying (comparatively speaking) are located in the southwest and northwest.

Figure 5. Dairy statistics for various districts outside the "Dairy Belt"



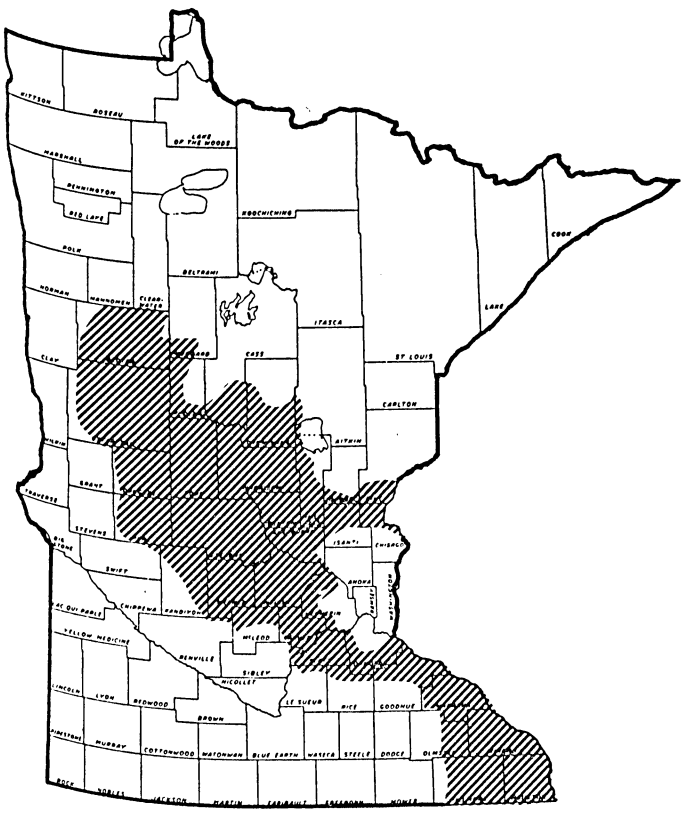
Processors continue to operate in these areas, helping dairymen located nearby. The viability of these two dairy centers depends largely on continued concentration of milk supplies. Movement into alternative agricultural enterprises can only weaken the industry and darken prospects for area dairymen. This does not imply that other types of farming may not be equally or more advantageous, only that dairying and those farmers committed to dairying are vulnerable to decisions made by neighboring farmers.

Present stresses and strains may possibly create a northerly gravitation of the industry. In any event, future dairying would tend to fall in the area profiled in figure 6. Possibly, the belt may not narrow at the waist quite as extensively as shown in the figure, particularly where outlying counties truly lack worthwhile alternatives. A couple dairy nuclei may arise in the north and southwest. The belt may also slide north.

Some strengthening of the industry can also come through improved milk procurement. Industry representatives indicate that attempts are being made to reduce overlapping hauling routes. With three large cooperatives operating in the area, some improvement is expected. Much more improvement could take place under a reciprocal agreement through which haulers could be routed without plant ties. Such agreements will probably never be reached. At the same time, individual firms can do much to improve hauling efficiency. Use of twin trailers are now permitted in Minnesota. They add significantly to effective outreach of dairy plants to direct-shipper patrons. Thus, hauling per se is not the sole limiting factor in dairy belt constriction.

Another trend which could have a stabilizing influence is the movement toward long term contracts with dairy farmers. Just as farmers are contracted to grow and sell field crops to local processors, so can milk contracts be drawn up to assure relatively long term producer-processor relationships. Producers are thus assured a market, and industry is assured a milk supply. Under such conditions, a better environment exists for long range planning. Truck routes can be fixed and routed for efficiency. Plant size and growth and farm size and growth can be better regulated and planned. With this arrangement, the producer loses mobility, but gains some stability. Presently and for the near future, this would appear to be a healthy trade off.

Figure 6. Area where dairying may continue at present strength



Grade A vs. grade B (manufacturing grade milk)

A strong trend toward grade A abated rather abruptly between 1972 and 1973. Those two years saw grade A holding at about 36 percent of the state's total milk supply (table 7). A major factor in stemming the grade A movement was the small price differential between the two grades. This reflects a favorable market for cheese and, thus, for manufacturing milk. Unless an attractive differential exists, conversion to grade A is inhibited. Also, a schism exists in parts of the industry with respect to its need for grade A conversions. A strong desire for increasing grade A supplies is maintained because of quality and markets. However when surplus grade A depresses the utilization of fluid milk in local, federally controlled markets, the base price is lowered. The price to local farmers decreases. Producer cooperatives in these areas cannot view this effect with anything but unease. As a result, no clear mandate or commitment to conversion of B milk to grade A exists, nor can one be expected to exist in a large segment of industry. Some narrowing of focus could occur if Federal Order Markets were combined nationwide so Minnesota dairymen could participate in a resulting higher national base. But as the situation now stands, grade A conversions may not take place as fast as during the past several years. Conversions that do take place will center primarily on manufacturing grade bulk milk shippers (as distinguished from can milk shippers) who, because of state milkhouse requirements, are not far removed from grade A in physical facilities. Herein lies the strong relationship between potential for conversion and trend to bulk. All grade A milk is handled in bulk. Grade A represents 36 percent of the 1973 milk supply. For that same year, manufacturing milk was divided at 42.9 percent bulk and 21.1 percent can milk (in volume) (table 9). In dairy farm numbers, however, these two groups were divided equally at 14,000 dairymen each.

Some 14,000 dairymen are still latent converters to grade A. Another 14,000, already in bulk, are but one step away from conversion. Obviously, many of the former group cannot make this conversion. They represent small, part-time operators and older, semi-retired farmers. Larger processing firms have, to a great extent, closed or will close their doors to this low-volume, high-cost milk supply—primarily out of economic considerations and deference to the majority of patrons who must subsidize can intake.

Table 7. Percentage of Grade A and manufacturing grade milk

(Minnesota – by year)

Year	Grade A (%)	Mfg. Grade (%)
1965	16.9	83.1
1970	29.1	70.9
1971	32.7	67.3
1972	36.3	63.7
1973	36.0	64.0
1975	40.0	60.0
1980	66.0	34.0

Figure 7. Area (solid color) where most of the Grade A milk is concentrated

Percentage of state's total Grade A production

1970	1971	1972
82	83	88

Percentage of state's total production of all milk

1970	1971	1972
86	85	84

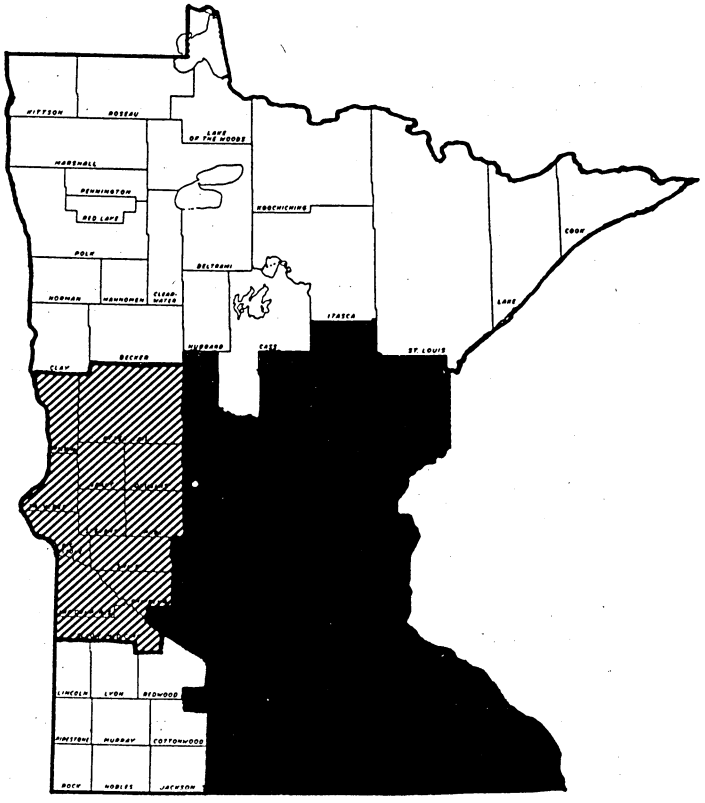


Table 8. Present and projected grade A and manufacturing grade dairy farms in Minnesota

Year	Grade A	Manufacturing grade	Total dairy farms
1965	5,043	53,761	58,804
1970	6,439	34,206	40,645
1971	6,687	32,070	38,757
1972	7,760	30,944	38,704
1973	7,951	27,652	36,603
1975	9,000	24,000	33,000
1980	15,000	8,000	23,000

For these small grade B shippers, few or no dairy alternatives exist except for an occasional small local plant which may be able to survive (at the expense of economies of scale) solely on can milk. Increased fuel cost can only work against these dairymen through increased hauling costs. Perhaps one-fourth of can milk shippers are large enough and are sufficiently committed enough to dairying to convert to bulk. This might represent one-third of the volume or, in 1973, about 600 million pounds of milk per year—an amount only adequate enough to efficiently operate one dairy plant. On the other hand, together with manufacturing grade bulk milk presently (1973) available, some 4.5 billion pounds is rather readily convertible to grade A. This is nearly 50 percent of the state's total. It presently appears to be in the long range interests of Minnesota dairymen to make this conversion. Minnesota dairymen must ultimately compete for markets against grade A milk and the dry milk, butter, and cheese manufactured from surplus grade A

Present and projected farm numbers in grade A and manufacturing grade milk are shown in table 8. Numbers projected for 1980 depend on several factors which could alter the figures shown. Still, grade A conversions will probably continue, and by 1980, the two classes will be divided about two-thirds and one-third in volume and possibly 15,000 and 8,000, respectively, in farm numbers. Prospects depend largely on milk price considerations. Figure 7 identifies the major grade A milk production area in the state.

A long term trend toward a single standard for all milk has been underway for years. Although presently slowed, this trend will probably continue. (At least one major cooperative is strongly encouraging grade A conversion.) Our industry should be gearing up to meet this challenge.

Can vs. bulk milk handling

Table 9 profiles can and bulk milk by farm numbers and milk volume. All grade A milk (for 1973, 36 percent of the milk produced, about 8,000 farms) is bulk. In 1973, manufacturing milk was produced by 14,000 farms in can and the same number in bulk, but bulk milk accounted for 66 percent of the supply (43 percent overall in the state). Projections to 1975 and 1980 would estimate bulk milk at 80 and 90+ percent of the milk in Minnesota, respectively.

Assuming that one-fourth of the can shippers could convert to bulk, over 3,000 conversions can be expected to take place between now and 1980 when remaining can shippers will have dropped from the dairy business. Energy shortages (increased trucking costs) can only work against the can milk producer; he will find himself one of a smaller and smaller minority scattered at ever increasing distances from markets. But even if the 10,000-11,000 present can milk producers can be discounted as meaningful milk suppliers, they do pose a socio-economic problem that will have to be dealt with within the next few years.

Table 9. Farm numbers and volume of milk shipped in can and bulk (manufacturing milk)

Year	No. of farms	% of milk	No. of farms in bulk	% of milk	Total "B" farms	% all milk in bulk
1965	?	45.3	?	37.8	53,761	54.0
1970	20,545	31.7	13,661	39.2	34,206	68.3
1971	19,091	28.7	12,979	38.6	32,070	71.3
1972	17,479	24.4	13,465	39.3	30,944	75.1
1973	14,217	21.1	14,435	42.9	28,652	78.9
1975	10,000	–	–	–	24,000	80.0
1980	–	–	–	–	8,000	90.0+

Producers converting to bulk will need technical help meeting milkhouse requirements and in planning construction details.

Can milk production is tending to concentrate in certain areas of the state. A pocket exists north of the Twin Cities, another concentration may be found in the upper northwest, a third is located in the south central and southeastern parts of the state. Herd size figures and current supply/processing trends indicate most of the conversions will take place in the southeast and in counties just north of the Twin Cities.

Also, the large cooperatives have already or are now phasing out can milk. Other efficiencies are being attempted to reduce overlapping hauling routes. Aiding this and adding additional stability and efficiency is the trend to long term contracts between processing plants and dairy farmers (similar to acreage and production contracts for vegetable growers).

Summary, part I

Fewer, larger dairy farms are the outlook for the immediate future. Trends favor more loose housing, fewer stanchion installations, and a dramatic increase in pipeline milkers. Grade A conversions will continue, but possibly at a slower rate. Possibly two-thirds of the milk supply will be grade A by 1980. By then, numbers of dairy farms will have dropped to about 23,000. Perhaps 15,000 of these will be grade A.

For the immediate future, a strong need exists to improve the quality of manufacturing grade milk, particularly as the industry trends to cheese processing. Better mastitis control is essential; it is important to milk production, cheese yield, and drug residues (some of which inhibit cheese cultures). More pipeline milkers mean more CIP cleaning and sanitizing and a possible greater tendency to rancidity.

To maintain viable farm and processing installations, every effort must be made to increase milk production. The DHIA program is critical to this potential. Dairy farmers will need faster feedback of pertinent data to adjust to volatile feed grain supply conditions.

Payment for milk on a protein or solids basis is being given renewed consideration. In the marketplace, protein has become equal to or more valuable than milkfat. To reflect this change, adjustment in purchase focus may well occur.

But together with consideration of a value-oriented purchase plan is a further need to generally strengthen objectivity in testing programs. Quality evaluation, particularly, requires a renewed commitment to utilize the most critical tests available. These would reduce the temptation to use test results for unfair advantage in milk procurement. A strong independent laboratory control program, together with appropriate regulatory supervision, must be the cornerstone of milk quality control, as required by market and/or public health concerns.

Table 10. Select types and numbers of dairy plants (Minnesota).

	1971	1972	1973	1974
Butter	123	84	65	59
Powder (human food)	49	43	40	36
Cheese	17	19	18	24
Bottling	63	58	47	43
Frozen products	35	30	29	25
Receiving stations	224	233	192	164
receiving solely				104

Total plants 1974 = 284.

PART II

When food is destined for human consumption, production of raw products—whether grain, fruit, vegetables, meat, or milk, and their processing—join irrevocably to one another. There is no dairy farmer and dairy processor; there is only the dairy industry—that production, processing, and marketing system that puts food on the market shelf. This concept often mires down in the jungle of survival and private interest. So the second part of this report deals with processing and marketing trends and functions.

Plant numbers

Dairy plant numbers are also continuing to decline. Once Minnesota had 900 or more plants; now there are 284. A sizeable proportion of these (104) are receiving stations which could be and are being phased out in lieu of direct shipment to processing plants. As of 1974, there were 137 plants processing one or more manufactured dairy products, i.e., butter, powder, cheese, etc. Ninty-three bottled market milk products. Receiving stations totaled 164. Nevertheless, Minnesota has 17 percent of the butter plants, 23 percent of the powder operations, and 2 percent of the cheese plants in the nation. Only four states have more manufacturing plants than does Minnesota. In 1972, Minnesota ranked first in butter production. With 2 percent or less of the cheese plants, it ranked second in cheese manufacture. These statistics show Minnesota's enormous economies of scale. Minnesota manufactures 20 percent of the nation's butter, 14 percent of the nation's cheese, and 80 percent of the country's powder. The state's contribution to fluid milk production is relatively small, but it is growing, and this growth is expected to continue. Tables 10 and 11 summarize some of these trends. In addition, the recent conversions to cheese must be considered. Five large plants have been modified to accommodate cheese processing. One new plant is processing cheese now, and a second is being constructed—each with a process capacity of 1-2 million pounds of milk daily. (These are not large compared to technological potential.) Still other new facilities are being contemplated. Whereas 40-50 percent of the state's milk supply has been utilized for butter powder manufacture and 25-30 percent has been used for cheese, industry projections over the next 5 years would reverse those percentages. Fifty percent of the milk supply will be used for cheese. The Minnesota dairy industry is committing itself to cheese manufacture. Likewise, there's a significant trend away from prior specialization and

Table 11. Production of manufactured milk products

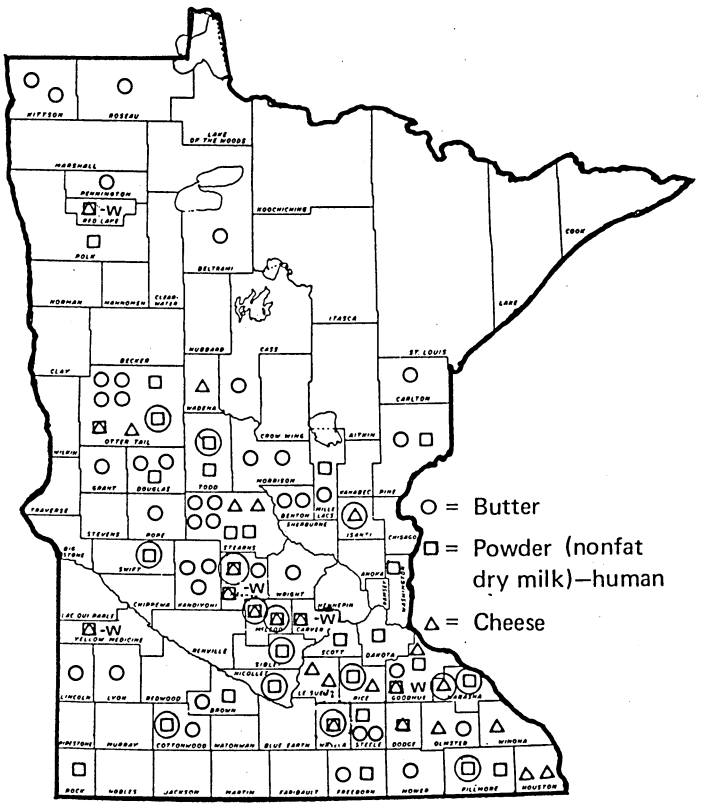
(Minnesota – by year)

Year	Butter (Mil. lbs.)	Nonfat dry[1] milk solids (Mil. lbs.)	Cheese[2] (Mil. lbs.)
1960	324	509	72
1965	357	605	74
1970	299	486	161
1971	286	433	202
1972	261	369	234
1973	220	302	287

[1]These figures represent total production, both for human and animal food.

[2]These figures represent total cheese production, including all varieties except cottage cheese.

Figure 8. Dairy plants and processing functions for manufactured dairy products, 1974



toward diversified technologies—allowing instantaneous shifting from one dairy product to another to meet specific market demands. However, gearing up for cheese processing is a long term, extensive undertaking. The technology is more complex and more subject to processing variables than either butter or powder. So while plant numbers are decreasing, plant sophistication is increasing. Fifteen years ago, 479 creameries in the state were manufacturing butter. In 1973, 65 plants processed essentially the same amount of butter. And this is not the ultimate; the potential is more dependent on milk and cream assembling costs than on technological deficiencies. Plant numbers (butter manufacturing) can be expected to decline even further during the next several years, although, in fact, "manufacturing" plants remained essentially stable (about 135) from 1972-1974. Their locations (figure 8) parallel production areas. The multi-process plants are also indicated, including at least four plants capable of processing butter, cheese, or dry products (including whey).

Somewhere around 70-80 percent of the manufactured dairy products are processed in plants owned and operated by one of Minnesota's three large cooperatives. These cooperatives and their respective plant locations are shown in figure 9.

Figure 10 shows the locations of Minnesota cheese processing plants in 1974. Twenty-five plants were manufacturing cheese.

Of all dairy plant operations, receiving stations are the most vulnerable to economic factors leading to discontinued operations. In the past, the trend has been away from butter manufacture (or butter and receiving stations) to receiving stations as the final step before plant doors are closed. In 1974, plants with a receiving station and/or other processing function numbered 164. Locations of plants combining butter and receiving station functions and also plants receiving milk as the

Figure 9. Plants of the three largest cooperatives in Minnesota, 1974

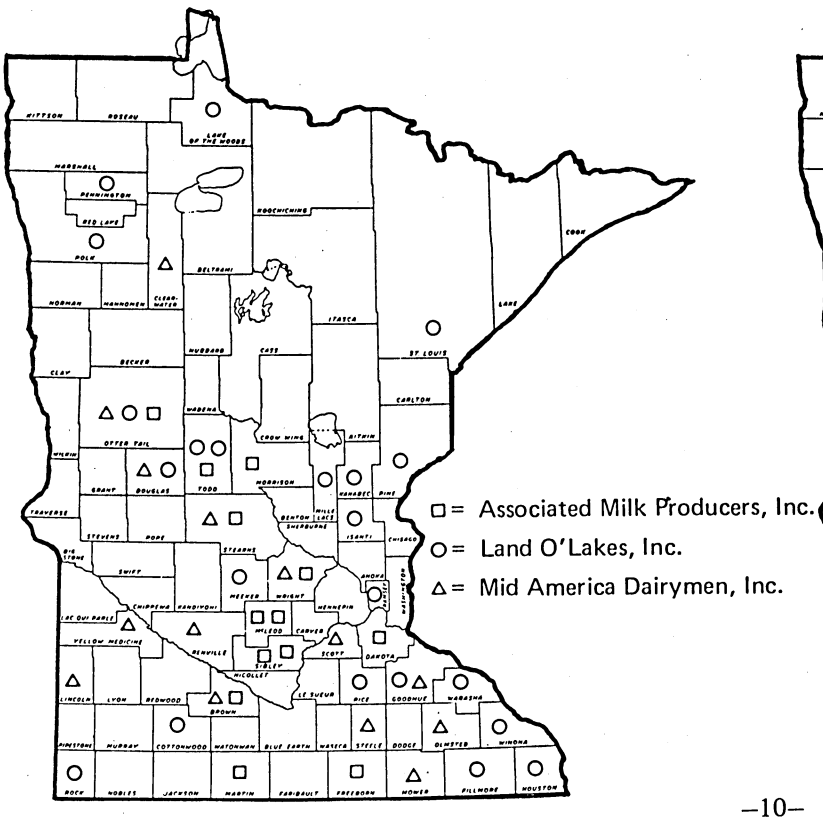
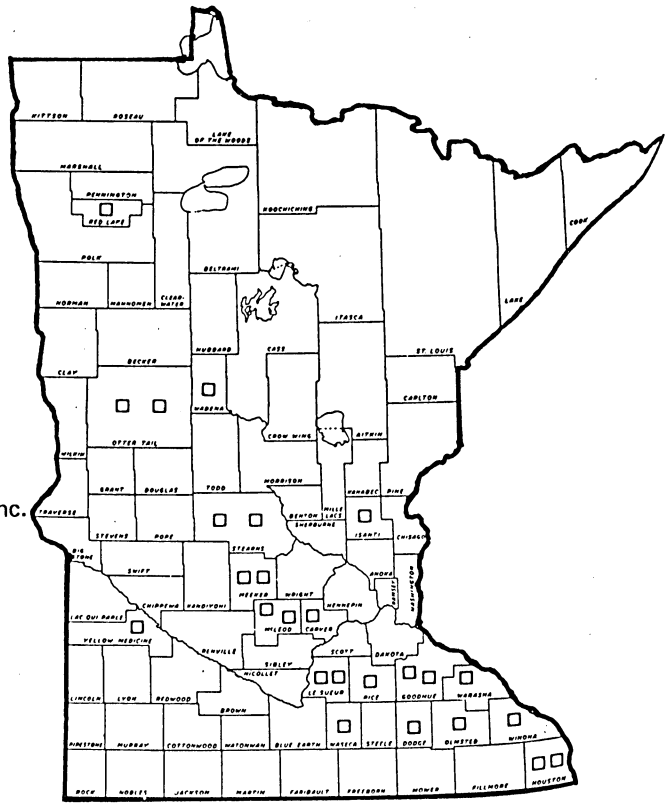


Figure 10. Locations of cheese processing plants, 1974



sole function are shown in figure 11. Many of these are located within the dairy belt. Because more profitable processing outlets may be found nearby, they are particularly vulnerable to closing.

Milk bottling operations—the instate outlets for most grade A milk—are indicated in figure 12. Proximity to major consuming centers (centers of population) generally determines the locations of these plants. Markets for grade A milk outside the state have expanded significantly in recent years. They apparently have growth potential, thus again showing the need for expanded supplies in this classification.

Sales and consumption trends

Until recently, cheese sales have been trending upward. They were spurred by strong consumer demands and strong prices. An additional incentive was provided by the product's high milkfat content and the ability to move milkfat (otherwise a drudge on the market) profitably through cheese. The market peaked and has since declined, but over the next few years, the prospects appear good for a continued fairly strong position for this dairy product. The other bright sales and consumption trends are in low-fat and skim milk products. Nevertheless, Minnesota is still a "manufacturing" state; most of its milk supply committed to manufactured products—now and in the immediate future—is concentrated in cheese.

Import-export policies play a major role in market outlook and potential, and dairy farmers must be aware of the impact of government action (price supports, trade policies, federal order markets, etc.). The cost of milk production in this country could possibly place the nation in an unfavorable competitive situation worldwide. At the same time, profits and capital retention for expansion and improvement of processing and marketing are considered essential to industry vitality.

As the industry moves to cheese production, whey products take on greater significance. New products and new methods and technologies for isolating and/or concentrating whey components will have to be found. Both cost and pollution potential negate disposing of whey other than in usable products. Moreover, the future "lifeblood" of the industry revolves around new product development and technologies for all dairy ingredients and byproducts. It is also inevitable that milk cost and availability (compared to vegetable protein sources) will determine the inroads "imitation" products will make on the market. Milk must compete with the overall beverage industry. The technology and know-how exists to make meat analogs and dairy product substitutes from vegetable protein sources. Only a competitive product—both in cost and consumer appeal—will survive. Again, profits to industry are part and parcel to hopes for continued vitality. When large marketing concerns discontinue marketing dairy products for lack of profit potential, the whole industry suffers.

While much has been done to improve process efficiency, much more remains to be done. Plants larger than those presently operating in Minnesota are readily possible. However for many plants designed for given capacities, the major source of improved efficiency is tighter control over product composition, quality, and waste. In the past, efficiencies have been incorporated primarily through economies of scale. No doubt these efficiencies will continue to be exploited, but the time has come for much greater emphasis on inplant efficiencies. Energy requirements only magnify overall needs.

As never before, impending food shortages call for stouthearted action. The world needs food, and animal agriculture has an unique role to play. Until a way is found to convert grassland and forage to edible and nutritious human food, this industry's place in the world's future is assured.

Figure 11. Locations of plants serving as receiving stations or butter processing and receiving stations during 1974

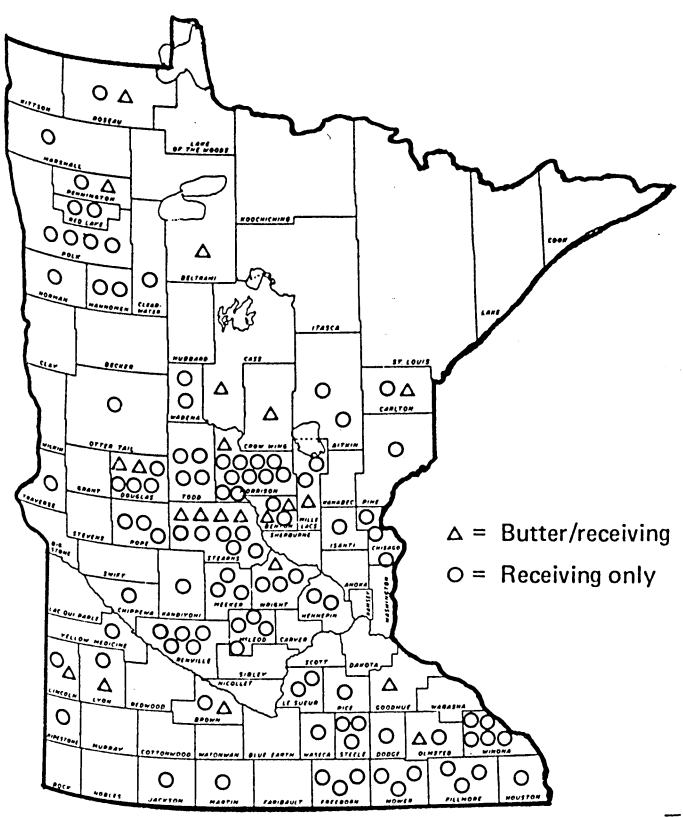
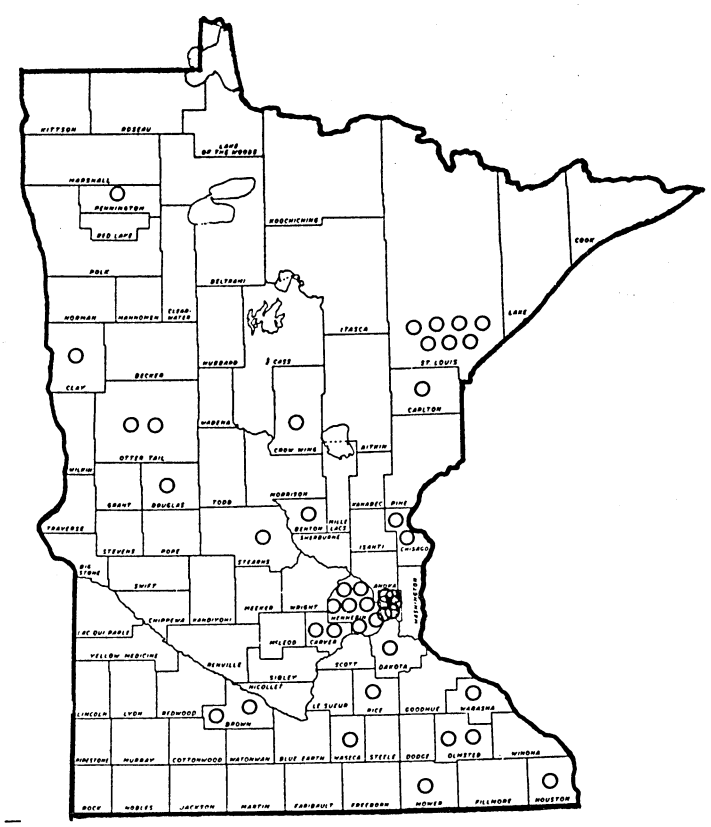
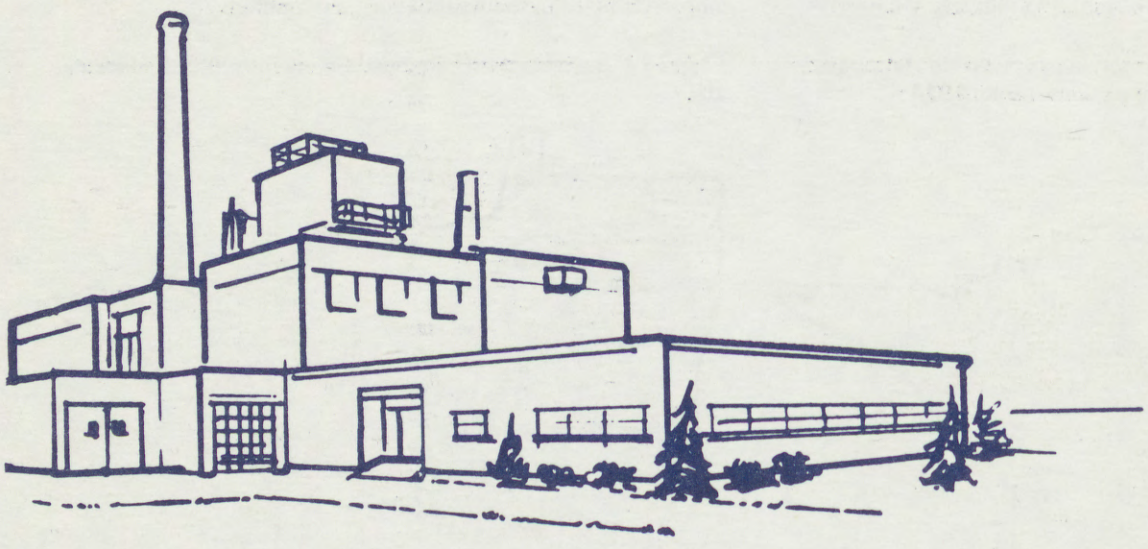


Figure 12. Locations of milk bottling operations in Minnesota, 1974





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