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Efficiency of Cream Stations in Cream Collection

By

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C. O. YOUNGSTROM, D. R. THEOPHILUS, F. W. ATKESON,
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IMPORTANCE of cream stations as a marketing agency for butterfat is indicated by their number and the volume of butterfat handled. One-fourth of the butterfat manufactured into butter in Idaho in 1929 was purchased through 178 cream stations. In the same year about one-third of the butterfat used for butter manufacture in the United States was marketed through 25,927 cream stations. (1) The two important bases for comparison of the cream station systems with other methods of cream collection are collection cost per pound of fat and quality of cream obtained.

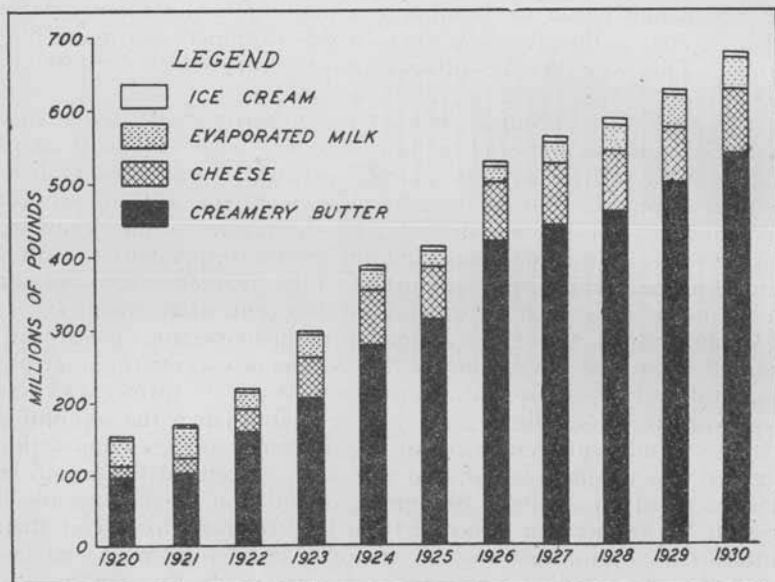


Fig. 1—Milk used annually in manufacturing dairy products in Idaho, 1920-1930.

In recent years many creamery operators have thought the cost of collecting butterfat through cream stations was too high. Also, cream obtained through stations has been considered poorer in quality than cream collected by some other methods.

(1) "Assembling of Butterfat Through Cream Stations," Distribution No. A-201. United States Department of Commerce, Bureau of the Census, Washington, D. C., 1932.
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Participation by the Idaho Bureau of Dairying consisted of furnishing records for analysis and gathering of field data in connection with routine inspection service.

Study of this system of cream collection seems justified because of the volume of butterfat involved. Any suggestions for improvement of the system would have far reaching effect. Comprehensive analysis of the cream station system should be helpful in adapting this method of cream collection to its proper place in the dairy industry.

Idaho dairymen will be particularly interested in the results from this study as 80 per cent of the milk in this state is used for butter manufacture. (Fig. 1) Butterfat production increased from 18,000,000 in 1920 to 36,000,000 pounds in 1930. (1)

History of the Development of the Cream Station System

The cream station system was developed as a result of a number of important changes over a period of years in the factory manufacture of butter. The first stage in the factory system of butter manufacture consisted of small creameries located in communities having enough butterfat to support a manufacturing plant. Milk was delivered to the creamery where it was skimmed and made into butter. This was the prevailing type of creamery about 1890 to 1900. (2, 3)

The need for furnishing a market for butterfat in the less highly developed dairy sections and the importance of large volume in manufacture were realized as early as 1892, as evidenced by the establishment of skimming stations in outlying sections not able to support a creamery (2). Milk was delivered by the farmer to the skimming station where it was skimmed and the cream shipped to a central point for the manufacture of butter. The creamery receiving the cream under this system became known as a centralizer creamery.

Cream stations, the next development in the marketing of butterfat, resulted from the invention of the continuous centrifugal cream separator and its widespread acceptance and use by farmers. These less expensive assembling units rapidly eliminated the skimming stations. Under this system cream was delivered to the cream station where it was weighed, tested, and shipped to a central factory to be manufactured into butter. Skimming of milk on the farm made it possible for farmers far removed from the creamery to deliver their butterfat at a minimum cost, as cream is more condensed and less perishable than milk. Shipment could be made through a local cream station or the cream shipped directly to the creamery. Farmers shipping independently to the central creamery became known as "direct shippers."

Creameries obtaining their cream by the "direct shipper" or cream station method are known as centralizer creameries. This type of creamery has contributed a great deal to the development of the dairy industry in the United States. Large volume of butterfat enables them to manufacture and market more efficiently than most

(1) Calculated from 1920 and 1930 census figures on the basis of 4 per cent milk.

(2) Jensen, F. W., Secretary-Manager, American Association Creamery Butter Manufacturers, Chicago, Illinois. Private communication.

(3) Slater, E. K., Editor, National Butter Journal, Milwaukee, Wisconsin. Private communication.

small creameries. Many individual farmers and even communities in less highly developed dairy districts would be without a market but for this type of creamery. Centralizer creameries have pioneered the dairy industry in many areas by furnishing a market outlet during the period in which the industry was developing from a small beginning to a well established enterprise.

The cream station system began about 1900 and was actively promoted by butter manufacturers in their efforts to increase their volume and to more intimately contact their patrons through local representatives (1). Cream stations appealed to the farmer because he could know the weight and test of the cream and receive a check in payment within less than an hour after delivery. From the creamery operator's viewpoint the cream station had advantages over direct shipments in that the station operator represented the company in soliciting business, less effort was required from the central office to contact the patrons, and usually more business was obtained from the community.

Competition frequently caused more stations to be located in towns or communities than would seem necessary because of insufficient volume and the resulting higher cost of assembling butterfat. The prevailing system of operating these stations was for the creamery to furnish all equipment, pay all shipping charges, and pay the operator a commission, usually 3 cents per pound of butterfat. In some stations the volume of butterfat handled was sufficient to furnish a livelihood for the operator. Frequently, however, the amount of butterfat handled was so small that the operator considered the cream station a side line to his other business, such as operating a store (1).

Costs of butterfat collection through cream stations have tended to increase during the last 10 to 15 years, particularly following the World War. Creamery operators are cognizant of this fact and through concerted efforts have made some attempts to reduce the cost of collecting butterfat through cream stations. The first attempt was made in the spring of 1929 when centralizer creameries operating in the Middlewest instituted a system called the "Service Charge Plan." Under this plan the farmer was paid the price quoted at the creamery, but was charged a definite amount, usually 31 cents per 10-gallon can, for handling and shipping costs. The station operator received no commission, but instead was allotted a definite amount of the service charge for weighing, testing, and shipping the cream, and the creamery received the remainder. Instigators of this plan hoped that the cost of collecting butterfat would be reduced, that some preference would be given to larger shipments, that advantages of local contact through cream stations could be retained, and that prices quoted could compete favorably with direct shipper prices. Apparently, however, this system was so unsatisfactory to

(1) Slater, E. K., Editor, National Butter Journal, Milwaukee, Wisconsin. Private communication.

the farmers and station operators that the creameries were forced to discontinue the plan (1, 2).

In the spring of 1931 another plan, known as the "Delivered Price System," was instituted over a large territory in the Middle-western states by concerted action among a group of centralizer creameries. Under the delivered price system the cream station operator signs a contract to sell all the butterfat he purchases to the creamery and is paid for the butterfat on a sliding scale. For example, "when the Chicago market on centralized 90 score butter, called 'standards,' is 23 and under 27, then creameries will pay 3 cents under standards delivered; if 27 and under 32, they will pay 2 cents under standards delivered; if 40 and under 43, they will pay $\frac{1}{2}$ cent over standards delivered, etc." (3) This plan in effect makes the operator an independent buyer for he pays all transportation charges and furnishes all his own station supplies (1, 2, 3, 4).

The purposes back of this system were much the same as those back of the "Service Charge Plan." Some doubt still exists as to the efficacy of this plan as indicated by the following extract from an article published in a trade paper: "While station cream buyers were not expected to be enthusiastic about the new plan of paying a fixed delivery price, more antagonism is probably being shown toward it than was anticipated. Reports from various sections indicate that 'exceptions' to the established plan are becoming more numerous each day, and fear is growing that their number will cause it to meet with the same fate as that encountered by the service charge, unless a halt is called upon numerous amendments being made." (5)

These two organized efforts attempted on such an extensive scale indicate that the cream station system of cream collection is a problem that merits investigation.

Number of Stations and Their Importance As a Marketing Agency in Idaho

All operators of dairy manufacturing plants and cream stations in Idaho are required by law to obtain an annual operating license and to report weekly to the Bureau of Dairying, Idaho Department of Agriculture, the volume of butterfat purchased (6). The number of cream stations licensed annually during the past six years is as follows (7):

- (1) Slater, E. K., Editor, National Butter Journal, Milwaukee, Wisconsin. Private communication.
- (2) Jensen, F. W., Secretary-Manager, American Association of Creamery Butter manufacturers, Chicago, Illinois. Private communication.
- (3) Rector, V. D., Assistant General Territory Manager, Fairmont Creamery Company, Omaha, Nebraska. Private Communication.
- (4) The Dairy Record, St. Paul, Minnesota, 1931, Vol. 31, No. 41, p. 8.
- (5) The Dairy Record, St. Paul, Minnesota, 1931, Vol. 31, No. 42, p. 10.
- (6) Idaho Session Laws, 1925, Chapter 224, Section A.
- (7) Report of Idaho Department of Agriculture, Bureau of Dairying, 1931.

Year	Number of Stations
1925	188
1926	179
1927	162
1928	154
1929	178
1930	156

Importance of the cream station as a marketing agency for butterfat in Idaho is indicated by the fact that 168 of the 178 stations operated in 1929 purchased 5,465,600 pounds, one-fifth of the total commercial butterfat, or one-fourth of the butterfat used for creamery butterfat manufacture (1).

Of the 43 creameries operating in Idaho during 1930 only 5 were of the centralizer type. These five creameries operated most of the cream stations. A few stations were operated by privately-owned creameries, a few by cooperative creameries, and a few by out-of-state centralizer creameries. Location of the creameries and of cream stations operated in Idaho during 1930 is shown in *Fig. 2* and *Fig. 3*, respectively.

Weekly reports on the volume of butterfat purchased during the year were available from 168 of 178 Idaho cream stations operated in 1929. These reports were analyzed to study the effect on efficiency of such factors as size of station, length of operating period during the year, and seasonal variation in volume.

TABLE I

Stations (1) Classified According to Yearly Volume of Butterfat (168 Stations)

	Yearly Volume of Butterfat, Pounds						Total
	10,000 and less	10,001 to 30,000	30,001 to 50,000	50,001 to 70,000	70,001 to 90,000	90,001 and over	
Number of Stations in Class	52	51	27	17	10	11	168
Per cent of Stations in Class	31.0	30.4	16.0	10.1	5.9	6.6	100.0
Total Volume in Class	364,000	1,006,600	1,070,400	1,020,900	772,500	1,331,200	5,465,600
Per cent of Volume in Class	4.9	18.4	19.6	18.7	14.1	24.3	100.0

(1) Data from 1929 reports to the Idaho Department of Agriculture, Bureau of Dairying.

Size of Stations

The average annual volume of butterfat for the 168 stations was 32,534 pounds. Thirty-one per cent of the stations had an annual volume of less than 10,000 pounds of butterfat, but this group purchased only 5 per cent of the total butterfat bought through this agency. Cream stations with an annual volume of less than 30,000

(1) 178 stations were licensed in 1929, but only 168 made separate reports to the Idaho Department of Agriculture, Bureau of Dairying.

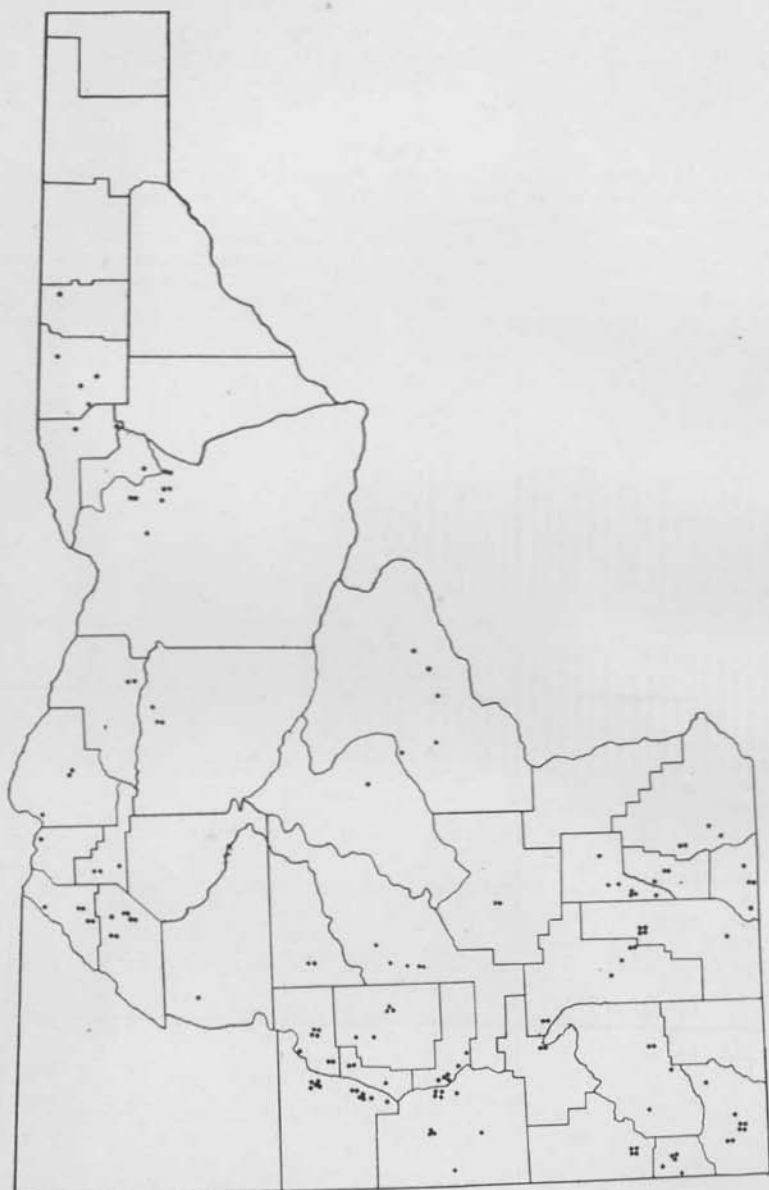


Fig. 3—Location of Idaho cream stations in 1930.

pounds of butterfat represented 61 per cent of the stations, but purchased 23 per cent of the butterfat. Importance of the larger stations with respect to total volume of all stations is indicated by the fact that the two groups of largest stations, representing 21 stations or only 13 per cent of the total, purchased 38.4 per cent of the total butterfat. (Fig. 4 and Table I)

TABLE II
Stations Classified According to Yearly Volume of Butterfat and Operation Period Entire Year or Part Year (1) (168 Stations)

			Yearly Volume of Butterfat, Pounds	Per cent of Total Volume	Per cent of Volume within Each Class	Number of Stations	Per cent of all Stations
Stations 10,000 and Less	Opera- tion Period	Entire Year	84,200	1.6	31.9	12	7.2
		Part Year	179,800	3.3	68.1	40	23.8
		Total	264,400	4.9	100.0	52	31.0
Stations 10,001 to 30,000	Opera- tion Period	Entire Year	773,100	14.1	76.8	38	22.6
		Part Year	233,500	4.3	23.2	13	7.8
		Total	1,006,600	18.4	100.0	51	30.4
Stations 30,001 to 50,000	Opera- tion Period	Entire Year	949,200	17.4	90.6	24	14.3
		Part Year	121,200	2.2	9.4	3	1.7
		Total	1,070,400	19.6	100.0	27	16.0
Stations 50,001 to 70,000	Opera- tion Period	Entire Year	1,020,900	18.7	100.0	17	10.1
		Part Year	.....	.....	.....	.....	.....
		Total	1,020,900	18.7	100.0	17	10.1
Stations 70,001 and Over	Opera- tion Period	Entire Year	2,103,700	38.3	100.0	21	12.5
		Part Year	.....	.....	.....	.....	.....
		Total	2,103,700	38.3	100.0	21	12.5
Total	Opera- tion Period	Entire Year	4,931,100	90.2	.....	112	66.7
		Part Year	534,500	9.8	.....	56	33.3
		Total	5,465,600	100.0	.....	168	100.0

(1) Data from 1929 reports to the Idaho Department of Agriculture, Bureau of Dairying.

Proportion of Stations Operated Entire Year

Fifty-six, or one-third, of the 168 stations did not operate throughout the entire year, 1929. The group of stations with the smallest volume had the smallest proportion operating throughout the year. (Table II) Of 52 stations in the class with less than 10,000 pounds of

butterfat annually, 40 did not operate all year, but represented 68 per cent of the butterfat purchased by this group.

Seasonal Variation in Volume

Volume of station appears to be an important factor in station management since such a large number of stations purchased so small

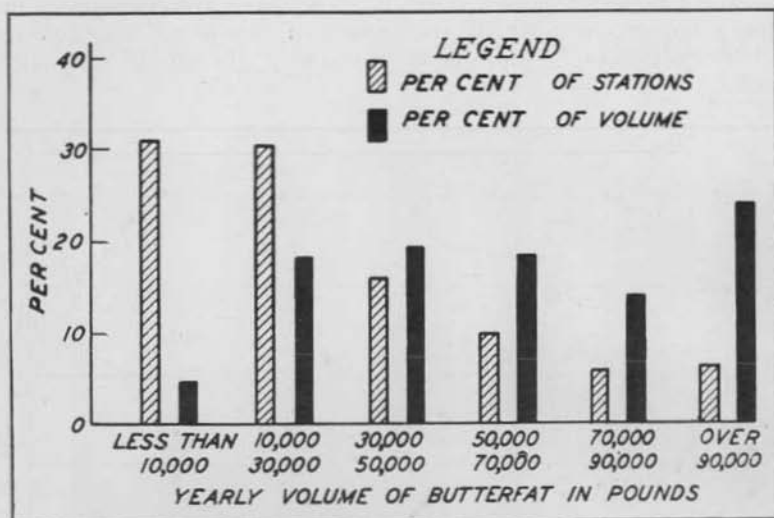


Fig. 4—Stations grouped according to yearly volume, showing relation of number of stations and volume. (168 station)

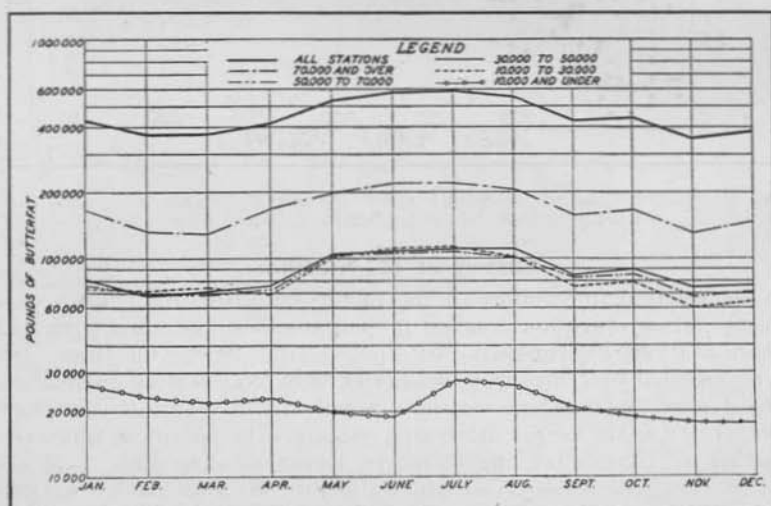


Fig. 5—Seasonal variation in volume of 168 cream stations grouped according to yearly volume.

a proportion of the total butterfat of all stations and since so many of the small stations operated only a part of the year.

Average volume per station was greatest in the months of May, June, July, and August. No important difference in the seasonal variation in the volume of butterfat existed among groups of stations of different sizes. (Fig. 5) The group representing less than 10,000 pounds of butterfat did not show the same seasonal tendencies as the other groups except when the stations which did not operate throughout the entire year, composing 68 per cent of the group, were eliminated.

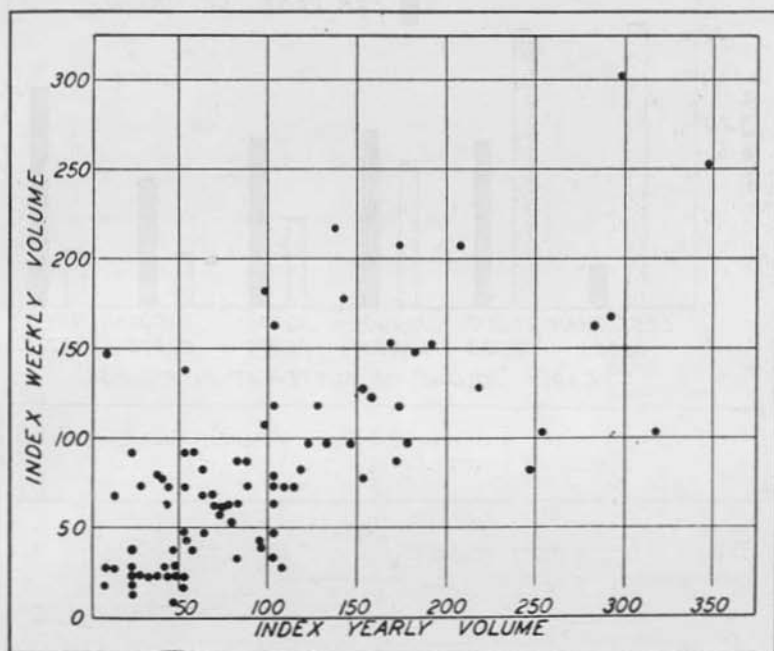


Fig. 6—Scatter diagram showing relation between indexes of yearly and weekly volume of cream stations. (89 stations)

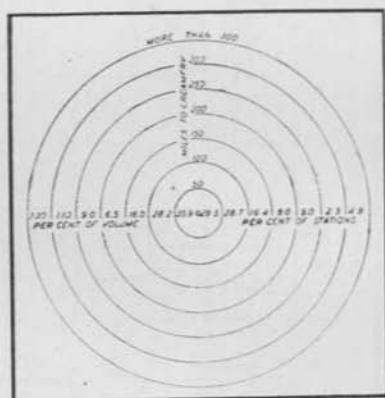
Survey of 122 Stations

In order to study more of the factors affecting the efficiency of cream station operation detailed information was obtained from 122 cream stations by personal visitation during 1930. Of these, 109 were operated by centralizer creameries, 9 by cooperative creameries, and 4 were independent stations owned by the station operators. One week was the period arbitrarily taken as the length of time covered by all records relating to the frequency of deliveries, total deliveries, and volume of cream and butterfat. Records for all stations did not represent the same week, and were scattered uniformly between February and August. While the weekly records were being taken a complete record was made of the Saturday deliveries of the

week involved. Facts relating to commission, methods of payment, expenses, grades of cream, and frequency of shipment were obtained from each station operator. Complete and detailed data pertaining to station operating costs and shipping charges were not available on all the 122 stations, but this information was secured from 37 representative stations for the entire previous year, 1929.

Data on weekly volume were compared to yearly volume and proved to be reliable as a basis for conclusions. Since the data for the year of the survey, 1930, was incomplete it was necessary to use the yearly volume of the previous year for comparison with the weekly volume. Comparison was made by converting yearly and weekly volumes into terms of index numbers and by determining the relationship between these indexes. That a significant relationship existed is indicated by the scatter diagram and by the correlation coefficient of 0.695 ± 0.036 . (Fig. 6) Data from only 89 of the 122 stations were used in these comparisons due to incomplete records on the remainder of the stations because of change of ownership or name, or non-continuance of station.

Fig. 7—Relation of distance of station from creamery to volume and number of stations (122 stations).



Distance of Stations from Creameries

One of the factors studied was the location of stations with respect to distance from the creamery to which each was shipping. The average distance shipped was 105 miles. Thirty per cent of the stations, representing 36 per cent of the total volume, were within 50 miles of the creamery. (Fig. 7 and Fig. 8) A radius of 100 miles included 58 per cent of the stations and 64 per cent of the volume, while a radius of 150 miles included 75 per cent of the stations and 70 per cent of the volume, or about three-fourths of each. Only 7.5 per cent of the stations, representing less than 4.5 per cent of the butterfat, were shipping more than 250 miles; while 5 per cent of the stations, representing 3.3 per cent of the butterfat, were shipping more than 300 miles. Distance appears to be a limiting factor in cream collection through the cream station system primarily because shipping costs increase with the increase in distance.

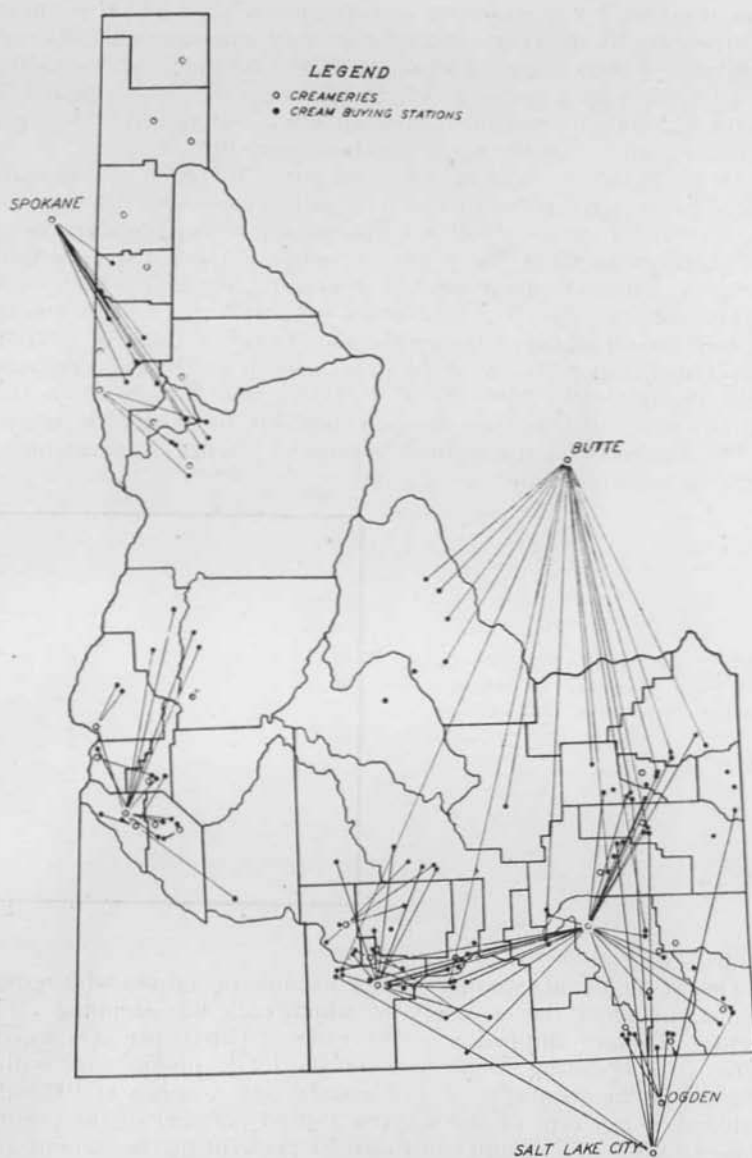


Fig. 8—Market outlets for Idaho cream stations, 1929. (122 stations)

Stations per Town

Analysis of the number of stations per town among the 122 involved showed 56 located in towns having only one station. (*Table III*) Although these represent nearly one-half of the stations studied,

EFFICIENCY OF CREAM STATIONS IN CREAM COLLECTION 15

TABLE III
Stations Classified According to Number per Town (122 Stations)

Stations per Town	No. of Towns	No. of Stations	Total Volume of Butterfat in Pounds	Per cent of Total Volume	Average Volume per Station
1	56	56	48,687	39.4	869
2	15	30	34,594	28.1	1153
3	4	12	16,156	13.0	1364
4	3	12	12,725	10.4	1060
5	1	5	3,336	2.7	672
6	---	---	---	---	---
7	1	7	7,824	6.0	1118
Total or Average	80	122	123,322	100.0	1011

their volume was 39.4 per cent of the total butterfat collected by the 122 stations. Thirty of the stations were in towns having two each, 12 in towns having three each, and 12 in towns having four each. One town had five stations and another seven. Number of stations per town had no relation to volume per station. Competition in the purchase of butterfat caused the establishment of several stations in communities with large volume of butterfat. The average volume of butterfat per station was about the same in towns with several stations as in towns with single stations. Although economies in certain cases might have resulted from the elimination of some stations, efficiency of the cream station system of buying butterfat was found to be as much a problem in towns with single stations as in towns with more.

Frequency of Shipments from Stations to Creamery

Classification of the 122 stations according to the frequency of weekly shipments of butterfat to the creamery, showed 69 or 57 per

TABLE IV
Stations Classified According to Frequency of Shipments of Cream from Station to Creamery (122 Stations)

	Shipments per Week						Total or Average
	Daily	Five Times	Four Times	Three Times	Two Times	One Time	
Number of Stations	69	1	4	32	14	2	122
Per cent of Stations	56.6	0.8	3.3	26.2	11.5	1.6	100.0
Average Volume per Shipment of Butterfat, pounds	192	269	381	302	249	274	220
Total Volume of Stations for Week in pounds of Butterfat	79,355	1,348	6,089	28,992	6,984	554	123,322
Per cent of Volume	64.3	1.1	4.9	23.5	5.8	0.4	100.0
Volume for Week per Station in pounds of Butterfat	1150	1348	1522	906	499	274	1011

cent shipped daily, one station shipped five times per week, and four shipped four times per week. (Table IV) Thirty-two stations or 26 per cent shipped three times per week. Fourteen or 12 per cent shipped twice a week, and two stations shipped only once a week. Stations shipping oftener than three times per week represented 61 per cent of the stations and 70 per cent of the butterfat, while those shipping three times per week or oftener represented 87 per cent of the stations and 94 per cent of the butterfat.

No apparent relationship existed between number of shipments per week and size of shipment. It seems that the station operator accumulated about the same amount of cream before shipping regardless of weekly volume, indicating that weekly volume of station was the determining factor in number of shipments per week.

Any delay in delivery of cream to the creamery affects its quality, thereby influencing the quality of butter. Stations with large weekly volumes, because of the frequency of shipments, should be able to deliver a higher quality cream, other factors being equal. However, since only 6 per cent of the butterfat purchased was shipped less than three times a week, more frequent shipment from the station to the creamery would not seem to offer as much opportunity in cream improvement as more frequent delivery of cream by the producer to the station.

Cream Grading

Reports showed cream grading in 22 or 18 per cent of the 122 stations. Three cents was the differential price in 20 of these. No premium was paid for first grade cream, but instead the current price for butterfat was paid, and second grade cream was penalized from 1 to 4 cents per pound of butterfat. Although reports from 22 stations indicated grading being practiced, during the weekly period covered by the study only eight stations received any second grade cream on which they discounted the price.

Apparently there has been little effort on the part of the cream

TABLE V

Stations Classified According to Weekly Volume of Butterfat (122 Stations)

	Weekly Receipts of Butterfat, Pounds						Total or Average
	500 or less	501 to 1000	1001 to 1500	1501 to 2000	2001 to 2500	2501 & over	
Number of Stations	35	47	18	11	4	7	122
Per cent of Stations	28.7	38.7	14.8	9.0	3.3	5.7	100.0
Volume of Cream, Pounds	28,697	94,728	64,903	47,641	21,864	84,062	341,895
Per cent of Total Cream	8.4	27.7	19.0	13.9	6.4	24.6	100.0
Volume of Butterfat, Pounds	10,144	34,816	22,471	18,025	8,372	29,494	123,322
Per cent of Volume of Butterfat	8.2	28.3	18.2	14.6	6.8	23.9	100.0
Per cent Fat in Cream	35.3	36.8	34.6	37.8	38.3	35.1	36.1

stations in general to improve the quality of cream which they receive either by offering a price differential or by any system of strict cream grading. This condition may be largely attributed to the competitive system of purchasing cream and the desire for a high volume per station.

Volume of Business

The average weekly volume of butterfat per station was 1,011 pounds. (Table VI) Stations with less than 500 pounds of butterfat per week represented 29 per cent of all stations, but only 8 per cent of the butterfat. (Fig. 9 and Table V) Those with less than 1,000

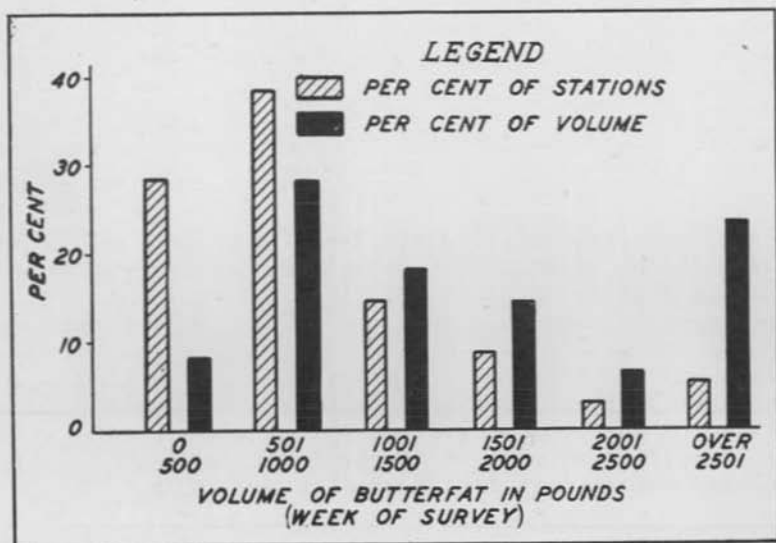


Fig. 9—Stations grouped according to weekly volume, showing relation of number of stations and volume. (122 stations)

pounds of butterfat per week represented 67 per cent, or two-thirds, of the stations, and 36 per cent or over one-third of the butterfat; while those receiving over 1,000 pounds of butterfat per week represented 33 per cent or one-third of the stations and 64 per cent, or about two-thirds, of the butterfat. Eighteen per cent of the stations and 45 per cent of the butterfat were represented by the stations receiving over 1,500 pounds of butterfat per week. These results raise the question as to whether or not the operation of such a large number of small stations is justified considering the amount of butterfat collected by each.

Patrons per Station

The 122 stations had 7,148 patrons, an average of 59 per station. Nineteen stations had less than 20 patrons and represented 16 per

TABLE VI
Stations Classified According to Number of Patrons (122 Stations)

Number Patrons per Station	Number of Stations	Per cent of All Stations	Number of Patrons	Per cent of All Patrons	Volume of Butterfat Pounds	Per cent of Total Volume	Average Volume in Pounds per Station	Average Volume in Pounds per Patron
19 or less	19	15.5	254	3.6	4,060	3.3	214	16.0
20-39	31	25.4	885	12.4	17,818	14.4	575	20.1
40-59	26	21.3	1248	17.6	22,002	17.8	846	17.6
60-79	21	17.2	1432	19.9	23,399	19.0	1114	16.3
80-99	9	7.4	866	12.0	12,835	10.4	1426	14.8
100-119	4	3.3	420	5.9	7,025	5.7	1756	16.7
120-139	5	4.1	642	9.0	9,744	7.9	1949	15.2
140-159	3	2.5	432	6.0	5,778	4.7	1926	13.3
160-Over	4	3.3	969	13.6	20,661	16.8	5165	21.3
Total or Average	122	100.0	7148	100.0	123,322	100.0	1011	17.3

cent of the stations, but only 3.6 per cent of the patrons and 3.3 per cent of the total butterfat. (Fig. 10 and Table VI) Fifty stations had less than 40 patrons and represented 41 per cent of the stations, 16 per cent of the patrons, and 18 per cent of the butterfat. Seventy-nine per cent, or nearly four-fifths, of all the stations were in groups having less than 80 patrons. These represented 54 per cent of all the patrons and 55 per cent of the butterfat. The greatest volume of butterfat came from the group of stations having from 40 to 80 patrons. The group with 160 patrons or more, although including only four stations, represented one-sixth of the butterfat.

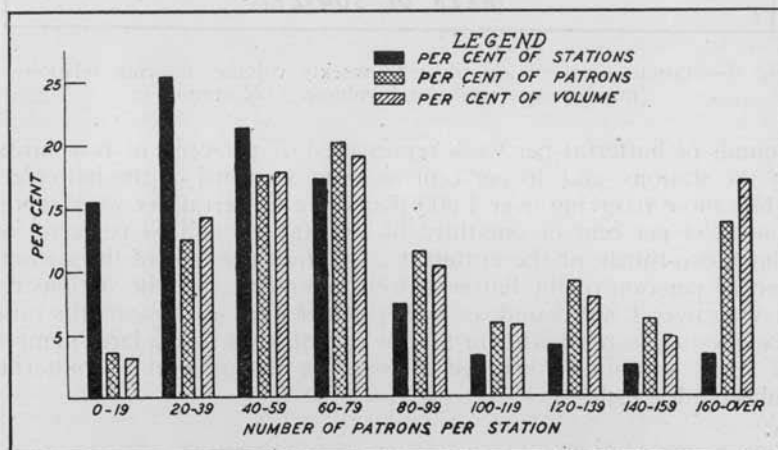


Fig. 10—Stations grouped according to number of patrons, showing relation of number of stations and volume. (122 stations)

Average volume per patron did not seem to have much relationship to number of patrons per station. The fact that nearly four-fifths of the stations had less than 80 patrons, with an average of only 39, indicates that too few patrons is the reason for so many stations with small volume.

Weekly Volume per Patron

Average weekly volume of butterfat per patron was 17 pounds of butterfat, or about 6.5 gallons of cream. Seven stations had an average weekly volume per patron of less than 10 pounds of butterfat. (*Table VII*) Groups of stations having less than 13 pounds of butterfat weekly per patron represented 35 stations or 29 per cent of the total and 19 per cent of the butterfat. Stations with an

TABLE VII
Stations Classified According to Patrons' Average Weekly Volume of Butterfat
(122 Stations)

Patrons' Average Weekly Volume of Butterfat, Pounds	Number of Stations	Per cent of All Stations	Volume of Butterfat, Pounds	Average Volume per Station, Pounds	Per cent of Total Volume	Number of Patrons	Average Number Patrons per Station	Per cent of all Patrons
7.0-9.9	7	5.7	4,292	613	3.5	461	66	6.5
10.0-12.9	28	23.0	19,683	703	15.9	1717	61	24.0
13.0-15.9	26	21.3	18,305	704	14.9	1258	48	17.6
16.0-18.9	21	17.2	19,081	908	15.5	1120	53	15.7
19.0-21.9	12	9.8	13,104	1,092	10.6	649	54	9.1
22.0-24.9	12	9.8	28,035	2,336	22.7	1195	100	16.2
25.0-27.9	7	5.7	10,052	1,436	8.2	382	55	5.3
28.0-30.9	5	4.1	6,782	1,366	5.5	246	49	3.4
31.0 and over	4	3.3	3,988	977	3.2	120	30	1.7
Total or Average	122	100.0	123,322	1,011	100.0	7148	59	100.0

average weekly volume per patron of less than 16 pounds represented 61 or one-half of the stations and 34 per cent or one-third of the butterfat, while stations with a weekly volume per patron of less than 19 pounds of butterfat represented 82 or two-thirds of the stations and one-half the total volume of butterfat. Stations with from 19 to 25 pounds of butterfat weekly per patron represented 24 stations or 20 per cent of the total and one-third of the total butterfat. An average weekly patron volume exceeding 25 pounds of butterfat included only 16 stations or 13 per cent of the total and 17 per cent of the butterfat. One-half of the butterfat was represented by two-thirds of the stations and 48 per cent of the patrons.

Two-thirds of the stations and one-half of the butterfat represented stations with an average weekly volume per patron of less

than 19 pounds of butterfat, equivalent to about 7 gallons of cream. The average weekly volume for the 4,556 patrons included in these two-thirds of the stations was 13.5 pounds of butterfat, equivalent to about 5 gallons of cream. These facts indicate that a majority of the stations are serving a class of producers who have very small volume, and it may be a question whether or not this type of producer could be as effectively served by any other system of cream collection. This, however, does not obviate the problem of economical operation of the small station. It is later shown that no relationship exists between the size of deliveries and frequency of deliveries. Therefore, there was a greater overhead cost on each pound of butterfat purchased from small volume patrons than from large volume patrons.

System of Payment

What does it cost to collect butterfat through cream stations; how does the expense per pound of fat compare with other systems of cream collection; and what are the factors affecting costs? Such questions are of vital interest to both creamery operator and producer. Study was made of the management of the stations with respect to system of payment, cost per pound of butterfat, and returns to operator.

In 105 of the 122 stations studied the creamery paid the operator a commission per pound of butterfat purchased. Fifty-seven operators received a commission only; 45 received a commission plus some station expense, such as rent, water, lights, and fuel; one received commission and salary; and two received commission, salary, and some station expense.

One operator was paid exclusively by salary, and 15 received salary and some station expense, which, together with the three receiving commission and salary, made a total of 19 receiving salary. One operator owning his own station was buying independently and selling on a spread.

All stations except four were furnished supplies and equipment by the creamery to which they were shipping. Three of these four owned their equipment, but were furnished supplies. The other station furnished both the equipment and supplies.

In 1930, 10 creameries owned by 6 companies were buying from 100 of the 122 stations. Eighty-three of these 100 were shipping to 4 creameries. Some of these companies purchasing from a large number of stations seemed to have a prevailing policy of commission only, while others furnished some compensation in addition to commission. Nevertheless, exceptions with all companies were quite numerous.

When the operator received a salary, the station generally had relatively large volume. When the expenses paid by the creamery were fairly large, they were compensated for by a lower commission rate. The most apparent conclusion is that method of payment seems to have been based on individual circumstances, local condi-

EFFICIENCY OF CREAM STATIONS IN CREAM COLLECTION 21

TABLE VIII
Commission or Salary and Return to Operator in Seventy-Five Stations
(Monthly Basis)

(A) Operator Pays Rent and Incidentals (42 Stations)

Station Index Number	Volume of Butterfat	Expenses Paid By Creamery		Expenses Paid by Operator		Return to Operator
		Commission per Pound Butterfat	Total Commission	Rent	Incidentals	
	Pounds	Cents	Dollars	Dollars	Dollars	Dollars
1	4,668	3	140.04	15.00	4.50	120.54
2	3,481	3	104.43	15.00	(1)	89.43
3	6,724	3	201.72	30.00	16.00	155.72
4	2,685	3	80.55	10.00	3.00	67.55
5	2,070	3	62.10	10.00	7.00	45.10
6	4,282	3	128.46	20.00	10.00	98.46
7	1,931	3	57.93	12.00	5.75	40.18
8	13,185	3	395.55	40.00	18.00	337.55
9	2,598	3	77.94	7.00	12.50	58.44
10	3,555	3	106.65	25.00	9.65	72.00
11	3,767	3	113.01	15.00	12.00	86.01
12	883	3	26.49	8.00	1.50	16.99
13	1,230	3	36.90	5.00	2.00	29.90
14	6,686	3	200.58	40.00	12.75	147.83
15	3,230	3	69.90	20.00	10.75	66.15
16	2,602	3	78.06	20.00	8.50	49.56
17	5,581	3	167.43	20.00	19.25	128.18
18	2,546	3	76.38	70.00	(1)	6.38
19	4,317	3	129.51	7.50	10.00	112.01
20	6,478	2	129.56	5.00	12.50	112.06
21	948	3	28.44	15.00	4.00	9.44
22	1,372	2	27.44	10.00	2.50	14.94
23	7,136	3	214.08	15.00	17.25	171.83
24	5,256	2.5	131.40	10.00	5.50	115.90
25	7,409	3	222.27	20.00	8.25	194.02
26	1,888	2.5	47.20	5.00	5.00	37.20
27	1,277	3	38.31	3.00	2.00	33.31
28	1,243	3	37.29	6.00	1.00	30.29
29	9,171	2	183.42	2.00	7.00	174.42
30	1,455	3	43.65	30.00	7.00	6.65
31	3,239	3	97.17	10.00	3.75	83.42
32	758	2	15.16	10.00	1.75	3.41
33	922	3	27.66	10.00	9.00	8.66
34	3,230	3	96.90	45.00	(1)	51.90
35	5,447	3	163.41	15.00	5.00	143.41
36	4,508	3	135.24	15.00	8.00	112.24
37	3,529	3	105.87	12.50	9.00	84.37
38	887	3	26.61	7.50	7.50	11.61
39	3,958	2.5	96.23	15.00	(1)	81.23
40	2,117	3	63.51	15.00	7.00	22.00
41	3,849	3	115.47	10.00	4.00	101.47
42	13,397	3	401.91	75.00	(1)	326.91
Weighted Average		2.86				Average 87.57

(1) Incidentals included with rent.

TABLE VIII
(continued)
(B) Creamery Pays Rent and Incidentals (25 Stations)

Station Index Number	Volume of Butterfat	Expenses Paid by Creamery					Return to Operator
		Commission per Pound Butterfat	Total Commission	Total Salary	Rent	Incidentals	
	Pounds	Cents	Dollars	Dollars	Dollars	Dollars	Dollars
43	3,278	2.0	65.56		25.00	19.50	65.56
44	4,434	2.0	88.68		15.00	8.50	88.68
45	10,959	1.28		140.00	35.00	85.00	140.00
46	22,165	.9		200.00	15.00	(1)	200.00
47	7,145	3.0	214.35		20.00	19.00	214.35
48	43,988	.83		365.00	75.00	6.50	365.00
49	5,283	2.0	105.66		25.00	9.80	105.66
50	3,802	2.0	76.04		15.00	22.50	76.04
51	4,204	2.0	84.08		20.00	20.00	84.08
52	2,637	2.0	52.74		15.00	1.50	52.74
53	5,079	2.0	101.58		15.00	6.75	101.58
54	6,378	2.0	127.56		25.00	2.50	127.56
55	5,629	1.49		84.00	25.00	1.50	84.00
56	11,665	1.50		175.00	22.50	(1)	175.00
57	2,663	2.0	53.25		7.00	1.50	53.26
58	5,083	1.97		100.00	20.00	15.50	100.00
59	12,349	2.5	308.73		10.00	11.75	308.73
60	2,685	2.5	67.13		10.00	1.50	67.13
61	9,431	2.5	235.78		30.00	18.25	235.78
62	3,689	2.0	73.78		20.00	2.00	73.78
63	1,732	2.5	43.30		15.00	4.25	43.30
64	5,928	1.69		100.00	30.00	1.50	100.00
65	7,443	2.0	148.86		9.00	2.50	148.86
66	7,006	1.93		135.00	50.00	3.00	135.00
67	6,976	2.0	139.52		30.00	8.00	139.52
Weighted Average		1.63				Average	131.41

(1) Incidentals included with rent.

(C) Operator and Creamery Each Pay a Portion of Rent and Incidentals (8 Stations)

Station Index Number	Volume of Butterfat	Expenses Paid by Creamery					Expenses p'd by Operator		Return to Operator
		Commission per pound Butterfat	Total Commission	Total Salary	Rent	Incidentals	Rent	Incidentals	
	Pounds	Cents	Dollars	Dols.	Dols.	Dols.	Dols.	Dols.	Dollars
68	1,052	3.0	31.56		15.00			1.00	30.56
69	4,971	3.0	149.13			16.75	30.00		119.13
70	2,459	4.07		100.00		24.00	20.00		80.00
71	3,083	3.0	92.49			3.00	8.00	1.75	82.74
72	2,369	3.0	71.07		12.50			19.00	52.07
73	3,473	2.75	95.51		10.00		5.00	5.00	85.51
74	2,910	2.0	58.20		7.50	4.00	7.50	6.50	44.20
75	5,807	3.0	174.21			10.00	30.00		144.21
Weighted Average		2.96					Average		79.80
Weighted Average all Stations		2.17					Average, all Stations		101.35

tions, or bargaining power, rather than the policy of the buyer or volume of the station.

Commission Rate per Pound of Butterfat

Information obtained from 75 of the 122 stations showed that the weighted average commission rate per pound of butterfat was 2.23 cents. Data from the other 47 of the 122 stations were not used because information was not available on such expenses as rent, light, water, and heat which was needed for comparisons. (*Table VIII*) A weighted average commission rate of 2.86 cents was paid in the 42 stations where the operator paid all expenses, such as rent and incidentals, supplies and equipment being furnished by the creamery. (*Table VIII*) In 35 of these stations the commission rate per pound of butterfat was 3 cents, in 4 it was 2 cents, and in 3 it was 2.5 cents.

In 25 stations (*Table VIII*) in which the creamery paid all costs and a salary or commission to the operator, the weighted average commission rate per pound of butterfat was 1.63 cents. When data from two extremely large stations were omitted the weighted average commission rate was 2.01 cents. These figures were obtained by computing all salaries into terms of commission. The weighted average commission rate in 8 stations in which the operator received a salary was 1.16 cents per pound of butterfat. In 17 stations in which the operator received a commission instead of a salary, the weighted average commission was 2.23 cents. The average commission rate of operators receiving salaries was lower than that of operators receiving commissions, due to the larger volume of the stations. In the former, the average volume was 14,053 pounds of butterfat per station, or 7,712 pounds with the two largest stations excluded; while in the latter the average was 5,248 pounds.

In the 8 stations (*Table VIII*) in which both creamery and operator paid part of the expenses other than salary or commission, the weighted average commission rate per pound of butterfat was 2.96 cents.

If these results are typical the lowest cost for butterfat collection through cream stations is where the creamery operates its own stations, pays all expenses, and pays the operator a salary. This system, however, requires large volume stations. Smaller stations operated on a commission basis rather than a salary basis, although more expensive per pound of butterfat collected, could probably not be feasibly operated on any other basis.

Returns to Operator

For these 75 stations the average monthly return per operator was \$101.35 after deducting from his monthly salary or commissions any operating costs which he paid. (*Table VIII*) Eighteen operators had a net return or income of less than \$50 per month, 43 less than \$100, 20 from \$100 to \$150, 6 from \$150 to \$200, and 6 over \$200 per month. There seemed some tendency for the creamery to pay all expenses in stations of larger volume with operators receiving returns above the average. Operators receiving commissions and pay-

ing all station expenses averaged \$87.57 net returns per month, while operators receiving commissions or salaries with the creamery paying all station expenses had net returns of \$131.41 per month. In the eight stations where the creamery and station operator each paid part of the operating expenses the net return was \$79.80 per month. Supporting these findings is the fact that 122 stations had an average weekly volume of 994 pounds of butterfat, or about 360 gallons of cream (*Table VI*), which at a commission of 3 cents per pound would return to the operator about \$30 per week in commissions. Butterfat received by stations with less than 80 patrons averaged 694 pounds. At a commission of 3 cents per pound the station operator would receive an average weekly income of about \$21, which figure represents four-fifths of the stations studied.

Volume per station in many cases was not sufficient, because of small deliveries and too few patrons, to justify the operator in devoting his entire time to this work. It has been shown that one-third of the licensed stations in 1929 did not operate the entire year. Probably the small volume reflected in the correspondingly low net return to the operator may account for this.

Procurement Costs in 37 Stations

Information on the 75 stations covered a month's operation and was obtained by survey through personal visitation. Study of the costs of operating 37 stations for the entire year 1929 was made possible through the cooperation of one creamery which furnished detailed information on these stations. Facts on the 37 stations are presented for comparison with or as supplementary to the data from the 75 stations.

The 37 stations averaged 36,800 pounds of butterfat yearly per station, making a total of 1,361,000 pounds of butterfat involved in the study. (*Table IX*) The weighted average commission rate for the 37 stations was 2.78 cents per pound of butterfat. This is in harmony with results reported on the 75 stations. (*Table VIII*) In instances where the operator received some salary it was computed into terms of commission rate to facilitate comparisons. Commission rate was determined by dividing salary by pounds of butterfat.

In all cases except two the operator was required to pay the expenses of the station from his commission or salary. The operator was paid only a commission in 35 of the stations, in 34 of which the commission was 3 cents, while in the other the commission was 2 cents and the creamery paid other expenses of the station. Operators of two stations were paid salaries. In one of these stations, which was much the largest of the entire group, the salary was at the rate of 1.2 cents commission, while in the other, about average in size, it was 4.1 cents.

The weighted average cost per pound of butterfat for shipping all the cream from the 37 stations to the creamery was 1.77 cents, which together with the average commission rate, 2.78 cents, made

TABLE IX
Cost of Operating 37 Stations in 1929

Station Index Number	Volume	Shortage of Butterfat		Procurement Costs per pound of Butterfat			
				Shipping Cost	Other Station Costs	Commission Rate	Total Cost
	Pounds	Pounds	Per Cent	Cents	Cents	Cents	Cents
1	24,924	151	0.6	1.74	0.76	3.0	5.50
2	33,920	69	0.2	2.35	0.69	3.0	6.04
3	20,355	93	0.5	1.83	0.81	3.0	5.64
4	35,364	395	1.1	1.17	0.67	3.0	4.84
5	3,467	142	4.0	1.95	2.37	3.0	7.32
6	10,642	166	1.5	1.86	1.11	3.0	5.97
7	22,728	169	0.7	1.86	0.77	3.0	5.63
8	3,545	44	1.2	1.34	2.31	3.0	6.65
9	73,265	112	0.2	1.95	0.91	2.0 (1)	4.86
10	65,336	145	0.2	1.51	0.59	3.0	5.10
11	2,751	24	0.9	2.21	2.86	3.0	8.07
12	8,741	69	0.8	1.92	1.26	3.0	6.18
13	33,521	531	1.5	1.81	0.67	3.0	5.48
14	45,875	156	0.3	1.39	0.63	3.0	5.02
15	66,579	70	0.1	1.98	0.59	3.0	5.57
16	4,523	279	6.2	1.50	1.93	3.0	6.43
17	7,991	101	1.3	2.60	1.31	3.0	6.91
18	3,725	8	0.2	1.56	2.26	3.0	6.82
19	147,067	206	0.1	1.58	0.84	1.24(2)	3.66
20	5,896	217	3.6	2.21	1.61	3.0	6.82
21	31,400	360	0.1	1.83	0.72	4.14(2)	6.69
22	40,500	597	0.1	2.56	0.65	3.0	6.21
23	8,951	23	0.3	1.55	1.23	3.0	5.78
24	134,444	342	0.3	1.88	0.51	3.0	5.39
25	22,182	125	0.6	1.82	0.79	3.0	5.61
26	10,190	144	1.4	1.66	1.13	3.0	5.79
27	110,089	135	0.1	1.53	0.56	3.0	5.09
28	81,480	541	0.7	1.72	0.57	3.0	5.29
29	11,222	243	2.1	1.79	1.07	3.0	5.86
30	16,570	208	1.2	1.69	0.88	3.0	5.57
31	80,897	664	0.8	1.74	0.57	3.0	5.31
32	6,679	12	0.2	1.43	1.49	3.0	5.92
33	41,750	388	0.9	1.77	0.66	3.0	5.43
34	23,131	228	1.0	1.93	0.78	3.0	5.71
35	8,698	121	1.4	1.93	1.26	3.0	6.19
36	74,053	33	0.1	1.81	0.59	3.0	5.40
37	38,512	93	0.2	1.94	0.66	3.0	5.60
Weighted Average	36,783	201	0.5	1.77	0.72	2.78	5.27

(1) Company pays more than its usual share of station expenses.

(2) Operator paid salary, commission rate computed by dividing salary by volume of butterfat.

Note—Other station costs include such expenses as supplies, equipment, interest, and taxes. Shipping cost represents the cost per pound of delivering butterfat to the creamery. This was computed by dividing the delivery costs by the volume of butterfat. Total cost of procurement per pound of butterfat was obtained by adding commission rate, other station costs, and shipping costs.

an average procurement cost of 4.55 cents per pound of butterfat, exclusive of supplies and equipment, interest, and taxes. These latter incidentals combined represented an average cost of 0.72 of one cent per pound of butterfat, which when added to the commission rate and shipping costs made a weighted average total procurement cost of 5.27 cents per pound of butterfat.

"Other costs," namely supplies, equipment, interest, and taxes, represented a weighted average of 0.72 of one cent per pound of butterfat for the 1,361,000 pounds of butterfat from the 37 stations. Study of "other costs" by station averages showed the stations ranged from 0.51 to 2.86 cents with an arithmetic mean of 1.06 cents for the 37 stations. An array of these costs by station averages showed 15 stations between 0.5 and 0.75 of one cent, 8 between 0.75 and 1.0 cent, 4 between 1.0 and 1.25 cents, 4 between 1.25 and 1.5 cents, and 6 above 1.5 cents.

On the 1,361,000 pounds of butterfat from the 37 stations the weighted average shipping cost was 1.77 cents per pound of butterfat, but per station the average shipping cost was 1.81 cents per pound of butterfat. An array of the average shipping costs by stations showed that 4 of the 37 stations were below 1.5 cents, 6 between 1.5 and 1.6, 2 between 1.6 and 1.7, 5 between 1.7 and 1.8, 8 between 1.8 and 1.9, 7 between 1.9 and 2, and 5 above 2 cents.

Weighted average total procurement cost was 5.27 cents per pound on the 1,361,000 pounds of butterfat from the 37 stations, but averages by stations showed an arithmetic mean of 5.82 cents for the 37 stations. Stations varied in the average procurement costs from 3.66 to 8.07 cents. In 3 stations procurement costs per pound of butterfat were below 5 cents; in 9 stations, 5 to 5.5 cents; in 13, 5.5 to 6; in 5, 6 to 6.5; in 5, 6.5 to 7; and in 2, above 7 cents.

The coefficient of variation on shipping costs was 16.8, on "other costs" 55.7, and on total costs 13.4. Since commission rate was the same in all except 3 of the 37 stations, "other costs" appeared to be the most important factor in variation of total procurement cost. There seemed to be a tendency toward lower procurement cost per pound of butterfat with increased volume. (Fig. 11) These results are in accord with some published work (1), but contrary to other (2).

Station Shortage (3)

Station shortage was not considered in the above costs because the operator absorbed this loss. Of 1,368,378 pounds of butterfat purchased through the 37 stations, 1,360,963 pounds were delivered to the creamery and 7,415 pounds represented shortage. The average shortage on this quantity of butterfat was 0.5 of one per cent.

(1) "Cooperative Cream Pools in Idaho," University of Idaho Agricultural Experiment Station, 1926, Bulletin 144.

(2) "Factors Involved in Buying Missouri Cream," Missouri Agricultural Experiment Station, 1930, Research Bulletin 137.

(3) Station shortage is the difference in pounds of butterfat purchased at the cream station and the butterfat delivered to the creamery.

Shortage by stations ranged from 0.1 of one per cent to 6.2 per cent, with an average (median) of 0.7 of one per cent for the 37 stations. Stations varied greatly in average shortage, but there seemed to be no relationship between shortage and volume.

Per Cent of Fat in Cream

As previously mentioned creamery operators are interested in the cream station system from the standpoint of its relative efficiency in economical butterfat collection and in quality of cream obtained. Even though collection costs might be low, if this system were con-

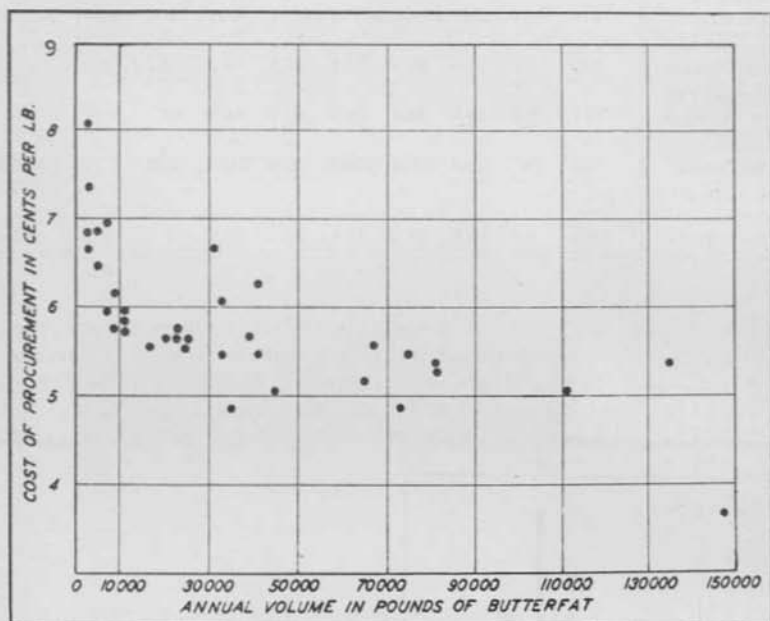


Fig. 11—Relation of annual volume of stations and cost per pound of procurement of butterfat. (37 stations)

ductive to poor quality of cream the cream station might be of doubtful value. In the aggregate the two major factors influencing quality of cream collected through cream stations, are the per cent of fat in cream and frequency of delivery by the producer to the station. Low test cream is more difficult to keep sweet than high test cream. Also, the more frequently delivery is made the better the quality of cream. Frequency of delivery, however, raises the question of size of delivery since deliveries may be so small that division into smaller and more frequent deliveries cannot be expected.

The average test of the 341,895 pounds of cream was 36.1 per cent, making a total of 123,322 pounds of butterfat delivered to the 122 stations. When the 122 stations were classified according to

TABLE X

Deliveries of Cream Classified According to Per cent of Fat

	Per cent of Butterfat in Cream									Total or Average
	20 and less	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	
Number of Deliveries	26	113	415	815	920	550	183	46	4	3072
Per cent of all Deliveries	0.8	3.7	13.5	26.6	29.9	17.9	6.0	1.5	0.1	100.0
Pounds of Cream	710	3134	13844	27900	31734	18251	5327	1200	100	102,200
Per cent of Total Cream	0.7	3.1	13.5	27.3	31.1	17.9	5.2	1.2	0.1	100.0
Average Test of Cream	17.4	23.8	28.5	33.3	38.0	42.8	46.6	52.7	56.9	36.3
Pounds of Butterfat	123	747	3940	9278	12065	7820	2483	633	57	37,146
Per cent of Total Butterfat	0.3	2.0	10.6	25.0	32.4	21.1	6.7	1.7	0.2	100.0

weekly volume of butterfat no significant differences were evident in the per cent of fat in the cream of the various classes. (Table V) When all deliveries of cream were classified according to percentage of butterfat, irrespective of station, cream testing 25 per cent or less included only 4.5 per cent of the deliveries, 3.8 per cent of the cream,

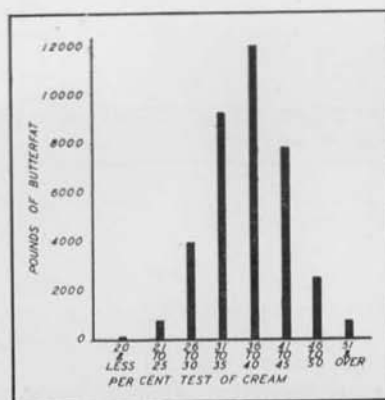


Fig. 12—Relation of per cent of fat in cream and volume of butterfat.

and 2.3 per cent of the butterfat. (Fig. 12 and Table X) Cream testing 30 per cent or less included 18 per cent of the deliveries, 17.3 per cent of the cream, and 12.9 per cent of the butterfat; while 44.6 per cent of the deliveries, 44.6 per cent of the cream, and 37.9 per cent of the butterfat represented cream testing 35 per cent or less.

Creamery operators consider cream testing from 35 to 40 per cent most desirable for churning. Lower testing cream necessitates unnecessary additional shipping expense and is more difficult to keep sweet. Cream testing above 40 per cent may be shipped at less cost per pound of fat and will keep better, but accurate sampling for testing is more difficult, and the cream is not so desirable for churning. Since one-third of the butterfat delivered represented cream testing from 35 to 40 per cent and only 13 per cent tested less than 30 per cent, per cent of fat does not seem to be a serious problem from the standpoint of quality cream.

Classification of all Saturday deliveries according to size, in pounds of cream, showed no significant differences in the test of cream in different sizes of deliveries. (Table XI) This is in harmony with the averages for stations classified according to volume of butterfat. (Table V) However, variation within each class, as measured by the standard deviation, showed a tendency to become less as the size of the delivery increased which is probably because small deliveries represent producers that are giving less consideration to their dairy enterprise on account of small volume.

Frequency of Deliveries by Patrons to Stations

Data for study of frequency of deliveries per week per patron were obtained by classifying the Saturday patrons of the week involved according to number of deliveries made during that week.

TABLE XI
Patrons' Deliveries Classified According to Size, Number, and Volume

	Size of Delivery in Pounds of Cream											Total or Average
	9 and Less	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 & Over	
Pounds of Cream	1870	9960	14625	19110	17505	6930	7995	8025	9095	855	6230	102,200
Number of Deliveries	374	664	580	546	389	126	123	107	107	9	47	3,072
Per cent of Total Deliveries	12.2	21.6	18.9	17.8	12.6	4.1	4.0	3.5	2.5	0.3	1.5	100.0
Pounds of Butterfat	686	3580	5240	7100	6445	2557	2857	2913	3202	306	2257	37,143
Per cent of Total Butterfat	1.8	9.6	14.1	19.1	17.3	6.8	7.6	7.8	8.6	0.8	6.0	100.0
Average Test of Cream	36.6	35.9	35.8	37.1	36.8	36.9	35.7	36.3	35.2	35.7	36.2	36.3
Standard Deviation of Tests of Cream (1)	7.14 ±.262	6.83 ±.187	6.60 ±.194	5.90 ±.178	5.58 ±.200	6.62 ±.479	5.78 ±.370	6.23 ±.431	5.82 ±.401	5.13 ±.493	(2)	6.45 ±.082

(1) Standard error has been calculated.

(2) Combined with deliveries of 90-99 pounds.

Operators' estimates on all patrons (not Saturday only) for frequency of deliveries were obtained as a check for comparison with Saturday patrons, and the result seemed in close harmony. (Fig. 13 and Table XII). Discussion of frequency of delivery is limited to Saturday patrons only. These represented 3,072 patrons with 4,450 deliveries per week or an average of one and one-half deliveries per week. Once a week deliveries represented 52 per cent of all patrons and 55 per cent of the butterfat, and twice a week deliveries represented 24 per cent of the patrons and 25 per cent of the butterfat, making a total of 76 per cent of the patrons and 80 per cent of the butterfat in the classes of twice a week deliveries or less. If miscellaneous patrons, that is, those delivering to the respective stations less frequently than once a week, are included, then 91 per cent of the patrons and 92 per cent of the butterfat would be represented by deliveries not oftener than twice a week. Three deliveries per

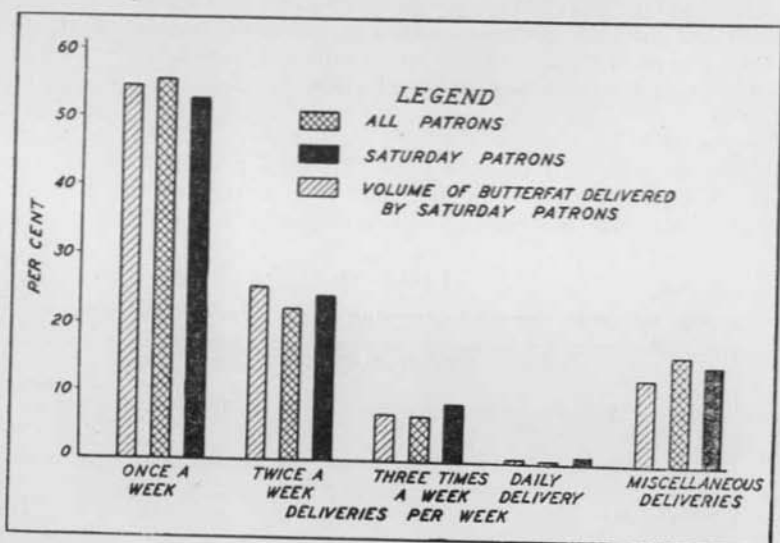


Fig. 13—Patrons grouped according to frequency of delivery per week, showing relation to number of patrons and volume of butterfat. Also comparison of Saturday patrons with estimate of all patrons.

week represented only 8 per cent of the patrons and 7 per cent of the butterfat, while daily deliveries represented just 0.9 of one per cent of the patrons and 0.7 of one per cent of the butterfat.

Classification of all deliveries according to frequency showed no significant differences in the average test of all the cream in the different classes. (Table XII) The small variation shown in the standard deviations of the tests of the cream in the various classes supports this conclusion.

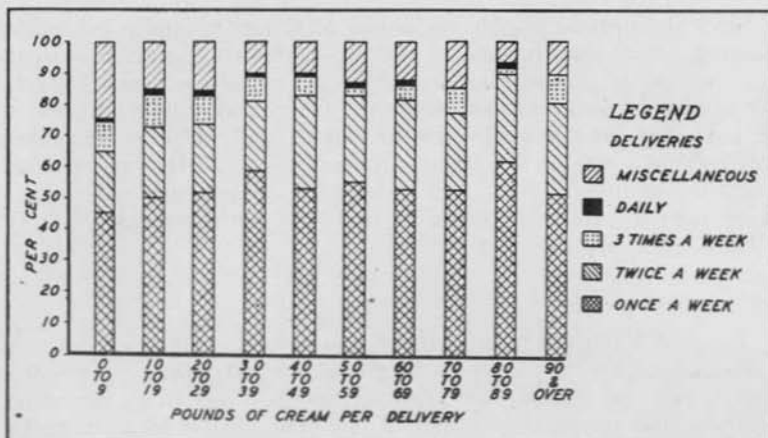


Fig. 14—Relation of size and frequency of deliveries of Saturday patrons.

No relationship was found between frequency of delivery and cows per square mile or the average number of cows per farm. Number of cows per square mile and per farm was obtained from the 1930 census report. Reports used were based on county units and hence their adequacy in these two comparisons is questionable.

TABLE XII
Patrons' Deliveries Classified According to Frequency of Delivery Per Week

	Frequency of Patrons' Delivery					Total or Average
	Once a Week	Twice a Week	Three a Week	Daily	Miscel- laneous	
Number of Saturday Deliveries	1,611	730	255	27	449	3,072
Per cent of Saturday Deliveries	52.4	23.8	8.3	0.9	14.6	100.0
Total Pounds of Butterfat Delivered on Saturday	20,397	9,279	2,552	270	4,648	37,146
Per cent of Total Butterfat Delivered on Saturday	54.9	25.0	6.9	0.7	12.5	100.0
Total Pounds of Cream Delivered on Saturday	55,439	25,823	7,282	775	12,881	102,200
Average Test of Cream Delivered on Saturday	36.7	35.9	35.1	34.8	36.1	36.3
Standard Deviation of Tests of Cream	6.59	5.88	6.26	7.07	6.67	6.45
Estimate of All Patrons for Week	3,699	1,453	453	36	1,044	6,685
Per cent of Estimate of All Patrons for Week	55.3	31.8	6.8	0.5	15.6	100.0

Since promptness of delivery is one of the most important factors affecting cream quality, one of the most important findings in this investigation is the preponderance of both patrons and butterfat represented by deliveries not more than twice a week, with more than one-half only once a week. If these results are typical, frequency of delivery is a very serious handicap in creamery butter improvement programs, because of the large volume of cream collected through cream stations, about 25 per cent in Idaho and about 33 per cent in the United States.

Sizes of Deliveries

The 3,072 patrons averaged 33 pounds of cream per delivery, or about 4 gallons of cream, or 12 pounds of butterfat. (*Table XI*) Twelve per cent of the deliveries represented less than 10 pounds of cream and included less than 2 per cent of the total butterfat. Deliveries of less than 20 pounds of cream represented 34 per cent of all deliveries and 11 per cent of the butterfat; while deliveries of less than 30 pounds of cream, less than 4 gallons, represented 53 per cent of all deliveries and 26 per cent of the butterfat. Seventy-one per cent of all deliveries and 45 per cent of the butterfat were represented by deliveries of less than 40 pounds of cream, while 83 per cent of all deliveries and 62 per cent of the butterfat were represented by deliveries of less than 50 pounds of cream, about 6 gallons. Only 4 per cent of the deliveries and 15 per cent of the butterfat represented deliveries of over 10 gallons of cream. No relation seemed to exist between size of deliveries and frequency of deliveries. (*Fig. 14*).

Finding that four gallons of cream represented the average delivery, over one-half of the deliveries being less than that amount, suggests why 80 per cent of the total butterfat was delivered to the stations twice a week or less. More frequent delivery in still smaller lots cannot be expected except in the large deliveries representing 20 to 25 per cent of the butterfat.

The average of all deliveries was 12 pounds of butterfat, equivalent to about 300 pounds of milk per week, or 43 pounds of milk daily, equal to the milk from three low producing cows. Not only were more than one-half of the deliveries less than 30 pounds of cream but the average of this large group of small deliveries was only 16 pounds of cream or 5.9 pounds of fat. This is equivalent to 148 pounds of milk per week, or 21 pounds of milk per day, about equal to the production from one and one-half low producing cows. Although these estimates do not include milk used in home consumption, it is evident that cream stations in Idaho are furnishing a market primarily to a class of producers with small volume production and with whom dairying probably is very much of a side line. These facts substantiate the previous conclusions to the effect that more frequent deliveries in the majority of instances cannot be expected even though better quality of cream would be obtained.

Summary and Conclusions

Importance of cream stations as a marketing agency for butterfat is indicated by their number and the volume of butterfat handled. One-fourth of the butterfat manufactured into butter in Idaho in 1929 was purchased through 178 cream stations. In the same year about one-third of the butterfat used for butter manufacture in the United States was marketed through 25,927 cream stations. The two important bases for comparison of the cream station system with other methods of cream collection are collection cost per pound of fat and quality of cream obtained.

Reports from 168 of the 178 stations operated in Idaho in 1929 showed that stations with an annual volume of less than 30,000 pounds of butterfat represented 61 per cent of the stations, but only 23 per cent of the butterfat was marketed through this agency. Fifty-six of the 168 stations did not operate the entire year. In 40 of the 56, the annual volume was less than 10,000 pounds of butterfat. No important difference in the seasonal trend existed among stations grouped according to yearly volume.

Detailed information on 122 stations was obtained by personal visitation during 1930. Distance from the creamery to which each of these stations shipped averaged 105 miles. Seventy-five per cent of the stations, representing 70 per cent of the butterfat, were within 150 miles of the creamery. Distance appears to be a limiting factor in cream collection through the cream station system, primarily because shipping costs increase with the increase in distance.

Of the 122 stations, 56 were in towns with single stations, 30 in towns with 2 each, 12 in towns with 3 each, and 24 in towns with 4 or more stations. Number of stations per town showed no relation to volume per station. Although some economies might have resulted from the elimination of some stations, efficiency of the cream station system was found to be as much of a problem in towns with single stations as in towns with more.

In 57 per cent of the 122 stations cream was shipped daily to the creamery. Those stations shipping three times per week or oftener represented 87 per cent of the stations and 94 per cent of the butterfat. Frequency of shipment from station to creamery did not appear to be much of a problem in delivery of quality cream to the creamery.

Twenty-two, or 18 per cent, of the stations reported cream grading, but data of the week studied showed only 8 stations with second grade cream. Differential in price was made by deducting from the standard price. Usual deduction was three cents per pound of fat.

Average weekly volume of butterfat per station was 1,011 pounds. Stations with less than 1,000 pounds of butterfat per week represented over two-thirds of the stations, but only one-third of the volume. Justification for the operation of such a large number of small stations considering the amount of butterfat collected by each might be questioned.

The 122 stations had 7,148 patrons, an average of 59 per station. Since average volume per station did not seem to have much relationship to number of patrons per station, and since four-fifths of the stations had less than 80 patrons, with an average of only 39, too few patrons seems to be the reason for so many stations with small volume.

Average weekly volume per patron was 17 pounds of butterfat, about 6.5 gallons of cream. Two-thirds of the stations, representing one-half of the total butterfat, averaged 13.5 pounds of fat, or 5 gallons of cream weekly per patron. The majority of the stations appear to be serving a class of patrons with very small volume. Whether or not these patrons could be as effectively served by any other cream marketing system does not obviate the problem of economical operation of stations.

In 105 of the 122 stations the creamery paid the operator a commission per pound of butterfat, in 16 the operator received some salary, and one station was privately owned. Various combinations of these systems with station expense contributions existed. In larger stations the creamery usually paid the operator a salary, which was to its advantage. Method of payment seems to have been based mostly on individual circumstances, local conditions, or bargaining power, rather than on policy of buyer or volume per station.

Information obtained from 75 of the 122 stations showed that the weighted average commission rate per pound of fat was 2.23 cents. When the operator paid all expenses except supplies the weighted average commission rate was 2.86 cents, being 3 cents in all but three stations. When the creamery paid all costs in addition to salary or commission the weighted average commission rate was 1.63 cents. In 8 stations in which both creamery and operator paid part of the expenses the weighted average commission rate was 2.96 cents. Smaller stations could probably not be feasibly operated on any basis other than commission.

Average monthly return per operator in the 75 stations was \$101.35. Eighteen operators had an income of \$50 per month, 43 less than \$100, 20 \$100 to \$150, and 12 above \$150. Small deliveries and too few patrons, resulting in small volume per station and in turn small income per operator, probably account for the number of stations operating only part of the year.

Detailed operating costs for the entire year 1929 were studied in 37 stations which had a total yearly volume of 1,361,000 pounds of fat. The weighted average commission rate was 2.78 cents per pound of fat. Shipping costs represented a weighted average of 1.77 cents per pound of fat, while "other costs" represented a weighted average of 0.72 of one cent. Total procurement cost per pound of fat represented a weighted average of 5.27 cents. Total procurement costs by stations averaged 5.82 cents, of which 1.81 cents were shipping costs and 1.06 cents were "other costs." "Other costs" were most variable. There seemed to be a tendency toward lower procurement cost with increasing volume.

The weighted average of station shortage on 1,360,963 pounds of fat was 0.5 of one per cent. Shortage by stations represented an average (median) of 0.7 of one per cent but varied greatly.

The average test of 341,845 pounds of cream was 36.1 per cent making a total of 123,322 pounds of butterfat delivered to the 122 stations. Average test of cream showed no significant relation to volume per station. Since only 13 per cent of the cream tested less than 30 per cent, test does not seem to be a serious problem from the standpoint of quality cream.

Patrons delivering once a week represented 52 per cent of the patrons and 55 per cent of the butterfat, while deliveries made twice a week or less included 76 per cent of the patrons and 80 per cent of the butterfat. If miscellaneous patrons are included, twice a week deliveries or less would represent 91 percent of the total patrons and 92 per cent of the total deliveries. Since promptness of delivery is one of the most important factors affecting cream quality, one of the most important findings in this investigation is the great preponderance of both patrons and butterfat represented by deliveries not more than twice a week, with more than one-half only once a week.

Deliveries averaged 33 pounds of cream, about 4 gallons of cream or 12 pounds of butterfat. Eighty-three per cent of all deliveries, representing 62 per cent of the total fat, were less than 50 pounds of cream, about 6 gallons. More frequent deliveries, in still smaller lots, may hardly be expected.

The average of all patrons' deliveries was equivalent to about 300 pounds of milk per week, or 43 pounds daily. This is equal to the production of three low producing cows and indicates that, in Idaho, cream stations are furnishing a market primarily to a class of producers with small volume production and with whom dairying probably is very much of a side line. This further emphasizes the fact that more frequent deliveries in the majority of instances can not be expected even though better quality of cream would be obtained.

