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# COSTS *and* RETURNS *to* ALABAMA MILK DISTRIBUTORS

AGRICULTURAL EXPERIMENT STATION
*of the* ALABAMA POLYTECHNIC INSTITUTE
E. V. Smith, *Director* Auburn, Alabama

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# COSTS *and* RETURNS *to* ALABAMA MILK DISTRIBUTORS*

SHELDON W. WILLIAMS, *Agricultural Economist*°°

BOTTLED WHOLE MILK is considered an essential food for children and a highly important food for adults. It constitutes a major item of expense in the food budgets of a large share of the consuming public. Consequently, living expenses of many families are as much affected by the price of milk as by the price of any other food item.

In Alabama, the State Milk Control Board[1] establishes both producer and consumer prices for milk in most of the important markets of the State. In carrying out this responsibility, the Board is directed by law to "investigate what are reasonable costs and charges for producing, handling, bottling, packing, distributing, processing, and marketing of milk . . . and what prices are reasonable for milk produced, marketed, and sold in the several localities of the State, and what prices will . . . best protect the milk industry within the State, and insure a sufficient quantity of pure and wholesome milk to the inhabitants of the State, and be most in the public interest" *(1)*. At the request of the Board, a study previously has been made of the cost of producing fluid milk in Alabama *(2)*. The information reported in this publication is based on the results of a companion study covering the operations of milk distributors operating in Alabama.

* This study was financed with funds made available by the Research and Marketing Act of 1946 and with State research funds.

** Resigned.

[1] The State Milk Control Board in Alabama is empowered to regulate milk prices, define fair trade practices, and otherwise to stabilize the State's market milk industry. The Board consists of five members who are appointed by the Governor with legislative approval. The members of the Board are chosen from and are representatives of producers, producer-distributors, distributors, consumers, and the public at large.

The study was made with several purposes in mind:

(1) To provide information about the expenses, receipts, and net incomes of Alabama milk distributors,

(2) To examine reasons for variations in expenses and in net incomes among distributors and among markets, and

(3) To bring to light possible means of reducing costs of processing and distributing bottled milk products.

Data for 1948 were obtained from 35 milk distributors. For 32 of these distributors, information was for the calendar year. For the other three, information was for fiscal years that ended 1 or 2 months after December 31, 1948.[2]

To get more nearly current data on expenses and net incomes, similar though somewhat less extensive information covering the first 6 months of 1949 was obtained from 20 of the 35 distributors. In large part, the 1949 data supported conclusions generally similar to those drawn from the 1948 data. For that reason, the 1949 data are presented only where they differ significantly from the 1948 data or supplement it in an important way.

The information was drawn mainly from accounting records, supplementary reports of purchases and sales of milk, income tax returns, and similar records of milk distributors. Estimates of some expense items were needed in the case of a few small distributors, and for a number of operations in which other enterprises were closely associated with processing and distribution of milk. For lack of summarized physical records, quantities of bottled items sold by container sizes and sales channels were usually estimated. Usually, however, estimates that had to be made of physical quantities of items sold, and their allocation among products, container sizes, and sales channels, were based on analyses of delivery-route loadout sheets and platform sales tickets in sample weeks of the period. It was often necessary, however, to accept estimates for a few items of physical information, such as the number of customers served on routes.

To provide uniformity and comparability in the data, expenses were reclassified when necessary into standard groupings. For the same reasons, the following adjustments were made in financial data of individual plants where needed:

[2] In these cases, prices paid and received for milk were the same in plants with fiscal years ending on January 31 or February 28, 1949, as they would have been if the fiscal year had ended on December 31, 1948.

(1) The receipts, expenses, capital investments, etc., of milk production, processing and distribution of ice cream, and any non-dairy enterprises operated in conjunction with the milk processing and distribution business were eliminated. Inclusion of these other enterprises would have obscured the costs and returns of milk processing and distribution, toward which the study was directed.

(2) Regular milk supplies from distributors' own herds, from members of cooperatively-owned milk plants, and from out-of-state producers, were charged to businesses at Milk Control Board prices for that market if they had been paid for at prices that differed materially from the prices established by the Board.

(3) Bulk milk and/or cream sold to other plants or used in making ice cream were credited to product costs rather than being included in sales.

(4) Interest and dividend payments and income taxes were excluded from operating expenses.

(5) Charges were included for the labor of unpaid plant owners and members of their families who worked in the business. These charges were based on estimated costs of the services these persons rendered.

(6) Net sales were adjusted to eliminate returns and allowances, and the sales value of individual products were reduced proportionately.[3]

## DESCRIPTION of OPERATIONS STUDIED

### Location and Sample

The study included one or more distributors in each market regulated by the Milk Control Board in 1948 except the Phenix City and Tuskegee-Union Springs markets (Figure 1). The cities represented were well scattered over the State. They included all Alabama markets that had 1950 populations, including suburbs, of 35,000 or more.

Data were obtained from each milk distributor in the surveyed markets from whom useable information about operations in 1948 was available. In the markets studied, seven distributor

[3] The books of about a fifth of the distributors showed items that were classified as returns and allowances. These were reported to include losses and shortages, adjustments on bills, credits on returned merchandise, etc. They were deducted to make dollar sales of these distributors comparable with those of distributors who deducted such items directly from receipts. Returns and allowances in no case exceeded a fraction of a cent per dollar of sales.

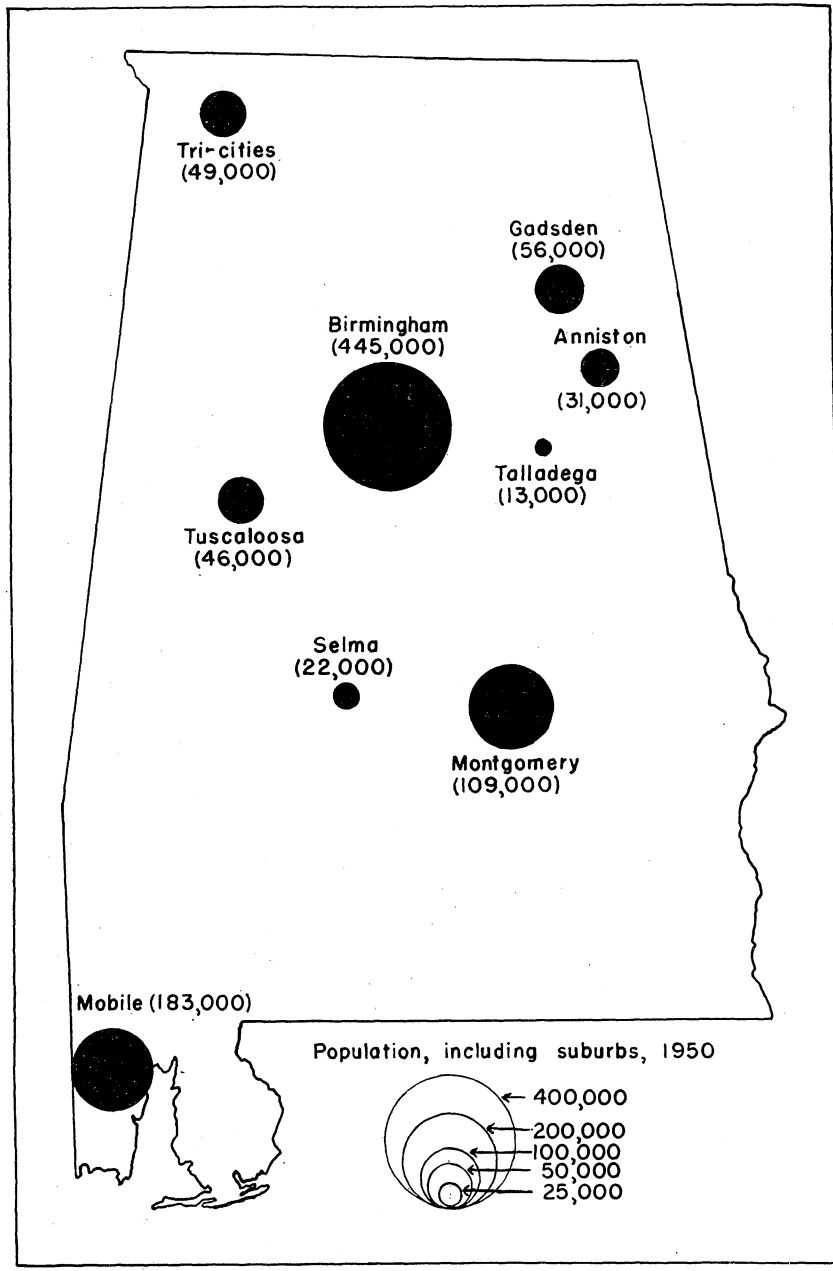


**FIGURE 1. Markets, by relative size, in which milk distributor operations were studied in Alabama, 1948 and 1949.**

operations, as defined in this report (p. 63), were not included because factors such as changes in ownership and management of the plant, going out of business, inadequate records, or lack of cooperation, made it impossible to obtain needed information from operators of these plants. Most of the operations that were not studied were small ones.

Distributors included in the survey handled most of the whole milk bottled in a large share of the markets studied, and practically three-fifths of the total amount bottled in the State in 1948 (Table 1). Among the three largest markets in the State, the proportion of milk handled by distributors included in the study ranged from a high of 90 per cent in Birmingham to a low of 54 per cent in Mobile. The share of all buttermilk handled by distributors included in the study was somewhat higher than the share of whole milk.

TABLE 1. NUMBER OF DISTRIBUTOR OPERATIONS STUDIED IN SPECIFIED MARKETS IN 1948 AND 1949, AND APPROXIMATE SHARE OF WHOLE MILK AND BUTTERMILK BOTTLED IN THOSE MARKETS IN 1948 HANDLED BY DISTRIBUTORS IN THE STUDY, ALABAMA

| Market | Distributor operations studied | | Approximate total quantity bottled per day in the market area by all distributors, 1948[1] | | Proportion handled by distributors studied, 1948 | |
|---|---|---|---|---|---|---|
| | 1948 | 1949 | Whole milk | Buttermilk | Whole milk | Buttermilk |
| | *Number* | *Number* | *Gallons* | *Gallons* | *Per cent* | *Per cent* |
| Birmingham | 10 | 9 | 22,000 | 4,575 | 90 | 93 |
| Mobile | 9 | 2 | 10,200 | 1,200 | 54 | 60 |
| Montgomery | 3 | 3 | 7,600 | 1,450 | 73 | 80 |
| Gadsden | 2 | 1 | [2] | [2] | [2] | [2] |
| Tuscaloosa | 3 | 0 | 3,800 | 800 | 96 | 99 |
| Tri-Cities[3] | 3 | 1 | 2,200 | 350 | 86 | 92 |
| Anniston | 3 | 2 | 2,800 | 775 | 87 | 88 |
| Selma | 1 | 1 | [2] | [2] | [2] | [2] |
| Talladega | 1 | 1 | [2] | [2] | [2] | [2] |
| STATE | 35 | 20 | 75,000 | 14,000 | 59 | 64 |

[1] Unpublished data, Ala. Agr. Expt. Sta. Estimates do not represent sales of bottled milk in these markets because they have not been adjusted for shipments of bottled milk into and out of the market.
[2] Withheld to preserve confidential information.
[3] Florence, Sheffield, and Tuscumbia.

## Ownership *and* Associated Enterprises

Twenty-five of the 35 operations studied were privately owned by individuals or groups of individuals who did not operate other milk plants. Of the remainder, three were operated by regional

dairy chains and three by operators who owned more than one plant. Three of the other four plants were operated by bona fide cooperatives and one was owned by a group of farmers who did not operate in every detail as a cooperative.

Among the 25 independent plant operators, 16 owned dairy herds that produced part of the milk they processed. While a few of these dairy herds were independent operations, most of them were under the same management as the plants. In these cases, expenses of the two enterprises were commonly intermingled in accounting records.

Another enterprise commonly associated with the milk business was the production of frozen dairy products, or mix for these products. In 1948, frozen products or mix were made by 11 of the plants in the study. In a few of these cases, frozen products were processed by separate departments of the business, but this was not the general rule.

Ice was produced for sale at two plants. However, milk production and the making of frozen dairy products or mix were the only jointly operated enterprises that presented serious problems in the allocation of expenses.

## Capital

In 1948, the average amount of capital (or assets) at the beginning and end of the year was $118,000 per distributor for the 34 distributors from whom information was obtained (Table 2). About five-eighths of this amount, or $75,000 per distributor, was in real estate and in plant, office, and delivery equipment. Accounts and notes receivable was another important item, constituting nearly a fifth of all capital.[4]

Among the 20 distributors from whom data were obtained for both 1948 and the first half of 1949, total capital averaged $144,000 per plant in 1948 and $171,000 per plant in January-June 1949. The larger investments of the 20 distributors than of the 34 distributors reflected larger volume per plant and also somewhat heavier investments in relation to volume. The increase in capital among these plants between 1948 and 1949 was mainly in real estate and plant equipment. Chief reasons for the increase in these items were that one distributor moved into a new plant while another purchased facilities previously rented.

[4] In part, credit extended to customers was compensated by amounts payable to producers. At any given time, distributors owed producers for from 5 to 20 days' milk, the exact amount depending on the day of the month.

TABLE 2. AVERAGE AMOUNT OF CAPITAL PER PLANT AND PER 1,000 QUARTS-EQUIVALENT, 34 ALABAMA MILK DISTRIBUTORS, 1948, AND 20 ALABAMA MILK DISTRIBUTORS, 1948, AND JANUARY-JUNE, 1949

| Item | 34 distributors, 1948[1] | | 20 distributors | | | |
|---|---|---|---|---|---|---|
| | | | 1948 | | Jan.-June, 1949 | |
| | Average amount per plant | Amount per 1,000 quarts-equivalent | Average amount per plant | Amount per 1,000 quarts-equivalent[2] | Average amount per plant | Amount per 1,000 quarts-equivalent[2] |
| | *1,000 dollars* | *Dollars* | *1,000 dollars* | *Dollars* | *1,000 dollars* | *Dollars* |
| Cash | 12 | 4.04 | 14 | 4.06 | 15 | 4.06 |
| Accounts and notes receivable | 21 | 6.97 | 26 | 7.71 | 26 | 7.15 |
| Inventory, product and supplies | 7 | 2.25 | 10 | 2.95 | 11 | 2.88 |
| Other current assets | 2 | .67 | 2 | .63 | 5 | 1.25 |
| Real estate | 29 | 9.33 | 40 | 11.87 | 51 | 13.66 |
| Plant and office equipment | 32 | 10.40 | 34 | 10.31 | 42 | 11.30 |
| Delivery equipment | 14 | 4.61 | 17 | 5.12 | 19 | 5.01 |
| Other assets | 1 | .32 | 1 | .39 | 2 | .66 |
| TOTAL | 118 | 38.59 | 144 | 43.04 | 171 | 45.97 |

[1] Total capital for 1948 not obtained from one distributor.
[2] Annual basis. Quarts-equivalent are average of quarts-equivalent processed and quarts-equivalent distributed. The term "quarts-equivalent" is defined on page 63; method of computation is described on pages 68-70.

Some increase in investments was to be expected. In 1948, distributors were using considerable real estate and equipment that had been purchased at prewar prices. Accordingly, replacement of facilities at post-war prices generally raised capital investments.

## Products Handled

Whole milk comprised about four-fifths of the quantity and value of all products sold by milk distributors (Table 3).[5] Approximately a fourth of the whole milk was homogenized, of which a large part was reinforced with vitamin D. The average of the reported butterfat tests of whole milk (weighted by volume of sales) was 3.9 for standard (creamline) milk and 3.7 for homogenized.

By far the most important of the other products handled was plain buttermilk, which accounted for nearly 16 per cent of the

[5] Products sold refer only to items delivered on routes or sold at the plant for regular distribution (p. 63).

TABLE 3. AVERAGE QUANTITY AND VALUE OF PRODUCTS SOLD PER PLANT, PROPORTION OF DISTRIBUTORS SELLING EACH PRODUCT, AND AVERAGE BUTTERFAT TEST, 35 ALABAMA MILK DISTRIBUTORS, 1948

| Product | Quantity sold | | Value | | Proportion of distributors selling | Average butterfat test[2] |
|---|---|---|---|---|---|---|
| | Average per plant (based on all plants) | Proportion of total quantity[1] | Average per plant (based on all plants) | Proportion of net sales | | |
| | *1,000 gallons* | *Per cent* | *1,000 dollars* | *Per cent* | *Per cent* | *Per cent* |
| Whole milk: | | | | | | |
| Standard[3] | 339.9 | 56.8 | 296.3 | 58.2 | 97 | 3.9 |
| Homogenized[3] | 127.9 | 21.4 | 121.3 | 23.8 | 71 | 3.7 |
| All whole milk | 467.8 | 78.2 | 417.6 | 82.0 | | 3.8 |
| Buttermilk: | | | | | | |
| Plain | 93.9 | 15.7 | 43.9 | 8.7 | 97 | .2 |
| Whole | 2.9 | .5 | 2.7 | .5 | 26 | 3.7 |
| All buttermilk | 96.8 | 16.2 | 46.6 | 9.2 | | |
| Chocolate drink | 17.5 | 2.9 | 15.9 | 3.1 | 89 | 1.5 |
| Skim milk | .1 | [4] | .1 | [4] | 23 | |
| All buttermilk, skim milk, chocolate drink | 114.4 | 19.1 | 62.6 | 12.3 | | |
| Table cream: | | | | | | |
| Coffee[5] | 4.7 | .8 | 13.6 | 2.6 | 97 | 20.3 |
| Whipping | 1.7 | .3 | 8.0 | 1.6 | 83 | 33.2 |
| All cream | 6.4 | 1.1 | 21.6 | 4.2 | | 23.7 |
| Other products: | | | | | | |
| Orange drink | 6.3 | 1.0 | 3.4 | .7 | 31 | |
| Egg nog | .3 | .1 | 1.1 | .2 | 31 | 13.0 |
| Cottage cheese | 1.6[1] | .3 | 1.4 | .3 | 37 | 2.7 |
| Butter | .4[1] | .1 | 1.0 | .2 | 34 | |
| Minor items[6] | .4[1] | .1 | .6 | .1 | | |
| All other products | 9.0 | 1.6 | 7.5 | 1.5 | | |
| ALL PRODUCTS | 597.6 | 100.0 | 509.3 | 100.0 | | |

[1] In terms of gallon-equivalents. Four pounds or 4 packages of cottage cheese, or 4 pounds of butter, were considered equivalent to 1 gallon of fluid products.
[2] Based on reports from 34 distributors.
[3] In a few cases, it was impossible to determine exactly how much homogenized milk was sold in pints and half-pints. This may have resulted in a slight understatement of sales of homogenized milk and an overstatement of sales of standard whole milk.
[4] Less than 0.05 per cent.
[5] Includes a small quantity of cereal cream.
[6] Straws, starter, goat's milk, American cheese, orange juice, ice cream mix.

quantity and 9 per cent of the value of all items sold. Chocolate drink comprised 3 per cent of sales.

The only other products handled by a large majority of distributors were coffee cream (and a small amount of cereal cream),

and whipping cream. Cream sales were small. In total, they comprised only 1 per cent of the volume of all products sold and 4 per cent of dollar sales.

A variety of other items were sold, though mainly by large distributors. Orange drink and whole buttermilk were the only other products that accounted for as much as 0.5 per cent of sales volume.

## Sales Channels

Wholesale sales accounted for 60 per cent of total sales volume.[6] Retail sales made up 32 per cent, and sales at the plant to independent distributors 8 per cent.

TABLE 4. PROPORTION OF TOTAL SALES VOLUME OF EACH OF SIX MAJOR PRODUCTS WHOLESALED, RETAILED, AND SOLD AT PLANTS TO SUBDEALERS, 35 ALABAMA MILK DISTRIBUTORS, 1948

| Product | Proportion of volume sold | | |
|---|---|---|---|
| | Wholesale | Retail | At plants to subdealers |
| | *Per cent* | *Per cent* | *Per cent* |
| Standard whole milk | 60 | 30 | 10 |
| Homogenized whole milk | 47 | 48 | 5 |
| Plain buttermilk | 74 | 18 | 8 |
| Chocolate drink | 63 | 32 | 5 |
| Coffee cream[1] | 76 | 21 | 3 |
| Whipping cream | 72 | 21 | 7 |

[1] Includes a small quantity of cereal cream.

Disregarding inter-plant sales, five distributors sold their products exclusively on wholesale routes, two sold entirely at the plant to subdealers, and one had retail routes only. All of the other 27 distributors had wholesale outlets and 25 of them operated retail routes, but only 13 sold at the plant to subdealers.

The respective proportions of total sales of each of the six leading products that were wholesaled (to stores, eating establishments, institutions, etc.), retailed, and sold at the plant to subdealers, are shown in Table 4. A more detailed analysis, indicating the quantity of each product disposed of in each size of container by channel of sales is given in Appendix Table 2.

[6] The percentage of sales at wholesale possibly is slightly understated and the percentage at retail slightly overstated. In a number of plants, it was necessary to use 1949 data in sales analyses. While distributors were questioned about changes from 1948 to 1949, little change was indicated. In some markets there has, however, been a gradual increase in percentage of retail sales during this period.

There was considerable variation among products in the share sold through a given channel, and especially in the comparative amounts sold at wholesale and at retail. Slightly less than half of the homogenized milk was sold at retail, but little more than a fifth of the cream and a sixth of the plain buttermilk. The products of which the largest proportions were sold at the plant to subdealers were standard whole milk, plain buttermilk, and whipping cream.

Retail sales were almost entirely in quarts except for cream, which was largely in half-pints. On wholesale routes, appreciable shares of whole milk and chocolate drink were sold in pints and even larger proportions in half-pints. Comparatively large wholesale sales of whole milk in half-pints reflected in part a considerable volume going to schools *(4)*.

**Product Costs**[7]

In 1948, distributors spent an average of about $370,000 per plant for fluid milk and other materials used in products sold (Table 5). More than 90 per cent of this expense was for fluid milk; no other item amounted to as much as 5 per cent of the total. Returns from bulk milk and cream sold or transferred to other operations and inventory increases were deducted from the costs of materials purchased. Net product cost, after allowing for these credits, was 89 per cent of gross purchases.

Supplies of fluid milk were larger relative to sales of bottled milk in the first 6 months of 1949 than in 1948. In consequence, a larger proportion of the milk purchased was disposed of in bulk to other plants. Also, relatively smaller purchases of powdered and condensed skim milk in 1949 probably were attributable mainly to this changed supply-sales relationship. In early 1948, a number of plants used considerable skim milk that had been reconstituted from condensed skim milk in standardizing whole milk. This practice was out of the picture in 1949 *(4)*. Likewise, the availability of more fresh skim milk to use in buttermilk and chocolate drink reduced the amount of powdered and condensed skim milk used in these items in 1949.

The butterfat obtained in fluid milk was practically all of that handled by milk distributors. The amount purchased in bottling cream was relatively small, and only about a fourth of the quantity disposed of in surplus and salvaged cream sold in bulk or used in other operations.

[7] This term is defined on page 63.

TABLE 5. ANALYSIS OF PRODUCT COSTS, 35 ALABAMA MILK DISTRIBUTORS, 1948, 20 ALABAMA MILK DISTRIBUTORS, JANUARY-JUNE, 1949

| Item | 35 distributors, 1948 | | | 20 distributors, Jan.-June, 1949 | | |
|---|---|---|---|---|---|---|
| | Average value per plant | Percentage of gross cost | Percentage of gross butterfat intake[1] | Average value per plant | Percentage of gross cost | Percentage of gross butterfat intake[2] |
| | *1,000 dollars* | *Per cent* | *Per cent* | *1,000 dollars* | *Per cent* | *Per cent* |
| Fluid milk: | | | | | | |
| Regular supplies | 310 | 84 | 91 | 209 | 88 | 92 |
| Supplementary | 29 | 8 | 7 | 11 | 5 | 4 |
| Total | 339 | 92 | 98 | 220 | 93 | 96 |
| Powdered and condensed skim milk[3] | 16 | 4 | 0 | 5 | 2 | 0 |
| Bottling cream | 6 | 2 | 2 | 5 | 2 | 4 |
| Other dairy products[4] | 3 | 1 | [6] | 2 | 1 | [6] |
| Other materials[5] | 5 | 1 | 0 | 5 | 2 | 0 |
| Gross purchases | 369 | 100 | 100 | 237 | 100 | 100 |
| **Less credits:** | | | | | | |
| Change in inventory | 1 | [6] | [6] | −1 | [6] | [6] |
| Whole and skim milk sold in bulk[7] | 19 | 5 | 5 | 24 | 10 | 12 |
| Cream sold in bulk[7] | 19 | 6 | 9 | 17 | 7 | 14 |
| Total credits | 39 | 11 | 14 | 40 | 17 | 26 |
| NET COST | 330 | 89 | 86 | 197 | 83 | 74 |

[1] Data for 32 plants for which butterfat content of milk supplies could be determined.
[2] Data for 19 plants for which butterfat content of milk supplies could be determined.
[3] Includes a small quantity of fresh skim milk.
[4] Bottled dairy products, butter, cottage cheese, American cheese, goat's milk.
[5] Chocolate powder or syrup, sugar, orange concentrate, vitamin D concentrate, egg nog mix, straws, buttermilk culture, etc.
[6] Less than 0.5 per cent.
[7] Includes materials transferred to ice cream department or other excluded operations.

## Operating Expenses

Data on operating expenses were obtained by items, using a common classification for all plants (Table 6). Operating expenses were grouped into three major classes: (1) plant and container expenses, (2) selling and delivery expenses, and (3) administrative and general expenses. Operating expenses as listed do not include interest or dividends on either owned or borrowed capital, allowances for shrinkage and loss of product,

TABLE 6. COMPOSITION OF OPERATING EXPENSES, 35 ALABAMA MILK DISTRIBUTORS, 1948, 20 ALABAMA MILK DISTRIBUTORS, JANUARY-JUNE, 1949

| Item | 35 distributors, 1948 | | | 20 distributors, Jan.-June, 1949 | | |
|---|---|---|---|---|---|---|
| | Average expense per plant | Percentage of total operating expense | Amount per quart equivalent[1] | Average expense per plant | Percentage of total operating expense | Amount per quart equivalent[1] |
| | *1,000 dollars* | *Per cent* | *Cents* | *1,000 dollars* | *Per cent* | *Cents* |
| **Plant and container expenses:** | | | | | | |
| Depreciation | 7 | 3.9 | 0.21 | 4 | 3.8 | 0.22 |
| Repairs | 5 | 3.1 | .17 | 2 | 2.4 | .13 |
| Property taxes | 1 | .6 | .04 | 1 | .7 | .04 |
| Insurance | 1 | .5 | .03 | 1 | .6 | .04 |
| Rent | 3 | 1.9 | .10 | 2 | 2.0 | .11 |
| Total[2] | 17 | 10.0 | .55 | 10 | 9.5 | .54 |
| Labor[3] | 29 | 17.4 | .94 | 18 | 16.7 | .96 |
| Containers | 19 | 11.4 | .62 | 13 | 11.6 | .66 |
| Fuel, electricity, water, ice | 7 | 4.5 | .24 | 4 | 3.9 | .22 |
| Plant supplies | 5 | 2.9 | .16 | 3 | 2.4 | .14 |
| Total | 77 | 46.2 | 2.51 | 48 | 44.1 | 2.52 |
| **Selling and delivery expenses:** | | | | | | |
| Labor[3] | 48 | 29.2 | 1.67 | 35 | 31.3 | 1.91 |
| Truck | 18 | 11.0 | .63 | 12 | 11.1 | .68 |
| Advertising and related items | 5 | 3.1 | .18 | 3 | 3.0 | .19 |
| Bad debts | 1 | .4 | .03 | 1 | .8 | .05 |
| Total | 72 | 43.7 | 2.51 | 51 | 46.2 | 2.83 |
| **Administrative and general expenses:** | | | | | | |
| Labor[3] | 11 | 6.6 | 0.37 | 6 | 5.6 | 0.33 |
| All other[4] | 6 | 3.5 | .20 | 5 | 4.1 | .24 |
| Total | 17 | 10.1 | .57 | 11 | 9.7 | .57 |
| TOTAL OPERATING EXPENSES | 166 | 100.0 | 5.59 | 110 | 100.0 | 5.92 |

[1] Plant and container expenses per quart-equivalent processed; selling and delivery expenses per quart-equivalent delivered. Administrative and general expenses divided by average of quarts-equivalent processed and quarts-equivalent delivered.

[2] Equipment costs are for all equipment except trucks.

[3] Includes payroll taxes and compensation insurance.

[4] Roughly a third of this item was for general office charges of three chain plants. General office charges of two of these plants were not analyzed in detail. While primarily expense for regional executives and other home office services, these general office charges may have included some expenses corresponding to those classified as plant and container expenses and/or selling and delivery expenses in independent plants.

compensation for risk, or income taxes. Thus, they do not represent all costs of distribution.

In 1948, plant and container expenses comprised nearly half of all operating expenses. The chief components, in order of importance, were labor costs, container expense, and building and equipment costs. These three categories accounted for about five-sixths of all plant and container costs and nearly two-fifths of all operating expenses.

Selling and delivery expenses were approximately as large in total as plant and container expenses.[8] Payments to routemen, supervisors, and any helpers hired by milk distributors made up about two-thirds of all selling and delivery costs and was the largest single item of operating expenses. Truck costs, which included depreciation and cash expenses, made up the bulk of remaining selling and delivery expenses.

Administrative and general expenses constituted about a tenth of all operating expenses. Labor costs, which covered both office help and general management, accounted for about two-thirds of the expense in this category.

Labor costs, including charges for the services of non-salaried owners, value of any unpaid family labor, payroll taxes, compensation insurance, and a few minor costs of similar nature, made up more than half of all operating expenses. All building and equipment costs, including those for trucks, were next in importance, and comprised about a fifth of the total. Container expense, the only other important item, comprised nearly an eighth of operating expenses.

In 1948, total operating expenses amounted to about 5.6 cents per wholesale quart-equivalent. Plant and container costs came to about 2.5 cents per quart-equivalent of product processed, and selling and delivery expenses came to an equal amount per wholesale quart-equivalent delivered on plants' own routes. The remaining 0.6 cent per quart-equivalent was administrative and general expenses.

Operating expenses in 1949 were similar in composition to those in 1948. However, selling and delivery costs were somewhat more per quart in 1949 than in 1948. The difference was

[8] Selling and delivery expenses, as classified, did not include any share of building costs, of the expense for ice and refrigeration, nor any charge for cold room and shipping labor. Those items were included in plant expenses. Except possibly for advertising, selling and delivery expenses as classified correspond to those borne by a subdealer or vendor who buys milk outright at the plant.

chiefly in delivery labor costs. Apparently it resulted mainly from the fact that plants in Birmingham, which had comparatively high delivery labor costs, comprised a proportionately larger share of the 1949 sample than of the 1948 sample (p. 7).

## Margins *and* Returns

In 1948, distributors paid out 64.8 cents per dollar of sales for milk and other raw materials (Table 7). Of the average gross margin of 35.2 cents per dollar of sales, 32.5 cents was used to meet operating expenses, leaving 2.7 cents as return for use of capital and for risk.[9] This net return averaged $14,000 per plant, or 0.5 cent per quart-equivalent of product handled.

In comparing 1948 returns with those in January-June 1949, it should be noted that prices of fluid and bottled milk were reduced in the middle of the later period in all markets regulated by the Milk Control Board. With these lower prices, average

TABLE 7. RECEIPTS, EXPENSES, AND RETURNS PER DOLLAR OF SALES AND PER QUART-EQUIVALENT, 35 ALABAMA MILK DISTRIBUTORS, 1948, AND 20 ALABAMA DISTRIBUTORS, 1948, AND JANUARY-JUNE, 1949

| Item | 35 distributors, 1948 | | 20 distributors | | | |
|---|---|---|---|---|---|---|
| | | | 1948 | | Jan.-June, 1949 | |
| | Amount per dollar of sales | Amount per quart-equiv-alent[1] | Amount per dollar of sales | Amount per quart-equiv-alent[1] | Amount per dollar of sales | Amount per quart-equiv-alent[1] |
| | *Cents* | *Cents* | *Cents* | *Cents* | *Cents* | *Cents* |
| Sales | 100.0 | 17.2 | 100.0 | 17.4 | 100.0 | 16.8 |
| Product cost | 64.8 | 11.1 | 64.1 | 11.1 | 63.1 | 10.6 |
| Gross margin | 35.2 | 6.1 | 35.9 | 6.3 | 36.9 | 6.2 |
| Operating expenses | 32.5 | 5.6 | 33.0 | 5.8 | 35.1 | 5.9 |
| Return for use of capital and for risk | 2.7 | .5 | 2.9 | .5 | 1.8 | .3 |
| Interest on total capital at 5 per cent[2] | 1.2[3] | .2[3] | 1.2 | .2 | 1.3 | .2 |
| Net profit above 5 per cent interest on total capital[2] | 1.4[3] | .2[3] | 1.7 | .3 | .5 | .1 |

[1] Average of quarts-equivalent processed and quarts-equivalent delivered.
[2] Interest charged at annual rate of 5 per cent.
[3] Data for 34 plants for which information on capital was obtained; consequently sum of these two items does not equal average return for use of capital and for risk for the 35 plants.

[9] For definitions of "gross margin" and "return for use of capital and for risk," see page 63.

gross margins per quart-equivalent were slightly narrower among the 20 plants studied in 1949 than among the same plants in 1948. Because operating expenses per quart-equivalent also were slightly higher in 1949, net return for use of capital and for risk was only three-fifths as much per quart-equivalent as it had been in 1948.

Net return for use of capital and for risk was expressed as a percentage of the average of total capital at the beginning and end of the year. On this basis, the rate of return in 1948 (for 34 plants for which total capital was determined) was 11 per cent. On an annual basis, the rate in 1949 was 7 per cent.

In 1948, net profit above 5 per cent interest on total capital (for the 34 plants for which total capital was determined) averaged 1.4 cents per dollar of sales, or 0.2 cent per quart-equivalent. In January-June 1949, the 20 plants for which information was obtained returned profits of 0.5 cent per dollar of sales, or 0.1 cent per quart-equivalent above interest on total capital at an annual rate of 5 per cent.

Two points in particular should be kept in mind in evaluating these returns. Nearly half the operations studied were losing money, and paid no income taxes. For distributors who made money, however — and this included all of the larger ones — net incomes were materially reduced by the payment of income taxes.[10]

In the second place, many items of capital and depreciation, as carried on the books of these milk distributors, were for capital goods that had been purchased at prewar price levels. As these goods, particularly buildings, are replaced at postwar price levels, capital, and expenses for capital items, will increase.

Caution should be used in comparing these returns with returns of milk distributors in other areas and with returns of other businesses. In 1948, the average profit margin of 18 dairy operations in the United States was reported to be 2.4 per cent of sales *(17)*. As nearly as can be determined, the corresponding rate of return for the 35 distributors was 2.6 per cent.[11] Com-

[10] It was impossible to obtain information about income taxes paid on net returns of a number of these operations. In most cases, the business was operated by an individual, by partners, or by a corporation whose tax rate was influenced by income available from other sources.

[11] Computed by subtracting interest payments from net return for use of capital and for risk, and dividing by net sales.

puted in the same manner, the rate of return for the 20 distributors in January through June, 1949, was 1.6 per cent. This compared with a return to 18 dairy corporations in the United States during the calendar year 1949 of 3.2 per cent. Reported return on net assets (net worth) of these 18 dairy corporations was 13.0 per cent in 1948 and 15.2 per cent in the calendar year 1949. The limited data available suggest that in 1948 the percentage return on net worth of the Alabama plants studied averaged somewhat higher than the 13.0 per cent return of the 18 dairy corporations. On the other hand, returns on net worth of the 20 distributors in the first half of 1949 almost certainly were below the 18-corporation average for the calendar year 1949.[12]

### Variations *in* Costs *and in* Returns

Both operating expenses per quart-equivalent and returns for use of capital and for risk per quart-equivalent varied widely (Figures 2 and 3). In 1948, operating expenses per quart-equivalent ranged from a low of 4.1 cents to a high of 7.9 cents. In three-fourths of the plants, however, values were between 4.4 and 6.3 cents. There was a similar variation in the 1949 data.

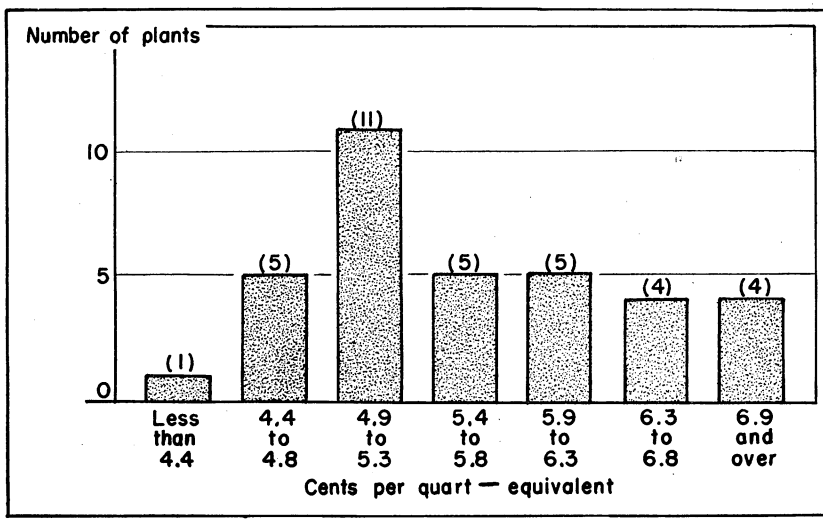


**FIGURE 2. Variation in operating expenses per quart-equivalent, 35 Alabama milk distributors, 1948.**

[12] Conclusions are based on data for 12 plants in 1948, and 9 plants in January-June 1949, for which net worth capital was determined.

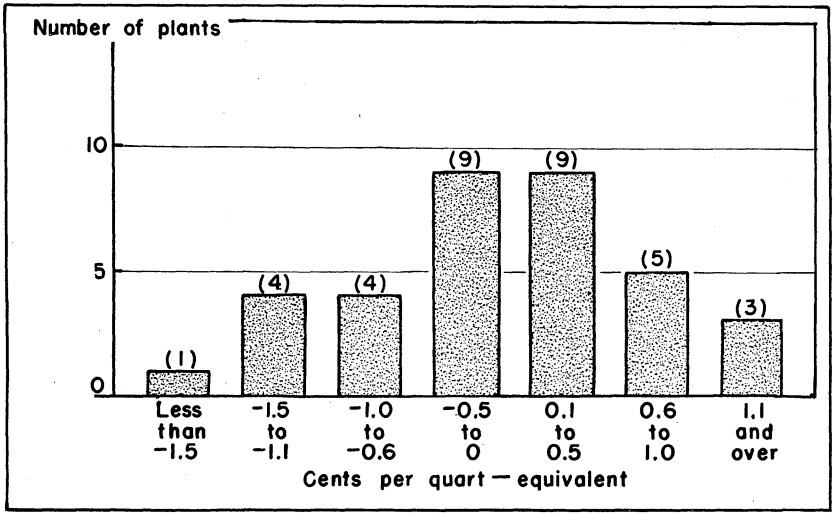


**FIGURE 3. Variation in net return for use of capital and for risk per quart-equivalent, 35 Alabama milk distributors, 1948.**

In 1948, net return for use of capital and for risk ranged mainly between a high of plus 1.3 cents per quart-equivalent and a low of minus 1.5 cents per quart-equivalent. Returns of about half the plants were in the range from plus 0.5 to minus 0.5 cent per quart-equivalent. In 1949, the range in returns was much the same as in 1948.

## Disposition of Sales Dollar

A summary of information on receipts, expenses, and returns emphasizes that nearly all the money taken in by these milk distributors was used in meeting expenses, leaving only a small part as return for use of capital and for risk (Figure 4). Product cost absorbed nearly two-thirds of each sales dollar, and cost of labor about one-sixth. Containers and truck expenses each amounted to slightly less than 4 per cent of sales. Expenses for buildings and other equipment comprised a little over 3 per cent, and all other operating expenses about 5 per cent. The amount left as return for capital and for risk (before income taxes) was 2.7 cents per dollar of sales in 1948 and 1.8 cents in January-June 1949. If a 5 per cent interest charge on total capital had been deducted from these returns, there would have been left as net profit about 1.5 cents per dollar of sales in 1948

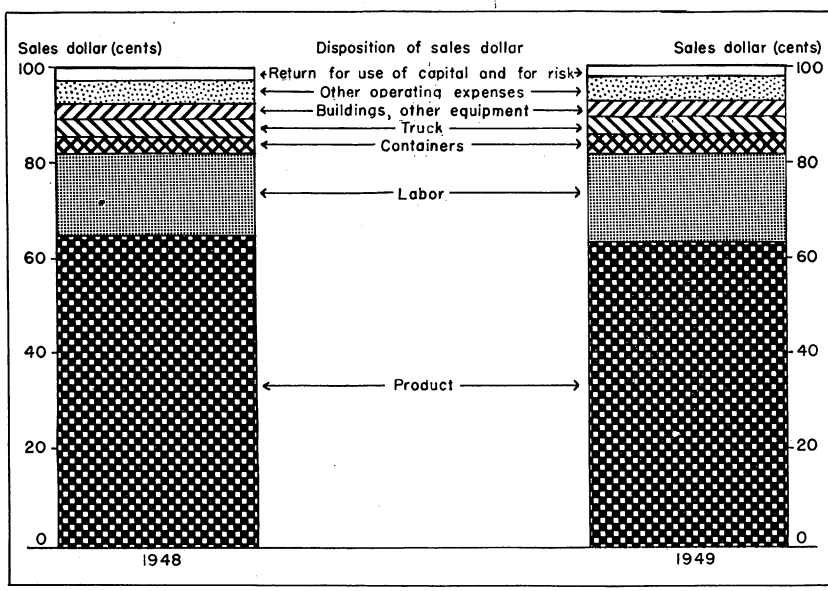


**FIGURE 4. Disposition of sales dollar, 35 Alabama milk distributors, 1948, 20 Alabama milk distributors, January-June, 1949.**

and 0.5 cent in 1949 before making any deductions for income taxes.

## GROSS MARGIN[13]

### Computed Margins *on* Standard Whole Milk *in* Quarts

Average prices per quart paid to producers for Class I milk, and wholesale and retail selling prices for milk in quart bottles in the markets included in the study in 1948, are shown in Table 8.[14] The producer price shown was that for Class I milk of the average butterfat content reported sold by distributors studied in specified markets. From these prices, the gross margin per quart on wholesale and doorstep sales, respectively, was computed. Margins in the Alabama markets were compared with averages of reported margins in cities of similar size in other states (3).

[13] This term is defined on page 63.

[14] Class I milk refers to fluid milk used in bottled whole milk and in those other bottled milk products for which farmers are paid the highest price returned for fluid milk other than premium grades.

TABLE 8. APPROXIMATE DEALERS' HANDLING MARGINS PER QUART ON STANDARD WHOLE MILK IN QUART BOTTLES IN ALABAMA CITIES AND IN OTHER CITIES, BY SIZE OF MARKET, 1948[1]

| Market | Amount per quart | | | | |
|---|---|---|---|---|---|
| | Paid to producers[2] | Wholesale price[3] | Margin on wholesale sales[3] | Doorstep price | Margin on doorstep sales |
| | *Cents* | *Cents* | *Cents* | *Cents* | *Cents* |
| **Cities of less than 75,000:**[4] | | | | | |
| Gadsden | 13.0 | 20.2 | 7.2 | 22.4 | 9.4 |
| Tuscaloosa | 13.9 | 20.5 | 6.6 | 23.0 | 9.1 |
| Tri-Cities[5] | 12.4 | 19.5 | 7.1 | 21.7 | 9.3 |
| Anniston | 13.8 | 20.5 | 6.7 | 23.0 | 9.2 |
| Selma and Talladega[6] | 14.2 | 20.2 | 6.0 | 22.7 | 8.5 |
| 18 cities outside Alabama | 11.2 | 17.7 | 6.5 | 20.0 | 8.8 |
| **Cities of 75,000-199,999:**[4] | | | | | |
| Mobile | 14.7 | 21.5 | 6.8 | 24.0 | 9.3 |
| Montgomery | 13.4 | 19.8 | 6.4 | 22.3 | 8.9 |
| 21 cities outside Alabama | 11.4 | 17.8 | 6.4 | 20.2 | 8.8 |
| **Cities of 200,000-499,999:**[4] | | | | | |
| Birmingham | 14.1 | 21.5 | 7.4 | 24.0 | 9.9 |
| 19 cities outside Alabama | 12.3 | 18.8 | 6.5 | 21.3 | 9.0 |

[1] Alabama prices from Milk Control Board orders. For prices that changed during the year, simple average of monthly prices was used. Prices in cities outside Alabama adapted from Herrmann, Louis F., and Baill, Mordecai. "Farm to Retail Margins for Fluid Milk." Bur. Agr. Econ., U. S. Dept. Agr. pp. 24-26. 1951.

[2] Price for milk used in bottled whole milk. For Alabama markets, price adjusted to average reported butterfat test of whole milk sold in quart bottles sold at regular prices. For other markets, "Prices were adjusted to the fat test of milk . . . most commonly sold in each market."

[3] Price and margin for sales on wholesale routes.

[4] Population in 1950.

[5] Florence, Sheffield, and Tuscumbia.

[6] Simple average of data for the two markets. Composite data presented to preserve confidential information.

Within Alabama, margins varied appreciably from market to market. These variations were due in part to differences in the spread established by prices set by the Milk Control Board and in part to variation among markets in the average butterfat content of the standard whole milk that was sold. Margins in most Alabama markets were somewhat wider than the average margins in cities of comparable size in other parts of the United States. The difference was greatest in Birmingham where margins on both wholesale and doorstep sales averaged 0.9 cent per quart above averages for other cities of comparable size. Margins were below national averages only in one or two of the smaller Ala-

bama markets. However, in Montgomery, Tuscaloosa, and Anniston, margins on wholesale sales were equal or close to averages for markets of similar size outside the State.

There are definite limitations to margin comparisons of this type. They give no indication of comparative margins on other products and container sizes, of the relative costs of processing and distributing milk in the various markets, nor of the differences among cities in the relative profitableness of surplus milk to distributors. For these reasons, it should not be inferred that milk processing and distribution is profitable in markets with wide margins, and vice versa. Unusual conditions may necessitate a wider than average margin in a given market.

### Plant-to-Plant Variations in Gross Margins

Among the 35 plants in the study, gross margins varied from a low of about 4.0 cents to a high of roughly 8.0 cents per quart-equivalent (Figure 5).[15] Gross margins of between 5.1 and 6.5 cents per quart-equivalent were most common. However, in a fifth of the plants, gross margins were less than 4.6 cents per quart-equivalent while in about a fourth of the plants they exceeded 6.0 cents per quart-equivalent.

This variation in gross margins accounted for a large part of the difference among plants in net returns (Table 9). In 1948,

TABLE 9. RELATION BETWEEN GROSS MARGIN PER QUART-EQUIVALENT AND RETURN FOR USE OF CAPITAL AND FOR RISK, 35 ALABAMA MILK DISTRIBUTORS, 1948

| Gross margin per quart-equivalent | | Number of plants | Return for use of capital and for risk | |
|---|---|---|---|---|
| Range | Average | | Per quart-equivalent | Percentage of plants with plus returns |
| *Cents* | *Cents* | *Number* | *Cents* | *Per cent* |
| Under 5.0 | 4.38 | 10 | –0.58 | 10 |
| 5.0-5.9 | 5.62 | 14 | .29 | 64 |
| 6.0 or more | 6.55 | 11 | .73 | 82 |
| ALL PLANTS | 6.05 | 35 | .47 | 54 |

[15] To exclude, insofar as practicable, the influence of such obvious factors as channel of sales, size of container, and type of product, on gross margin per unit, the unit in which gross margins are expressed is quarts-equivalent (Appendix, pp. 68). Variation in gross margin per quart-equivalent represents difference in the average spread available to milk distributors on units estimated to be approximately equal in handling cost. In computing quarts-equivalent, no adjustment was made for differences in costs between markets.

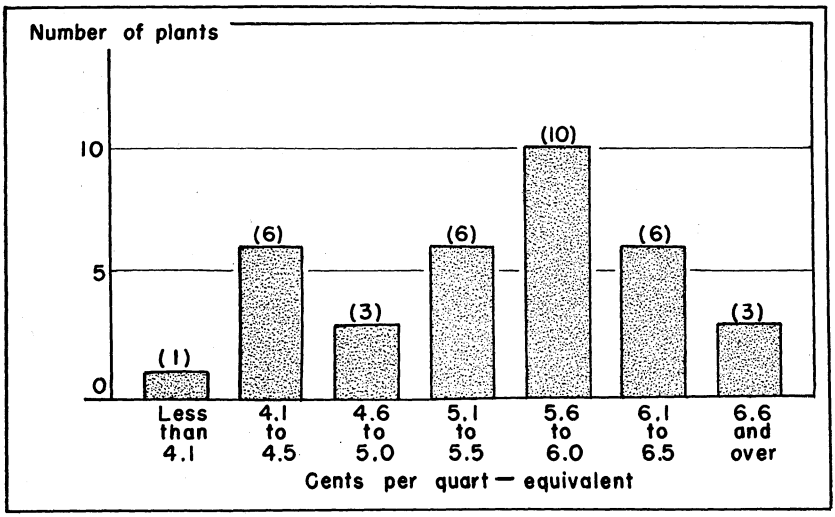


**FIGURE 5. Variation in gross margin per quart-equivalent, 35 Alabama milk distributors, 1948.**

11 distributors who had gross margins of 6.0 cents or more per quart-equivalent averaged 1.3 cents per quart-equivalent higher return for capital and risk than did 10 distributors who had gross margins of less than 5.0 cents per quart-equivalent. Eighty-two per cent of the distributors with wide margins made plus returns for use of capital and risk, but 90 per cent of the distributors with narrow margins had inadequate incomes to provide compensation for these items.

### Factors Affecting Gross Margins

A number of factors contributed to plant-to-plant differences in gross margins. One of the most important was differences in butterfat content of bottled whole milk. Among 34 distributors from whom information was obtained, reported butterfat tests of bottled whole milk sold in 1948 ranged from a low of 3.5 to a high of 4.6. Five of these 34 distributors reported average butterfat tests for bottled whole milk of less than 3.7, while 7 reported average tests of more than 4.2.

In 1948, the average value of surplus butterfat sold by Alabama milk distributors in sweet cream was about $1.00 per pound. At that price, 0.1 per cent butterfat in a quart of milk was worth slightly more than 0.2 cent (2.15 pounds $\times$ .001 $\times$ $1.00 = $0.00215). Thus, if other factors affecting gross margins

were constant, this would account, for example, for a spread of slightly over 1.0 cent per quart more on milk containing 3.7 per cent butterfat than on milk containing 4.2 per cent butterfat.

It has been shown in the preceding section that gross margins on standard whole milk differed appreciably among markets. Part of this variation in margins was due to differences between markets in butterfat content of bottled whole milk. Nevertheless, gross margins for whole milk of uniform fat content were about 1.0 cent per quart higher in Birmingham and Gadsden than in Montgomery. There was an even wider range between markets in gross margins on plain buttermilk (Table 10).

Besides these differences in margins on quarts of standard whole milk, there were noticeable differences among products in gross margins per quart of product handled. In quart bottles, homogenized milk reinforced with vitamin D generally sold for 1.0 cent more than standard whole milk.[16] Likewise, in most markets, gross margins per quart of product were wider on the

TABLE 10. ESTIMATED APPROXIMATE GROSS MARGINS PER QUART AT 1948 PRICES ON WHOLESALE SALES IN QUART BOTTLES OF STANDARD WHOLE MILK OF UNIFORM BUTTERFAT CONTENT, PLAIN BUTTERMILK, AND CHOCOLATE DRINK, BY MARKETS[1]

| Market | Estimated approximate gross margins per quart | | |
|---|---|---|---|
| | Whole milk | Buttermilk | Chocolate drink |
| | Containing 4.0 per cent butterfat | Containing no added butterfat | Of reported actual butterfat content |
| | *Cents* | *Cents* | *Cents* |
| Birmingham | 7.0 | 8.3 | 10.7 |
| Mobile | 6.7 | 8.3 | 11.5 |
| Montgomery | 6.1 | 6.9 | 9.6 |
| Gadsden | 7.1 | 7.3 | 12.0 |
| Tuscaloosa | 6.6 | 7.3 | 12.5 |
| Tri-Cities | 6.8 | 7.3 | 5.1 |
| Anniston | 6.7 | 7.3 | 7.9 |
| Selma and Talladega[2] | 6.5 | 7.3 | 8.6 |

[1] Margins for buttermilk and chocolate drink assume manufacture from powdered or condensed skim milk and surplus butterfat. Weighted average prices paid by disributors for non-fat solids in powdered and condensed skim milk and received by them for surplus butterfat were used in these computations. Cost of chocolate and sugar for chocolate drink was the average for 20 plants for which the information could be segregated. Prices used were 19.3 cents per pound for non-fat solids, $1.00 per pound for butterfat, and 3.0 cents per quart of chocolate drink for chocolate and sugar.

[2] Simple average of data for the two markets. Composite data presented to preserve confidential information.

[16] In one market, homogenized milk was not reinforced with vitamin D and sold at the same price as standard whole milk. Commonly, homogenized milk in pint and half-pint bottles did not sell at a premium.

two leading sideline products (plain buttermilk and chocolate drink) than they were on standard whole milk.

It was concluded from observations made in the course of this study that the vitamin D and extra processing costs involved in producing homogenized vitamin D milk cost less than 1.0 cent per quart. It appears, therefore, that homogenized vitamin D milk sold at premium prices, which was some two-thirds to three-fourths of all homogenized milk handled, was generally more profitable than standard whole milk.

On the other hand, determination of the relative profitableness of buttermilk and chocolate drink is too complicated to be attempted from information obtained in this study. Many Alabama distributors consider buttermilk and chocolate drink to be comparatively profitable products. At the same time, most distributors with whom the matter was discussed agreed that costs of processing and bottling these products exceeded costs for whole milk, though there was not a high degree of agreement as to the amount of difference. Consequently, even though cost differences were estimated in the computation of quarts-equivalent, these units were based on inadequate information to be used in a careful weighing of the added costs of handling these products against the wider margins per quart of product that generally existed on them.[17]

Question may be raised as to whether, within markets, there were differences between distributors in cost of purchased milk that contributed importantly to the variation in gross margins. While it was not determined in detail to what extent base prices were paid for milk that might legally have been classified as surplus, cursory examination suggested that differences in costs of milk were a minor factor in the variation in gross margins. Some distributors, especially those with small volume, apparently did pay base prices for limited quantities of milk that might have been purchased as surplus. More important, a few distributors purchased large quantities of emergency milk that cost them considerably more than local milk. Also, in a few cases, such items as heavy hauling costs borne by the distributor raised the cost of milk from regular sources appreciably above the market average. For the group of plants as a whole, however, the combined effect of these milk-cost factors on gross margins

[17] Analysis of the profitableness of buttermilk and chocolate drink was further complicated by the fact that distributors handling above-average proportions of these products commonly sold bottled milk of below-average butterfat content and handled proportionally large quantities of homogenized vitamin D milk.

seemingly was much less than the effect of differences in such factors as the butterfat content of bottled milk.

Discussion of this topic should not be closed without mention of product lost or unaccounted for. Practically none of these distributors kept records that showed how much milk was lost or unaccounted for in processing and distribution. In most plants, however, it was possible to estimate butterfat intake and to compare it with apparent butterfat outgo in bottled and bulk milk, in cream, and in other dairy products disposed of.[18] The excess of intake of butterfat over outgo, best termed unaccounted-for butterfat, is used here as the best available indicator of product loss.

In the 32 plants for which these estimates were computed, the quantity of butterfat accounted for in milk and dairy products sold was only 91 per cent of computed butterfat intake. It is inconceivable that all or even the greater part of the other 9 per cent actually was lost. However, granting limitations in the method of measurement used, the fact that three-fourths of these plants had 5 per cent or more of their butterfat unaccounted for indicates that the problem was a real one. Moreover, the share of the butterfat unaccounted for was substantially the same in large plants as in small ones.

Discussions with a few plant operators who have started checking unaccounted-for butterfat have given some support to these findings. These discussions have led the author to believe that in some operations more butterfat is lost in processing and distribution than is commonly recognized by milk distributors.[19] These discussions also suggested that in plants where product loss is not checked, more butterfat may be included in products sold than management realizes.

Regardless of what becomes of unaccounted-for butterfat, it was of sufficient volume to be of real consequence to plant operators. For these 32 plants, the estimated amount averaged 18,400 pounds per plant in 1948, which would be worth approximately $18,000 at existing prices for surplus butterfat in sweet cream. No matter what the explanation for it, management of these dairy plants could well afford to give the matter careful attention.

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[18] Unaccounted-for butterfat was not computed for three small plants whose operators did not purchase milk from producers on a butterfat basis.

[19] A study of seven milk distributor operations in Memphis, Tennessee, in 1948 showed a loss of milk of about 4 per cent of the quantity handled *(21)*.

## VOLUME PER PLANT

### Range

Volume per plant varied widely. In 1948, each of the three smallest plants sold less than 300 gallons of all products per day.[20] At the other extreme, each of the five largest plants sold more than 4,000 gallons of products per day. This group averaged about 5,000 gallons per day.

There was similar variation in terms of other measures of size. Sales varied from less than $100,000 per year in each of the three smallest plants to amounts ranging upward from not quite $1,500,000 per year in the five largest plants. Correspondingly, quarts-equivalent of products processed varied from 500,000 per year or less in each of the three smallest plants to 8,000,000 or more in each of the five largest. Proportionately as much variation in size was found among plants for which 1949 data were obtained.

### Relation to Gross Margins

Distributors whose sales amounted to 1,500 gallons per day or more had gross margins that were well over 1.0 cent per quart-equivalent higher than distributors who operated smaller plants (Table 11). Several reasons for this sizable difference were ap-

TABLE 11. RELATION OF VOLUME PER PLANT TO FACTORS AFFECTING GROSS MARGINS AND TO GROSS MARGINS PER QUART-EQUIVALENT, 35 ALABAMA MILK DISTRIBUTORS, 1948

| Average daily sales per plant, all products | | Number of plants | Average butterfat test of bottled whole milk | Proportion of bottled whole milk that was homogenized[1] | Proportion of sales buttermilk and chocolate drink | Gross margin per quart-equivalent |
|---|---|---|---|---|---|---|
| Range | Average | | | | | |
| *Gallons* | *Gallons* | *Number* | *Per cent* | *Per cent* | *Per cent* | *Cents* |
| Less than 600 | 390 | 12 | 4.3[2] | 5 | 13 | 5.05 |
| 600-1,499 | 870 | 11 | 4.0 | 6 | 15 | 5.18 |
| 1,500 or more | 3,580 | 12 | 3.7 | 33 | 21 | 6.29 |
| ALL PLANTS | 1,630 | 35 | 3.8[2] | 26 | 19 | 6.06 |

[1] The bulk of the homogenized milk, but not all of it, sold for 1.0 cent per quart more than standard whole milk.

[2] Data not available for one plant; averages are for one less than total number of plants in these groups.

[20] Averages are for 7 days per week. For a plant operating 6 days per week, the 6-day average would be one-sixth more. Quantities of non-fluid products sold were converted to estimated equivalent in gallons.

parent. The butterfat test of bottled whole milk was materially lower in large plants than in small ones, and the proportion of homogenized milk sold was considerably higher. Possibly another contributing factor was the somewhat greater proportion of buttermilk and chocolate drink sold by distributors operating large plants. Moreover, a larger share of the big plants than of the small ones were in Birmingham, where gross margins on leading products were comparatively wide.

### Relation to Operating Expenses and Efficiency

Unit operating expenses for many items varied with volume per plant (Table 12). In the aggregate, however, total operat-

TABLE 12. RELATION OF VOLUME PER PLANT TO OPERATING EXPENSES PER QUART-EQUIVALENT, 35 ALABAMA MILK DISTRIBUTORS, 1948[1]

| Item | Average daily sales per plant, all products | | | All plants |
|---|---|---|---|---|
| | Less than 600 gallons | 600-1,499 gallons | 1,500 gallons or more | |
| | *Cents* | *Cents* | *Cents* | *Cents* |
| **Plant and container expenses:** | | | | |
| Labor[2] | 1.00 | 0.79 | 0.97 | 0.94 |
| Containers | .71 | .87 | .56 | .62 |
| Building and equipment costs[3] | .57 | .49 | .55 | .55 |
| Fuel, electricity, water, ice | .36 | .29 | .22 | .24 |
| Plant supplies | .24 | .24 | .13 | .16 |
| Total plant and container expenses | 2.88 | 2.68 | 2.43 | 2.51 |
| **Selling and delivery expenses:** | | | | |
| Labor[2] | 1.29 | 1.10 | 1.81 | 1.67 |
| Truck | .90 | .82 | .57 | .63 |
| Advertising and related items | .10 | .13 | .20 | .18 |
| Bad debts | .06 | .04 | .02 | .03 |
| Total selling and delivery expenses | 2.35 | 2.09 | 2.60 | 2.51 |
| **Administrative and general expenses:** | | | | |
| Labor[2] | 0.51 | 0.34 | 0.36 | 0.37 |
| All other | .10 | .09 | .22[4] | .20[4] |
| Total administrative and general expenses | .61 | .43 | .58[4] | .57[4] |
| TOTAL OPERATING EXPENSES | 5.84 | 5.20 | 5.61 | 5.59 |

[1] Plant and container expenses per quart-equivalent processed; selling and delivery expenses per quart-equivalent delivered; administrative and general expenses divided by average of quarts-equivalent processed and quarts-equivalent delivered.
[2] Includes payroll taxes and compensation insurance.
[3] Equipment costs are for all equipment except trucks.
[4] Includes general office charges of three chain plants. These charges may have contained some items corresponding to those included in the plant and/or delivery expenses of independent plants.

ing expenses per quart-equivalent were practically identical in small and large plants, though somewhat less in plants of medium size than in those at either extreme.

Plant and container expenses per quart-equivalent were about a sixth less in large plants than in small ones. The difference showed up most clearly in two of the smaller items of plant expense, (1) fuel, electricity, water, and ice, and (2) plant supplies. These items were only half to two-thirds as much per quart-equivalent processed in large plants as in small ones. On the other hand, while expenses for labor, containers, and buildings and equipment (excluding trucks) were no higher in large plants than in small plants, none of these items declined consistently as volume increased.

Selling and delivery expenses per quart-equivalent delivered were higher in large plants than in small and medium-sized plants. The difference was due mainly to higher labor costs in the large plants, though slightly more also was spent for advertising. In general, truck expenses per quart-equivalent delivered were less in large plants than in small ones.

Somewhat lower administrative labor costs per quart-equivalent in large plants than in small ones were largely compensated by higher costs for other items of administrative and general expenses.[21] Total administrative and general expenses per quart-equivalent were about the same in large plants as in small ones, but lowest in plants of medium size.

The minor differences in unit costs of labor between small and large plants do not indicate that labor was about as productive in the one group of plants as it was in the other. In 1948, amount of product handled per hour of plant labor was three-eighths more in large plants than in small ones (Table 13). Quantity of product delivered per delivery worker also was greater in large operations than in small ones, though in this respect performance was best among plants in the middle group. Volume of business per administrative worker was about three-fourths greater in large plants than in small ones.

Wage rates of plant and administrative workers, though low among medium-sized plants, averaged about a fourth higher in the large plants than in the small ones. For selling and delivery

[21] Other administrative and general expenses include general office charges of three chain plants. These charges may have contained some items corresponding to those included in plant and/or delivery expenses of independent plants.

TABLE 13. RELATION OF VOLUME PER PLANT TO QUANTITY OF PRODUCT HANDLED PER UNIT OF LABOR, TO WAGE RATES, AND TO HYPOTHETICAL OPERATING EXPENSES PER QUART-EQUIVALENT COMPUTED BY USING AVERAGE PLANT AND DELIVERY WAGE RATES FOR PLANTS OF ALL SIZES, 35 ALABAMA MILK DISTRIBUTORS, 1948

| Item | Average daily sales per plant, all products | | | |
|---|---|---|---|---|
| | Less than 600 gallons | 600-1,499 gallons | 1,500 gallons or more | All plants |
| **Product handled per unit of labor:** | *Number* | *Number* | *Number* | *Number* |
| Quarts-equivalent processed per hour of plant labor | 79 | 91 | 109 | 102 |
| Quarts-equivalent delivered daily per delivery man-equivalent[1] | 643 | 791 | 752 | 748 |
| Quarts-equivalent daily per administrative worker[2] | 1,960 | 2,551 | 3,438 | 3,100 |
| **Wage rates:** | *Dollars* | *Dollars* | *Dollars* | *Dollars* |
| Average cost per hour of plant labor | 0.78 | 0.72 | 1.06 | 0.97 |
| Average annual wage per delivery man-equivalent[1] | 2,740 | 2,880 | 4,180 | 3,850 |
| Average annual wage per administrative man-equivalent | 3,090 | 2,680 | 3,870 | 3,560 |
| **Selected operating expenses per quart-equivalent computed at average plant and delivery wage rates:** | *Cents* | *Cents* | *Cents* | *Cents* |
| Plant labor cost | 1.23 | 1.07 | 0.89 | 0.94 |
| Total plant and container expenses[3] | 3.11 | 2.96 | 2.35 | 2.51 |
| Selling and delivery labor cost | 1.81 | 1.48 | 1.55[4] | 1.56[4] |
| Total selling and delivery expenses[5] | 2.87 | 2.46 | 2.38[4] | 2.43[4] |
| TOTAL OPERATING EXPENSES[6] | 6.59 | 5.85 | 5.31[7] | 5.51[7] |

[1] Averages for 32 plants for which data were available. One of the plants without data was in each size group. For definition of man-equivalent, see page 64.
[2] Average of quarts-equivalent processed and quarts-equivalent delivered.
[3] Includes containers; building and equipment costs; fuel, electricity, water, and ice; and plant supplies.
[4] Averages exclude one plant for which information about average delivery wage rate was not obtained.
[5] Includes truck costs, advertising, and bad debts.
[6] Includes administrative and general expenses.
[7] Adjusted selling and delivery expense per quart-equivalent included in this total was average shown above. This average was for one less than the total number of plants in the group.

workers, wage rates averaged half again as high in the large plants as in the small ones.

The effect of these differences in wage rates is clearly demonstrated when costs of plant and delivery labor are computed by

applying uniform (average) wage rates in all groups. If wage rates had been equal, large plants would have had materially lower costs than small plants for both plant and delivery labor, though not as low costs for the latter as middle-sized plants. Correspondingly, with such an adjustment, plant, delivery, and total operating expenses per quart-equivalent decline with each increase in volume per plant. For large plants, the adjusted operating expense per quart-equivalent was about a fifth below that for small plants.

The greater operating efficiency of large plants traced in part to advantages in delivery (Table 14). In 1948, wholesale trucks of large plants carried nearly twice as large loads as wholesale trucks of small plants, and sold about three-fourths more product per mile. On retail routes, medium-sized plants had the biggest loads, but again large plants sold most milk per mile.

TABLE 14. RELATION OF VOLUME PER PLANT TO EFFICIENCY IN DELIVERY AND TO OTHER FACTORS THAT AFFECTED OPERATING COSTS, 35 ALABAMA MILK DISTRIBUTORS, 1948

| Item | Average daily sales per plant, all products | | | |
|---|---|---|---|---|
| | Less than 600 gallons | 600-1,499 gallons | 1,500 gallons or more | All plants |
| **Efficiency in delivery:** | | | | |
| | *Number* | *Number* | *Number* | *Number* |
| Number of plants for which complete route data were available: | | | | |
| Wholesale routes | 10 | 7 | 10 | 27 |
| Retail routes | 7 | 6 | 8 | 21 |
| | *Gallons* | *Gallons* | *Gallons* | *Gallons* |
| Wholesale routes: | | | | |
| Average size of loads | 155 | 209 | 285 | 256 |
| Sales per mile[1] | 3.2 | 3.9 | 5.5 | 5.0 |
| Retail routes: | | | | |
| Average size of loads | 100 | 126 | 104 | 106 |
| Sales per mile[1] | 2.7 | 2.4 | 4.0 | 3.6 |
| **Other factors:** | | | | |
| | *Per cent* | *Per cent* | *Per cent* | *Per cent* |
| Plant operations, in percentage of capacity[2] | 76 | 80 | 117[3] | 90[3] |
| Percentage fluid products sold in paper cartons | 0 | 24 | 16 | 16 |

[1] Mileage was total traveled by trucks on delivery routes.
[2] A plant operating at 100 per cent capacity was defined as a plant processing and bottling as much product as normally could be handled with existing facilities and one shift of plant workers.
[3] Averages exclude one plant for which data were not obtained.

Within the plant, large distributors used facilities at a higher percentage of capacity than did small distributors. While use of paper containers was not yet general, in 1948, milk was packaged in paper only in medium-sized and large plants.

### Relation to Returns

Because higher wage rates largely canceled out the advantages of large plants in efficiency of operation, differences between small and large plants in net incomes reflected mainly the differences between them in gross margins (Table 15). These differences were enough, however, so that most small distributors made negative returns for use of capital and for risk, while all large distributors made positive returns. Large distributors' returns for use of capital and for risk, and their net profit above 5 per cent interest on total capital, averaged about 1.5 cents per quart-equivalent higher than corresponding returns of small distributors.

The average amount by which small distributors failed to make returns for use of capital and for risk was equivalent to 18 per cent of total capital. On the other hand, large distributors made positive returns equivalent to 17 per cent of total capital.

TABLE 15. RELATION OF VOLUME PER PLANT TO FINANCIAL RETURNS, 35 ALABAMA MILK DISTRIBUTORS, 1948

| Average daily sales per plant, all products | Per quart-equivalent | | | Net return expressed as average percentage return on total capital | Percentage of distributors making positive return on capital | Net profit per quart-equivalent above 5 per cent interest on total capital |
|---|---|---|---|---|---|---|
| | Gross margin | Total operating expenses | Net return for use of capital and for risk | | | |
| *Gallons* | *Cents* | *Cents* | *Cents* | *Per cent* | *Per cent* | *Cents* |
| Less than 600 | 5.05 | 5.84 | –0.79 | –17.8 | 17 | –1.01 |
| 600-1,499 | 5.18 | 5.20 | – .02 | – .5 | 45 | – .22 |
| 1,500 or more | 6.29 | 5.61 | .68 | 16.7[1] | 100 | .47 |
| ALL PLANTS | 6.06 | 5.59 | .47 | 11.1[1] | 54 | .25 |

[1] Average excludes one plant for which total capital was not determined.

## TYPE of CONTAINER

At the time of this study, the single-service paper container was not in widespread use in Alabama milk plants. In 1948, four of the plants packaged all of their fluid products in paper cartons, three packaged between 15 and 40 per cent and two pack-

aged some but less than 10 per cent of their fluid products in paper cartons. Numbers of plants using paper, either exclusively or in part, were too small to provide conclusive evidence of its relative advantages. Nevertheless, some of the differences between plants using paper cartons and those using glass bottles exclusively were sufficiently pronounced to deserve attention.

Plants in which paper cartons were used had somewhat larger average sales and a smaller share of sales at retail than plants in which all milk was put in glass (Table 16). However, the differ-

TABLE 16. RELATION OF TYPE OF CONTAINER USED TO INDICATORS OF EFFICIENCY AND TO PLANT AND CONTAINER EXPENSES, SELLING AND DELIVERY EXPENSES, AND TOTAL OPERATING EXPENSES PER QUART-EQUIVALENT, 33 ALABAMA MILK DISTRIBUTORS, 1948[1]

| Item | Unit | Type of container used | | |
|---|---|---|---|---|
| | | Paper only | Paper and glass | Glass only |
| Number of plants | *Number* | 4 | 3 | 26 |
| Average daily sales per plant, all products | *Gallons* | 1,807 | 2,061 | 1,394 |
| Quarts-equivalent processed per hour of plant labor | *Number* | 142 | 88 | 97 |
| Quarts-equivalent delivered daily per delivery-man-equivalent | *Number* | 848[2] | 648 | 653[3] |
| Index of load size[4] | *Index* | 135 | 100 | 88 |
| **Plant and container expenses per quart-equivalent processed:** | | | | |
| Labor | *Cents* | 0.61 | 0.89 | 1.00 |
| Containers | *Cents* | 1.34 | .68 | .48 |
| Building and equipment costs | *Cents* | .81 | .41 | .46 |
| Fuel, electricity, water, ice | *Cents* | .26 | .24 | .26 |
| Plant supplies | *Cents* | .09 | .21 | .17 |
| Total plant and container expenses | *Cents* | 3.11 | 2.43 | 2.37 |
| **Selling and delivery expenses per quart-equivalent delivered:** | | | | |
| Labor | *Cents* | 0.95[2] | 1.41 | 1.84[5] |
| Truck | *Cents* | .67[2] | .66 | .64[5] |
| Total[6] | *Cents* | 1.88[2] | 2.26 | 2.68[5] |
| TOTAL OPERATING EXPENSES PER QUART-EQUIVALENT[7] | *Cents* | 5.43 | 5.22 | 5.62 |

[1] Two plants in which paper machines were installed late in the year were excluded from this sort.
[2] Average for three plants that had delivery routes.
[3] Average for 24 plants. One of the 26 plants had no delivery routes; data on number of delivery workers unavailable for another.
[4] Method of computing index of load size is described on page 64.
[5] Averages for 25 plants with delivery routes.
[6] Includes advertising and bad debts as well as labor and truck expenses.
[7] Includes administrative and general expenses.

ences in volume and in sales channels were not enough to account in large measure for the differences in efficiency that showed up between plants using paper exclusively and those using glass exclusively. Quantity of milk processed and packaged per hour of plant labor was about one-half more in plants in which paper cartons only were used than in those in which all milk was bottled in glass. Delivery loads and quantity of milk distributed per delivery worker also averaged appreciably larger among plants in which all fluid products were packaged in paper. None of these advantages in efficiency showed up in plants in which both glass and paper containers were used.

In keeping with these differences, labor costs per unit of product handled, both in the plant and in distribution, were materially less for plants in which only paper containers were used than in those in which all fluid products were bottled in glass. In delivery, lower labor costs per unit of product of plants in which paper containers were used were due in part to their location outside Birmingham, where delivery wages were high. Nevertheless, among plants in other markets, delivery labor costs per unit of product delivered averaged lower in those using paper cartons than in those using glass bottles. This may have been due to chance. It is reasonable to believe, however, that delivery workers were willing to deliver products in paper at lower commission rates, making up the difference by handling larger volumes.

Lower unit expense for plant supplies in plants using paper cartons apparently was due to elimination of bottle washing. Savings in this item and in labor were fully compensated, however, by the much higher cost of paper than of glass containers and heavier equipment costs that presumably were attributable to rental of paper-packaging equipment. Thus, total operating expense per quart-equivalent was not significantly lower in plants in which milk was put up exclusively in paper than in plants in which all milk was bottled in glass.

While this comparison was based on a limited number of cases, the conclusions drawn from it are generally in line with those of others who have investigated the comparative costs of paper and glass operations. For instance, Meissner, after gathering available data on the subject, concluded that in retail distribution, efficiencies in processing and delivery in a 100 per cent paper operation did not compensate for the added cost of paper con-

tainers. In wholesale distribution, however, paper operations were at less of a disadvantage, and in some conditions had lower unit costs than glass operations *(19)*. Some others have been more emphatic about the advantages of exclusive paper operations in wholesale distribution. Bartlett, after studying costs of a large number of plants concluded that "milk can be handled as efficiently, if not more so, in wholesale plants using paper containers exclusively than in plants using glass containers exclusively" *(22)*.

To attain most economical use of paper containers, their advantages of lighter weight, compactness, and relative ease of refrigeration, must be reflected in apparently lower unit costs in delivery for milk in paper cartons than for milk in glass bottles. Normally, it is much easier to take advantage of these potential economies in delivery, and of the savings in plant costs made possible by the use of paper, in a 100 per cent paper operation than in an operation that combines paper and glass *(7, 20, 22, 23)*.

## EFFICIENCY *in* DELIVERY

In a discussion of differences among markets, considerable variation is shown in rates of compensation of delivery workers (pp. 44-46). This variation in pay rates is reflected in important differences in unit costs of delivery. Despite its effect upon costs, it is essential that the variation in pay rates be distinguished from differences in efficiency.

Of the factors basically responsible for differences in efficiency of delivery, the most important appears to have been size of load. To give a comparable indicator of load size for plants with varying proportions of wholesale and retail sales, an index of load size was computed for each of the 32 plants for which route information was obtained.[22]

Differences in load size were mainly in wholesale loads, which averaged nearly two and a half times as large in the 10 plants with largest loads as in the 9 plants with smallest loads (Table 17). However, sales per mile on retail routes as well as on wholesale routes were nearly twice as large in the former group as in the latter.

[22] Method of computing index of load size is described on page 64.

TABLE 17. RELATION OF INDEX OF LOAD SIZE TO OTHER INDICATORS OF EFFICIENCY, TO SELLING AND DELIVERY EXPENSES PER QUART-EQUIVALENT, AND TO AVERAGE WAGE PER DELIVERY WORKER, 32 ALABAMA MILK DISTRIBUTORS, 1948[1]

| Item | Unit | Index of load size | | |
|---|---|---|---|---|
| | | Less than 80 | 80-110 | 111 or more |
| Number of plants | *Number* | 9 | 13 | 10 |
| Number of plants for which complete route data were given: | | | | |
| Wholesale routes | *Number* | 8 | 12 | 7 |
| Retail routes | *Number* | 6 | 11 | 4 |
| Average load per truck, all products: | | | | |
| Wholesale | *Gallons* | 140 | 236 | 330 |
| Retail | *Gallons* | 100 | 100 | 126 |
| Product delivered per mile:[2] | | | | |
| Wholesale | *Gallons* | 3.2 | 4.7 | 5.9 |
| Retail | *Gallons* | 2.7 | 3.3 | 5.1 |
| Quarts-equivalent delivered daily per delivery man-equivalent | *Number* | 602 | 667 | 922 |
| Selling and delivery expense per quart-equivalent delivered: | | | | |
| Labor | *Cents* | 1.38 | 1.70 | 1.43 |
| Truck | *Cents* | .93 | .68 | .57 |
| Total[3] | *Cents* | 2.44 | 2.60 | 2.22 |
| Average annual wage per delivery man-equivalent | *Dollars* | 2,740 | 3,740 | 4,340 |

[1] Of the 35 plants in the study, two operated no routes; data on number of routes were not obtained from one other plant.
[2] Mileage was total traveled by trucks on delivery routes.
[3] Includes advertising and bad debts as well as labor and truck expense.

Not all of the reasons for these differences in load size were determined. It has been shown, however, that wholesale loads and sales per mile on both wholesale and retail routes of large plants were considerably above those of small plants (pp. 28-32). Likewise, distributors packaging milk in paper had larger loads than those who bottled milk in glass (pp. 32-35).

Quantity of milk delivered daily per delivery worker increased with size of load, but there was no accompanying decline in unit expense for delivery labor. Usually route drivers were paid a straight percentage commission on sales, especially in the larger operations. Thus, larger deliveries per man were reflected mainly in higher route men's wages rather than in lower unit costs to the plant operator for delivery labor.

The only readily apparent benefit to distributors with large loads consisted of a moderate saving in truck costs. It is possible,

however, that these distributors found it easier to keep drivers and obtained other benefits that were not readily apparent.

## PRODUCT HANDLED PER UNIT of LABOR

### Variation

In both plant and delivery operations, considerable variation was found in amount of product handled per unit of labor. In 1948, quarts-equivalent of product processed per hour of plant labor ranged from a low of about 50 to a high of more than 200. For more than half of the plants, figures were in the range from 75 through 124, inclusive. Nevertheless, amount of product processed per hour of plant labor in the five plants in which it was largest averaged more than three times that in the five plants in which it was smallest.

There was similar though not quite as wide variation in numbers of quarts-equivalent delivered per day per delivery man-equivalent. For about two-thirds of these plants quarts-equivalent delivered daily per delivery man-equivalent were in the range from 500 through 749, inclusive. However, the average of 950 for the five plants with largest deliveries per man was twice the average of 470 for the five plants with smallest deliveries per man.

It was beyond the scope of this study to determine all of the reasons for this variation in labor efficiency. However, some conditions that favored above-average efficiency in use of labor have been pointed out in preceding sections of this publication. These were: (1) large volume per plant (pp. 27-32), (2) large loads on delivery routes (pp. 35-37), and (3) packaging milk in paper (pp. 32-35).

### Relation to Costs and Returns

An index of labor efficiency was computed to provide an overall indicator of product handled per unit of labor, considering both plant and delivery operations. To compute the index for a given plant, its numbers of quarts-equivalent processed per hour of plant labor and quarts-equivalent delivered per delivery man-equivalent were expressed as percentages of the averages for these factors for all plants. The sum of the two percentages was then divided by two.[23] It may help in interpreting this index

[23] Two plants without delivery routes and one plant for which number of delivery workers was not reported were excluded from this analysis.

to note that among the 10 plants for which the index was highest about twice as much milk was processed per hour of plant labor, and a half more was delivered per delivery worker, than among the 11 plants for which the index was lowest (Table 18).

Both plant labor expenses and total plant and container expenses were roughly 0.5 cent less per quart-equivalent in the group of plants where output per unit of labor was highest than in the group where it was lowest. There was a similar though somewhat smaller difference in cost of delivery labor. Presumably, the savings obtained by plant operators through efficient use of delivery labor would have been greater had it not been for the fact that many route drivers were hired on a straight commission basis. In cases in which they were, the benefits obtained by handling large quantities of milk per man accrued mainly to

TABLE 18. RELATION OF INDEX OF LABOR EFFICIENCY TO OPERATING EXPENSES, AND TO RETURNS FOR USE OF CAPITAL AND FOR RISK, 32 ALABAMA MILK DISTRIBUTORS, 1948[1]

| Item | Unit | Index of labor efficiency[2] | | | |
|---|---|---|---|---|---|
| | | Less than 85 | 85-109 | 110 or more | All plants |
| Number of plants | *Number* | 11 | 11 | 10 | 32 |
| Average index of labor efficiency[2] | *Index* | 73 | 96 | 134 | 100 |
| Quarts-equivalent processed per hour of plant labor | *Number* | 73 | 89 | 151 | 102 |
| Quarts-equivalent delivered daily per delivery man-equivalent | *Number* | 612 | 697 | 922 | 748 |
| **Operating expenses and returns per quart-equivalent:[3]** | | | | | |
| Plant and container expenses: | | | | | |
| Labor | *Cents* | 1.28 | 1.04 | 0.73 | 0.96 |
| Total[4] | *Cents* | 2.85 | 2.45 | 2.45 | 2.55 |
| Selling and delivery expenses: | | | | | |
| Labor | *Cents* | 1.76 | 1.63 | 1.38 | 1.56 |
| Truck | *Cents* | .82 | .62 | .59 | .66 |
| Total[5] | *Cents* | 2.84 | 2.43 | 2.19 | 2.43 |
| TOTAL OPERATING EXPENSES[6] | *Cents* | 6.32 | 5.50 | 5.16 | 5.55 |
| Return for use of capital and for risk | *Cents* | −.02 | .49 | .77 | .48 |

[1] Two plants without delivery routes and one plant for which number of delivery workers was not reported were excluded.
[2] Average output per unit of labor in all plants=100.
[3] Plant and container expenses per quart-equivalent processed; selling and delivery expenses per quart-equivalent delivered.
[4] Includes containers; building and equipment costs; fuel, electricity, water, and ice; and plant supplies as well as labor.
[5] Includes advertising and bad debts as well as labor and truck expenses.
[6] Includes administrative and general expenses.

drivers in the form of increased wages, rather than to plant operators in the form of reduced expense per quart for delivery labor (pp. 35-37).

Handling of larger loads did reduce truck expense per quart of product sold. Accordingly, total selling and delivery expense was nearly 0.67 cent less per quart-equivalent among plants that used labor most efficiently than among those that used labor least efficiently.

Total operating expenses averaged more than 1.0 cent less per quart-equivalent among plants whose output per unit of labor was high than among those whose output was low. This was a saving in operating expenses of nearly a fifth. A similar though somewhat smaller difference showed up in returns for use of capital and for risk.

## Relationships among Plants of Similar Size

Part of the differences in costs and returns shown in the preceding section may have been attributable to differences in other factors that were associated with differences in use of labor. Most important of these other differences was the increase in size of plant that was associated with the increase in labor

TABLE 19. RELATION OF INDEX OF LABOR EFFICIENCY TO OPERATING EXPENSES AMONG SMALL AND LARGE PLANTS, 32 ALABAMA MILK DISTRIBUTORS, 1948[1]

| Index of labor efficiency[2] | | Number of plants | Average daily sales | Operating expenses per quart-equivalent[3] | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Plant and container expenses | | Selling and delivery expenses | | Total operating expenses[6] |
| Range | Average | | | Labor | Total[4] | Labor | Total[5] | |
| *Index* | *Index* | *No.* | *Gallons* | *Cents* | *Cents* | *Cents* | *Cents* | *Cents* |
| **Plants with average daily sales of less than 825 gallons:** | | | | | | | | |
| Less than 96 | 71 | 8 | 430 | 1.07 | 2.93 | 1.43 | 2.38 | 5.75 |
| 96 or more | 105 | 8 | 540 | .81 | 2.64 | 1.15 | 2.18 | 5.37 |
| **Plants with average daily sales of 825 gallons or more:** | | | | | | | | |
| Less than 96 | 84 | 6 | 3,260 | 1.25 | 2.56 | 1.89 | 2.79 | 6.04 |
| 96 or more | 129 | 10 | 2,300 | .74 | 2.46 | 1.37 | 2.16 | 5.14 |

[1] Two plants without delivery routes and one plant for which number of delivery workers was not reported were excluded.
[2] Average output per unit of labor in all plants=100.
[3] Plant and container expenses per quart-equivalent processed; selling and delivery expenses per quart-equivalent delivered.
[4] Includes containers; building and equipment costs; fuel, electricity, water, and ice; and plant supplies as well as labor.
[5] Includes advertising and bad debts and truck expenses as well as labor.
[6] Includes administrative and general expenses.

efficiency. To remove as much as possible of its influence, relationships of labor efficiency to operating expenses were analyzed separately among small and large plants (Table 19). This analysis showed substantial differences in amount of product handled per unit of labor among plants of comparable size.

In each size group, both plant and delivery labor costs per quart-equivalent were lower in plants with above average indexes of labor efficiency than in plants with below average indexes. Among both small and large plants, these savings in labor costs were reflected in lower plant and container expenses, lower selling and delivery expenses, and lower total operating expenses per quart-equivalent for distributors with higher than average output per unit of labor.

## COMPARISONS AMONG MARKETS

### Market Groupings

Data for 1948 were obtained from plants in nine markets. In markets other than Birmingham and Mobile, number of plants per market varied from one to three. The data for these seven other markets are shown in two groups. Averages are shown for the three larger markets (Gadsden, Montgomery, and Tuscaloosa) and for the four smaller ones (Anniston, Selma, Talladega, and Tri-Cities). This grouping is based upon differences in volume per plant and related characteristics as well as in size of market.[24]

Since producer-distributors were excluded from the study, there was no market for which data were representative of all milk distributors' operations. Moreover, in some cases, complete data were not obtained for distributor operations of the type studied.[25]

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[24] It is erroneous to assume that conditions were similar in all respects in the markets in either of the latter two groups. Some differences in market conditions were indicated by the data. However, there were too few plants in these markets to support reliable conclusions about these differences and to indicate to what extent they were beyond the control of management.

[25] In Mobile, for example, information was not obtained from one of the largest and best located plants in the market as well as from two or three smaller ones. In Birmingham, physical information about retail delivery operations was not obtained from one large volume retail distributor, and no data were obtained from a medium-volume distributor who apparently sold an above-average share of his milk on retail routes.

## Sales Characteristics and Gross Margins

Sales on wholesale routes comprised a much larger share of total sales in Mobile than in other markets (Table 20). Platform sales were most important in the group of four small markets, mainly because one dealer in Anniston and one in Talladega sold all milk at the plant to independent distributors. Distributors in Mobile sold comparatively more whole milk, and less buttermilk and other low-fat products, than did dealers in other markets.

Homogenized milk, mostly sold at 1.0 cent per quart above standard whole milk, comprised larger proportions of all whole milk in Birmingham and in Gadsden-Montgomery-Tuscaloosa than in the four small markets. In Mobile, no whole milk was sold at premium prices, though some of it was homogenized.

Gross margins ranged from a high of 6.41 cents per quart in Birmingham to a low of 5.01 cents in Mobile. Data were inade-

TABLE 20. COMPOSITION AND CHANNEL OF SALES, GROSS MARGINS, AND FACTORS AFFECTING GROSS MARGINS, BY MARKETS, 35 ALABAMA MILK DISTRIBUTORS, 1948

| Item | Unit | Market | | | |
|---|---|---|---|---|---|
| | | Birmingham | Mobile | Gadsden, Montgomery, Tuscaloosa | Anniston, Selma, Talladega, Tri-Cities |
| Number of plants | *Number* | 10 | 9 | 8 | 8 |
| Proportion of total volume sold on: | | | | | |
| Wholesale routes | *Per cent* | 55 | 90 | 59 | 49 |
| Retail routes | *Per cent* | 40 | 5 | 33 | 25 |
| Platform | *Per cent* | 5 | 5 | 8 | 26 |
| Proportion of total volume composed of: | | | | | |
| Whole milk and cream | *Per cent* | 78 | 87 | 78 | 81 |
| Buttermilk and chocolate drink | *Per cent* | 20 | 13 | 20 | 18 |
| Average butterfat test of bottled whole milk | *Per cent* | 3.7 | 3.9[1] | 3.9 | 4.0 |
| Proportion of bottled whole milk that was homogenized[2] | *Per cent* | 27 | [2] | 30 | 14 |
| Gross margin per quart-equivalent | *Cents* | 6.41 | 5.01 | 6.03 | 5.40 |

[1] Average for eight plants for which information was available.

[2] In most markets, the bulk of homogenized milk was sold for 1.0 cent per quart more than standard whole milk. In Mobile, some homogenized milk was sold, but not at premium prices.

quate to give an exact accounting for these differences. Some of the factors that contributed to them were (1) differences between markets in margins provided by Milk Control Board regulations, (2) differences in percentage of whole milk homogenized and sold at premium prices, (3) differences in butterfat test of whole milk, though small, and possibly (4) differences in relative volume of buttermilk and chocolate drink.

## Delivery Operations

Available information did not indicate that any of these market groups possessed a major advantage over the others in efficiency of delivery operations (Table 21). Both on wholesale and retail

TABLE 21. FACTORS AFFECTING EFFICIENCY IN DELIVERY AND DELIVERY WORKERS' WAGES PER DOLLAR OF SALES ON WHOLESALE AND RETAIL ROUTES, BY MARKETS, 35 ALABAMA MILK DISTRIBUTORS, 1948

| Item | Unit | Market | | | |
|---|---|---|---|---|---|
| | | Birmingham | Mobile | Gadsden, Montgomery, Tuscaloosa | Anniston, Selma, Talladega, Tri-Cities |
| **Wholesale routes:**[1] | | | | | |
| Number of plants for which route data were given | *Number* | 9 | 8 | 7 | 3 |
| Number of routes | *Number* | 70 | 24 | 32 | 12 |
| Average length of routes | *Miles* | 43 | 71 | 55 | 52 |
| Average size of loads | *Gallons* | 239 | 256 | 311 | 209 |
| Sales per mile | *Gallons* | 5.6 | 3.6 | 5.7 | 4.0 |
| Sales per wholesale stop[3] | *Gallons* | 4.6 | 6.2 | 3.6 | 4.6 |
| Delivery workers' wages per dollar of sales | *Cents* | 10.1 | 4.0 | 7.5[2] | 7.1 |
| **Retail routes:**[1] | | | | | |
| Number of plants for which route data were given | *Number* | 8 | 3 | 7 | 3 |
| Number of routes | *Number* | 50 | 6 | 47 | 8 |
| Average length of routes | *Miles* | 31 | 33 | 26 | 42 |
| Average size of loads | *Gallons* | 103 | 87 | 106 | 130 |
| Sales per mile | *Gallons* | 4.0[4] | 2.6 | 4.1 | 3.1 |
| Sales per retail stop[3] | *Gallons* | .55 | .56 | .55 | .52 |
| Delivery workers' wages per dollar of sales | *Cents* | 14.2 | 7.4[5] | 12.3[2] | 11.3 |

[1] Data for a number of mixed routes were not included. Numbers and mileages of some routes with mixed businesses were split between wholesale and retail in cases in which some basis existed for the division.

[2] Data for eight plants.

[3] Applies to all wholesale (or retail) customers served, including those on mixed routes.

[4] Data for nine plants.

[5] Data for two plants.

routes, delivery efficiency in Birmingham was average or better in most respects. In Mobile, wholesale routes, which were the chief type operated, were long and sales per mile below average. Apparently, the main reason for this was that several plants were some distance from town.

Wide differences were noticeable in rates of compensation of delivery workers. On wholesale routes, wage rates per dollar of sales averaged two and a half times as large in Birmingham as in Mobile. On retail routes, Birmingham rates were not quite twice the rates in Mobile.

### Volume *and* Efficiency

Average volume per plant was nearly three and a half times as large in Birmingham as in Mobile (Table 22). The average for Gadsden, Montgomery, and Tuscaloosa was about a sixth less than that for Birmingham, while that for the four small markets was about a tenth more than that for Mobile. Percentage of fluid products packaged in paper ranged from zero in Birmingham to 41 in Mobile.

While differences were of modest proportions, in all departments quantity of product handled per unit of labor were largest in Mobile. Average labor efficiency in the three largest of the other markets compared favorably with that in Birmingham, but labor efficiency in the four small markets was generally below average.

Earnings of employees were much more variable. Plant workers received nearly half again as much per hour in Birmingham as in Mobile. Reflecting the differences in rates of compensation previously noted, annual earnings of delivery workers were nearly twice as large in Birmingham as in Mobile. Payment rates of workers in other markets were between these extremes. In these other markets, average wages were lower in the four small cities than in the three larger ones.

TABLE 22. OVER-ALL FACTORS AFFECTING EFFICIENCY, PRODUCT HANDLED PER UNIT OF LABOR, AND WAGE RATES, BY MARKETS, 35 ALABAMA MILK DISTRIBUTORS, 1948

| Item | Unit | Market | | | |
|---|---|---|---|---|---|
| | | Birmingham | Mobile | Gadsden, Montgomery, Tuscaloosa | Anniston, Selma, Talladega, Tri-Cities |
| **Over-all factors affecting efficiency:** | | | | | |
| Average daily sales per plant, all products | *Gallons* | 2,600 | 770 | 2,190 | 830 |
| Plant operations in percentage of capacity[1] | *Per cent* | 102[2] | 85 | 100 | 74 |
| Percentage fluid products packaged in paper | *Per cent* | 0 | 41 | 27 | 24 |
| **Product handled per unit of labor:** | | | | | |
| Quarts-equivalent processed per hour of plant labor | *Number* | 99 | 115 | 111 | 88 |
| Quarts-equivalent delivered daily per delivery man-equivalent | *Number* | 710 | 880 | 740 | 740[3] |
| Quarts-equivalent daily per administrative worker | *Number* | 3,590 | 3,690 | 2,800 | 2,110 |
| **Wage rates:** | | | | | |
| Average cost per hour of plant labor | *Cents* | 104 | 72 | 98 | 88 |
| Average annual wages per delivery man-equivalent | *Dollars* | 4,520[2] | 2,350 | 3,680 | 3,210[3] |
| Average annual wages per administrative man-equivalent | *Dollars* | 3.620 | 2,960 | 3.880 | 3,070 |

[1] A plant operating at 100 per cent of capacity was defined as a plant processing and bottling as much product as normally could be handled with existing facilities and one shift of plant workers.
[2] Average for nine plants for which data were available.
[3] Average for six plants that operated delivery routes.

## Operating Expenses

The differences among markets in efficiency and in wage rates were reflected in unit operating expenses (Table 23). Plant labor costs per quart-equivalent were noticeably lower in Mobile than in other markets. On the other hand, there was an even larger differential in container costs in favor of Birmingham. Total plant and container expense per quart-equivalent was about 0.35 cent less in Birmingham than in Mobile, where it was slightly below the level of other groups of markets.

TABLE 23. OPERATING EXPENSES PER QUART-EQUIVALENT, BY MARKETS, 35 ALABAMA MILK DISTRIBUTORS, 1948[1]

| Item | Birmingham | Mobile | Gadsden, Montgomery, Tuscaloosa | Anniston, Selma, Talladega, Tri-Cities |
|---|---|---|---|---|
| | *Cents* | *Cents* | *Cents* | *Cents* |
| **Plant and container expenses:** | | | | |
| Labor[2] | 1.05 | 0.62 | 0.89 | 0.99 |
| Containers | .39 | 1.04 | .73 | .82 |
| Building and equipment costs[3] | .45 | .55 | .72 | .48 |
| Fuel, electricity, water, ice | .24 | .27 | .21 | .29 |
| Plant supplies | .14 | .14 | .15 | .26 |
| Total plant and container expenses | 2.27 | 2.62 | 2.70 | 2.84 |
| **Selling and delivery expenses:** | | | | |
| Labor[2] | 2.06 | 0.84 | 1.46 | 1.31 |
| Truck | .62 | .82 | .57 | .67 |
| Advertising and related items | .18 | .12 | .21 | .12 |
| Bad debts | .02 | .02 | .04 | .05 |
| Total selling and delivery expenses | 2.88 | 1.80 | 2.28 | 2.15 |
| **Administrative and general expenses:** | | | | |
| Labor[2] | 0.32 | 0.26 | 0.45 | 0.47 |
| All other | .26 | .10 | .15 | .13 |
| Total administrative and general expenses | .58 | .36 | .60 | .60 |
| TOTAL OPERATING EXPENSES | 5.73 | 4.78 | 5.58 | 5.59 |
| **Selected operating expenses per quart-equivalent computed at average plant and delivery wage rates:** | | | | |
| Plant labor[2] | 0.98 | 0.84 | 0.87 | 1.10 |
| Total plant and container expenses | 2.20 | 2.84 | 2.68 | 2.94 |
| Selling and delivery labor[2] | 1.64[4] | 1.37 | 1.53 | 1.57 |
| Total selling and delivery expenses | 2.54[4] | 2.33 | 2.35 | 2.41 |
| TOTAL OPERATING EXPENSES[5] | 5.32[6] | 5.53 | 5.63 | 5.95 |

[1] Plant and container expenses per quart-equivalent processed; selling and delivery expenses per quart-equivalent delivered. Administrative and general expenses divided by average of quarts-equivalent processed and quarts-equivalent delivered.

[2] Includes payroll taxes and compensation insurance.

[3] Equipment costs are for all equipment except trucks.

[4] Averages exclude one plant for which information about average delivery wage rate was not obtained.

[5] Includes administrative and general expenses.

[6] Adjusted selling and delivery expense per quart-equivalent included in this total was average shown above, which was for one less than total number of plants in the group.

High wage rates for route men in Birmingham were responsible for a selling and delivery expense of about 1.0 cent per quart-equivalent more in that market than in Mobile, and about 0.67 cent above the average of the two other groups of markets. The low cost in Mobile was achieved despite above average truck expense in that market.

Total operating expenses were about 1.0 cent per quart-equivalent higher in Birmingham than in Mobile, where administrative expenses also were below average. In other markets, however, total operating expenses per quart-equivalent were practically identical with those in Birmingham.

The smaller expense per quart-equivalent in Mobile was entirely attributable to differences in wage rates. With labor costs in each market computed at average wage rates for all plants in the study, costs per quart-equivalent for both plant and delivery labor would have been only slightly lower in Mobile than in other markets. Moreover, if wage rates had been uniform, the saving in container expense in Birmingham would have resulted in a slightly lower total operating expense per quart-equivalent in that market than in others.

TABLE 24. FINANCIAL RETURNS, BY MARKETS, 35 ALABAMA MILK DISTRIBUTORS, 1948

| Item | Unit | Market | | | |
|---|---|---|---|---|---|
| | | Birmingham | Mobile | Gadsden, Montgomery, Tuscaloosa | Anniston, Selma, Talladega Tri-Cities |
| **Per quart equivalent:** | | | | | |
| Gross margin | *Cents* | 6.41 | 5.01 | 6.03 | 5.40 |
| Operating expenses | *Cents* | 5.73 | 4.78 | 5.58 | 5.59 |
| Net return for use of capital and for risk | *Cents* | .68 | .23 | .45 | –.19 |
| Percentage of distributors making positive return on capital | *Per cent* | 60 | 33 | 75 | 50 |
| Net return for capital and risk expressed as average percentage return on total capital | *Per cent* | 16.7 | –4.3[1] | 11.1 | –4.6 |
| Net profit per quart-equivalent above 5 per cent return on total capital | *Cents* | .48 | –.37[1] | .25 | –.39 |

[1] Data for eight plants for which information on total capital was available. The plant for which data on capital were lacking was relatively profitable. Average net return for use of capital and for risk of the nine Mobile plants in the study was positive, but with that plant excluded it was negative.

### Returns

The difference between gross margins in Birmingham and Mobile exceeded the difference in operating expenses (Table 24). Consequently, net return for use of capital and for risk averaged nearly 0.5 cent per quart-equivalent more in Birmingham than in Mobile. In the larger of the other markets, net return per quart-equivalent was about 0.25 cent below that in Birmingham, while in the small markets it was nearly 0.9 cent lower than in Birmingham. There was not a corresponding variation among markets in the share of distributors making positive returns. However, the percentage was somewhat below average in Mobile and in the small markets.

Average net returns on total capital ranged from 16.7 per cent in Birmingham to minus 4.6 per cent in the group of small markets. Net profit per quart-equivalent (above 5 per cent interest on total capital) varied from a high of plus 0.48 cent in Birmingham to a low of minus 0.39 cent in the small markets.

## COMPARATIVE EFFICIENCY *of* ALABAMA *and* OUT-*of*-STATE PLANTS

### Birmingham vs. Memphis, Tennessee

It is possible to make limited comparisons of the operations of Alabama milk plants with the operations of plants in other states for which similar information is available. Most directly comparable are data for Memphis, Tennessee, where 1948 operations of seven milk distributors were studied *(21)*. The Memphis data were compared with data for Birmingham, which is a city of about the same size.[26]

Relative importance of the various products handled were generally similar in the two markets (Table 25). The Memphis distributors studied retailed a somewhat smaller share of their milk than did Birmingham distributors. Rough checks indicate, however, that the difference was insufficient to affect materially conclusions drawn from comparison of the two sets of data.

[26] The Memphis study did not include the two largest distributors in the market, but provides the best available indication of conditions there. A number of adjustments in classification were made in the Memphis data to improve its comparability, though it is to be expected that the data for the two markets may not be strictly comparable in all details. It was impossible to express costs and returns for Memphis in terms of the same unit (quarts-equivalent) that has been generally used in earlier sections of this publication. Instead, the unit used is gallons of product sold.

TABLE 25. COMPOSITION AND CHANNEL OF SALES, 10 DISTRIBUTORS, BIRMINGHAM, ALABAMA, AND 7 DISTRIBUTORS, MEMPHIS, TENNESSEE, 1948

| Item | Birmingham | Memphis[1] |
|---|---|---|
| | *Per cent* | *Per cent* |
| **Proportion of total sales volume:** | | |
| Whole milk, all types | 76.3 | 74.5 |
| All buttermilk, chocolate drink, skim milk | 20.1 | 22.7 |
| Table cream[2] | 1.3 | 2.2 |
| Other products | 2.3 | .6 |
| All products | 100.0 | 100.0 |
| **Percentage of total dollar sales:** | | |
| Wholesale, including platform[2] | 56 | 62 |
| Retail | 44 | 38 |

[1] Memphis data from "Costs and Margins of Milk Distributors in Memphis, Tennessee, in 1948." Louis T. Herrmann, and Thomas J. Whatley. Bur. of Agr. Econ., U. S. Dept. of Agr. (Mimeographed) 1950. Also, supplementary information made available by the authors of that report.

[2] Excludes surplus cream sold in bulk.

This comparison is of special interest because of the general impression that distributors' margins have been much wider in Birmingham than in Memphis. In 1948, the computed margin on standard whole milk in quarts was about 3.7 cents more in Birmingham than in Memphis on milk sold to stores, and about 4.0 cents more on milk delivered to retail customers *(3)*.

Financial data for the two groups of distributors show, however, that on the over-all milk businesses as operated, the difference in gross margins in 1948 actually was about 9.0 cents per gallon, or 2.3 cents per quart (Table 26). It is impossible to determine in detail from available information exactly what factors caused the difference in margin to be less when computed in this way and how important each was. In general terms, some of the reasons the distributor data showed a smaller difference in gross margins were:

1. The amounts per gallon by which gross margins in Birmingham exceeded those in Memphis were considerably less on both types of buttermilk (in all container sizes) than they were on whole milk in quarts. In similar manner, differences were much less on smaller than quart containers of homogenized milk and chocolate drink than on whole milk in quarts. These indicated differences in margins were on items sold in appreciable volume by Memphis distributors. In addition, a slightly higher percentage of sales in Memphis than in Birmingham were of products such as cream, on which gross margins per gallon were

TABLE 26. OPERATING EXPENSES, MARGINS, AND RETURNS PER GALLON OF PRODUCT SOLD, 10 DISTRIBUTORS IN BIRMINGHAM, ALABAMA, AND 7 DISTRIBUTORS IN MEMPHIS, TENNESSEE, 1948

| Item | Per gallon of product sold | |
|---|---|---|
| | Birmingham | Memphis[1] |
| | *Cents* | *Cents* |
| Net sales | 89.2 | 69.1 |
| Product cost | 56.0 | 45.0 |
| Gross margin | 33.2 | 24.1 |
| **Plant and container expenses:** | | |
| Labor | 5.4 | 4.7 |
| Containers | 2.0 | 2.5 |
| Building and equipment costs | 2.3 | 2.3 |
| Plant supplies | .7 | 1.0 |
| Fuel, electricity, water, ice | 1.3 | .7 |
| Total plant and container expenses | 11.7 | 11.2 |
| **Delivery and selling expenses:** | | |
| Labor | 10.7 | 5.8 |
| Truck | 3.2 | 2.2 |
| Advertising and promotion | 1.0 | .5 |
| Bad debts | .1 | .1 |
| Total selling and delivery expenses | 15.0 | 8.6 |
| **Administrative and general expenses:** | | |
| Labor | 1.7 | 2.9 |
| All other | 1.3 | 1.0 |
| Total administrative and general expenses | 3.0 | 3.9 |
| TOTAL OPERATING EXPENSES | 29.7 | 23.7 |
| Returns for capital and risk | 3.5 | .4 |
| Net profit above 5 per cent return on capital | 2.5 | –.7 |

[1] See footnote 1, Table 25. A number of adjustments in classification were made in the Memphis data to improve its comparability with the Birmingham data.

comparatively large. The aggregate effect of these factors was to cause the average difference in gross margins on all items to be materially below that on whole milk in quarts.

2. Percentage of butterfat unaccounted for was higher in Birmingham than in Memphis. The monetary value of Birmingham's excess quantity unaccounted for apparently was about 2.0 cents per gallon, or 0.5 cent per quart.

3. Supplementary milk, which was about 10 per cent of all milk purchased by Birmingham distributors, cost roughly 70 cents per 100 pounds (equivalent to 1.5 cents per quart), more than milk from regular sources. In Memphis, producers bore the extra cost of importing emergency supplies. Averaged over the

year, this apparently cancelled out some 0.15 cent per quart of the difference.

Total operating expenses were 6.0 cents per gallon more in Birmingham than in Memphis. Just about the same difference between the two markets showed up in selling and delivery expenses. Some items of plant and administrative expense were higher in one market than in another, but on the whole, items in these groups just about balanced out. For example, plant labor costs were somewhat higher in Birmingham, but container expenses were lower.

Most of the difference in selling and delivery expense was in labor costs, which were about 5.0 cents per gallon more in Birmingham than in Memphis. However, truck costs and advertising and promotional expense also were somewhat higher in Birmingham.

The difference between the two groups of distributors in operating expenses was less than that in margins. Consequently, returns for use of capital and risk averaged 3.1 cents per gallon more in Birmingham than in Memphis. In similar manner, computed net profit above 5 per cent interest on total capital was 2.5 cents per gallon in Birmingham as compared with minus 0.7 cent per gallon in Memphis.

The few comparable efficiency and wage-rate indicators available for both sets of distributors suggested that higher costs in Birmingham were primarily due to higher wage rates in that market (Table 27). Investments were higher relative to volume in Birmingham than in Memphis. This may have contributed to the difference in truck costs, but there was no similar difference in building and equipment costs. Average volume per plant was larger, and output per hour of plant labor was fully as high in Birmingham as in the Memphis plants that were studied. On the other hand, reported wage rates of plant workers were only about three-fourths as high in Memphis as in Birmingham.

In delivery, differences in performance accounted only in small part for the fact that costs per unit were 75 per cent higher in Birmingham than in Memphis. Wholesale loads were somewhat larger in Memphis, but there was no similar difference in retail loads. What information is available on sales per mile of route travel indicates that Birmingham distributors had a slight advantage in this respect; but not so for pay rates. Despite somewhat smaller wholesale loads, route drivers' gross pay averaged more than 50 per cent higher in Birmingham than in Memphis.

TABLE 27. VOLUME PER PLANT, INDICATORS OF EFFICIENCY IN PLANT OPERATIONS AND IN DELIVERY AND WAGE RATES, AS SHOWN BY STUDIES IN ALABAMA, MEMPHIS, TENNESSEE, MAINE, AND NEW YORK CITY METROPOLITAN MARKET[1]

| Item | Unit | 35 Alabama distributors 1948 | 10 Birmingham distributors 1948 | 7 Memphis distributors 1948[2] | 11 large Maine distributors 1945[3] | N. Y. City market[4] | |
|---|---|---|---|---|---|---|---|
| | | | | | | New York City proper 1944 | Suburbs 1944 |
| Average daily sales per plant, all products | *Gallons* | 1,630 | 2,600 | 2,110 | 1,800[5] | ---- | ---- |
| Volume of product processed daily per $1,000 in fixed assets | *Gallons* | 22 | 20 | 29 | 19[5] | ---- | ---- |
| Volume of product processed per hour of plant labor | *Gallons* | 20 | 19 | 18[5] | 23[5] | ---- | ---- |
| Average annual wages per plant worker | *Dollars* | 2,450 | 2,600 | 1,900 | ---- | ---- | ---- |
| **Wholesale routes:** | | | | | | | |
| Number plants for which route data were given | *Number* | 27 | 9 | 6 | 9 | 77 | 20 |
| Average size of loads | *Gallons* | 256 | 239 | 292 | 294 | 406 | 332 |
| Sales per mile | *Gallons* | 5.0 | 5.6 | [6] | 12.5 | 16.2 | 9.6 |
| Sales per stop | *Gallons* | 4.3 | 4.6 | ---- | 6.5 | 14.0 | 9.3 |
| **Retail routes:**[7] | | | | | | | |
| Number plants for which route data were given | *Number* | 21 | 8 | 3 | 11 | 210 | 161 |
| Average size of loads | *Gallons* | 106 | 103 | 92 | 106 | 92 | 92 |
| Sales per mile | *Gallons* | 3.9[8] | 4.0[8] | [6] | 3.8 | 5.8 | 3.4 |
| Sales per stop | *Gallons* | .54 | .55 | ---- | .60 | .60 | .68 |
| Average annual gross wages per delivery worker[9] | *Dollars* | 3,850 | 4,600 | 3,200 | - | - | ---- |

[1] Information from these various studies is essentially comparable, though methods of analysis differed in some details. All reflect conditions after wartime adjustments in milk delivery had been made.

[2] See footnote 1, Table 25.

[3] Adapted from "Cost of Distributing Milk in Maine Markets." Alvah L. Perry. Maine Agr. Expt. Sta. Bul. 451. pp. 82, 86. 1947.

[4] Adapted from "A Study of Milk Delivery in the New York Market with Particular Attention to Wartime Adjustments." Leland Spencer and H. Alan Luke. Cornell Univ. Agri. Expt. Sta. Bul. A. E. 534. (mimeographed). pp. 43-69. 1945. These data represent sales of milk and cream on wholesale routes and sales of milk only on retail routes, but buttermilk and chocolate drink are less important in those markets than in Alabama. New York City proper is the area included in the five boroughs of New York City. Suburbs refer to Nassau, Suffolk, and Westchester counties.

[5] Approximation based upon information given in other terms.

[6] Sales per mile not reported separately for wholesale and retail routes in Memphis. Average sales per mile on all routes was 4.3 gallons in Memphis as compared with 4.7 gallons in Birmingham.

[7] Volume per load and per mile on retail routes in Maine and in New York City market include some milk sold to wholesale customers.

[8] Includes one large Birmingham plant for which other retail route data were not available.

[9] Average gross salary paid selling and delivery workers hired by distributor, before deducting wages paid helpers by route men.

### Comparison *with* Selected Northeastern Markets

Information from a study in Maine and from a study of delivery operations in the greater New York City market also throws some light on the comparative efficiency of milk distributor operations in Alabama *(6, 24)*. Gallons of product processed per hour of plant labor was somewhat higher in Maine than in Alabama.[27]

The greatest apparent difference between Alabama and these northern markets was in efficiency of wholesale delivery. In Maine and in suburban areas of the New York City market (Nassau, Suffolk, and Westchester counties), wholesale loads averaged roughly a third larger than in Alabama; in New York City proper they were about two-thirds larger. Wholesale sales per mile and per stop were much larger, even outside of New York City, than in Alabama markets. On retail routes, however, load size and sales per mile and per stop in Alabama compared quite favorably with the corresponding figures for these other markets.

Although these data point up serious deficiencies in Alabama operations only in wholesale distribution and perhaps in product loss, it is obvious that they are too limited to permit thorough comparisons. It also should be emphasized in this connection, that the averages shown in Table 27 in no sense represent goals for superior performance. Wide variation among plants in such factors as labor efficiency and load size has been pointed out in earlier sections. This variation clearly demonstrates that far better than average performance was possible.

## SUMMARY *and* CONCLUSIONS

### Summary

This study was made to provide information about the financial aspects and over-all efficiency of milk processing and distribution in Alabama. While it gives some indication of the level of returns, it is primarily concerned with reasons for differences in costs, returns, and profits, and possible means of reducing distribution costs.

The study was based mainly on data for the calendar year 1948 from 35 Alabama milk distributors. Similar data for the first half of 1949 from 20 of these same distributors were used in some com-

[27] Part of this difference may be attributable to the fact that buttermilk and chocolate drink, which require more labor than whole milk, comprised a larger share of the volume in Alabama than in Maine.

parisons. Financial data covering receipts, expenses, and capital investments were obtained in some detail. These were supplemented with such items as quantities and butterfat content of dairy products purchased and sold, number and wage rates of employees by departments, and route information.

Schedules for 1948 were taken from all distributors in major regulated markets who purchased more than half of the milk they processed and from whom usable information could be obtained. The sample included the bulk of the distribution in most of these markets, and nearly three-fifths of the total for the State.

In 1948, total capital averaged $118,000 per plant. About five-eighths of it was invested in real estate and in plant, delivery, and office equipment. Investments presumably would have been larger had many distributors not been using facilities purchased and valued at prewar prices.

In the aggregate, whole milk, including homogenized, comprised about four-fifths of the quantity and value of dairy products sold. Plain buttermilk was second in importance. By volume, 60 per cent of all sales were to stores, restaurants, schools, and other wholesale outlets, 32 per cent were direct to consumers, and 8 per cent were platform sales to independent distributors.

Not quite two-thirds of distributors' receipts were spent for milk and other materials used in products sold. More than nine-tenths of this expense was for fluid milk and practically all butterfat taken in was in this item. However, a considerable volume of non-fat solids was purchased in powdered and condensed skim milk.

About a third of distributors' receipts went to meet operating expenses which, as classified, did not include any charge for interest, income taxes, or compensation for risk. Plant and container expenses, which consisted chiefly of plant labor costs, container expense, and building and plant equipment costs, made up nearly half of all operating expenses. Selling and delivery expenses, which were made up chiefly of costs of delivery labor and of truck operation, were nearly as large in total, and as much per quart-equivalent, as plant and container expenses. Administrative and general expenses were only a tenth of the total. In the aggregate, labor costs made up more than half of all operating expenses, while costs of buildings and all equipment, including trucks, made up about a fifth.

In 1948, operating expenses averaged 5.6 cents per quart of standard whole milk, or its equivalent, delivered on wholesale routes. The range by plants was from a low of 4.1 cents to a high of 7.9 cents.

After meeting operating expenses, distributors had left, as compensation for use of capital and for risk, returns that varied from plus 1.3 cents to minus 1.5 cents per quart-equivalent. Though nearly half of the distributors had negative returns, the average (weighted by volume) was 0.5 cent per quart-equivalent. For 34 distributors who reported total capital, this return was equivalent to 11 per cent of average total capital. For the same group, net profit after deducting a 5 per cent interest charge was 0.2 cent per quart-equivalent. Returns, like operating expenses, varied widely.

Much of the variation in returns was attributable to differences in gross margins, which ranged roughly from 4.0 cents to 8.0 cents per quart-equivalent. Differences in margins were due in part to variations between markets in margins allowed dealers by price regulations. In a given market, a low butterfat content for whole milk and a relatively large volume of homogenized milk sold at premium prices contributed to a wide margin. Data were inadequate to establish with certainty whether or not margins on buttermilk and chocolate drink were enough wider than margins on whole milk to compensate, or more, for the apparently higher costs of handling these sideline products.

Rough checks of butterfat intake and outgo indicated large amounts that were not accounted for. Even though these calculations may have overstated the actual loss, potential savings were sufficient to justify more careful product accounting.

Volume per plant varied from a few hundred gallons to more than 5,000 gallons per day. In general, plant, delivery, and administrative labor were used more effectively, delivery was more efficient, and better use was made of facilities and supplies in large plants than in small ones. These efficiencies were not reflected in lower unit costs, however, because their effect was compensated by higher wage rates paid by large distributors. Gross margins were materially wider in large plants than in small ones. Consequently, large distributors made much better incomes than did small distributors even though there was no important difference in level of operating expenses.

Four distributors were packaging milk exclusively in paper. In their operations, which were somewhat above average in size,

efficiency in use of labor and in delivery was well above that in glass operations. Savings obtained on labor and other items were approximately cancelled out, however, by the higher costs of paper containers.

In delivery, important differences were found in load size, especially on wholesale routes. Unit costs of truck operation were low in plants with large loads, but delivery labor costs were not. Most drivers were compensated on a straight commission basis, especially those hired by large distributors. Consequently, the larger deliveries per man associated with large loads were reflected mainly in higher route men's wages rather than in lower unit costs for delivery labor.

Wide variation was found both in volume of product processed per hour of plant labor and in quantity delivered per route worker. Operations in which output per worker was high showed savings of roughly 1.0 cent per quart-equivalent in labor costs and in total operating expenses over those in which output per worker was low. Part of this difference may have been attributable to differences in other factors, such as size of plant, that were associated with differences in labor efficiency. Nevertheless, important differences in labor efficiency, and accordingly in labor costs and in operating expenses, were found among plants of comparable size.

Analysis by markets showed wide differences between them in gross margins, costs, and profits. For this analysis, plants in all markets outside Birmingham and Mobile were combined into two groups with Gadsden-Montgomery-Tuscaloosa plants in one group and all plants in the four smaller markets in the other. With plants thus combined, in most respects in which there were important differences, averages for Birmingham plants were at one extreme, averages for Mobile plants at the other, and averages for other groups in between.

Outstanding characteristics of the Birmingham plants were large size, comparatively heavy retail sales and sales of sideline products, exclusive use of glass with low expense for containers, approximate average efficiency in delivery and in use of labor, but high wage rates that resulted in high unit costs, particularly for delivery labor. Gross margins were wide, and, as a result, net incomes were generally higher in Birmingham than in any other market group.

Operations in the Mobile market were relatively small and

characterized by a high proportion of wholesale sales, small sales of sideline products, comparatively heavy use of paper with high expense for containers, above average labor efficiency, and low wage rates. However, gross margins per quart-equivalent were much narrower than in Birmingham, and therefore returns were lower.

In many respects, operations in the three larger of the other markets were similar to those in Birmingham. Most notable differences were use of some paper, and therefore heavier expense for containers, larger wholesale loads, somewhat better use of labor, slightly lower wage rates, especially for delivery workers, and somewhat narrower gross margins and smaller net incomes.

Operations in the four small markets more nearly resembled those in Mobile. They differed from Mobile, however, in that a smaller share of the milk was packaged in paper, poorer use was made of labor, wage rates and total operating expenses per quart-equivalent were higher, and, despite somewhat wider gross margins, returns were lower.

These Alabama operations were compared in some respects with operations of the same type in other states for which similar data could be obtained. Much of this comparison was between 1948 operations of Birmingham plants and of plants in Memphis, Tennessee.

Computed dealer margins on standard whole milk in quart bottles were nearly 4.0 cents per quart wider in Birmingham than in Memphis. For various reasons, however, the average gross margin on all products and container sizes, as computed in this study, was only 9.0 cents per gallon, or about 2.3 cents per quart, wider in Birmingham. Since there was a corresponding difference of 6.0 cents per gallon in operating expenses, net returns were about 3.0 cents per gallon more in Birmingham than in Memphis.

Except for larger loads on wholesale routes in Memphis, lower operating expenses in that market did not reflect generally superior efficiency. Instead, lower costs in that market appeared to be due primarily to lower wage rates.

More limited comparisons with data for certain northeastern markets provided further indication that wholesale delivery was relatively inefficient in most Alabama markets. Deficiencies showed up not only in load size, but also in volume of sales per mile and per stop.

Comparative data were too limited to support general con-

clusions about the over-all efficiency of milk distribution in Alabama. However, the wide variation found among plants in such factors as labor efficiency and load size suggests that for most plants material improvements in performance are possible in many respects.

## Conclusions: Suggestions for Reducing Distribution Costs

Results of this study indicate a number of areas in which important reductions in costs of distribution may be possible. In addition, they focus attention on a number of conditions that affect efficiency of operation. A number of practical suggestions for improvement can be drawn from this and related studies.

**Costs Must be Reduced if Dealers' Margins are to be Narrowed Materially.** With few exceptions, only the largest distributors made appreciable net profits after meeting legitimate operating expenses and allowing 5 per cent interest on average total capital. Even among these distributors, net profits, as thus defined, amounted to only a fraction of a cent per quart of product handled. This indicates that if marketing margins are to be narrowed materially reduction must be accomplished primarily by cutting costs of processing and distribution.

**Cost Reductions Rest Largely on More Efficient Use of Labor.** Labor costs comprise more than half of all operating expenses. Accordingly, reduction in processing and distribution costs will depend to a large extent on adjustments that result in handling increased quantities of milk per man. Increased efficiency is especially important in delivery because of the heavy expense for delivery labor.

**Delivery Labor Costs per Unit Should Vary with Efficiency of Delivery.** The straight commission basis used in paying many route drivers works against reduction in delivery labor costs. This is true because a major share of the benefits obtained by handling a large load accrues to the driver, even if the large load results from efficiencies in distribution and does not add appreciably to the amount of time put in or work done by the driver. On the other hand, a straight salary offers little incentive to the driver to build up his load. Moreover, neither of these plans is

equitable among drivers because neither reflects accurately the work required on individual routes *(26, 28)*.

What is needed is a payment plan that accurately relates the compensation of the route driver to the amount of necessary work he does *(26)*. The best single measure of work done is the number of customers served *(28)*. With such a plan, economies attained in distribution can be reflected in lower prices to consumers. In attempting to meet the problems of high labor costs in delivery, some dealers have sold part or all of their milk at the plant to vendors. The merits of this type of distribution are worth investigating.

**Specific Suggestions *for* Increasing Efficiency *in* Delivery.** No matter what basis of compensation is used, a good route driver is a highly paid worker. His time and energy should be used as effectively as possible. The following are suggestions as to how route men may deliver larger loads *(25, 26, 27, 28)*. Except as noted, they apply to both wholesale and retail routes.

(1) Adopt pricing plans which properly reflect the lower cost per unit of delivering milk in large lots. Such plans encourage customers to buy exclusively from one distributor, and may induce small volume retail customers, who can not be served efficiently on routes, to buy their milk at stores.

(2) Minimize route mileage by careful planning and organization of routes.

(3) Eliminate glass containers on wholesale routes on which sales volume in glass is relatively small. This will permit hauling larger loads, reduce the number of items, and avoid the need of picking up and accounting for empty bottles.

(4) Adopt three-times-a-week delivery on retail routes and eliminate on all routes call backs and special services.

(5) Have order changes of all types called in to the plant, and payments mailed in, to conserve the driver's time.

(6) Serve scattered wholesale stops on retail routes that are in the same territory.

(7) Seek maximum efficiency in loading and unloading trucks, and in the bookkeeping required of route drivers.

The limited information available suggests that *minimum* goals for efficient load size should be at least 325 gallons on wholesale routes and 125 gallons on retail routes.

**Changes Especially Needed to Achieve Efficient Wholesale Distribution.** Wholesale distribution appeared to be one of the least efficient phases of Alabama operations. This situation may have traced in part to the shift that seemed to be taking place in some markets from store to home-delivered sales. One reason for the shift appeared to be that the price of milk was no lower at the store than at the consumer's doorstep, while sales taxes were applicable only to the stores sales.[28]

Two adjustments are especially needed if the efficiency of wholesale distribution is to be improved:

(1) Most important, there must be a pricing arrangement that will permit the economies possible in wholesale distribution to be reflected in reduced prices to consumers. The potentialities of wholesale distribution can not be realized as long as those who might merchandise milk efficiently through stores are unable to attract the sales volume they need because they can not price milk in line with the costs that would be incurred in efficient wholesale distribution.

(2) Prices to wholesale customers should decrease as volume of milk delivered increases in order to minimize duplication in delivery. Observations indicated that lack of a pricing provision of this sort was encouraging many storekeepers to buy from a number of distributors, reducing volume of sales per distributor at many wholesale stops. Such a pricing arrangement is economically justified. For example, a California study has indicated that wholesale delivery costs were approximately cut in half when the quantity of milk delivered per stop increased from 25 units to 100 units, and declined further as volume per stop increased to higher levels *(30)*. These findings applied to a market in which drivers were on straight salary.

If favorable conditions are provided, it is possible to distribute milk through stores at low cost. Evidence of this is found in the shift from doorstep to store sales that has been taking place in many parts of the country *(23)*. It is also found in the lower prices charged consumers for milk at stores than on retail routes

[28] In 1948, the sales tax rate was 2 per cent. It has since been raised to 3 per cent. In some cases, the price of milk at stores has been further increased by charging a premium on milk in paper cartons, most of which is sold through stores.

in many markets *(3)*. It is known that some distributors are merchandising milk through stores at exceptionally low costs.[29]

**Conditions *and* Practices *that* Will Improve Operating Efficiency Within *the* Plant.** Because differences in container type and in container costs may be involved, the efficiency of operations within the plant should not be judged solely by the quantity of milk handled per unit of labor. However, except in plants using paper containers, no evidence was noted that efficient use of plant labor involved above average plant expense for other items.

While there was wide variation in plant labor efficiency, there was no indication that even the most efficient operations were approaching the highest attainable levels of performance.[30] Moreover, continuing gain in efficiency must be sought in plant operations as improved equipment and methods become available.

The following list suggests a few of the conditions and practices that favor efficient plant operations *(23, 25, 26, 27, 29)*. Volume of business, which probably is the most important single factor, is discussed in another place.

(1) Eliminate as many as possible of the products and container sizes handled in small lots, on which costs are likely to be high. Exchange or purchase of small-volume items that can not be dropped may be practical under some conditions, especially for small distributors.

(2) If feasible, package milk exclusively either in glass or in paper containers. An operation that involves both glass and paper is likely to be inefficient, especially if volume is small.

(3) Give adequate consideration to adjustments and practices designed to increase the efficiency of plant labor. Examples are:

a. Most convenient possible arrangement of equipment and facilities.

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[29] The manager of a Washington, D. C., milk plant operated by a chain store recently reported wholesale loads on routes to stores that averaged about 1,600 gallons per day and average daily deliveries per store of 400 quarts. In this operation, the gross margin between the price paid producers for milk and the price charged consumers at the store was 5.9 cents per quart *(29)*. While it might be impossible, even with favorable conditions, to reach that high level of performance in Alabama, this example indicates that tremendous improvements in wholesale distribution are possible.

[30] Most efficient use of plant labor in Alabama was in an all-paper operation in which 43 gallons of product were handled per hour of plant labor. In exclusive paper operations in other regions, output as high as 70 and 80 gallons per hour of plant labor has been reported *(23, 29)*.

b. Schedule deliveries to the plant to reduce idleness by employees and to eliminate long waits by haulers.

c. Stagger working hours to avoid underemployment of some workers when a full crew is not needed.

d. Use incentive payment plans.

(4) If conditions permit, take advantage of promising mechanical developments such as in-place (permanent) plant pipelines and bulk handling of milk from producers.

As a *minimum* goal, it appears that 35 gallons or more of product should be handled per hour of plant labor.

**Importance of Volume—Possible Adjustments for Small Distributors.** An adequate volume of business is of paramount importance, especially in plant operation and in wholesale distribution. Although some large plants are not efficient, operating efficiency tends to increase with size up to and beyond the volume of the largest plants included in this study. Optimum volume has been increasing as milk processing has become more highly mechanized and market areas have expanded. Further increases are to be expected.

A *minimum* average daily sales volume of 2,000 gallons appears necessary, and a larger volume is to be preferred. In one study, it was concluded that a plant bottling 12,500 gallons per day or more, if properly arranged and modernly equipped, usually could operate more efficiently than a plant with a smaller volume *(23)*.

Distributors whose sales are limited by the size of their local markets may be able to increase volume profitably by expanding their distribution areas. This is especially true for distributors who are packaging milk in paper.

For many small dealers, widening of distribution areas appears to be impracticable. For those in this category, there are possible alternatives to unprofitable plant operation. These include such adjustments as (1) giving up processing to distribute milk purchased from another dealer, (2) having milk custom-bottled, or (3) joining with other distributors in the operation of a cooperative processing plant.

**Records Needed for Efficient Operation.** Particularly in large plants, efficient management is unlikely to be attained without adequate records of the right type. A few examples of sum-

marized records needed by management that were not available in many plants at the time of this study are listed below:

(1) Quantities of dairy products sold, both packaged and in bulk. Wholesale and retail sales should be summarized separately. Supplementary information also is needed as to quantities and butterfat content of surplus dairy products used in ice cream or similar products. Quantities of butterfat disposed of in all items should be readily determinable.

(2) Quantities of labor hired, by departments, and amounts of gasoline, fuel, electricity, and other major items used.

(3) Distances traveled by delivery trucks, numbers of customers served, and average size of loads, summarized separately for wholesale and retail routes.

There is little point in keeping such records unless the information is used in studying the business. For example, it has been noted that product losses might be reduced materially by checking them periodically. Measures of efficiency also should be computed from time to time and compared with corresponding figures for other periods and, if available, with other plants.

## DEFINITION of TERMS

**Milk distributor** — a pasteurizing-plant operator who purchased more than half of the fluid milk he handled.

**Products sold** — items delivered on routes or sold at the plant for regular distribution. Products sold in bulk to other plants or transferred to ice cream operations were excluded from sales.

**Net sales** — net receipts from products sold, after deducting returns and allowances.

**Product costs** — costs of fluid milk, bottling cream, powdered and condensed skim milk, other dairy products, chocolate syrup, sugar, orange concentrate, vitamin D concentrate, and other ingredients purchased, adjusted for inventory changes, and credited with milk and/or cream sold in bulk to other plants or used in ice cream.

**Gross margin** — net sales less product cost.

**Operating expenses** — all business expenses exclusive of (1) product cost, (2) interest and dividend payments, and (3) income taxes. Operating expenses include charges for the labor of unpaid plant owners and members of their families who worked in the business.

**Return for use of capital and for risk** — the excess of net sales over the sum of product cost plus operating expenses. This represented the net income available, before deducting income taxes, to compensate for the use of all capital and for risk.

**Net profit above 5 per cent interest on total capital** — net return for use of capital and for risk less 5 per cent interest on average total capital.

**Quart-equivalent** — a unit of product sold estimated to be approximately equivalent in handling cost to a quart of standard whole milk sold on a wholesale route. Quarts-equivalent processed were computed separately from quarts-equivalent delivered. Plant and container expense per quart-equivalent was determined by dividing by quarts-equivalent processed; selling and delivery expense per quart-equivalent by dividing by quarts-equivalent delivered. Unless otherwise indicated, the divisor used in expressing other expenses, net returns, etc., on a quart-equivalent basis was the average of quarts-equivalent processed and quarts-equivalent delivered. The schedule and method used in computing quarts-equivalent are presented in the Appendix.

**Man-equivalent** — number of full-time men or the estimated equivalent in other help. In computing delivery man-equivalent, route helpers were included at one-third man-equivalent per helper.

**Index of labor efficiency** — a measure of productiveness of both plant and delivery labor. To compute the index for a plant, number of quarts-equivalent processed per hour of plant labor in that plant was expressed as a percentage of the corresponding average for all plants. Likewise, quarts-equivalent delivered per delivery man-equivalent were expressed as a percentage of the corresponding average for all plants. Index of labor efficiency was the average of the two percentages.

**Index of load size** — an indicator of comparative size of a distributor's delivery load, considering both wholesale and retail routes. To compute this index, the distributor's wholesale sales in gallons were divided by average gallons per load on wholesale routes of all plants that had them. Similarly, the distributor's retail sales in gallons were divided by average gallons per load on retail routes of all plants that had them. The two quotients were totaled, and the total divided by actual number of routes operated by that distributor. The latter quotient was multiplied by 100 to express it as an index number. While the index took into account deliveries on mixed routes, average load sizes used were those only for routes that had been classified as wholesale or retail.

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# APPENDIX

## COMPUTATION of QUARTS-EQUIVALENT

Quarts-equivalent were computed to provide a common denominator to facilitate comparisons of costs and efficiency among plants. The item handled in largest volume, standard whole milk in quarts sold on wholesale routes, was assigned a unit value of 1.0 (Appendix Table 1). The unit value assigned to each other item was intended to express the comparative cost of handling that item in relation to the cost of handling standard whole milk in quarts sold on wholesale routes.

APPENDIX TABLE 1. UNIT VALUES PER BOTTLE OR PER PACKAGE USED IN COMPUTING QUARTS-EQUIVALENT[1]

| Product | Unit | Units per bottle or per package | | |
|---|---|---|---|---|
| | | Plant and container units | Wholesale delivery units | Retail delivery units |
| | | *Number* | *Number* | *Number* |
| Whole milk | *Gallons* | 2.4[2] | 2.4 | |
| | *Quarts* | 1.0[2] | 1.0 | 1.6 |
| | *Pints* | .8[2] | .7 | |
| | *Half-pints* | .6[2] | .4 | |
| Buttermilk (plain or whole) | *Quarts* | 1.3 | 1.0 | 1.6 |
| | *Pints* | 1.1 | .8 | |
| | *Half-pints* | .9 | .6 | |
| Chocolate drink (or chocolate milk) | *Quarts* | 1.2 | 1.1 | 1.6 |
| | *Pints* | 1.0 | .8 | |
| | *Half-pints* | .7 | .5 | |
| Coffee cream (or cereal cream) | *Quarts* | 2.0 | 1.2 | |
| | *Pints* | 1.6 | .9 | |
| | *Half-pints* | 1.2 | .6 | 1.6 |
| Whipping cream | *Quarts* | 2.2 | 1.3 | |
| | *Pints* | 1.8 | .9 | |
| | *Half-pints* | 1.3 | .6 | 1.6 |
| Orange drink | *Quarts* | 1.0 | 1.1 | 1.6 |
| | *Pints* | .8 | .8 | |
| | *Half-pints* | .6 | .5 | |
| Skim milk | *Quarts* | 2.0 | 1.2 | 1.6 |
| Eggnog | *Quarts* | 3.0 | 1.3 | 1.6 |
| Cottage cheese | *Packages* | 3.0[3] | 1.0 | 1.6 |
| | *Pounds (bulk)* | 2.0[3] | .75 | |
| Butter | *Pounds* | 3.0[4] | .75 | 1.6 |

[1] Values for minor items not shown were estimated on basis of comparative costs of processing and delivery in relation to products shown.
[2] Five per cent was added for homogenized milk.
[3] One unit less if curd purchased.
[4] Two units less if purchased.

Two sets of figures representing quarts-equivalent were computed for each plant. One set, computed using unit values termed plant and container units, was used as a basis of determining unit costs of receiving, processing, packaging, etc., including containers. The other set was the sum of wholesale and retail delivery units. No delivery units were assigned to sales at the platform to sub-dealers. For administrative expenses per unit, and for most other quotients except those involving plant and/or delivery expenses, the average of numbers of plant and delivery units was used as the denominator. Total operating expense per quart-equivalent was the sum of (1) plant and container expenses per quart-equivalent processed plus (2) selling and delivery expense per quart-equivalent delivered plus (3) total administrative and general expenses per unit computed in the manner described in the preceding sentence.

The unit values assigned to various products and container sizes were determined partly from information obtained from a number of the milk distributors included in the study, partly from data obtained in the study on wage rates of wholesale and retail routemen, and partly from various published reports of milk distribution costs (5-16, 18). Because these sources did not provide ready-made answers, final decision as to the exact unit values to use rested with the author.

In view of the apparent differences found in the comparative cost of handling a given product and container, the unit values shown are presented as rough indicators of differences in handling costs. It would require much more time and money than was expended upon this phase of the study to develop refined ratios that might justifiably be used in allocating milk distributors' operating expenses to products and containers. That is especially true for operations in which buttermilk and chocolate drink comprise as large a share of sales volume as they do in Alabama.

Despite these limitations, quarts-equivalent provide a better common denominator to use in comparing costs and efficiency than such other available common denominators as dollar sales and gallons (or quarts) of products sold. That is true because the computation of quarts-equivalent takes into account that there are differences in the costs of handling different products; that container, packaging, and delivery costs for a given volume of product are generally higher if it is in pints or half-pints than if it is in quarts; and that delivery is more expensive on retail than on wholesale routes.

APPENDIX TABLE 2. QUANTITY OF EACH PRODUCT SOLD BY CONTAINER SIZE AND CHANNEL OF SALE, 35 ALABAMA MILK DISTRIBUTORS, 1948[1]

| Product | Container size | Quantity sold | | | |
|---|---|---|---|---|---|
| | | Wholesale | Retail | To subdealers | Total |
| | | *1,000 gallons* | *1,000 gallons* | *1,000 gallons* | *1,000 gallons* |
| Standard whole milk[2] | *Gallon* | 31 | | | 31 |
| | *Quart* | 5,188 | 3,573 | 973 | 9,734 |
| | *Pint* | 725 | 1 | 32 | 758 |
| | *Half-pint* | 1,207 | [3] | 163 | 1,370 |
| Homogenized milk[2] | *Gallon* | 3 | | | 3 |
| | *Quart* | 1,489 | 2,149 | 199 | 3,837 |
| | *Pint* | 151 | | 4 | 155 |
| | *Half-pint* | 454 | | 28 | 482 |
| Plain buttermilk | *Gallon* | 1 | [3] | | 1 |
| | *Quart* | 2,327 | 582 | 258 | 3,167 |
| | *Pint* | 91 | | 1 | 92 |
| | *Half-pint* | 27 | | [3] | 27 |
| Whole buttermilk | *Quart* | 27 | 54 | 6 | 87 |
| | *Pint* | 8 | | | 8 |
| | *Half-pint* | 5 | | | 5 |
| Chocolate drink | *Gallon* | 1 | | | 1 |
| | *Quart* | 127 | 191 | 7 | 325 |
| | *Pint* | 123 | 3 | 13 | 139 |
| | *Half-pint* | 136 | 1 | 9 | 146 |
| Coffee cream[4] | *Gallon* | 1 | | | 1 |
| | *Quart* | 83 | 2 | 2 | 87 |
| | *Pint* | 14 | 3 | [3] | 17 |
| | *Half-pint* | 26 | 30 | 3 | 59 |
| Whipping cream | *Gallon* | [3] | [3] | [3] | [3] |
| | *Quart* | 8 | [3] | [3] | 8 |
| | *Pint* | 3 | 1 | 1 | 5 |
| | *Half-pint* | 32 | 11 | 3 | 46 |
| Orange drink | *Quart* | 96 | 47 | 31 | 174 |
| | *Pint* | 5 | | [3] | 5 |
| | *Half-pint* | 41 | | 1 | 42 |
| Eggnog | *Quart* | 6 | 5 | [3] | 11 |
| Skim milk | *Gallon* | 1 | | | 1 |
| | *Quart* | 1 | 2 | [3] | 3 |
| | | *1,000 units* | *1,000 units* | *1,000 units* | *1,000 units* |
| Cottage cheese | *Package* | 107 | 60 | 7 | 174 |
| | *Pound* | 50 | | [3] | 50 |
| Butter | *Pound* | 48 | 2 | [3] | 50 |
| Straws | *Box* | 9 | | [3] | 9 |

[1] Excludes products sold by fewer than three distributors.

[2] In a few cases, it was impossible to determine exactly how much homogenized milk was sold in pints and half-pints. This may have resulted in a slight understatement of sales of homogenized milk and an overstatement of sales of standard whole milk.

[3] Less than 500 gallons.

[4] Includes a small amount of cereal cream.