Costs of producing and distributing market milk in the Billings-Laurel area of Montana
by Roy Blanch

A THESIS Submitted to the Graduate Committee in partial fulfillment of the requirements for the Degree of Master of Science in Agricultural Economics
Montana State University

Abstract:
Date on cost of production and cost of distribution of market milk were supplied by 26 operators located in the BillInge-Laurel market area. These data were used to determine the per quart cost of producing and the per unit and per quart equivalent cost of distributing market milk for each operator. The average production cost of the 22 producers and the average distribution cost of the 11 distributors were also calculated. An analysis was made to determine the factors exerting the greatest in-fluence in causing the wide variation in costs among individual operators.

The average cost of producing milk was 4,19 cents per quart and the range among individual operators was from 2.78 cents to 5.92 cents. Labor and feed were the largest costs, accounting for 40 per cent and 36 per cent respectively of the total cost.

The average cost of distributing market milk was2.79 cents per unit of fluid sales and 3.82 cents per quart equivalent. The range among individual operators in these costs was from 2.01 cents to 5.24 cents per unit and from 2.63 cents to 6.25 cents per quart equivalent. The largest single cost of distributing market milk was for labor which accounted for about 60 per cent of the total cost. The costs of truck operation and of depreciation were the next largest costs, accounting for 12 per cent and 8 per cent respectively of the total cost.

The retail price of market milk in Billings was 11cents per single quart and 10 cents per quart when four or more quarts were taken. The milk handled by the operators furnishing data, however, was sold both as market milk and as surplus milk. The latter was sold in the form of manufactured products at lower prices.

The factors exerting the greatest influence in causing the wide variation among individual operators in costs of producing and distributing market milk were found to be as follows: 1. Production per cow 2. Size of herd 5. Volume of milk handled during the year 4. Labor efficiency 5. Use of equipment to varying capacities 6. Lack of an organized credit system.

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Approved:

Harold F. Hollands
In Charge of Major Work

Harold F. Hollands
Chairman, Examining Committee

H. B. Rother
Chairman, Graduate Committee

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COSTS OF PRODUCING AND DISTRIBUTING MARKET MILK IN THE BILLINGS-LAUREL AREA OF MONTANA

ABSTRACT

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The average cost of producing milk was 4.19 cents per quart and the range among individual operators was from 2.78 cents to 5.92 cents. Labor and feed were the largest costs, accounting for 40 per cent and 36 per cent respectively of the total cost.

The average cost of distributing market milk was 2.79 cents per unit of fluid sales and 3.82 cents per quart equivalent. The range among individual operators in these costs was from 2.01 cents to 5.24 cents per unit and from 2.63 cents to 6.25 cents per quart equivalent. The largest single cost of distributing market milk was for labor which accounted for about 50 per cent of the total cost. The costs of truck operation and of depreciation were the next largest costs, accounting for 12 per cent and 8 per cent respectively of the total cost.

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The factors exerting the greatest influence in causing the wide variation among individual operators in costs of producing and distributing market milk were found to be as follows:

1. Production per cow
2. Size of herd
3. Volume of milk handled during the year
4. Labor efficiency
5. Use of equipment to varying capacities
6. Lack of an organized credit system.

PART I. INTRODUCTION

Nutritional authorities have recommended a quart of milk a day for children and a pint a day for adults. 1/ On a weighted average basis this is equal to about one and one-third pints per capita. Yet at present the average consumption of milk in the United States is not more than half this amount. 2/ Some consumers would increase their consumption of quality milk if adjustments in the present price relationships were instituted. 3/ These adjustments may take the form of higher consumer incomes, of governmental subsidies, or of lower milk prices.

Studies of the St. Louis, Boston, New York, and other markets have shown that consumers appear to be much more interested in low priced milk than they are in its nutritional value. 4/ This fact seems to indicate that a greater increase in the consumption of milk could be obtained if the present sponsors of educational programs would center more attention on the installation of economies in production and distribution in order to give consumers the low priced milk they want.

The conditions contributing to high costs of producing and distributing milk have existed for many years. Primarily, these conditions exist because of the nature of milk production and distribution, which is

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1/ Recommended by Dr. E. V. McCollum of Johns Hopkins University, Dr. H. C. Sherman and Dr. Mary Swartz Rose of Columbia University. Bartlett, R. W., "Increasing the Consumption of Milk" from Dairy Manufacture's Short Course Manual, Illinois Extension Service, 1938, p. 145.

2/ Bartlett, R. W., "St. Louis Milk Problems With Suggested Solutions," Ill. Exp. Sta. Bul. 412, p. 161, 1935.

3/ Ibid.

4/ Ibid.

characterized by the presence of many firms engaged in the business in one market area. It has been found that these conditions result in inefficiencies which are largely due to small yearly volumes of business, inefficient use of labor, and duplications of facilities utilized in production and distribution. Consequently, costs of production are in many cases considerably greater than necessary, which result in a low return to the producer, a high price to the consumer, or both. If milk production and distribution costs are to be reduced and milk consumption is to be increased, the ways of reducing such costs and their relative merits must be considered. 5/

Milk production and distribution in some of the smaller markets, such as the one involved in this study, have not been completely divided into separate functions. Unlike the usual practice in large cities where different firms perform the functions of production and of distribution, both of these functions may be performed in the smaller markets by one firm. In the Billings-Laurel area there are several individuals performing only one of the functions either production or distribution, while others perform both functions.

Purposes of the Study

The purposes of this study are: (1) to determine the costs of producing and distributing market milk in the cities of Billings and Laurel, Montana, as an aid to those producers and distributors who may wish to use such information in the working out of a more balanced

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5/ Rinear, Earl H., "Milk Distribution Costs of Producer-Distributors and Subdealers in New Jersey," New Jersey Exp. Sta. Bul. 663, p 55.

economic unit; (2) to analyze the costs incurred in the production and distribution of market milk and the factors affecting costs so that individual operators may compare their operations with others in the area; (3) to indicate the conditions that enable one dairyman to produce or distribute milk at a lower cost than another in order that factors affecting the costs may be rearranged to conform with the lowest cost combination; (4) to indicate possible ways whereby dairymen may reduce their costs of producing and distributing market milk in order to reduce the price and stimulate consumption; (5) to give a basis by which the consumer may determine whether or not he is paying unjustifiably high prices for milk; and (6) to furnish government agencies with information that may be of value in carrying out their programs.

Sources and Characteristics of Data

The interview method was employed in obtaining these data. A schedule was prepared to facilitate gathering the essential information and the data were recorded on the schedule during the interview with each operator.

Twenty-eight of the 57 licensed dairymen supplying fluid milk to the Billings and Laurel area cooperated in this study by supplying data concerning their dairy enterprise. The records of two of these later had to be discarded.

Most of the operators who furnished data keep no formal records. The four distributors and the one producer-distributor keeping complete records do not segregate costs between the market milk enterprise and

other enterprises. Several of the operators maintained records on parts of their enterprises.

Records when available supplied the data. When records were not available, costs were computed on the basis of information supplied by the operator. When joint costs were involved, the proportion of the total cost charged to market milk was calculated on a percentage basis. Two such bases were used: (1) the proportion of the total use of equipment that was devoted to the market milk enterprise and (2) the proportion of the total gross receipts of the business that came from the sale of market milk. Equipment costs were calculated by using the first method because the proportion of total equipment used by the market milk enterprise varied widely among operators. For example: Ten per cent of one operator's total equipment may be used by the market milk enterprise and 30 per cent of his total gross receipts may come from the sale of market milk products, while 40 per cent of another operator's equipment may be used by market milk and the sale of market milk products account for only 20 per cent of his total gross receipts. Charging equipment costs of these operators on the basis of the percentage of gross receipts would not be justified. If this method had been used, the first operator would have had an equipment cost too high and the second a cost too low. However in dividing the total cost of building maintenance between the market milk and other enterprises of the business percentage of gross receipts is the more logical method to use. This results from the difficulty of determining the per cent of the total use of the buildings

devoted to market milk and because all the enterprises of the business require the use of the building, it is reasonable to charge each in accordance with its percentage of the total gross receipts.

Information needed for this analysis consisted of a complete record of all costs incurred in producing and distributing market milk. Since this study is concerned only with the production and distribution of market milk, data were obtained only on this portion of the individual's farming operations.

The operators furnishing data showed considerable interest in the study. Due to this and the freedom with which information was given, it is believed that these data were relatively accurate.

Because of the number of dairymen operating in the market area and the unwillingness or inability of some dairymen to give information, it was impossible to obtain data from all operators. Since complete cost data were not obtained from all dairymen, it is desirable to determine what per cent of the total market milk consumed in the market was handled by the operators furnishing data. A rough percentage was computed and indicates that about 65 per cent of the total milk marketed in the area was from the dairymen whose records are used in this study. 6/

Since this study includes both producing and distributing costs, it was necessary to set a point at which production costs end and distri-

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6/ This percentage figure was computed in the following manner: the per capita consumption of milk in cities and villages in the United States was multiplied by the combined populations of Laurel and Billings. Then the product was divided into the total milk handled by the 11 operators furnishing data.

bution costs begin. This point was set on the basis of the costs incurred by the producer who sells his milk in bulk to the distributor. The producer's costs, except for hauling, cease after the milk enters the milk house and is cooled. In calculating producer-distributor's costs, this point was taken as the dividing line between production and distribution costs.

Description of the Market

The City of Billings, county seat of Yellowstone County, is located on the north bank of the Yellowstone River in south central Montana (figure 1).

Due to its favorable location as a distributing point for a large agricultural area, it is a rapidly growing city. The 1930 census reports its population as 16,380 whereas preliminary figures for 1940 report it as 23,313, an increase over the 1930 figure of 6,933 or 42.3 per cent.

Laurel, Montana, with a population in 1940 of 2,754, is located 16 miles southwest of Billings. This city owes its growth chiefly to the fact that it is a freight terminal on the Northern Pacific and the Chicago, Burlington, and Quincy railroads. The extensive railroad repair and construction shops, together with a large oil refinery, furnish employment for many men.

Conditions favorable to the production and sale of market milk are common to both cities. First, adequate supplies of feed can be obtained at low prices because of the general practice of including alfalfa and grains in the crop rotation systems. Second, the growing population of the cities provides an expanding market for the sale of milk and cream.

MONTANA

Figure 1. Location of Billings and Laurel, Montana

The operators engaged in the dairy industry in this area may be classified into three groups; producer, producer-distributor, and distributor. The distributors are located in or near the City of Billings and derive their supplies of fresh milk from the producers, the majority of whose farms lie northeast of the city along the Yellowstone River. The producer-distributors are located principally on the valley floor to the west of the city (figure 2).

Government Agencies in the Market

Montana Livestock Sanitary Board - Producers and distributors of market milk in the State of Montana must comply with the requirements of the Montana Livestock Board. The rules, regulations, and orders of this board are designed to guarantee to the consumer the production of a sanitary product. Milk produced and handled in accordance with the regulations of the Montana Livestock Sanitary Board is designated as inspected milk. All dairies wishing to produce milk and cream for fluid consumption must secure a license to do so from this board. Such dairies must then be inspected annually by an official appointed by the board and must score not less than 70 points on an official score card. Any milk purchased by milk plants from dairies not entitled to sell inspected milk must pasteurize all such milk before selling it to the consumer. Furthermore, uninspected milk cannot be mixed with or added to milk sold under the classification of inspected milk.

Official standards for the sale of fluid milk products published in, "Livestock Sanitary Laws of Montana," Montana Livestock Sanitary Board, 1927, are as follows:

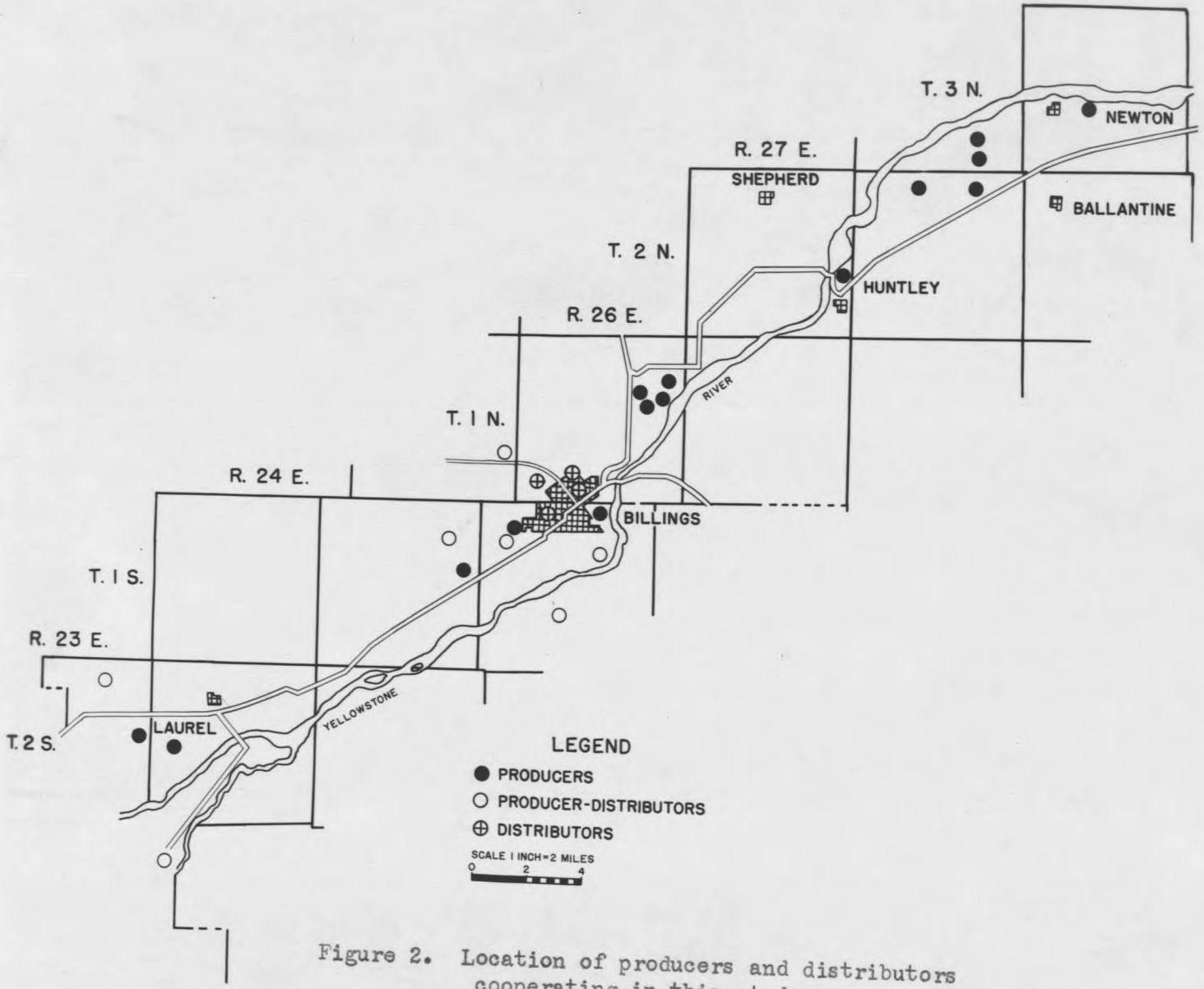

Figure 2. Location of producers and distributors cooperating in this study

1. All milk must contain not less than 3.25 per cent butterfat and not less than 8.5 per cent solids not fat.

2. All cream sold as whipping cream must contain not less than 30 per cent butterfat and not more than .2 per cent of acid reacting substance calculated in terms of lactic acid.

3. Raw milk shall not contain more than 150,000 bacteria per milliliter.

4. Raw cream shall not contain more than 300,000 bacteria per milliliter.

5. Pasteurized milk shall not contain more than 30,000 bacteria per milliliter.

6. Pasteurized cream shall not contain more than 150,000 bacteria per milliliter.

The following grades of fluid milk are sold to consumers in the Billings market.

1. Inspected raw milk or pasteurized milk containing not less than 3.25 per cent or more than 4.00 per cent butterfat.

2. Inspected raw or pasteurized coffee cream containing not less than 20 per cent or more than 25 per cent butterfat.

3. Inspected raw or pasteurized special cream testing not less than 25 per cent or more than 30 per cent butterfat.

4. Inspected raw or pasteurized whipping cream testing not less than 30 per cent or more than 36 per cent butterfat.

5. Inspected raw or pasteurized cream containing 36 per cent or more butterfat.

6. Inspected raw or pasteurized creamed buttermilk containing not less than one-half of one per cent or more than 3.5 per cent butterfat.

7. Inspected raw or pasteurized cultured or natural buttermilk containing not less than one-half of one per cent or more than one per cent butterfat.

8. Inspected raw or pasteurized skim milk containing less than one-half of one per cent butterfat.

Montana Milk Control Board - This market is also subject to the rules, regulations, and powers of the Montana Milk Control Board. The Board is operative and exercises the following powers; to fix by official order:

(a) The minimum prices to be paid by the milk dealers to producers and others for milk. The orders of the Board with respect to the minimum prices to be paid to producers and others shall apply to the locality or zone in which the milk is produced in respect to the market or markets in which milk so produced is sold, and may vary in different localities or zones or markets according to varying uses and different conditions. Each order fixing prices or handling charges may classify milk by forms, classes, grades or uses as the Board may deem advisable and may specify the minimum prices therefor.

(b) The minimum wholesale or retail prices to be charged for milk in its various grades and uses handled within the State for fluid consumption and wheresoever produced when sold by milk dealers whether licensed or unlicensed, to consumer; by stores to consumers except for consumption on the premises where sold; by milk dealers to other milk dealers.

A minimum wholesale or retail price to be charged for milk shall not be fixed higher than is necessary to cover the costs of ordinarily efficient and economical milk dealers, including a reasonable return upon necessary investment.

The Board may, upon its own motion, or upon application in writing from any market, or from any party at interest, alter, revise or amend any

official order theretofore made by the Board provided that before making, revising, or amending any order fixing prices to be charged or paid for milk in any of its grades or uses, the Board shall hold a public hearing on such matter in the same manner provided herein for the original fixing of prices.

The retail price to be charged for milk in quart bottles shall not be more than twice the price paid by the distributor to the producer for the same grade and butterfat content of fluid milk purchased from the producer by such distributor. The Board shall make adjustment from the basic rate in prices of milk sold in less quantities than quarts and at wholesale.

In any market, where the provisions of this Act apply, it shall be unlawful for any producer, producer-distributor, or distributor to produce, transport, process, store, handle, distribute, buy or sell milk unless such dealer be duly licensed as provided by this Act. It shall be unlawful for any such person to buy, sell, handle, process, or distribute milk which he knows or has reason to believe has been previously dealt with or handled in violation of any provision of this Act. The Board may decline to grant a license, or may suspend or revoke a license already granted, upon due cause and after hearing. 7/

The operation of this law in the market may be a factor affecting the efficiency with which milk is being produced and distributed.

Definition of Terms

A number of terms used in this report have not been standardized. In order to indicate clearly their meaning the following definitions are given:

Producer - a dairyman who produces milk and sells it in bulk to distributor or a producer-distributor.

Producer-distributor - a producer of market milk who packages and sells his fluid milk products direct to the consumer or to another retailer. He maintains a milk route and may supplement his own production by purchas-

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7/ Montana Milk Control Board Law, Mimeographed Copy, 1939, pp 12-13.

ing milk from a producer or another producer-distributor.

Distributor - an individual or firm that purchases milk from producers, processes it for sale in fluid form to retailers and consumers.

Market or fluid milk - milk that has been prepared for human consumption without being converted into any other product.

Fluid sales - includes sales of milk in the form of fluid milk, fluid cream, butter-milk, chocolate milk and skim-milk.

Unit of fluid sales - all fluid sales are sold in various size containers ranging from gallons to one-half pint bottles. Each container is considered a unit regardless of its size, i.e., each half-pint, pint, quart, or gallon is considered one unit.

Quart equivalent - refers to one quart or fluid sales. It is calculated by converting all fluid sales into quarts, i.e., two pints are equal to one quart equivalent, one gallon is equal to four quart equivalents.

Wholesale - refers to the sale of milk and milk products to stores, restaurants, and other large consumers at wholesale prices.

Retail - fluid sales at retail prices.

Milk house - refers to the room or building and the equipment used by the producer in cooling and storing his milk until it is delivered to the distributor.

Milk plant - refers to the room or building and the equipment used by the distributor in processing the milk.

Processing - cooling, pasteurizing, spearating the cream, bottling, refrigerating milk.

Distribution - refers to all services performed after the milk enters the milk house and is cooled, until it is purchased and paid for by the consumer.

Delivery - transporting the fluid milk from the milk plant to the purchaser.

Cost of production - represents all the costs incurred in the production of market milk.

Cost of distribution - is the cost of distributing the fluid products and represents all the costs incurred from the time the milk is received at the plant until it is delivered to and paid for by the purchaser.

Cow appreciation - increase in the value of cows during the year due to growth and increased capacity of milk production.

Cow depreciation - decrease in the value of cows during the year because of age, improper care, and injury. 8/

Method of Analysis

The presentation of the cost of production and distribution factors and their analysis is divided into two major parts. The costs and the factors affecting costs of producing milk are presented and discussed as Part II. Distribution costs and the factors affecting costs are presented in like manner in Part III. In each of these parts the factors affecting its cost are analyzed as follows: First, the market as a whole; second,

8/ Changes in the market price of cows during the year resulting from fluctuations in the price level were eleminated in computing appreciation and depreciation of cows.

the characteristics of the individual enterprise; and third, the differences between individual operators. Averages are used to indicate the characteristics of the market as a whole. Scatter diagrams are employed to illustrate the salient features and differences of the individual enterprises.

In order not to reveal the identity of the individual operator, each has been assigned a number. Reference to the same number will indicate the same operator throughout the study. Operators 1 to 15 inclusive are producers, operators 14 to 22 are producer-distributors, while operators 23 through 26 are distributors.

The small number of records obtained from the Laurel area, and the similarity of the factors affecting the costs of production and distribution in the two cities indicates that it is desirable to consider the two as one market. Operators numbered 14 and 15 are producers and operators 21 and 22 are producer-distributors who are located near and market their milk in Laurel.

PART II. PRODUCTION OF MARKET MILK

The cost of producing milk includes the sum of all the cost factors which enter into its production. These factors vary with the different producers and account for the diversity in total costs among producers. 9/

In order to facilitate an analysis, the factors pertaining to production costs are classified as follows: (1) costs, which are made up of labor, feed, buildings and equipment, cow depreciation, hauling, association dues, licenses, taxes, and miscellaneous; (2) credits, made up of market value of calves at birth, value of manure produced, cow appreciation and sale of by-products.

Costs and credits are in turn affected by: (1) volume, (2) production per cow, (3) size of herd, and (4) distance from market.

A summary of the costs of producing milk during the year ending November 1, 1940 is presented in table I. This summary includes all the costs of the 22 dairymen who furnished complete cost data.

The net cost of producing milk in the Billings-Laurel area was 4.19 cents per quart. Labor and feed were the two most important cost factors, contributing 40 per cent and 36 per cent respectively. The remaining 24 per cent of the total cost was divided among buildings and equipment, cow depreciation, hauling, association dues - licenses - taxes, and miscellaneous (table I).

9/ Herrman, L. F., Stelzer, R. O., and Bowling, S. A., "A Study of the Costs Incurred by 51 Farms in the Morgantown and Fairmont Markets in 1934-1935," West Virginia Agricultural Experiment Station Bulletin No. 268.

TABLE I. AVERAGE COSTS AND PROPORTIONATE DISTRIBUTION OF COSTS OF PRODUCING MILK PER COW AND PER QUART, BILLINGS-LAUREL AREA, 1940

Item	Cost per cow	Cost per quart	Per cent of total
	Dollars	Cents	
Costs			
Labor	$72	1.82	40.1
Feed	65	1.64	36.2
Use of buildings and equipment	16	.39	8.6
Cow depreciation	8	.21	4.6
Hauling	7	.17	3.7
Association dues, licenses, and taxes	2	.05	1.1
Miscellaneous	10	.26	5.7
Total costs	180	4.54	100
Credits			
Value of calf at birth	9	.23	64.3
Manure	4	.10	28.6
By-products	1	.02	7.1
Total returns	14	.35	100
Net cost of producing milk a/	166	4.19	

a/ Twenty-two operators

Credits

In the production of milk, joint products are also produced. These joint products, considered as credits, are deducted from the gross costs of producing milk in order to obtain the net costs. These joint products are classified and computed as follows:

Value of calves - Calves at birth were valued at the market price and accounted for 64 per cent of the total credits. The market price of calves averaged $9 per cow, a relatively high value helping to reduce the cost of producing milk.

Value of manure - Operators estimated the value of manure produced. This item averaged $4 per cow or 29 per cent of the total credits.

Cow appreciation - In those cases where the total of the ending inventory value of the herd, sales, and losses was larger than the beginning inventory, purchases, and value of heifers freshened during the year, the net increase was termed cow appreciation. This credit item was practically negligible and was included in by-products in table I.

By-products - The sales value of by-products, including cow hides, dead animals, old dairy equipment and feed bags, was supplied by the operator and together with cow appreciation contributes 7 per cent of the total credits or an average of $1 per cow.

Costs

Among individual operators there was a wide variation in the per quart cost of producing milk. The range was from 2.78 cents to 5.92 cents per quart. The majority of the operators' production costs fluctuated closely about the average; however, two operators had a production cost per

quart below three cents and three incurred a cost above 5 cents.

In analyzing costs, average figures may fail to represent the typical situation in the market because of the wide variation in costs among individual operators. Furthermore, individual figures are valuable in indicating the variations in costs.

The total cost per quart of producing milk of each operator is presented in table II. The data in this table, also, indicate to what extent the individual operator's total cost was made up of: (1) labor, (2) feed, (3) buildings and equipment, (4) cow depreciation, (5) hauling, (6) association dues - licenses - taxes, and (7) miscellaneous. Cost figures appearing in this table have been adjusted for credits granted. 10/ Therefore, the costs appearing represent the net cost to the operators and will be termed costs during the remainder of Part II.

The data in table III indicate for each operator the percentage that each of the 7 items of cost is of his total cost. The cost of labor accounted for the largest percentage of the total cost of 17 operators, while feed was the most important cost item of 5 operators.

There was a wide variation among individual operators in the per cent of the total cost expended for the different cost items. However, the percentage distribution of the total cost among the different cost items apparently has no affect upon the total quart cost of producing milk.

10/ Adjustments were made as follows: the individual operator's gross cost of each of the 7 cost items and his total credits were determined. The total of the credit items was then multiplied by the percentage that each of the cost items was of the total so that the total of the credit items was divided among the cost items according to their percentage of the total cost. These credits were then subtracted from the different cost items to give the net cost of each operator.

TABLE II. COSTS OF PRODUCING MILK PER QUART, BY OPERATORS, BILLINGS-LAUREL AREA, 1940*

Farm no.	All costs	Labor	Feed	Bldgs. and equip-ment	Cow depreciation	Hauling	Assoc. dues, licenses & taxes	Miscellaneous
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
1	2.95	.90	1.10	.20	.39	.09	.07	.20
2	4.79	1.63	1.86	.55	.40	.05	.06	.24
3	5.30	1.80	2.10	.60	.16	.41	.03	.20
4	3.90	1.50	1.40	.30	-	.42	.05	.23
5	4.29	1.85	1.56	.18	.07	.40	.03	.20
6	3.48	1.32	1.29	.20	.29	.24	.07	.07
7	5.86	2.67	1.81	.71	.18	.18	.03	.28
8	4.41	2.00	1.22	.22	-	.70	.06	.21
9	4.04	2.02	.97	.30	-	.53	.05	.17
10	4.22	1.85	1.46	.20	.35	.16	-	.20
11	3.25	1.58	1.00	.39	-	.12	.02	.14
12	4.37	1.53	1.32	.22	-	1.13	.07	.10
13	5.07	2.49	2.03	.10	-	-	.02	.43
14	4.92	2.06	1.78	.34	.45	-	.01	.28
15	5.20	1.80	2.00	.74	-	-	.10	.56
16	5.92	2.34	2.14	.77	.29	-	.03	.35
17	3.71	1.60	1.76	.11	-	-	.02	.22
18	3.98	1.98	1.20	.57	-	-	.02	.21
19	3.37	1.40	1.14	.16	.40	-	.04	.23
20	3.89	2.27	.78	.49	.09	-	.02	.24
21	3.96	1.67	1.57	.26	.09	-	.02	.35
22	2.78	.89	1.56	.10	-	-	.02	.21
Average	4.19	1.68	1.52	.36	.19	.16	.04	.24

*Data in this table have been adjusted for credits

TABLE III. PROPORTIONATE DISTRIBUTION OF COSTS OF PRODUCING MILK, BY OPERATORS, BILLINGS-LAUREL AREA, 1940

Farm No.	Total	Labor	Feed	Bldgs. and equipment	Cow depreciation	Hauling	Assoc. dues, licenses & taxes	Miscellaneous
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
1	100	30.5	37.2	6.6	13.2	3.3	2.4	6.8
2	100	34.0	38.8	11.5	8.3	1.1	1.3	5.0
3	100	47.2	29.5	7.7	3.2	7.8	.6	4.0
4	100	38.5	35.9	7.4	-	11.0	1.3	5.9
5	100	43.1	36.4	4.2	1.6	9.3	.6	4.8
6	100	37.9	37.0	5.9	8.3	6.9	2.1	1.9
7	100	45.6	30.9	12.2	3.0	3.0	0.6	4.7
8	100	45.5	27.6	4.9	-	15.6	1.5	4.9
9	100	50.5	24.0	7.4	-	13.2	1.2	4.2
10	100	43.7	34.6	4.8	8.4	3.8	-	4.7
11	100	48.8	30.7	11.9	-	3.5	0.6	4.4
12	100	35.0	30.2	4.9	-	25.6	1.7	2.6
13	100	49.1	40.1	1.9	-	-	0.5	8.4
14	100	41.9	36.2	6.8	9.1	-	0.2	5.8
15	100	33.7	39.3	14.3	-	-	2.0	10.7
16	100	39.5	36.1	13.0	4.9	-	0.5	6.0
17	100	43.0	47.4	3.1	-	-	0.5	6.0
18	100	49.6	30.1	14.4	-	-	0.7	5.2
19	100	41.5	33.9	4.8	11.9	-	1.2	6.7
20	100	58.3	20.0	12.5-	2.4	-	0.4	6.3
21	100	42.2	39.5	6.7	2.3	-	0.5	8.8
22	100	31.9	56.0	3.7	0.3	-	0.5	7.6
Average	100	40.1	36.2	8.6	4.6	3.8	1.0	5.7

Labor accounted for over 45 per cent of the total cost of producing milk of 8 operators, and of these, 4 had a total cost per quart above the average of the 22 operators and 4 had a cost below. Feed amounted to over 36 per cent of the total cost of 12 operators and these, too, were equally divided, 6 had a cost above and 6 below the average.

The wide variation among individual operators in the per quart cost of producing milk appears to be, from results of this study, caused by differences in the per quart cost of the items making up the total cost and these in turn are affected by differences in such factors as total volume of milk produced, production per cow, and size of herd. An analysis of these cost items and related factors should indicate why costs vary, the effect that the different items of cost and related factors have upon the total cost, and as a result may assist dairymen having high production costs in adjusting their enterprises to conform to low cost combinations.

Labor - Labor costs include those for the operator, the unpaid family, the hired help, and horse labor as expended on the production of milk. Operator's time spent in the dairy enterprise was determined and charged according to the rate of that type of labor as was unpaid family labor. Hired help was charged at the actual rate paid plus the share of board and room and other services furnished by the operator corresponding to the time spent in the dairy enterprise. 11/ Horse labor was valued at $1 per day and charged to the dairy enterprise according to the time spent.

11/ The allowance used for board and room was $30 per month, other allowances were dependent on the type of service furnished.

Man labor accounted for 97 per cent of the total and horse labor, so small as to be almost negligible, 3 per cent. Because of the relative unimportance of horse labor it was considered desirable to combine man and horse labor and analyze them as labor cost.

The total cost of labor per quart of milk produced averaged 1.68 cents (table II). Among individual operators this item ranged from .92 cents to 2.67 cents per quart.

The relative importance of this cost item and the wide range existing among individual operators suggest that it is one of the most important single items causing the wide variation in the total cost per quart of producing milk.

Operator's labor averaged $117 per month and the range among individual operators was from $80 to $200 per month. Of the 22 operators, two valued their labor at $80 per month, four at $90, nine at $100, one at $120, two at $125, one at $150 and three at $200.

Unpaid family labor averaged $65 per month and ranged among enterprises from $40 to $93. The 17 operators utilizing unpaid labor evaluated it as follows: two between $40 and $59 per month, 13 between $60 and $79, and two between $80 and $99.

The value of hired help averaged $64 per month. Ten dairymen hired help during the year and of these, seven paid a wage plus allowances between $50 and $69 per month, one $170, one $175, and one $105.

The variations in the monthly valuation of operator's labor may have an effect upon the per quart cost of labor. The relationship between the per quart cost of labor and the monthly value of the operator's labor

is indicated in figure 3. As the value of operator's labor increases the cost per quart of labor tends to decrease until the value of operator's labor reaches $130 per month and then there is an indication that the cost of labor per quart increases. The variations among individual operators in the monthly value of operator's labor are apparently offset to some extent by differences in the individual operator's working efficiency. There was no relationship between production costs and unpaid family labor or between costs and hired help.

Feed - Feed was the second largest single item of cost, accounting for 36 per cent of the total (table III). The cost of feed averaged 1.52 cents per quart (table II), and the range among individual operators was from .78 cents to 2.14 cents. Feed costs include costs incurred for alfalfa, pasture and field, succulents, concentrates, and straw utilized by the milking herd. Feed raised on the farm was valued at the price it could be sold for at the farm. Cost of pasture and field were charged at the local rental rates and varied in accordance with the quality.

Dairymen in this area usually operate a general farm upon which they grow a major portion of the feed for their dairy herds. Mill feed, dried beet pulp, mineral feeds, and brewer's malt were the principal feeds purchased.

Alfalfa was the only hay the 22 dairymen fed to their milking herds and accounts for 43 per cent of the total cost of feed (table IV). Operators fed an average of 3.8 tons of alfalfa per cow at an average cost

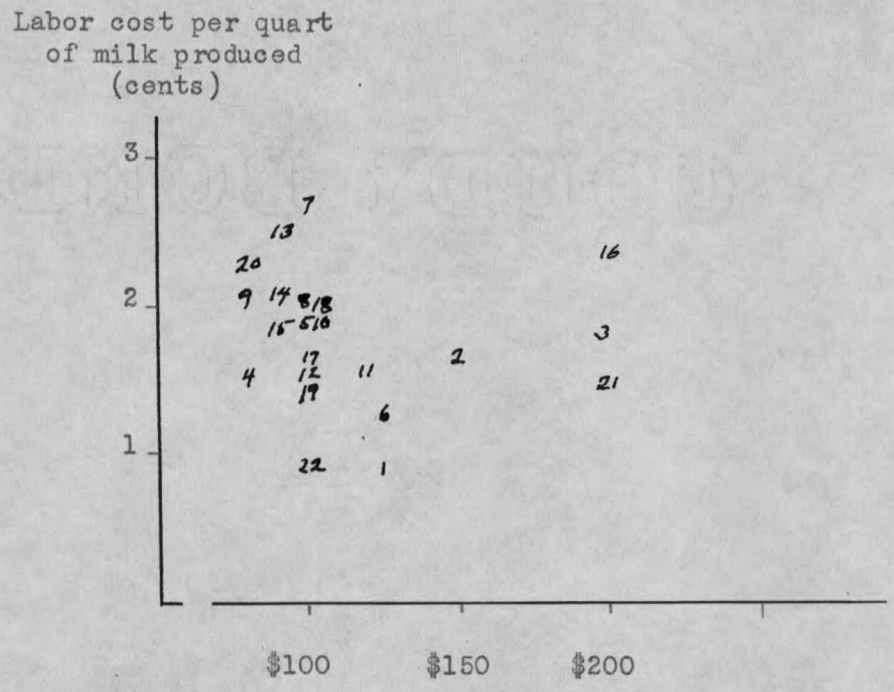

Figure 3. Relation between labor cost per quart of milk produced and value of operator's labor per month, 22 operators

TABLE IV. FEED COSTS AND PROPORTIONATE DISTRIBUTION FOR THE DIFFERENT FEEDS PER QUART OF MILK PRODUCED, BY OPERATORS, BILLINGS-LAUREL AREA, 1940

Farm No.	Total Cost		Alfalfa		Pasture & Field		Concentrates		Succulents	
	Cents	Pct.	Cents	Pct.	Cents	Pct.	Cents	Pct.	Cents	Pct.
1	1.67	100	0.32	28	0.07	2	0.70	61	0.58	9
2	1.54	100	0.63	35	0.30	17	0.88	48	-	-
3	1.49	100	0.58	39	0.31	21	0.60	40	-	-
4	1.42	100	0.41	29	0.21	15	0.76	53	0.04	3
5	1.53	100	0.66	43	0.19	12	0.68	45	-	-
6	1.24	100	0.63	51	0.20	16	0.41	33	-	-
7	1.73	100	0.63	36	0.38	22	0.72	42	-	-
8	1.29	100	0.57	44	0.19	15	0.51	39	0.02	2
9	0.99	100	0.33	34	0.17	17	0.49	49	-	-
10	1.44	100	0.53	37	0.34	24	0.44	30	0.13	9
11	1.11	100	0.47	42	0.10	9	0.54	49	-	-
12	1.44	100	0.76	53	0.10	7	0.48	33	0.10	7
13	2.13	100	0.87	41	0.40	19	0.86	40	-	-
14	1.88	100	1.01	54	0.24	13	0.63	33	-	-
15	2.22	100	1.06	48	0.20	9	0.96	43	-	-
16	2.24	100	1.34	60	0.10	5	0.80	35	-	-
17	1.79	100	0.70	39	0.11	6	0.98	55	-	-
18	1.25	100	0.56	45	0.06	5	0.40	32	0.23	18
19	1.12	100	0.38	34	0.21	19	0.46	41	0.07	6
20	0.74	100	0.59	80	0.12	16	0.03	4	-	-
21	1.78	100	0.48	27	0.13	7	0.96	54	0.21	12
22	1.57	100	0.84	54	0.11	7	0.62	39	-	-
Ave.	1.58	100	0.67	43	0.16	10	0.68	44	0.04	3

of $7 per ton which amounts to a total cost of $27. On a quart basis, the average cost was .67 cents and the range among operators was from .32 cents to 1.06 cents (table IV).

The relationship between the cost of alfalfa per quart of milk produced and total cost of production indicates that low costs of alfalfa are associated with low costs of producing milk and as alfalfa costs increase, total production costs tend to increase (figure 4).

Pasture and field costs averaged $6 per cow. The average cost per quart of milk produced was .16 cents, the range among individual operators was from .06 to .40 cents (table IV).

The wide variation in the per quart cost of pasture and field is due in part to differences in the quality and the quantity of pasture and field used. A number of operators did not have access to an adequate supply of pasture and field and so were forced to hand feed their milking herds during all or a large part of the summer months. Others used pasture and fields of inferior quality and, also, were forced to supplement their pasture and field by hand feeding. No relationship was evident between cost of pasture and field per quart of milk produced and total cost per quart of producing milk.

Concentrates accounted for 44 per cent of the total feed cost. This item averaged .68 cents per quart or $27 per cow. However, among individual operators extreme variations were present, indicating great diversity among operators in the amounts of concentrates fed. The range in the cost per quart was from .03 cents to .98 cents (table IV).

The relationship between cost of concentrates per quart of milk

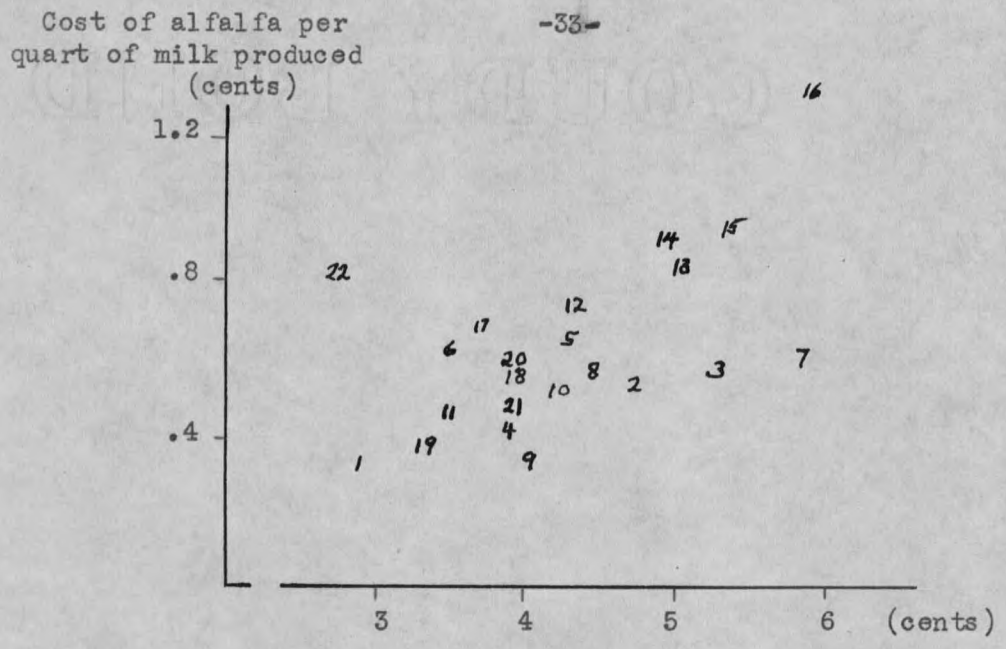

Figure 4. Relation between cost of alfalfa per quart of milk produced and total production cost per quart, 22 operators

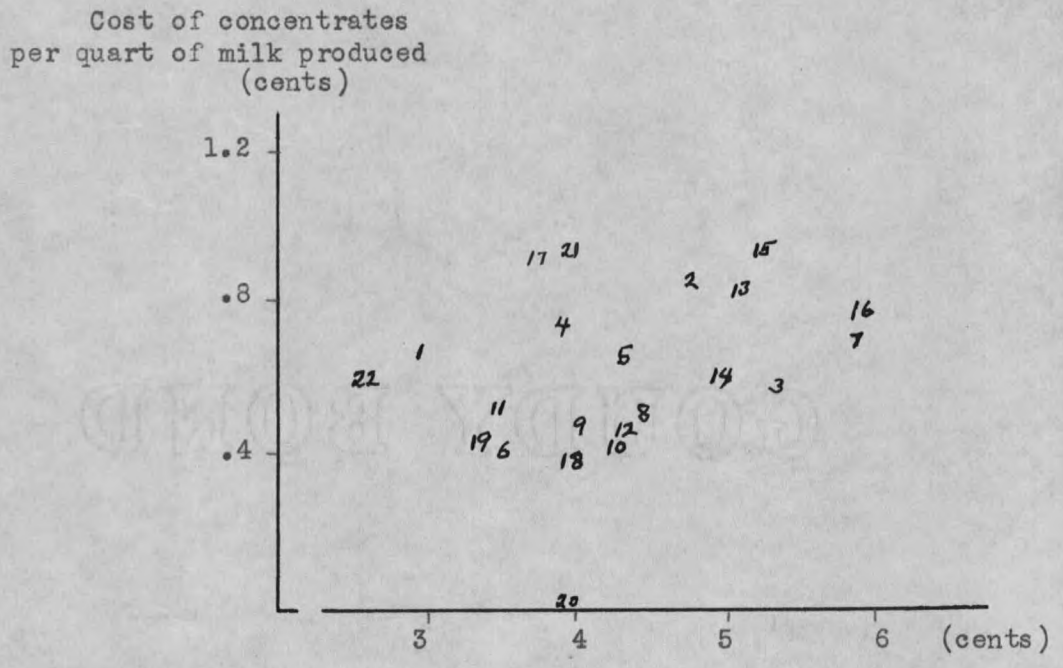

Figure 5. Relation between cost of concentrates per quart of milk produced and total production cost per quart, 22 operators

produced and total cost of production is illustrated in figure 5. The relationship is almost flat indicating that the cost of concentrates has little affect upon the total cost per quart of producing milk.

Concentrates fed by dairymen in this study include dried beet pulp, mill feed, barley, oats, wheat, corn, molasses and mineral feeds. The first four of these were the principal feeds used.

Succulent feeds, including corn silage and brewer's malt, were fed by eight of the dairymen furnishing data and constitute only 3 per cent of the total cost of feed. Each of the operators numbered 1, 4, 8, 10, 12, 18, and 19 who fed succulent feeds had a lower total cost per quart of feed than the average of the group, while the remaining operator, number 21, feeding succulents incurred a higher than average production cost. It may be that the use of succulent feeds tends to reduce feed costs. However, sufficient data are not available to accurately determine the affect that feeding succulents has upon the total cost of feed.

Straw was used for bedding by the 22 dairymen. An average of 1.42 tons costing $1.90 per cow was utilized.

Buildings and equipment - Buildings and equipment costs include the cost of repairs, insurance, depreciation on buildings which was charged at 4 per cent and on equipment charged at the average rates of depreciation for the area, 12/ taxes, determined by the assessed value on the average

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12/ Average depreciation rates for the Billings-Laurel area were obtained from Dr. J. A. Nelson, Professor of Dairy Industry, Montana State College.