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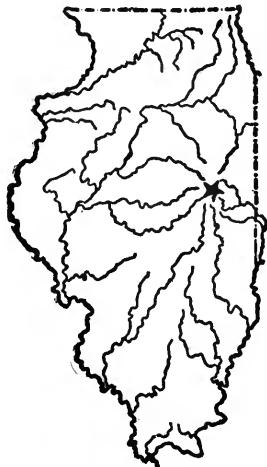
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BULLETIN No. 224

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THE SEASONAL COST OF MILK PRODUCTION

By F. A. PEARSON



URBANA, ILLINOIS, DECEMBER, 1919

## SUMMARY OF BULLETIN No. 224

**INTRODUCTION.**—The present study is concentrated upon the seasonal variations in the cost of milk production and not upon the method of calculation. Page 3

**SOURCE OF DATA.**—The data presented in this bulletin were secured from cost-accounting records kept on dairy farms located in the dairy district tributary to Chicago. Page 3

**HERD COST OF MILK PRODUCTION BY MONTHS.**—With the herd as the basis of computation, the monthly cost of producing one hundred pounds of milk varied from \$.94 in June to \$2.14 in December (1914-15 prices). Approximately three times as much hay and grain were fed per hundredweight of milk produced during the winter months as during the summer months. The average feed expense per hundredweight of milk was nearly twice as great during the winter months as during the summer months. The amount of labor used, per hundredweight of milk, was 35 percent greater during the winter months than during the summer months. Page 4

By applying current prices to the amounts of feed (other than pasture) and labor shown to have been used in producing one hundred pounds of milk, and multiplying the result by the percentage which feed and labor are shown to have constituted of the total net cost, the approximate cost of milk production may be ascertained for any month or season of the year. Page 10

**SIGNIFICANCE OF SEASONAL VARIATIONS IN FEED AND LABOR EXPENSE.**—It is clear that pasture is the important factor in reducing the cost of milk production during the summer months. Pasture reduces the amount of labor spent on the herd and permits more time to be spent with the crops during a period when the returns from labor spent on crops are relatively large compared with returns from the herd. Page 11

**COW COST OF MILK PRODUCTION BY MONTHS.**—With the cow as the basis of calculation, the net cost of producing one hundred pounds of milk varied from \$1.15 in June to \$2.08 in December and February (1914-15 prices). Page 12

**SEASONAL VARIATION IN COST OF PRODUCTION AND PRICE OF MILK.**—In general, the monthly variation in the price paid for milk at the Chicago market has followed the relative fluctuations in the cost of production. Page 16

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# THE SEASONAL COST OF MILK PRODUCTION

BY F. A. PEARSON, ASSISTANT CHIEF IN DAIRY HUSBANDRY

## INTRODUCTION

The present study pertains to the seasonal cost of producing milk for direct consumption. Numerous organizations in various parts of the United States have made from time to time many studies of the cost of milk production, but in most instances these data involve what is known as the year cost of milk production. Little or no attention has been given to the seasonal variations in the cost of producing this important commodity.

The question of seasonal variations in the cost of fat production was discussed briefly in 1914 before the American Farm Management Association and later the proceedings were published by the association.<sup>1</sup> The present study presents quantitative results which set forth in rather precise form the large variation in the cost of producing milk for urban consumption in the different months of the year.

## SOURCE OF DATA

The Department of Dairy Husbandry has been carrying on detailed cost-accounting investigations pertaining to various problems of dairy farm administration since 1912. The data presented in this bulletin involve eighteen of the thirty-six farms included in the study of the year cost of milk production published as Bulletin 216 of this station.<sup>2</sup>

The eighteen herds under consideration were located in the whole-milk district tributary to Chicago. The data were secured during the fiscal years 1914-15 and 1915-16 before the war had produced any marked increase in the general price level. The data for herd cost involve 407 cows, 19 bulls, and 234 young stock.<sup>3</sup> The cows produced for sale in the period under consideration 2,733,735 pounds of milk testing 3.47 percent of butter fat, or 94,870 pounds—an average of 6,717 pounds of milk and 233 pounds of fat per cow. Fifty-seven percent of the milk was produced in the six winter months. During the winter months the 407 cows dropped 138 living calves, and dur-

<sup>1</sup>Proceedings of Fifth Annual Meeting of the American Farm Management Association, page 41. 1914.

<sup>2</sup>Pearson, F. A. *The Cost of Milk Production Computed on the Year Basis.* 24 pp., 1919.

<sup>3</sup>In Bulletin 216 the figures showing young stock represent cattle units, two young stock being considered one unit, while in the present study the figures represent individuals. This occasions a discrepancy in the two sets of figures.

ing the summer six months, 219. Of the 219 cows freshening in the summer six months, 149 freshened in September and October and are considered fall-freshening cows. During January, 35 living calves were dropped; February, 15; March, 12; April, 11; May, 23; June, 8; July, 17; August, 22; September, 70; October, 79; November, 40; and December, 25.

The data for cow cost involve the same farms as the data for herd cost, but not the same quantities of milk and fat, as a small amount was fed to the young stock.

### HERD COST OF MILK PRODUCTION BY MONTHS

Briefly stated, the herd cost of milk production involves not only the cost of producing milk but also the cost of replacing the depleted cow stock. Usually the appreciation in the young stock raised more than counterbalances the depreciation of the milking herd. Before the tuberculin law went into effect the majority of the milking cows in the dairy district tributary to Chicago were purchased from the creamery and cheese-factory districts of Illinois and Wisconsin, and at that time the amount of young stock raised in the whole-milk areas did not counterbalance the depreciation of the milch cows.

Specifically, the herd cost of milk production is the expense of feed, pasture, man labor, the interest on stock, the use of buildings, horse labor, miscellaneous expenses, and the use of equipment; minus the returns not milk, such as the appreciation of stock, manure, etc.

*The feed* includes purchased and farm-raised feeds. In the present study, the purchased feeds are charged to the herd at the purchase price and the farm-raised feeds at the prevailing values on the farm; that is, the market price less the cost of transporting them to the market. Pasture is charged at prevailing rates at which pastures were rented in that district.

*Man labor* involves the labor of milking and caring for the stock.

*Interest* on the inventory value of the stock is charged at 5 percent.

*The use of buildings* is figured at 8 to 10 percent of the value of the structure.

*Horse labor* is the amount of labor necessary to haul the milk and feed and is charged at the actual cost per hour of horse labor on the farms.

*Miscellaneous expenses* include veterinary fees, bull service, cow-testing fees, acid, registration fees, and membership in various organizations of breeders or milk producers.

*The use of equipment* includes the repairs and depreciation of the dairy equipment.

*Appreciation of live stock* includes the net increase in the amount and value of the stock.

*Manure* hauled on the land is credited to the cows at \$1 per load.



*Miscellaneous credit* includes credit for grain sacks, cow hides, and bull service.<sup>1</sup>

The final result obtained in attempting to ascertain the monthly cost of milk production is possibly subject to some criticisms owing to the method of prorating certain factors of expense and return for each month of the year. It is at present not possible to allot to each month the proper wear and tear on dairy equipment. The same may be said of the use of buildings, the use of the water system, the depreciation on cows, and miscellaneous expenses. In the present study these expenses have been prorated according to the volume of milk produced. As the investment in live stock was fairly uniform throughout the year, the interest on the stock has been prorated equally among the twelve months. The manure has been prorated according to the actual amount recovered each month and hauled on the land. The appreciation in stock has been prorated according to the volume of milk produced.

The greatest discrepancy in prorating expenses, either by the month or by the volume of milk, takes place in the case of the building charge. Dairy barns are primarily erected for the care of cattle in the winter months. It is doubtful whether either method of prorating the charge for the use of buildings will not leave too large a portion of the expense charged to the milk produced in the summer months.

However, as 98 percent of the net yearly herd cost of producing milk is man labor and feed not pasture, some inaccuracy in prorating these minor items of expense and return makes little difference in the final result.

Table 1 shows for the year and for each month of the year the detailed items of expense and of return other than milk involved in the production of the milk on the eighteen farms under consideration.

The net yearly herd cost of producing the 2,733,735 pounds of milk was \$46,624.46. The cost of producing 1,572,343 pounds of milk in the winter months (November, December, January, February, March, and April) was \$31,541.17. The cost of producing 1,161,392 pounds of milk in the summer months was \$15,083.29.

The average cost of producing one hundred pounds of milk was, for the year, \$1.71; for the winter six months it was \$2.00, and for the summer six months it was \$1.30. The monthly cost per hundred-weight of milk varied from \$ .94 in June to \$2.14 in December.

#### VARIATION IN FEED EXPENSE

By inspection of Table 1 it will be noted that the item of expense in which occurred the greatest monthly variation was that of feed.

<sup>1</sup>For further details concerning these items of charge and credit, see Bulletin 216, previously referred to.

TABLE 1.—HERD COST OF MILK PRODUCTION FOR THE YEAR AND FOR EACH MONTH OF THE YEAR

|                              | Year               | WINTER MONTHS     |                   |                   |                   |                   |                   |
|------------------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                              |                    | November          | December          | January           | February          | March             | April             |
| <b>PRODUCTION:</b>           |                    |                   |                   |                   |                   |                   |                   |
| Fat.....                     | 94 870 lbs.        | 7 440 lbs.        | 8 651 lbs.        | 9 053 lbs.        | 9 159 lbs.        | 10 366 lbs.       | 9 544 lbs.        |
| Milk.....                    | 2 733 735 lbs.     | 218 319 lbs.      | 256 240 lbs.      | 271 737 lbs.      | 263 208 lbs.      | 292 405 lbs.      | 270 434 lbs.      |
| <b>ITEMS OF EXPENSE:</b>     |                    |                   |                   |                   |                   |                   |                   |
| Feed other than pasture..... | \$34 421.61        | \$3 956.11        | \$4 615.97        | \$4 834.67        | \$4 750.00        | \$4 613.44        | \$3 762.81        |
| Pasture.....                 | 3 190.25           | 164.27            | 54.34             | 54.21             | 39.22             | 52.38             | 101.06            |
| Man labor.....               | 11 240.83          | 984.46            | 1 204.92          | 1 197.46          | 1 173.67          | 1 253.12          | 1 086.95          |
| Interest on herd.....        | 3 325.93           | 277.16            | 277.16            | 277.17            | 277.16            | 277.16            | 277.16            |
| Use of buildings.....        | 2 679.74           | 214.01            | 251.18            | 266.37            | 258.01            | 286.63            | 265.09            |
| Horse labor.....             | 2 305.55           | 176.96            | 232.83            | 219.12            | 210.09            | 247.86            | 206.43            |
| Miscellaneous.....           | 1 998.00           | 159.56            | 187.28            | 198.60            | 192.37            | 213.71            | 197.65            |
| Use of equipment.....        | 404.24             | 32.29             | 37.89             | 40.18             | 38.92             | 43.24             | 39.99             |
| Total.....                   | \$59 566.15        | \$5 964.82        | \$6 861.57        | \$7 087.78        | \$6 939.44        | \$6 987.54        | \$5 937.14        |
| <b>RETURNS NOT MILK:</b>     |                    |                   |                   |                   |                   |                   |                   |
| Appreciation of stock.....   | \$8 495.19         | \$748.15          | \$744.93          | \$841.48          | \$700.29          | \$749.79          | \$ 692.85         |
| Manure.....                  | 4 446.50           | 584.46            | 620.80            | 650.81            | 655.82            | 629.82            | 617.82            |
| Total.....                   | \$12 941.69        | \$1 332.61        | \$1 365.73        | \$1 492.29        | \$1 356.21        | \$1 379.61        | \$1 310.67        |
| <b>NET COST.....</b>         | <b>\$46 624.46</b> | <b>\$4 632.21</b> | <b>\$5 495.84</b> | <b>\$5 595.49</b> | <b>\$5 583.23</b> | <b>\$5 607.93</b> | <b>\$4 626.47</b> |
| <b>NET COST PER CWT.....</b> | <b>\$1.71</b>      | <b>\$2.12</b>     | <b>\$2.14</b>     | <b>\$2.06</b>     | <b>\$2.12</b>     | <b>\$1.92</b>     | <b>\$1.71</b>     |

TABLE 1.—*Concluded*

|                              | SUMMER MONTHS     |                   |                   |                   |                   | October           |
|------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                              | May               | June              | July              | August            | September         |                   |
| <b>PRODUCTION:</b>           |                   |                   |                   |                   |                   |                   |
| Fat.....                     | 9 900 lbs.        | 8 403 lbs.        | 6 680 lbs.        | 5 022 lbs.        | 4 289 lbs.        | 6 363 lbs.        |
| Milk.....                    | 280 323 lbs.      | 237 564 lbs.      | 187 342 lbs.      | 145 439 lbs.      | 126 278 lbs.      | 184 446 lbs.      |
| <b>ITEMS OF EXPENSE:</b>     |                   |                   |                   |                   |                   |                   |
| Feed other than pasture..... | \$1 709.84        | \$789.10          | \$940.07          | \$1 093.84        | \$1 314.14        | \$2 041.62        |
| Pasture.....                 | 457.37            | 490.05            | 440.56            | 423.20            | 477.39            | 436.20            |
| Man labor.....               | 898.60            | 701.20            | 685.12            | 641.19            | 632.30            | 781.84            |
| Interest on herd.....        | 277.16            | 277.16            | 277.16            | 277.16            | 277.16            | 277.16            |
| Use of buildings.....        | 274.79            | 232.87            | 183.64            | 142.57            | 123.78            | 180.80            |
| Horse labor.....             | 210.62            | 164.28            | 157.38            | 152.01            | 148.00            | 179.97            |
| Miscellaneous.....           | 204.88            | 173.63            | 136.92            | 106.30            | 92.29             | 134.81            |
| Use of equipment.....        | 41.45             | 35.13             | 27.70             | 21.51             | 18.67             | 27.27             |
| <b>Total.....</b>            | <b>\$4 074.71</b> | <b>\$2 863.42</b> | <b>\$2 848.55</b> | <b>\$2 857.78</b> | <b>\$3 083.73</b> | <b>\$4 059.67</b> |
| <b>RETURNS NOT MILK:</b>     |                   |                   |                   |                   |                   |                   |
| Appreciation of stock.....   | \$788.56          | \$598.55          | \$536.88          | \$470.20          | \$717.07          | \$906.34          |
| Manure.....                  | 228.54            | 40.00             | 50.00             | 55.00             | 80.00             | 233.43            |
| <b>Total.....</b>            | <b>\$1 017.10</b> | <b>\$638.55</b>   | <b>\$586.88</b>   | <b>\$525.20</b>   | <b>\$797.07</b>   | <b>\$1 139.77</b> |
| <b>NET COST.....</b>         | <b>\$3 057.61</b> | <b>\$2 224.87</b> | <b>\$2 261.67</b> | <b>\$2 332.58</b> | <b>\$2 286.66</b> | <b>\$2 919.90</b> |
| <b>NET COST PER CWT.....</b> | <b>\$1.09</b>     | <b>\$.94</b>      | <b>\$1.21</b>     | <b>\$1.60</b>     | <b>\$1.81</b>     | <b>\$1.58</b>     |

The total expense for feed varied from \$1,279.15 in June to \$4,888.88 in January. The feed expense per hundredweight of milk varied from \$ .54 in June to \$1.89 in November.<sup>1</sup> For the winter six months the average expense per hundredweight of milk was \$1.72, and for the summer six months, \$ .91.

This variation in feed expense is due to the varying kinds and quantities of feed consumed at different times of the year. Large amounts of grain, hay, and silage are fed during the winter months, while in the summer months the cattle derive their sustenance largely from pasture. It is clear that pasture is the important factor in reducing the cost of milk production in the summer months. In June, when little or no silage, hay, or grain is fed in addition to pasture, and the flow has materially increased, the feed cost per hundredweight of milk is very low. In the present study the feed expense in the winter months was found to be more than three times that in the month of June.

#### VARIATION IN LABOR EXPENSE

Altho the labor expense for the various months of the year exhibits important variations, these variations are not so great as are those for feed.

The total amount of labor required to produce the 2,733,735 pounds of milk was valued at \$11,240.83; 61 percent of which was required during the winter months. On the basis of one hundred pounds of milk produced, the winter average for labor was 43.9 cents and the summer average 37.4 cents. The greatest expense for labor was in December, 47 cents; and the lowest was in June, 29.5 cents.

The greater expense for labor in the winter months is due to the additional labor required to feed, bed, and clean out the stables. In the summer months, when the cows are on pasture, this work is largely eliminated. Altho the volume of milk produced during the winter months is somewhat greater than that produced in the summer months, it is not enough greater to make up for the additional cost of labor.

#### QUANTITIES OF FEED AND LABOR PER HUNDREDWEIGHT OF MILK

In Table 2 are shown the amounts of feed (except pasture) and man labor required in the production of one hundred pounds of milk during the various months of the year. It will be noted that June and July are the months in which the cost of feed and labor constitute the lowest proportion of the total net cost of production.

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<sup>1</sup>Altho the largest total feed cost prevails in January, the maximum production under barn feeding is also reached in that month, with the result that the feed cost per hundredweight of milk produced is lower than it is in November, when barn feeding prevails but production under these conditions is at the minimum.



In June, when the cost of feed and labor was only 66.9 percent of the total cost, there was utilized in the production of one hundred pounds of milk, 1.87 hours of labor, 16.6 pounds of grain, 22.0 pounds of hay, 4.2 pounds of other forage, and 62.6 pounds of succulent feed. In January, when the cost of feed and labor constituted 107.8 percent of the total cost, there was utilized in the production of one hundred pounds of milk, 2.76 hours of labor, 51.2 pounds of grain, 75.1 pounds of hay, 70.0 pounds of dry forage, and 261.2 pounds of succulent feed. In June, 22.0 pounds of hay and in July 11.1 pounds of hay were fed per hundred pounds of milk, while both in November and in December about 75 pounds were used, and in January, 68 pounds.

If we except October from the summer months, we find that three times as much grain and hay were fed, per hundredweight of milk produced, during the winter months as during the summer months. The amount of labor required during the winter months was 35 percent greater, as an average, than during the summer months.

#### USE OF THE SEASONAL HERD COST OF MILK PRODUCTION

By using the amounts shown in Table 2 and applying to them the farm values for a given season, it is relatively simple to secure the approximate cost of milk production for any month or season. For instance, assuming the following values for feed and labor: grain, \$55 per ton; silage, \$6 per ton; hay, \$10 per ton; dry forage, \$6 per ton; and man labor, 25 cents per hour, the December cost would be:

|  |            |                |               |
|--|------------|----------------|---------------|
| Grain .....                                  | 51.2 lbs.  | @ \$55 per ton | = \$1.41      |
| Silage .....                                 | 272.9 lbs. | @ 6 per ton    | = .82         |
| Hay .....                                    | 76.1 lbs.  | @ 10 per ton   | = .38         |
| Other roughage .....                         | 70.5 lbs.  | @ 6 per ton    | = .21         |
| Man labor .....                              | 2.94 hours | @ 25c per hour | = .74         |
| Value of feed and labor.....                 |            |                | \$3.56        |
| Proportion that feed and labor form of total |            |                |               |
| net cost .....                               |            |                | 105.9 percent |
| Net herd cost of milk per hundredweight..... |            |                | \$3.36        |

If the same values are applied to the quantities of feed and labor for June, the summer six months, the winter six months, and the year, the following costs are secured: June, \$1.85; summer months, \$2.20; winter months, \$3.20; and year, \$2.76.

## SIGNIFICANCE OF SEASONAL VARIATIONS IN FEED AND LABOR EXPENSE

In the past due significance has not been attached to the rôle that pasture plays in dairy farming. The most popular method of dispensing with the pasture question has been to contrast the total amount of food secured from an acre of pasture with the amount secured from an acre of corn silage or alfalfa. However, in spite of much advice to the contrary, the dairy farmers have continued to make general use of pasture since the cheapest food for the summer months is obtained in this way and the farmer is enabled to reduce the amount of labor spent on the herd. As the months favorable to pasturing stock approximately coincide with the crop season, this reduction in the amount of labor spent on the herd enables the farmer to spend more labor on the crops.

On the eighteen farms under discussion, the man labor devoted to the production of milk during the summer months totaled 27,632.5 hours, an average of 152 hours per day. In the winter months it amounted to 43,533.0 hours, or 238 hours per day. The difference per day per farm between summer and winter was 4.8 hours.

The expense for feed in the summer months is much less than in the winter months. In this study, in the month of June, when pastures are best, the feed expense was considerably less than one-third the average for the winter months (Table 1). This was due to the fact that much more grain was fed per hundredweight of milk in the winter months than in the summer months (Table 2).

Pasture is a crop which is in most cases planted, grown, and harvested without much assistance from the farmer. Dairy farmers pasture-feed in the summer, rather than barn-feed, because they usually have in permanent blue grass some land which cannot be tilled with profit. Pasture reduces the amount of labor spent on the herd and permits more time to be spent with the crops during a period when the returns secured from labor spent on crops are relatively large compared with returns from the herd. If the farmers did not pasture their stock in the summer and yet continued in the dairy business, barn-feeding during the summer months, more buildings would have to be maintained to house the additional feed necessary, or fewer cows would have to be kept. Farmers without pasture who embark in the dairy business and sell to the ordinary markets have one of two alternatives; either they must barn-feed in the summer, or they must turn good crop land into pasture. The first alternative, in the absence of a large amount of unpaid labor, is very unprofitable. The latter, altho unprofitable, is probably less so than the former.

Competition has inevitably driven extensive dairy farming to the cooler, pasture regions. Dairying will not become extensive in non-pasture regions until labor becomes relatively cheap.

### COW COST OF MILK PRODUCTION BY MONTHS

The cow cost of milk production involves only the maintenance of the bulls and the milking stock; the cost of rearing the young stock is not included. The milking herds are maintained by purchasing cows or by replacing depleted stock with heifers raised in the herd.

The data presented in Table 3 involve 407 cows and 19 bulls, the cows producing 2,806,277 pounds of milk at a net cost of \$48,479.67, or \$1.73 per hundredweight. It will be noted that the net winter cost of producing this milk was \$31,669.94, or \$1.98 per hundredweight, and the summer cost, \$16,809.73, or \$1.40 per hundredweight. The monthly cost varied from \$1.15 per hundredweight in June to \$2.08 in December and February.

### VARIATION IN FEED EXPENSE

For the herds under consideration the feed expense per hundredweight of milk produced, varied from 40.1 cents in June to \$1.41, or over three times as much, in December, with an average of \$1.05 for the year. For the winter months the feed expense aggregated \$21,307.29, or \$1.33 per hundredweight of milk, and for the summer months, \$8,159.56, or \$.68 per hundredweight of milk.

As explained on page 11, pasture is responsible for the great reduction in feed expense during the summer months.

### VARIATION IN LABOR EXPENSE

The expense of man labor per hundredweight of milk produced, varied from 27.9 cents in June to 41.0 cents in December, with an average of 36.3 cents for the year. During the winter six months an average of 11.7 hours per day of man labor was spent on each herd, while in the summer months an average of only 7.9 hours per day was used.

While the variations exhibited in the labor expense are not so great as those shown in feed expense, they are still great enough to contribute materially to the large variation in the total cost of production.

### QUANTITIES OF FEED AND LABOR PER HUNDREDWEIGHT OF MILK

By an inspection of Table 4 it will be noted that with the cow as the unit of computation, the value of the man labor, grain, hay, dry



TABLE 3.—COW COST OF MILK PRODUCTION FOR THE YEAR AND FOR EACH MONTH OF THE YEAR

|                              | Year           | WINTER MONTHS |              |              |              |              |              |     |      |      |        |           |         |
|------------------------------|----------------|---------------|--------------|--------------|--------------|--------------|--------------|-----|------|------|--------|-----------|---------|
|                              |                | November      | December     | January      | February     | March        | April        | May | June | July | August | September | October |
| Milk production.....         | 2 806 277 lbs. | 227 269 lbs.  | 202 129 lbs. | 278 653 lbs. | 267 295 lbs. | 294 776 lbs. | 272 607 lbs. |     |      |      |        |           |         |
| ITEMS OF EXPENSE:            |                |               |              |              |              |              |              |     |      |      |        |           |         |
| Feed other than pasture..... | \$27 538.52    | \$3 151.30    | \$3 681.69   | \$3 855.00   | \$3 799.18   | \$3 691.92   | \$3 015.83   |     |      |      |        |           |         |
| Pasture.....                 | 1 928.33       | 92.68         | 3.56         | 1 063.42     | 1 031.67     | 1 109.82     | 16.13        |     |      |      |        |           |         |
| Man labor.....               | 10 193.90      | 878.56        | 1 074.75     | 588.11       | 564.14       | 622.14       | 575.35       |     |      |      |        |           |         |
| Live-stock depreciation..... | 5 922.83       | 479.68        | 553.24       | 197.68       | 197.68       | 197.68       | 197.68       |     |      |      |        |           |         |
| Interest on stock.....       | 2 372.16       | 231.36        | 231.36       | 217.37       | 205.60       | 243.98       | 205.22       |     |      |      |        |           |         |
| Horse labor.....             | 2 274.38       | 173.85        | 188.66       | 200.55       | 192.38       | 212.15       | 196.20       |     |      |      |        |           |         |
| Use of buildings.....        | 2 019.72       | 163.57        | 162.55       | 172.79       | 165.75       | 182.79       | 169.04       |     |      |      |        |           |         |
| Miscellaneous.....           | 1 740.17       | 28.40         | 32.77        | 34.84        | 33.42        | 36.85        | 34.08        |     |      |      |        |           |         |
| Use of equipment.....        | 350.83         | 28.40         | 32.77        | 34.84        | 33.42        | 36.85        | 34.08        |     |      |      |        |           |         |
| Total.....                   | \$54 340.84    | \$5 306.66    | \$6 126.26   | \$6 329.76   | \$6 189.82   | \$6 297.33   | \$5 382.01   |     |      |      |        |           |         |
| RETURNS NOT MILK:            |                |               |              |              |              |              |              |     |      |      |        |           |         |
| Manure.....                  | \$3 695.17     | \$485.91      | \$516.21     | \$540.97     | \$545.04     | \$523.24     | \$513.26     |     |      |      |        |           |         |
| Calves.....                  | 2 166.00       | 242.69        | 151.67       | 212.35       | 91.01        | 72.81        | 66.74        |     |      |      |        |           |         |
| Total.....                   | \$5 861.17     | \$728.60      | \$667.88     | \$753.32     | \$636.05     | \$596.05     | \$580.00     |     |      |      |        |           |         |
| NET COST.....                | \$48 479.67    | \$4 578.06    | \$5 458.38   | \$5 576.44   | \$5 553.77   | \$5 701.28   | \$4 802.01   |     |      |      |        |           |         |
| NET COST PER CWT.....        | \$1.73         | \$2.01        | \$2.08       | \$2.00       | \$2.08       | \$1.93       | \$1.76       |     |      |      |        |           |         |
|                              |                | SUMMER MONTHS |              |              |              |              |              |     |      |      |        |           |         |
| Milk production.....         |                | 284 867 lbs.  | 239 145 lbs. | 190 701 lbs. | 149 785 lbs. | 140 108 lbs. | 198 942 lbs. |     |      |      |        |           |         |
| ITEMS OF EXPENSE:            |                |               |              |              |              |              |              |     |      |      |        |           |         |
| Feed other than pasture..... |                | \$1 379.37    | \$638.17     | \$758.21     | \$880.60     | \$1 053.82   | \$1 633.43   |     |      |      |        |           |         |
| Pasture.....                 |                | 285.07        | 321.05       | 297.91       | 290.98       | 328.62       | 292.33       |     |      |      |        |           |         |
| Man labor.....               |                | \$26.43       | 666.36       | 654.41       | 606.01       | 590.92       | 719.07       |     |      |      |        |           |         |
| Live-stock depreciation..... |                | 601.23        | 504.73       | 402.49       | 316.13       | 295.71       | 419.88       |     |      |      |        |           |         |
| Use of buildings.....        |                | 205.02        | 172.12       | 137.25       | 107.80       | 100.84       | 143.18       |     |      |      |        |           |         |
| Horse labor.....             |                | 204.33        | 161.46       | 156.35       | 150.20       | 146.42       | 178.24       |     |      |      |        |           |         |
| Interest on stock.....       |                | 197.68        | 197.68       | 197.68       | 197.68       | 197.68       | 197.68       |     |      |      |        |           |         |
| Miscellaneous.....           |                | 176.65        | 148.29       | 118.25       | 92.88        | 86.88        | 123.36       |     |      |      |        |           |         |
| Use of equipment.....        |                | 35.61         | 29.90        | 23.84        | 18.73        | 17.52        | 24.87        |     |      |      |        |           |         |
| Total.....                   |                | \$3 911.39    | \$2 839.76   | \$2 746.39   | \$2 661.01   | \$2 818.41   | \$3 732.04   |     |      |      |        |           |         |
| RETURNS NOT MILK:            |                |               |              |              |              |              |              |     |      |      |        |           |         |
| Manure.....                  |                | \$189.93      | \$ 33.26     | \$ 41.39     | \$ 45.82     | \$ 66.51     | \$193.63     |     |      |      |        |           |         |
| Calves.....                  |                | 139.55        | 48.54        | 103.14       | 133.48       | 424.71       | 479.31       |     |      |      |        |           |         |
| Total.....                   |                | \$329.48      | \$ 81.80     | \$144.53     | \$179.30     | \$491.22     | \$672.94     |     |      |      |        |           |         |
| NET COST.....                |                | \$3 581.91    | \$2 757.96   | \$2 601.86   | \$2 481.71   | \$2 327.19   | \$3 059.10   |     |      |      |        |           |         |
| NET COST PER CWT.....        |                | \$1.26        | \$1.15       | \$1.36       | \$1.66       | \$1.66       | \$1.54       |     |      |      |        |           |         |

TABLE 4.—COW COST OF MILK PRODUCTION: AMOUNTS OF MAN LABOR AND FEED OTHER THAN PASTURE REQUIRED TO PRODUCE 100 POUNDS OF MILK, AND THE PERCENTAGE WHICH THE VALUE OF THESE FORMS OF THE NET COST

|  | Year          | WINTER MONTHS |          |       |       |          |          | Winter six months |
|--|---------------|---------------|----------|-------|-------|----------|----------|-------------------|
|  |               | January       | February | March | April | November | December |                   |
| Man labor.....                                       | <i>hrs.</i>   | 2.39          | 2.43     | 2.39  | 2.26  | 2.42     | 2.56     | 2.41              |
| Feed   | <i>lbs.</i>   | 41.5          | 51.6     | 48.3  | 39.8  | 40.0     | 41.7     | 43.9              |
| Grain.....   |               | 58.0          | 52.5     | 47.1  | 43.2  | 60.1     | 59.1     | 53.0              |
| Hay.....   |               | 25.9          | 41.1     | 35.6  | 24.6  | 55.9     | 49.4     | 42.1              |
| Other forage.....                                    |               | 154.0         | 183.4    | 154.7 | 162.8 | 183.8    | 214.6    | 183.2             |
| Percentage that feed and labor form of net cost..... | <i>perct.</i> | 88.1          | 87.0     | 84.2  | 83.1  | 88.0     | 87.1     | 86.3              |
|  |               | SUMMER MONTHS |          |       |       |          |          | Summer six months |
| Man labor.....                                       | <i>hrs.</i>   | 1.85          | 1.76     | 2.18  | 2.58  | 2.69     | 2.28     | 2.15              |
| Feed   | <i>lbs.</i>   | 20.6          | 13.7     | 13.4  | 12.9  | 15.5     | 26.7     | 17.6              |
| Grain.....   |               | 14.9          | 1.7      | 8.6   | 13.8  | 20.0     | 29.9     | 14.2              |
| Hay.....   |               | .78           | .29      | .37   | .48   | 8.7      | 17.8     | 4.3               |
| Other forage.....                                    |               | 79.3          | 49.9     | 91.4  | 192.5 | 227.4    | 130.5    | 115.0             |
| Percentage that feed and labor form of net cost..... | <i>perct.</i> | 61.6          | 47.3     | 54.3  | 59.9  | 70.7     | 76.9     | 61.9              |

forage, and succulent feeds represents 77.8 percent of the net yearly cost of producing the milk. The percentage which feed and labor constituted varied from 47.3 in June to 88.1 in January.

The amount of labor per hundred pounds of milk varied from 1.76 hours in June to 2.69 hours in September, averaging 2.29 hours for the year. The grain fed per hundred pounds of milk varied from 13.7 pounds in June to 51.6 pounds in February, averaging 32.4 pounds for the year.

The amounts of feed and hours of labor, and the percentage which the total value of these forms of the net cost, being determined, it is relatively simple to determine the approximate cost of milk production for any given period. The costs being expressed in commodities may be converted into terms of value by applying farm prices to these units. Assuming that the prices given on page 10 prevail, the June cost would be:

|   |              |                |          |
|---|--------------|----------------|----------|
| Grain . . . . .   | 13.70 lbs.   | @ \$55 per ton | = \$3.77 |
| Silage . . . . .  | 49.90 lbs.   | @ 6 per ton    | = .150   |
| Hay . . . . .   | 1.70 lbs.    | @ 10 per ton   | = .039   |
| Other roughage . . . . .  | .29 lbs.     | @ 6 per ton    | = .001   |
| Man labor . . . . .   | 1.76 hours   | @ 25c per hour | = .440   |
|   |              |                | \$ .977  |
| Value of feed and labor . . . . .                               |              |                |          |
| Proportion that feed and labor form of total net cost . . . . . | 47.3 percent |                |          |
| Net cow cost of milk per hundredweight . . . . .                | \$2.07       |                |          |

Figured in a similar manner, the December cost would be \$3.30 per hundredweight of milk; the summer cost, \$2.34; the winter cost, \$3.19; and the year cost, \$2.81.

## SEASONAL VARIATION IN COST OF PRODUCTION AND THE PRICE OF MILK

The price of a commodity must in the long run cover the cost of production or production will be diminished. Milk is no exception to this rule. Furthermore, the price of a commodity like milk for urban consumption, which is both bulky and perishable, must fluctuate approximately with the cost of production or production will be concentrated in the more profitable seasons. The accompanying figure presents graphically the monthly percentage variation in the price paid for milk at the Chicago market during the ten years 1907 to 1916<sup>1</sup> and in the cost of production both with the herd as the unit and with the cow as the unit.

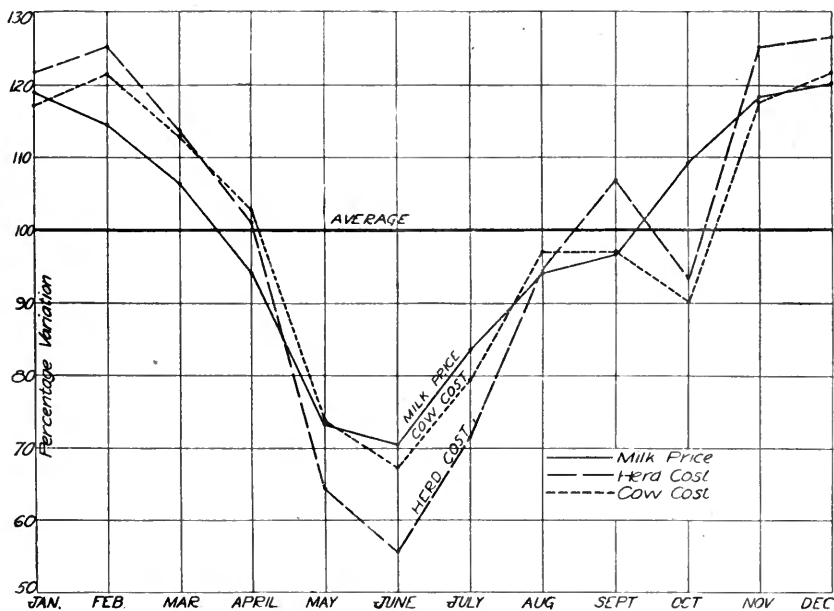
These curves indicate that in general the monthly variation in the price of milk has followed more or less closely the monthly variation in the cost of production. The price of milk tends to vary somewhat less than either the herd cost or the cow cost of production, not rising so high in the winter nor falling so low in the summer. Taking the yearly herd cost as the basis, the monthly herd cost per hundredweight of milk varies from 127 percent in February to 55 percent in June. Similarly, the monthly cow cost per hundredweight of milk varies from 122 percent in February and December to 67 percent in June. The price of milk varies from 120.3 percent in December to 70.6 percent in June.

In the past many persons have recommended a flat price for milk thruout the year. This recommendation has usually been made in the absence of due appreciation of the wide variation in the monthly cost of production. A flat yearly price for milk is out of the question, as production would tend to concentrate in the summer months of low cost. This would result in a supply in the winter season that would not be sufficient to meet the demand.

Other persons, admitting that a flat yearly price is not practical, have suggested that prices should be on the basis of two six-month periods, with the price for the winter months higher than that for the summer months. This scheme has many advantages over the plan of a flat yearly price, but it would still be impossible to set a price that would encourage a fairly constant volume of milk thruout the period, because the fluctuation in the cost of production is so great from month to month. For instance, April is a month during which a large volume of milk is produced at a cost considerably greater than that for the summer months, but yet somewhat lower than that for the winter months. April being between the two seasons of high and low prices, is the month during which, even under the present

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<sup>1</sup>For tabular presentation, see page 356 of Bulletin 216.



MONTHLY VARIATION IN PRICE OF MILK AND IN COST OF PRODUCTION

scheme of monthly adjustment, the farmer producing winter milk probably suffers most. Under a six-month scheme the price of April milk would have to be either as low as the summer price or else as high as the winter price. The former would be a handicap to the producer and the latter a burden to the buyer.

Again, it would not be satisfactory to sell milk in June, when there is usually a surplus, at the same price as in August and September, when there is usually a scarcity, altho these months occur in what are known as the summer months. Similar discrepancies could be pointed out for the winter months.

Owing to the great variation in the monthly cost of milk production, a flat price for any extended period would probably shift production to the more profitable months. Since milk production is so sensitive to changes in prices, the milk producer, the milk distributor, and the milk consumer are best protected thru a fluctuating price, which insures, so far as it seems now possible, a fairly constant supply of milk. If the price of milk fluctuates approximately with the cost of production, the distributor's supply is automatically regulated, the milk producer's market is protected, and the consumer is assured of a normal supply of milk throuth the year.

## CONCLUSIONS

1. The present study confirms the opinion held among dairy farmers of the great importance of pasture in milk production. The feed expense in the summer months in which pastures are good, is occasionally only one-fourth of that in certain winter months when large amounts of farm-raised and purchased feeds are fed.

2. The amount of man labor involved in the production of milk is considerably less in the summer months than in the winter months. This is true whether based upon the total amount of labor used on the herd or whether based upon the amount involved in the production of one hundred pounds of milk. Proper significance of this reduction in labor is appreciated only when attention is drawn to the fact that these savings in labor occur during the pasture season, which coincides with the crop season, when the maximum labor is needed in the field.

3. Aside from man labor, feed, and horse labor, the expenses of producing milk are more or less constant throughout the year. When all expenses are included, the net cost of producing one hundred pounds of milk in June is about 60 percent of the year cost, and in December about 120 percent.

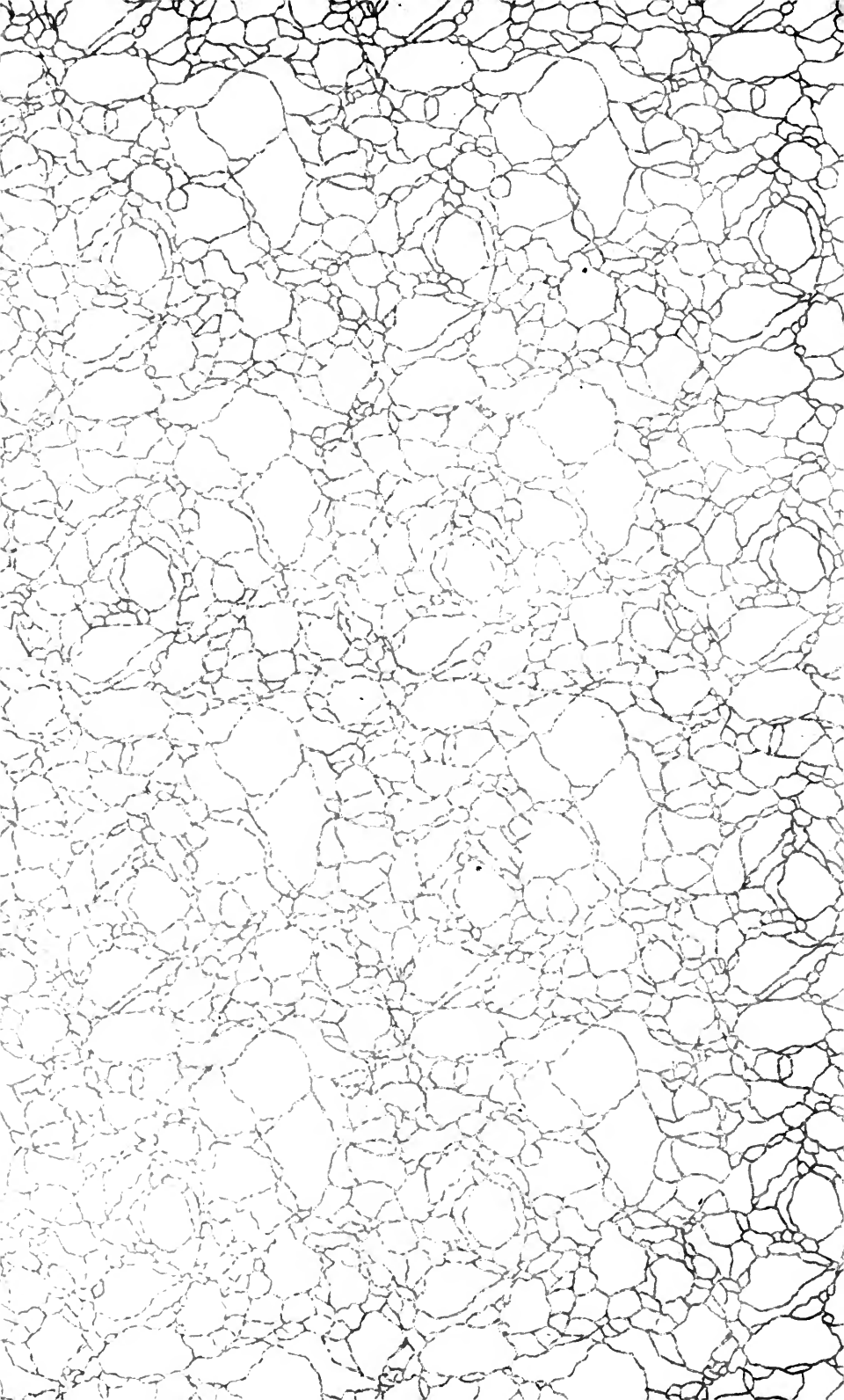
4. With a fluctuating seasonal cost, it is to be expected that farmers will tend to concentrate production in the more profitable months. As the urban trade demands a constant supply of milk throughout the year, the price of milk must fluctuate approximately with the cost of production in order to prevent an extreme shortage at one time and a large surplus at another. In other words, a properly adjusted fluctuating price for milk throughout the year protects the farmer's market and the distributor's and consumer's supply.













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