77-6

COMPONENT PRICING OF MILK TO DAIRY FARMERS

Randall Stelly

August 1977

The Texas Agricultural Market Research and Development Center
in cooperation with
Department of Agricultural Economics
Texas A&M University
The Texas Agricultural Experiment Station
College Station, Texas

THE TEXAS AGRICULTURAL MARKET RESEARCH AND DEVELOPMENT CENTER

An Education and Research Service
of
The Texas Agricultural Experiment Station
and
The Texas Agricultural Extension Service

The purpose of the Center is to be of service to agricultural producers, groups and organizations, as well as processing and marketing firms in the solution of present and emerging market problems. Emphasis is given to research and educational activities designed to improve and expand the markets for food and fiber products related to Texas agriculture.

The Center is staffed by a basic group of professional agricultural and marketing economists from both the Experiment Station and Extension Service. In addition, support is provided by food technologist, statisticians and specialized consultants as determined by the requirements of individual projects.

Robert E. Branson
Coordinator

COMPONENT PRICING OF MILK TO DAIRY FARMERS

Randall Stelly*

INTRODUCTION

Pricing milk to producers according to its components has been discussed for several years by many people in the dairy industry. The per capita civilian consumption of fluid whole milk decreased from 278 pounds in 1950, to 244 pounds in 1965, 182 pounds in 1975 and 175 pounds in 1976. During this same period, the per capita civilian consumption of low-fat and skim milk increased from 15.6 pounds in 1950, to 31.7 pounds in 1965, 78.7 pounds in 1975 and 83.6 pounds in 1976. The increase in consumer demand for low-fat and skim products indicates the need for a change in the present pricing procedure. What is needed is a pricing procedure that compensates producers for the SNF and protein components in their milk in a manner that will encourage production of the nonfat components.

Acknowledgements: The data used in this study was obtained in part from the records of the Federal Milk Market Administrator's Office for the Texas Market order. This research report was made possible in part by a grant from the Texas Jersey Cattle Club.

---

* Market Economist, Agricultural Market Research and Development Center, Texas Agricultural Experiment Station, Texas A&M University.

In recent years we have witnessed changing values of milk components. During the past 10 years, milk prices paid to farmers have about doubled, and breaking it down to Class I and Class II, the picture looks like this: Class I, 3.5 percent B.F. milk is up 84 percent; butterfat values are up 21 percent; and skim milk portion is up 148 percent. For Class II and Class III the price is up 147 percent, butterfat value is up 31 percent, while the skim milk portion is up 561 percent. Butter has not increased very much in price, whereas price of powder has gone up nearly 5 times, and cheese more than doubled. Yet the pricing system being paid to producers gives credit only to butterfat, the one component that supposely everyone doesn't want.

The increase in consumer demand for low-fat and skim products indicates a need for change in present pricing procedure. What is needed is a pricing procedure that compensates producers for SNF and protein components in their milk in a manner that will encourage production of nonfat components.

For over half a century, milk has been priced on the basis of weight plus or minus a fat differential. The present system prices, or pays for, the nonfat portion of the milk on the basis of an implicit assumption about a reliable relationship between total weight of fluid and the total weight of nonfat solids. The present pricing scheme encourages farmers to feed, breed, and cull their herds for volumes of milk production. Little incentive is given for fat production and no monetary differential is offered for other milk solids. As a result, total solids in the milk continue to decline.

Concern by the Food and Drug Administration to further protect consumers leads some people in the dairy industry to believe that nutrition labeling of food will soon be a reality. If and when nutrition labeling is required the dairy industry will be forced to account for components of milk other than butterfat. When milk handlers have to account for nonfat or protein solids as well as butterfat in fluid consumer products, the value of nonfat solids will take on added significance. The nonfat portion of milk will have to become a factor in the pricing procedure.

SUPPORT FOR COMPONENT PRICING GAINING SUPPORT

During the past year or so component or protein pricing of milk has received the attention of many sectors in the U. S. dairy industry, and several interested groups and/or dairy organizations have expressed affirmative reaction in favor of the concept. Some of the organizations that have adapted resolutions calling for action include the following:

1. From Associated Milk Producers, Inc.: Whereas, various studies show that higher minimum standards for fluid milk would tend to raise the income of dairy farmers while creating a more favorable product image with our consuming public, and, whereas, there is evidence that some processed whole milk now entering consumer sales channels does not even meet the present low minimum standards . . . be it resolved that this delegate body of AMPI recommend . . . the Federation request that FDA raise the minimum standards for fluid whole milk to 3.5 percent butterfat and 8.75 percent SNF; for low-fat milk to 2 percent butterfat and 10 percent SNF and for skim milk to 9 percent SNF.

2. From Mid-America Dairymen: Called on FDA to increase the minimum SNF content of fluid whole milk from 8.25 percent to 8.75 percent, and that low-fat milks contain at least 10 percent SNF.

3. From United Dairy Industries Association: That a committee be established to study the factors involved in the raising of federal minimum standards for various types of milk such as whole, low fat and skim; to recommend optimum levels for the minimum standards; to

recommend the best way to implement these standards and to report these recommendations to their respective organization no later than January 1, 1978.

4. From National Milk Producers Federation: A component pricing task force was appointed which met last April. It was the consensus that the primary objectives should be to achieve greater equity among dairy farmers and among handlers by adjusting prices for milk to reflect variations in composition in addition to butterfat.

It is viewed as an effort to increase the solids content of fluid milk products and to improve palatability, thus leading to increased consumer purchases. Other objectives are to increase the yield of manufactured products made from milk, reduce transportation and processing costs and provide farmers a justifiable incentive to alter the composition of milk through genetics and improved feeding practices.

5. From Texas Milk Quality Council: The Texas Milk Quality Council is of the opinion that a component pricing program would be beneficial to the long range goals of the dairy industry. This approach should result in improvements in the quality of fluid milk products. Improvements in nutritional and organoleptic qualities should result in increased Class I sales. Due to consumer awareness of nutritional values of foods, it seems logical that the dairy industry could improve its public image through a pricing system that would emphasize components other than butterfat. Dairy products contribute over 22% of the protein in the diets of people in the U. S. In view of the current emphasis on the need for additional protein to feed the world population, more emphasis should be

placed on the value of milk protein.

Based upon current regulations and marketing approaches, processors have no legal means of standardizing the SNF components of milk or means of recovering any additional costs of fluid milk in the market place. It is essential to orderly marketing that the price to handlers be consistent.

The council proposes that the dairy industry should pursue a component pricing system that would (a) provide for dual differential systems based upon butterfat and protein, (b) redistribute the dollars available in the market pool to producers on basis of butterfat and protein content, (c) continue to price milk to processors on the current basis of weight and butterfat.

6. From New England Nutritional Milk Pricing Committee: Our present pricing scheme encourages farmers to feed, breed, and cull their herds for volume of milk production. Little incentive is given for fat production and no monetary differential is offered for other milk solids. As a result, total solids in the milk continue to slide downward. We may soon find milk handlers having to fortify to sell legal fluid milk.

Even worse, water mixed in milk is worth about $5.50 to $6.00 per 100 pounds at present blend prices. Small additions of water are difficult to measure reliably.

The present system of pricing also encourages country plants to find high-solids milk and manufacture it into powder or cheese and ship the low-solids milk to the city for fluid. Dairy product manufacturers, to the extent they are successful in finding high-solids milk, get a yield

bonus without having to pay for it. Fluid milk consumers are paying the same price for less and less milk solids and more water.

The committee recommends a system which will provoke minimal turmoil in milk pricing but will improve the relation between prices paid and received for each tank of milk relative to its value in the market place.

In addition to the above, the California Cooperative Creamery has a producer protein bonus program in effect and the Mississippi Valley Milk Producers Association has been paying producers both fat and non-fat differentials for some time. There is also a host of New England Dairy organizations (32 in all) from Cabot Farmers Cooperative Creamery to Yankee Milk, Inc. that are on record as supporting component or "nutritional" pricing of milk.

OBJECTIVES OF COMPONENT PRICING -

The primary objectives of component pricing should be to achieve greater equity among dairy farmers and among handlers, by adjusting prices for milk to reflect variations in its composition in addition to butterfat.

Component pricing is viewed as an effort to increase the solids content of fluid milk products and to improve palatability, thus leading to increased consumer purchases.

Other objectives are to increase the yield of manufactured products made from milk, reduce transportation and processing costs, and provide farmers a justifiable incentive to alter the composition of milk through genetics and through improved feeding practices. Additionally, it is felt that component pricing would stimulate dairy herd improvement associations to test and keep records for the protein content of milk, as well as for butterfat and volume. This should be of benefit to farmers in their breeding programs.

Component pricing should not be viewed as a major source of additional revenue from the sale of milk, but farmers should be compensated for a general increase in nutrients provided consumers. Component pricing should be thought of as a refinement to the current system for pricing milk.

Most prices currently are expressed in terms of a hundredweight of milk with adjustments to reflect variations in butterfat content. Component pricing should be expressed in terms of a hundredweight of

milk with one adjustment to reflect variations in butterfat content and a second to reflect variations in protein content.

According to the New England Committee the following is the rationale for protein pricing:

a. Yield farmers a more accurate measure of the value of fat, protein, and water in the milk shipped to market so as to influence breeding, feeding, and selection of animals for market needs.

b. Equalize cost of product to milk processors by paying for higher or lower protein milk in accord with its market value.

c. Tie protein differential to an identifiable, widely marketed milk product in which protein is the major variable component.

d. Ease pricing transition in Class I plants by using low value for protein.

e. Allow processors to recover full value plus profit incentive by moving specific lots of milk where they will yield maximum returns.

f. Minimize accounting problems.

A Federal Milk Market administrator has stated that the current interest in a protein and solids-not-fat or nutritional pricing of milk centers around two systems. One system would involve charging handlers prices to recognize different solids-not-fat or protein levels and paying farmers on the same basis. The second system that has been discussed is to leave the handler payment system as it is at present and take the total dollars available for pay to producers in the pool and pay it out to the farmers on the basis of a butterfat and solids-not-fat differential or butterfat and protein differential. According to this

authority the first system is more complex and will require much more study and evaluation, and would be more difficult to put in effect at the present time. The second system would be easier to implement and would reflect only a change in the method of paying out money already available to pay dairy farmers.

In the final analysis an optimal pricing system should provide for as many of these basic objectives as possible:

1. Prices to farmers should give a clear signal as to what consumers want and are willing to pay for.

2. Pricing schemes should result in equitable cost to all milk handlers.

3. Prices should reflect market values.

4. Prices should encourage dairy product sales, i.e., maximum return to farmers consistent with profit incentives for processors.

5. Pricing must be understandable if it is to attract industry support and provide an economically rational signal to all dairymen.

6. The pricing system must be legally allowed by and enforceable under milk market orders.

7. Inexpensive, accurate methods for any necessary milk testing must be readily available.

8. Factors tested and paid for must be controllable by producers if the pricing scheme is to have a significant impact.

9. Pricing arrangements should minimize the incentive to adulterate.

10. Prices should maximize returns to producers without increasing costs to milk handlers.

THE NEED FOR COMPONENT PRICING AND ANALYSIS OF CHANGED SITUATION

The long term decrease in the consumption of milkfat relative to solids-not-fat in the United States is well known and well documented. The value of milkfat as a proportion of the total value of whole milk, has been declining for a long time. Although the non-fat position has received an increasingly larger share of the price paid for milk, it usually receives the same price per unit regardless of solids content. The higher value of skim milk with a larger percentage of non-fat solids is very evident when used in the manufacture of such products as cheese and non-fat by milk. Although the higher value of the non-fat portion is not so evident in the fluid milk market, the increasing per capita consumption of low-fat milk and cheese compared to decreased per capita consumption of whole fluid milk and butter attest to the changing demand situation. These changes in per capita consumption are shown in Table 1. In ten years we have witnessed a decrease in per capita consumption of whole fluid milk by almost 50 percent, while consumption of low-fat milk increased almost 3-fold.

A more vivid portrayal of the changing relative values of fat and non-fat solids in Class I fluid milk is contained in Table 2. This table was developed by personnel in the Market Administrator's office from records of the North Texas Market Order.

Table 1: U. S. PER CAPITA CONSUMPTION OF WHOLE FLUID MILK, LOW FAT MILK, BUTTER, AND AMERICAN CHEESE, 1965, 1975 and 1976

Year	Whole Fluid Milk	Low Fat Milk	Butter	American Cheese
		- - - - - - pounds - - - - - - -		
1965	244	31.7	5.8	5.7
1975	182	78.7	4.5	7.9
1976	175	83.6	4.3	9.0

Table 2: CHANGES IN THE VALUE OF BUTTERFAT AND SKIM MILK PORTIONS OF PRODUCER MILK USED IN CLASS I, NORTH TEXAS MARKET 1965-1976

Year	Avg. Cl. I Price per cwt. 3.5% Butterfat	Avg. B.F. Diff.	Butterfat		Skim Milk	
			Value of 3.5 lbs. of B.F.	Percent[1/]	Value of 96.5 lbs. of Skim	Percent[1/]
1965	$ 5.20	7.5	$ 2.625	50.5	$ 2.575	49.5
1966	6.08	8.3	2.905	47.8	3.175	52.2
1967	6.33	8.3	2.905	45.9	3.425	54.1
1968	6.56	8.3	2.905	44.3	3.655	55.7
1969	6.73	8.5	2.975	44.2	3.755	55.8
1970	6.97	8.6	3.010	43.2	3.960	56.8
1971	7.12	8.6	3.010	42.3	4.110	57.7
1972	7.32	8.6	3.010	41.1	4.310	58.9
1973	8.25	8.7	3.045	36.9	5.205	63.1
1974	9.58	8.0	2.800	29.2	6.780	70.8
1975	9.58	9.1	3.185	33.2	6.395	66.8
1976	10.92	10.6	3.710	33.9	7.210	66.1

[1/] Represents the percentage of the value of 3.5% milk assigned to Butterfat and Skim milk, respectively.

Earlier, mention was made to the fact, that under current producer pricing procedure there is an incentive for producers to produce large volumes of milk with as high a butterfat content as economically possible. Producers, milk market administrators, and processors usually keep a close account of butterfat pounds from their receipt through their dispositions, while very little accounting is done for the remaining components. In the meantime, values for the other components have risen due to shifts in consumer demand as evidenced by falling consumption of butter, cream and other high-fat products, and rising consumption of low-fat milk, skim milk, yogurt, and other low-fat products. This trend lends itself to speculation that possible additional profits may have accrued to processors at the expense of producers.

Tables 2 and 3 were developed to show more explicitly what has occurred in the relative price and value of solids-not-fat and butterfat in both Class I and Class II utilization. Although the situation in the North Texas Market is used in the example, a similar situation exists in all markets. With the rise in prices and the butterfat differential remaining virtually unchanged until the last year or so, the value of butterfat in producer milk has dropped rather drastically in relation to the value of the non-fat solids. For example, in producer milk used in Class I the value of the skim milk increased from 49.5 percent of the Class I price in 1965 to almost 71 percent in 1974. In milk utilized in Class II the relative value the skim milk increased from 21.7 percent in 1965 to 62 percent in 1974.

Table 3: CHANGES IN THE VALUE OF BUTTERFAT AND SKIM MILK PORTIONS OF PRODUCER MILK USED IN CLASS II, NORTH TEXAS MARKET 1965-1975

Year	Avg. Cl. II Price per cwt. 3.5% Butterfat	Avg. B.F. Diff.	Butterfat		Skim Milk	
			Value of 3.5 lbs. of B.F.	Percent[1]	Value of 96.5 lbs. of Skim	Percent[1]
1965	$ 3.086	6.9	$ 2.415	78.3	$ .671	21.7
1966	3.664	7.6	2.660	72.6	1.004	27.4
1967	3.784	7.5	2.625	69.4	1.159	30.6
1968	3.991	7.6	2.660	66.6	1.331	33.4
1969	4.120	7.6	2.660	64.6	1.460	35.4
1970	4.441	7.9	2.765	62.3	1.676	37.7
1971	4.736	7.8	2.730	57.6	2.006	42.4
1972	5.174	7.8	2.730	52.8	2.444	47.2
1973	6.121	8.0	2.800	45.7	3.321	54.3
1974	6.902	7.5	2.625	38.0	4.277	62.0
1975	7.620	9.1	3.185	41.8	4.435	58.2

[1] Represents the percentage of the value of 3.5% milk assigned to Butterfat and Skim milk, respectively.

With the change in consumer demand and the drastic realignment in residual prices and values, there is an urgent need to develop an alternative pricing plan that will properly compensate producers for the residual components of milk.

One of the major obstacles to a more complete evaluation of the effects of multiple component pricing on producer price and income has been the lack of a large set of continuous data on milk, fat and protein yields for a significantly large number of herds and cows over an extended period of time. The market administrator for the North Texas Market Order has determined the monthly average solids-not-fat content of producer milk in the North Texas Federal Order Market for the past 12 years. The data are presented in Table 4. Likewise, the Market Administrator's office has determined the monthly average protein content of producer milk received by handlers located in what was the North Texas Market prior to consolidation for the 5-year period of 1972 through 1976. The results are presented in Table 5.

These two tables are presented to indicate the following: (1) according to the data there has been very little perceptible or measurable change in the annual average content of either solids-not-fat or protein in producer milk during the time indicated; (2) there is very little seasonal variation in total non-fat solids (the three high months of December, January and February are only 2.3 percent larger than the three low months of July, August and September); (3) the seasonal variation in protein content is three times larger

Table 4: MONTHLY AVERAGE SOLIDS-NOT-FAT CONTENT[a/] OF PRODUCER MILK IN THE NORTH TEXAS FEDERAL ORDER MARKET[b/] JANUARY 1965 THROUGH DECEMBER 1976

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Weighted Annual Avg.
1965	8.945	8.952	8.934	8.978	8.944	8.825	8.766	8.788	8.802	8.920	8.968	8.986	8.901
1966	9.011	8.951	8.915	8.962	8.918	8.842	8.793	8.809	8.964	9.029	9.012	8.982	8.929
1967	8.966	8.965	8.928	8.882	8.946	8.897	8.852	8.818	8.871	8.944	9.052	9.017	8.925
1968	9.039	8.998	8.959	8.923	8.876	8.840	8.796	8.814	8.884	8.966	9.073	9.038	8.933
1969	8.994	9.003	8.972	8.983	8.943	8.877	8.824	8.791	8.890	9.060	9.129	9.083	8.961
1970	9.046	9.020	8.974	9.009	8.915	8.841	8.783	8.744	8.870	9.028	9.143	9.024	8.947
1971	9.039	9.033	8.995	8.961	8.902	8.817	8.765	8.850	8.870	8.947	9.046	9.084	8.942
1972	9.030	8.983	8.924	8.907	8.872	8.806	8.792	8.796	8.825	8.957	9.113	9.132	8.924
1973	9.060	8.987	8.953	8.994	8.929	8.825	8.743	8.739	8.804	8.881	8.973	8.981	8.905
1974	9.005	8.920	8.885	8.876	8.831	8.791	8.753	8.777	8.896	8.948	8.962	8.976	8.879
1975	8.913	8.917	8.918	8.914	8.817	8.760	8.708	8.681	8.778	8.885	8.952	8.991	8.851
1976	8.998	8.905	8.928	8.919	8.906	8.831	8.811	8.768	8.820	9.005	9.108	9.035	8.920
AVERAGE	9.004	8.970	8.940	8.942	8.900	8.829	8.782	8.781	8.856	8.964	9.044	9.027	8.918

[a/] Represents the Solids-Not-Fat Content in the Skim Milk Portion of Producer Milk.

[b/] Data for Handlers in the North Texas Area regardless of Orders under which regulated.

November (high month) is 4.1 percent more than August (low month).

Table 5: MONTHLY AVERAGE PROTEIN CONTENT OF PRODUCER MILK RECEIVED BY HANDLERS LOCATED IN WHAT WAS THE NORTH TEXAS ORDER PRIOR TO THE MERGER JANUARY 1972 THROUGH DECEMBER 1976[a/]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Weighted Annual Avg.
1972	3.408	3.349	3.288	3.288	3.284	3.215	3.273	3.275	3.340	3.465	3.587	3.576	3.357
1973	3.493	3.421	3.362	3.374	3.318	3.209	3.162	3.179	3.252	3.394	3.419	3.363	3.326
1974	3.324	3.234	3.187	3.212	3.173	3.136	3.086	3.144	3.312	3.396	3.379	3.394	3.241
1975	3.341	3.313	3.294	3.273	3.215	3.166	3.124	3.182	3.314	3.394	3.419	3.409	3.285
1976	3.367	3.289	3.258	3.229	3.196	3.184	3.176	3.183	3.222	3.356	3.443	3.445	3.276
AVERAGE	3.387	3.321	3.278	3.275	3.237	3.182	3.164	3.193	3.288	3.401	3.449	3.437	3.297

[a/] Represents the Protein Content in the Skim Milk portion of Producer Milk.

November (high month) is 9.0 percent more than July (low month).

percentagewise than is SNF variation (the three high months of October, November and December are 8.0 percent larger than the three low months of June, July and August).

EFFECT ON PRODUCER PRICE AND INCOME

Whenever the subject of pricing milk to producers on the basis of milk components other than butterfat is discussed the immediate question that every dairy producer has in mind is "how will this effect my milk price"? Since lower levels of butterfat in producer milk are associated with lower levels of both protein and solids-not-fat, one might expect owners of low butterfat producing herds to be skeptical of any producer pricing plans that would include any differential beside butterfat.

The Market Administrator's office for the Texas Market Order conducted an analysis of butterfat, protein and solids-not-fat content of milk deliveries by 37 producers individually for the month of February, 1976. These data are presented in Table 6 and form the basis of our analysis of butterfat -- protein relationships and the possible effect on producer prices.

The analysis of components on a herd basis indicate much greater variability in butterfat content than either protein or total non-fat solids. In fact, the difference in percent butterfat content between the lowest test herd and the highest was slightly more than 61 percent. In other words, milk from the highest test herd contained almost two-thirds more butterfat than the lowest test herd. The percentage difference in protein between the lowest and the highest test herd amounted to 34.4, while the highest test herd contained only 15.6 percent more solids-not-fat per unit than the lowest test herd. Among the

Table 6: BUTTERFAT, PROTEIN, PERCENT OF TOTAL SOLIDS AND SOLIDS-NOT-FAT AND PROTEIN AS A PERCENT OF S.N.F. ON CERTAIN TEXAS PRODUCERS, FEBRUARY 1976

Producer Number	Percent Butterfat	Percent Protein	Percent Total Solids	Percent Solids Not Fat	Percent Protein is of S.N.F.
1	3.55	3.044	11.73	8.18 (Low)	37.21
2	3.80	3.126	12.21	8.41	37.17
3	3.15	3.075	11.81	8.66	35.51
4	3.50	3.046	11.86	8.36	36.44
5	3.70	3.067	12.11	8.41	36.47
6	3.80	3.309	12.64	8.84	37.43
7	3.60	3.041	11.86	8.26	36.82
8	3.80	3.135	12.20	8.40	37.32
9	3.25	3.090	11.86	8.61	35.89
10	3.60	3.256	12.36	8.76	37.17
11	3.60	2.996	11.88	8.28	36.18
12	3.70	3.058	12.18	8.48	36.06
13	3.75	3.129	12.27	8.52	36.73
14	3.75	2.938	12.22	8.47	34.69 (Low)
15	3.90	3.196	12.42	8.52	37.51
16	3.85	3.298	12.72	8.87	37.18
17	3.80	3.208	12.49	8.69	36.92
18	4.40	3.623	13.54	9.14	39.64
19	3.70	3.413	12.54	8.84	38.61
20	4.75	3.929 (High)	14.21	9.46 (High)	41.53
21	4.60	3.686	13.73	9.13	40.37
22	4.60	3.894	14.04	9.44	41.25
23	5.00 (High)	3.874	14.32 (High)	9.32	41.57 (High)
24	4.30	3.614	13.34	9.04	39.98
25	3.10 (Low)	3.098	11.56 (Low)	8.46	36.62
26	3.30	3.213	11.80	8.50	37.80
27	3.10	3.147	11.70	8.60	36.59
28	3.50	3.087	11.79	8.29	37.24
29	3.40	3.119	11.76	8.36	37.31
30	3.80	3.257	12.36	8.56	38.05
31	3.50	3.280	12.21	8.71	37.66
32	3.65	3.111	12.04	8.39	37.08
33	3.70	2.923 (Low)	12.07	8.37	34.92
34	3.90	3.213	12.33	8.43	38.11
35	3.80	3.188	12.27	8.47	37.64
36	3.90	3.205	12.46	8.56	37.44
37	3.85	3.354	12.55	8.70	38.55
Average	3.78	3.250	12.42	8.49	37.59
Percent Diff. Low to High	61.3	34.4	23.9	15.6	16.6

37 herds in the analysis the percent variation in butterfat from highest to lowest was almost twice as large as was the variation in protein, and four times as large as the variation in solids-not-fat between the lowest and highest testing herds.

For purposes of analysis and comparison the individual herd data provided by the Market Administrator was categorized into "high" butterfat herds and "low" butterfat herds. The dividing point between high test and low test was set at 3.70 - 3.75 BF which provided for 18 herds below and 19 herds below the average, or dividing value. Results are shown in Table 7. The 18 herds in the "low" group had an average butterfat content of 3.48 percent - with a range of 3.10 to 3.70 percent. The 19 herds in the "high" group had an average butterfat content of 4.07 percent - with a range of 3.75 to 5.00 percent. The first group had an average protein content of 3.115 percent - with a range of 2.923 to 3.413, while the high test herds had an average protein content of 3.378 percent - with a range of 2.938 to 3.929.

Solids-not-fat averaged 8.47 percent for the low test herds and 8.79 for the high test herds. Thus, total solids amounted to 11.95 percent for the low test herds and 12.86 for the high test herds. On an individual herd basis the total solids ranged from a high of 14.32 percent to 11.56 percent, as shown in Table 6.

Probably the most relevant and important factor in component pricing as protein is included as a differential in the price formula will be the ratio of protein to fat in producer milk, or the relation-

Table 7: ANALYSIS OF COMPONENTS IN PRODUCER MILK, NORTH TEXAS MARKET, FEBRUARY, 1976

	Low Butterfat Herds (Less than 3.75 BF)	High Butterfat Herds (3.75 BF or more)
No. Herds	18	19
Average BF %	3.48	4.07
Range	3.10 - 3.70	3.75 - 5.00
% Protein	3.115	3.378
Range	2.923 - 3.413	2.938 - 3.929
Total Solids	11.95	12.86
% SNF	8.47	8.79
% Protein is of SNF	36.75	38.37

			Both
Protein to Fat Ratio	0.900	0.830	0.860
Factor	1.111	1.212	1.164

Regression Analysis gives 0.855

Base price of $10.28 (average blend for North Texas area for 1976)

Low Fat -- -20 cents

High Fat -- +86 cents

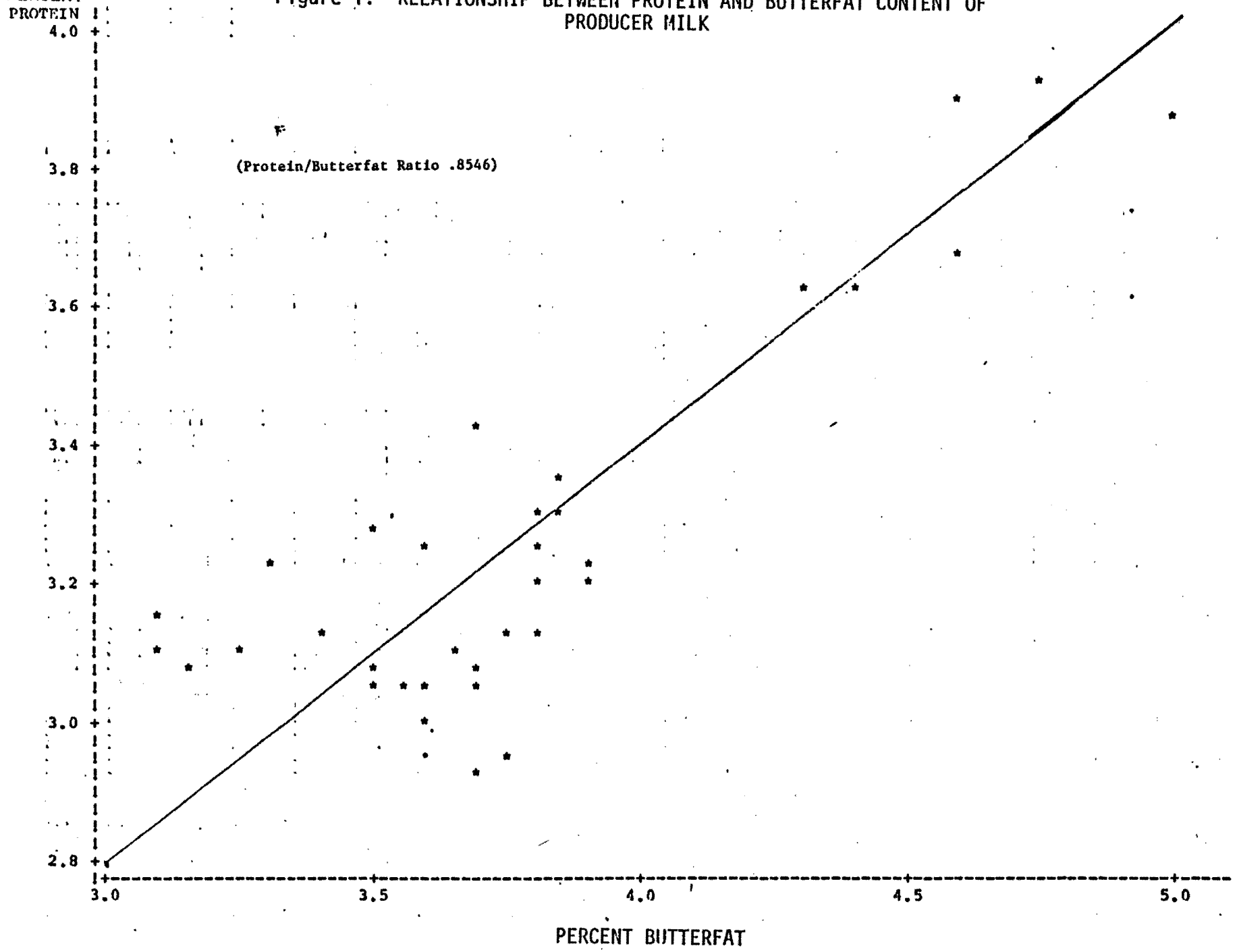
ship between the two. Although the study indicates greater between-herd variability in butterfat than in protein content, the ratio of protein to fat is higher among low-test herds than high-test herds.

From an individual herd standpoint the lowest average butterfat content of 3.10 percent contained the same percentage of protein, 3.098 percent - or a one-to-one ratio between the two components. Milk from the herd with the highest average butterfat content of 5.00 percent contained 3.874 percent protein for a ratio of 1.0 to .768, or about three-fourths of a pound of protein per pound of butterfat.

For the 18 herds in the low butterfat group the relationship of protein to butterfat was .900 pound of protein to 1.00 pound of butterfat, or 1.111 units of butterfat for each one unit of protein. For the 19 herds in the high butterfat group the relationship was .830 pound of protein for 1.00 pound of butterfat, or 1.212 units of butterfat for each one unit of protein. For all 37 herds the protein - butterfat relationship, according to results of statistical regression analysis, amounted to .855. This means that one can expect a change of 1.164 pound of butterfat for every 1.0 pound of protein for all the herds considered. Results of the IBM Computer regression analysis of butterfat/protein relationships are shown in Figure 1.

This study suggests that owners of low-fat producing herds should not have much to fear about the effects of protein pricing on the relative price they might receive for their milk or on their gross income. In fact, if a certain monetary value in the price formula was established between the fat and protein content, owners of herds with

Figure 1: RELATIONSHIP BETWEEN PROTEIN AND BUTTERFAT CONTENT OF PRODUCER MILK



below average butterfat would gain relatively more than those with herds producing high fat milk.

Using the 1976 monthly average blend price of $10.28 for the North Texas area of the Texas Milk Market Order and the average butterfat differential for the year, the average producer among the low fat group in our study would have received a blend price of $10.08 (or 20 cents below the average) while the average producer among the high fat group would have received a blend price of $11.14 (or 86 cents above the average). This is shown in Table 8. The range in price between highest and lowest amount to 80 cents for the low butterfat group and $1.87 for the high butterfat group. This difference is because of the wider range among the high butterfat group than among the low.

Because of the positive relationship between fat and protein (high fat -- high protein), producers of high BF would receive a higher price under any combination of BF/protein differential. However, because of the higher protein/BF ratio in low fat milk, producers of low BF milk would get a smaller reduction from the market-wide average pay price as the protein differential is increased relative to the BF differential. The relative price advantage accruing to high BF producers, on the other hand, would decrease with increased protein differential in relation to BF. This is shown in Table 9 which presents a hypothetical case where the total differential for BF and protein is maintained at 15 cents per point (or one tenth of one percent). At 15 cents butterfat and zero protein differential, low fat producers would receive a total differential from the average

Table 8: HYPOTHETICAL AVERAGE AND RANGE IN PRICES FOR PRODUCERS IN THE LOW BUTTERFAT AND HIGH BUTTERFAT GROUPS IN THE NORTH TEXAS MARKET AREA FOR 1976

	Average Price at Test	Range in Price at B. F. Test
Low B. F.	$10.08	$9.68 to $10.48
High B. F.	11.14	10.66 to 12.53
Blend Average	$10.28	

Table 9. DIFFERENCES BETWEEN PRICES FOR EACH OF SEVEN SELECTED PROTEIN-FAT PAYMENT PLANS AND THE BASE PRICE FOR LOW BUTTERFAT AND HIGH BUTTERFAT HERDS.

Differential (cents per pt.)		Low BF Test Herds 3.75% Base 3.48% av. Test -.27% below base			High BF Test Herds 3.75% Base 4.07% av. Test +.32% above base		
Protein	Fat	B.F. Diff.	Protein Diff.	Total Diff.	B.F. Diff.	Protein Diff.	Total Diff.
		- - - - - - - - cents per cwt. - - - - - - - -					
0	15	-40.5	--	-40.5	+48.0	--	+48.0
5	10	-27.0	-12.2	-39.2	+32.0	+13.3	+45.3
6	9	-24.0	-13.0	-37.0	+29.0	+14.4	+43.4
7	8	-21.6	-13.6	-35.2	+25.6	+14.9	+40.5
8	7	-18.9	-13.6	-32.5	+21.4	+14.2	+35.6
9	6	-16.2	-13.1	-29.3	+19.0	+14.2	±33.2
10	5	-13.5	-12.2	-25.7	+16.0	+13.3	+29,3

price at 3.75% BF base of minus 48.5 cents per cwt. while high fat producers on the average would receive 48.0 cents above base. At 10 cents for protein and 5 cents for fat, the low BF producers differential is reduced to -25.7 cents while the high group's advantage is reduced to +29.3 cents.