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ON THE BASIS OF PROTEIN CONTENT?

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SHOULD DAIRYMEN BE PAID FOR MILK ON THE BASIS OF PROTEIN CONTENT?

Rondo A. Christensen

In 1961, Professor George W. Trimberger, of Cornell University, pointed out the trend toward consumption of lowfat fluid milk and manufactured dairy products, the nutritional appeal of protein in milk, and the fact that protein in milk varies from herd to herd, and raised the question, "When will U. S. dairymen sell milk on the basis of protein content?"

In the meantime others have jumped on the "band wagon" for what is commonly called component pricing - pricing milk on the basis of fat and protein or nonfat solids. Component pricing has been recommended by various individuals as a more equitable way of paying producers, a way to reduce "watering" of milk, increase protein in producer milk, increase protein in fluid milk products, increase yields of manufactured dairy products, increase consumer nutrition, and equalize ingredient costs to fluid milk processors.

Claims by some nutritionists, dairy scientists and economists as to the advantage of component pricing have been so far reaching as to prompt the question from the floor at the last annual convention of the National Milk Producers Federation, "Will component pricing solve all of the problems of the dairy industry?" None of us expect that it will. More important, however, what problems will it solve, and what problems will it create?

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During the two decades which have followed since it became practical to test and pay for milk on the basis of protein or solids not fat, a few market milk cooperative associations, some manufacturing plants and the State of California have adopted some form of component pricing. Most of the dairy industry however, especially the market milk sector, continues to use the hundredweight-butterfat differential price plan developed in the 1940s.

This article deals mainly with whether use of component pricing would increase or decrease equity in paying market milk producers.

Manufacturing Grade Milk

Components in milk ought to be used in pricing only if they have extra value - that is, if the market pays or logically ought to pay extra for additional amounts, and if the extra value exceeds the extra cost of identifying, pricing, and marketing additional quantities of the component.

Most of the rationale for using component pricing has come from or has been based on applications appropriate to the pricing and marketing of manufacturing grade milk. The main ingredients in milk that have value in manufacturing are the solids - the fluid carrier is basically in the way and only adds to transportation and processing costs. The more fat, protein and other nonfat solids in milk, the more butter, cheese, nonfat dry milk, cottage cheese, and ice cream that can be made.

There would be some extra cost to pricing manufacturing milk according to its protein or nonfat solids content, but the cost would be minimal and would relate mainly to testing and pricing operations. No additional hauling or handling costs would be required since manufacturing milk would already be going direct from farms to local manufacturing plants on a regular basis.
Indeed, it would appear that component pricing would be an equitable, efficient way to price manufacturing grade milk, and that its effect on the industry would be positive and beneficial.

Market Milk

After concluding that additional fat, protein and other nonfat solids in manufacturing milk have value, and that component pricing would be appropriate for manufacturing grade milk, some proponents have then assumed that what is good for the goose must also be good for the gander, and that component pricing would be appropriate for market milk - milk produced for fluid consumption. In doing so, there has been a failure to properly take into account the nature of demand for fluid milk products and the unique characteristics and methods of operation in the market milk industry.

Demand for fluid milk

The primary mission and success of the market milk industry lies in satisfying consumer demand for fluid milk beverages that are fresh, natural, palatable and nutritious, and that fit their lifestyle. It does not spring from offering consumers units of fat and protein or nonfat solids. Consumers have for years largely thumbed their noses at the opportunity to buy milk nutrients and enjoy a lowfat, high protein, less expensive fluid milk product by mixing nonfat powdered milk with water in their homes. While we need standards to guarantee consumers minimal nutritional components in fluid milk products, we also need to remember that with fluid milk products we are selling beverages, not units of fat and nonfat solids.

Some interpret the trend in consumption away from high fat fluid milk products as a trend toward products high in protein. Such is not the case. The trend is toward low fat-low protein milk. Sales of high fat milk (whole
milk) by regulated handlers in Federal order marketing areas decreased from 78.4 percent of total fluid milk sales in 1970 to 63.4 percent in 1977 (Table 1). Even though sales of whole milk have decreased, they still account for a majority of sales. Sales of high protein milk (fortified lowfat and skim milk) after increasing from 13.5 percent of sales in 1970 to 15.4 percent in 1972, decreased to 11.6 percent in 1977. On the other hand, sales of low fat-low protein milk (plain lowfat and skim milk) more than trebled, increasing from 8.1 percent of sales in 1970 to 25.0 percent in 1977.

Nonfat solids used by Federal order handlers to fortify Class I products decreased from 46.8 million pounds in 1972 to 28.2 million pounds in 1977.

These data indicate that even though most consumers have the opportunity to buy fortified products, the trend is toward less fortification and lower rates of fortification. While there are studies that indicate consumers prefer a higher solids milk product, the track record in the market place indicates that consumers are not willing to pay a higher price for a higher solids product when the option of a lower price and a lower solids product is available to them (Townsend, 1978).

Value of milk components

It can be appreciated that additional solids in manufacturing milk have extra value. But what about components of market milk? Do they have extra value?

Consumers prefer fresh fluid milk products to reconstituted milk products. It costs considerably more to produce a local supply of fresh milk, transport it to consuming centers, make it available to processors on demand, and carry the operating and seasonal reserves that are necessary because of variations in supply and demand, than to reconstitute butter and powder, and consumers have demonstrated that they are willing to pay for it.
Table 1. Sales of packaged whole milk, lowfat milk and skim milk in Federal milk order marketing areas by regulated handlers, United States, 1970-1977*

<table>
<thead>
<tr>
<th>Year</th>
<th>Whole Milk#</th>
<th>Low fat, skim milk</th>
<th>Percent of total</th>
<th>Low fat, skim milk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Solids</td>
<td>Total</td>
<td>Whole Milk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added¢</td>
<td></td>
<td>Plain+</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>25.2</td>
<td>2.6</td>
<td>4.4</td>
<td>32.2</td>
</tr>
<tr>
<td>1971</td>
<td>24.9</td>
<td>3.0</td>
<td>4.7</td>
<td>32.6</td>
</tr>
<tr>
<td>1972</td>
<td>24.6</td>
<td>3.4</td>
<td>5.1</td>
<td>33.0</td>
</tr>
<tr>
<td>1973</td>
<td>23.7</td>
<td>4.1</td>
<td>5.0</td>
<td>32.8</td>
</tr>
<tr>
<td>1974</td>
<td>22.4</td>
<td>5.2</td>
<td>4.6</td>
<td>32.2</td>
</tr>
<tr>
<td>1975</td>
<td>22.3</td>
<td>6.4</td>
<td>4.5</td>
<td>33.1</td>
</tr>
<tr>
<td>1976</td>
<td>22.9</td>
<td>8.0</td>
<td>4.0</td>
<td>34.9</td>
</tr>
<tr>
<td>1977</td>
<td>22.1</td>
<td>8.7</td>
<td>4.0</td>
<td>34.8</td>
</tr>
</tbody>
</table>

*For markets where comparable data were available. Includes only in-area sales.

#Includes whole milk and flavored whole milk.

+Includes plain lowfat and skim milk, buttermilk and flavored milk drinks.

¢Includes lowfat and skim milk with nonfat solids added.

The extra utility consumers associate with fresh fluid milk products gives the fluid carrier in market milk used in fluid milk products extra value. The more hundredweights of milk produced and delivered to the market, the more fluid milk products that can be processed and packaged. The extra value of additional hundredweights of fluid carrier used in fluid milk products is essentially the Class I price differential. In Federal orders this varies from a low of $1.12 in the Upper Midwest market to a high of $3.15 in the Southeastern Florida area, and averages about $2.00 (USDA, Summary of Major Provisions In Federal Milk Marketing Orders, 1978).

Fat can be removed from or added to market milk, and milk can be standardized to any desired level of fat. Some of the fat removed from milk used in processing fluid milk products can be used in ice cream, creamed cheese and cottage cheese. Most of it, however, is used in making butter. Since residual amounts of fat in market milk left over after processing fluid milk and cream products are used in making butter, the value of extra fat in market milk is the value it has in making butter. This essentially is the butterfat differential, since the latter is based on the value of fat in butter.

Nonfat solids, unlike fat, cannot be removed from milk used in fluid milk products. They can be added to standardize milk at higher levels of nonfat solids, but they cannot be removed to standardize downward.

From a practical point of view this means that additional nonfat solids in market milk used for fluid products have extra value only if they replace nonfat solids which otherwise would have to be added to meet minimum Federal, state or label standards. The value of additional nonfat solids in milk which substitute for nonfat solids which otherwise would have to be added, is the cost of adding extra nonfat solids to milk.
If market milk already contains sufficient quantities of protein or nonfat solids, and fluid milk products made from it do not require fortification, then additional nonfat solids in milk would have no value because it would not be economical to charge handlers for them (Zurborg, 1978).

Most nonfat solids in market milk would have extra value if minimum solids notfat requirements were as high as they are in California where whole milk must contain at least 8.6 to 8.8 percent depending on the butterfat test, lowfat milk must have a minimum of 10 percent, and skim milk must contain a minimum of 8.25 percent. Most states, however, follow the Federal Food and Drug Administration standards which require a minimum of 8.25 percent solids notfat in all fluid milk products (USDA, Agriculture Handbook No. 51). This is considerably below the average solids notfat content of market milk, which is around 8.6 to 8.7 percent. It was 8.67 percent in California in 1978 (California Crop and Livestock Reporting Service, 1979).

In practice, how much market milk is used in fluid milk products which are fortified with extra solids notfat? Of the 77.9 billion pounds of market milk received from producers by handlers regulated under Federal orders in 1977, only 4.7 billion pounds, or 6.0 percent was used in fortified lowfat and skim milk products sold in and out of Federal order marketing areas (USDA, Statistical Bulletin No. 611).

These data indicate that for Federal order milk handlers, who handle 80 percent of all market milk produced in the U.S., additional nonfat solids in milk have little extra value in fluid milk products. Extra solids in whole milk and unfortified lowfat and skim milk would have little if any value, and they make up about 90 percent of total fluid milk sales.

Component pricing of market milk a gimmick

Some proponents of component pricing contend that even though additional
amounts of protein (or solids not fat) in milk may not have extra value in fluid milk products, market milk producers still ought to be paid a differential or premium for them. The logic given is that protein has extra value when used in manufacturing, and that producers should be paid for this value whether their milk is used for fluid or manufacturing. It is asserted that if efficiency is to prevail in the market, fluid milk handlers should at least pay for the protein in the milk they use what it is worth in alternative non-fluid uses.

To demonstrate that this is not being done and that the present hundredweight-butterfat differential price plan is "faulty" in that it does not provide for paying extra for high protein test milk, proponents have made analyses to show how blend prices would be redistributed among producers if both butterfat and protein differentials were used (Luedtke and Steely, 1975, Snyder and Smith, 1978, and Whitaker, 1978). Under the procedures used the same amount of funds would be paid out, but the blend price would be adjusted so as to permit paying a differential for both butterfat and protein. It was assumed that no additional funds would be available from the market to pay producers.

The results predictably show that in comparison to what they would receive under component pricing, producers of low protein test milk relative to fat are overpaid and producers of high protein test milk relative to fat are underpaid under the prevailing hundredweight-butterfat differential price plan (compare columns 4 and 5 in Table 2 which show prices 20 producers having varying protein and fat tests would have received under the pricing provisions of the Great Basin Federal order during February 1977, compared with what they would have received under a hypothetical component price).

These results not only lead proponents to conclude that component pricing of market milk would be more equitable to producers, but that if

<table>
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<tr>
<th>Producer</th>
<th>Protein test</th>
<th>Butterfat test</th>
<th>Butterfat price</th>
<th>Hypothetical component price</th>
<th>Value for manufacturing based on fat and protein*</th>
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<tr>
<td>Percent</td>
<td>Percent</td>
<td>Dollars per hundredweight of milk at test</td>
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<tr>
<td>1</td>
<td>2.94</td>
<td>3.80</td>
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<td>6.00</td>
<td>11.94</td>
<td>12.61</td>
<td>12.19</td>
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</tbody>
</table>

*Based on the Great Basin Class III price of $8.16 and BF differential of $1.04 per pound of fat and on assumed pool protein test of 3.41, (which was the average for the 20 producers included in the table). Class III price allocated to butterfat was 3.5 lbs of fat times $1.04 = $3.64. The remaining portion of the Class III price, $4.52, was allocated to protein as a proxy for all nonfat solids and equaled $1.33 per pound of protein.

each unit of protein and butterfat had a value as they would if component pricing were used in selling milk to fluid milk processors, handlers would be motivated to utilize milk's nonfat components more efficiently by satisfying the demand for fluid milk products with lower protein test milk, and diverting high protein test milk to manufacturing (Whitaker, 1978).

Such analyses and conclusions rather than demonstrating that the hundredweight-butterfat pricing system is inappropriate for market milk, vividly illustrate how component pricing of market milk without higher minimum standards for fluid milk products than now exist in most parts of the country could create false incentives that could damage the fluid milk market, which is the basis of the market milk industry. Market milk producers, fluid milk processors and consumers all ought to be apprehensive about a pricing system that would result in paying more for market milk used in manufacturing than for fluid, and which would drive high quality milk away from the fluid market, especially with proceeds partially derived from fluid milk sales.

The fallacy of such a pricing system can be seen by comparing the hundredweight-butterfat differential and hypothetical component prices in Table 2 with the value of fat and protein in milk for manufacturing. In all cases, except for one producer whose milk tested abnormally high in both fat and protein, prices paid producers under the hundredweight-butterfat differential price plan equaled or exceeded the component values of fat and protein for manufacturing. Use of component pricing and paying a premium for high protein milk would have only increased the amount by which producers of high protein milk would have been overpaid for their milk in relation to its value for manufacturing.
There is no need nor justification for component pricing where high protein milk has little or no extra value in fluid milk products, and the market milk blend price already exceeds the value of the fat and nonfat solids in milk for manufacturing. Component pricing of market milk and the payment of premiums for extra protein at first appears logical, fair, equitable and in keeping with modern nutritional trends, but upon closer examination, turns out to be only a pricing gimmick which transfers income from one group of producers to another, for no logical reason.

What is the gimmick or pricing quirk in proposed component pricing plans that makes what at first appears to be logical, lead to such illogical conclusions and results? It is the payment of a premium for high protein milk because of the extra value of the additional protein when used in manufacturing, plus the market milk blend price which includes a pro-rata share of the extra value of the fluid carrier when used in fluid milk products. The latter amounted to $1.11 per hundredweight of producer milk in the Great Basin Federal order area in February, 1977, the month of the price comparisons in Table 2.

Adding a protein premium to the blend price results in a price for high protein milk which is greater than its value for either manufacturing or fluid use. It would seem logical for producers to be paid the extra value their milk has for manufacturing or for fluid use, but not for both. Producers who insist on receiving a premium for the value extra protein in their milk has for manufacturing should be prepared to lose or forfeit the value the fluid carrier in their milk has in the fluid market, since by
committing their milk to manufacturing, it no longer is available for use in the fluid market.

Component pricing of market milk under these circumstances where premiums or differentials are added to blend prices and where extra protein or solids not fat have value only in manufacturing, does not increase equity in paying producers, but results in just the opposite. Without additional funds coming from the market, the only way more can be paid to one group of producers, is to withhold it from another group.

Analyses and conclusions that lead to component pricing of market milk place more importance on what premium is paid than on fluid milk sales and the resultant blend price that can be paid. Nothing would be gained by producers from a 10 cent per hundredweight premium for extra protein if it resulted in high protein milk being driven to the manufacturing market, a lowering in quality and sales of fluid milk products, and a drop in the blend price of 10 cents or more. Analyses that lead to the conclusion that component pricing of market milk is more equitable to producers than the prevailing hundredweight-butterfat differential price plan result from looking at the extra value additional protein has by itself rather than together with the fluid carrier as is necessary in the fluid milk market. It demonstrates what can happen when we equate the market for market milk to fat, protein and other nonfat solids, rather than beverages with minimum protein or solids not fat content.

When producers affiliate with the market milk rather than the manufacturing milk industry, they in effect commit their milk to meeting the needs of handlers for milk for fluid use. In return for this commitment, they share in the Class I differential paid by handlers for the fluid
carrier in milk used for fluid milk products as they participate in receiving the market blend price. In 1977, the average blend price in Federal order markets exceeded the Minnesota-Wisconsin price for manufacturing milk by $1.28 per hundredweight (USDA Statistical Bulletin No. 611).

Milk must always be available for fluid use for producers to logically claim the blend price. Whether their milk is actually used for fluid or diverted to manufacturing is an administrative decision made by the handler or producer association that markets the milk. That decision depends mainly on the location of the milk, the make up of bulk tank assembly routes, the location of fluid milk and manufacturing plants, the daily and seasonal variations in supply of milk from producers and demand for milk by fluid milk handlers.

If market milk producers are to be paid a premium or differential for the extra value additional protein in their milk has when used in manufacturing, and there is little or no extra value for fluid use, the premium should be added to the manufacturing price at standard test, not to the market milk blend price. It would also seem logical to deduct any extra marketing costs associated with handling high test protein milk separate from other market milk.

It is obvious from Table 2, that if most high protein milk producers were offered a choice of the value of their milk for fluid or for manufacturing, they would choose the market milk blend price, because in most instances, the extra value of the fluid carrier in fluid milk products exceeds the extra value of additional protein and other nonfat solids in manufacturing.
Other Considerations

Rejecting component pricing as a means of paying premiums for high protein milk does not solve the problem of low protein milk which contains less protein or solids not fat than minimum Federal, state or label requirements. This milk not only yields poorly if manufactured, but also must be fortified if used in fluid milk products. It obviously is overpriced under the hundredweight-butterfat differential price plan.

Rather than paying a premium for extra nonfat solids in high test milk that have no extra value in the fluid market and are already adequately compensated if used in manufacturing, a discount or penalty should be deducted to compensate for the fact that the milk would have to be fortified to bring it up to standard for use in fluid milk products, and that it has reduced value if used in manufacturing. Without higher minimum standards than now exist in most parts of the nation, this form of component pricing would be more efficient and equitable, and would put the price incentive to upgrade the quality of producer milk more squarely where it belongs.

Component pricing would be a rather indirect, ineffective way to eliminate the adding of water to milk, to the extent that it exists. Perhaps a better solution would be to assess a stiffer penalty if any water at any time were detected, such as being degraded for a year, or permanent loss of membership if a member of a marketing cooperative. Farmers adding water to their milk do not deserve to be a part of the fluid milk market nor receive the blend price paid for market milk. Component pricing is not the answer to this problem, however, because even with component pricing of market milk, one of the components must be the fluid carrier, as it is in California. To not include the fluid carrier as one of the components
in pricing market milk, would on the one hand place a greater value on fat and nonfat solids than their alternative value in manufacturing if the value of the fluid carrier were added to them, or reduce the value of market milk to the value of manufacturing milk if the value of the fluid carrier were eliminated. If the latter were done, fluid milk processors undoubtedly would not be able to obtain sufficient supplies of milk to supply the market.

Producers of high protein test milk look to component pricing as a way to get more for their milk. The simple facts of the matter are, however, that unless fluid milk handlers are charged more for the extra protein there is no extra money to logically pay a premium to producers, and if handlers are charged for the extra protein, they won't want the milk if it is above the minimum standard. Even in California where component pricing is used and where minimum standards are high, handlers are careful not to buy more protein in milk than they need in order to meet minimum standards if they can avoid it. For this and other reasons, all colored herds such as Jersey, Guernsey, and Ayrshire have virtually disappeared from the Class I market. Those that remain in production generally sell to cheese plants (Maes, 1978).

Some look to component pricing as a way to increase protein content in producer milk. Even though in the long run it may be physically possible through feeding and breeding to increase protein levels in milk, studies are beginning to show that the most economical way to increase production of protein and solids notfat is still to feed and breed for more total milk production, not for higher levels of notfat solids (Townsend, 1978, and Wankier, 1978). The component characteristics of fluid milk produced in California where component pricing has been used for almost 20 years do not appear to have been notably changed by component pricing (Maes, 1978).
Selling milk to fluid milk handlers on a component basis would equalize the cost of components to them, but it would create unequal costs per unit of product, such as a half gallon of milk, if the amount of nonfat solids varied, especially if they exceeded the minimum standard. One reason Federal milk orders were implemented was to help stabilize the market by equalizing the ingredient cost of milk per unit of product among competing handlers. Selling milk to handlers on a component basis could reintroduce an element of instability into the market, unless nonfat components in producer milk are standardized.

To avoid buying extra nonfat solids above minimum standards which have no value to them in fluid milk products, handlers in California who buy on a component basis, attempt to manage incoming raw product to achieve relatively uniform outgoing solids notfat near the prescribed minimum standard. Larger plants divert high solids milk to nonfluid operations; plants purchasing from cooperatives request incoming milk at desired levels of nonfat solids. Small plants may lack the capability to achieve uniform solids notfat in finished products and thereby experience adverse economic effects if incoming milk tests too high or too low. If it is too high, they pay for extra solids that are not needed and for which they cannot recover the cost from the market; if it is too low, they must fortify it with additional nonfat dry solids (Maes, 1978).

There has been some confusion between the roles of component pricing and minimum standards for nonfat solids in fluid milk products. Some favor the use of component pricing to increase protein in fluid milk products, when in fact without higher standards, as has been previously
indicated, it might drive some high protein milk now being used in fluid products to the manufacturing market, if it is not needed to meet minimum standards.

If more protein or nonfat solids in fluid milk than now exist in most parts of the nation are socially desirable, then a more direct and effective way to get them would be to set and enforce higher standards on a state or Federal level. With minimum standards as high or above the average natural content of protein and nonfat solids in milk, most nonfat solids in market milk would have extra value in the fluid market. Once this were the case, then component pricing would be an equitable way of paying market milk producers for nonfat solids in their milk, up to the minimum standard in fluid milk. In terms of a logical order or sequence of events, first should come higher minimum standards to give extra nonfat solids in producer milk value in fluid milk products, then component pricing to pay producers for the extra nonfat solids in high test milk. Use of a protein or nonfat solids differential from a standard test, would also deduct value from producers whose milk is low in nonfat solids.

Before minimum standards are increased throughout the nation to levels comparable to or above those in California, careful consideration should be given to the effect this would have on costs, prices and fluid milk consumption. Any additional costs of fortification can be expected to be passed on to consumers, and they are currently choosing in the market place lower solids milk at lower prices over higher solids milk at higher prices.

Some look to California as evidence that component pricing, if not higher minimum standards for nonfat solids and component pricing, increases sales and per capita consumption of fluid milk products. Often overlooked, however, when rationalizing the higher levels of milk consumption is that
the retail price of milk in California is about 20 percent lower than in the nation as a whole, per capita income is about 11 percent higher, and the California dairy industry spends about 50 cents per capita annually on dairy advertising. In actuality, these latter factors probably have more of an effect on consumption of milk in California than do minimum standards and component pricing (Christensen, 1979).
References


