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MEETING THE CHALLENGE OF SUBSTITUTE DAIRY PRODUCTS

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Substitute products in the dairy market are not new phenomena. For many years, margarine consumption has been increasing, and it now accounts for two-thirds of the spread market. Per capita consumption of butter was 5.5 pounds in 1967, as compared to per capita margarine consumption of over 10 pounds. More recently, in the Class I price category, non-dairy whipped toppings are estimated to have taken over 60 percent of the whipping cream market, and coffee whiteners are taking up about 35 percent of the coffee cream market. In fourteen states, not including Ohio, a vegetable fat ice cream (mellorine) is marketed and accepted on a significant basis.

While we have seen these changes taking place in the dairy market, we have accepted them somewhat philosophically, and have clung to the notion that while substitution could occur in some products, fluid milk was not substitutable. Suddenly we are having to reappraise this notion.

In recent months, filled milks, or fluid milk substitutes, have appeared throughout the State of Ohio. Many other parts of the United States are also reporting these products, and in an Arizona market where substitute milk has been available for more than a year, over 4 percent of the total market is accounted for by the substitute.

The appearance of these products is obviously disquieting to milk producers. In the United States, about 50 percent of the total milk supply goes to fluid use. With dairying ranking as the No. 1 farm income enterprise in Ohio and representing almost 20 percent of the income to Ohio agriculture, the potential impact is obvious. About 75 percent of the 4.2 billion pounds of Grade

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A milk produced annually in Ohio is utilized in the Class I fluid category. Fluid substitutes thus raise fundamental questions about the long run market and price for producer milk. Three types of substitute milk are being marketed:

(1) Skimmilk-Vegetable Fat Combination

The primary type of substitute fluid milk appearing in Ohio markets at the present time is a product in which a vegetable fat (usually coconut oil) replaces the butterfat in milk, i.e., regular skimmilk is homogenized with the vegetable fat. The primary basis for doing this is the cost difference between vegetable fat and butterfat. Presently, the value of butterfat used in Class I products in Ohio markets is about 90 cents per pound (based on $6.10 Class I price and 8.5 cent butterfat differential). The market price for coconut oil ranges from 25 to 35 cents per pound, depending on the quality. A quart of 3.5 percent fat milk weighing 2.15 pounds contains about 0.07 pounds of fat. The cost of butterfat in this quart would be 90¢ x .07 = 6.3 cents. The cost of coconut oil in this quart is assumed to be 35¢ x .07 = 2.45 cents. Therefore, the cost advantage on substitute milk due to the difference in fat values is nearly 4 cents per quart or 8 cents per half gallon. Much of this cost advantage potentially can be passed on in terms of lower consumer prices. Obviously, a potential price difference of this size has to be taken seriously.

(2) Nonfat Dry Milk-Vegetable Fat Combination

Substitute milk, in which reconstituted nonfat dry milk rather than skimmilk is combined with vegetable fat, represents a slight variation from the fluid skim base. At the present time, the value of skimmilk in Ohio's Federal order markets is about 3.5 cents per pound. Thus, in a quart of milk containing 2.07 pounds of skimmilk, the value of skim is about 7.2 cents. If nonfat dry milk is used, at a market price of 21 cents per pound for nonfat dry milk, and a quantity of one-fifth of a pound per quart of milk, the skimmilk cost becomes

0.20 pound x 21 cents = 4.2 cents. This cost difference of 3 cents per quart between skimmilk and reconstituted non-fat dry milk is explained by the fact that skimmilk is accounted for at the Class I price, while nonfat dry milk is accounted for at the Class II price.

Under the Federal order program, it is proposed that the costs to processors of skimmilk and reconstituted nonfat dry milk be equalized by essentially requiring a payment of 3 cents per quart on the reconstituted nonfat dry milk. This money would be paid into the local pool as an equalizing payment, and producers would receive the money.

Thus, for processors, there would be no cost difference between skimmilk and nonfat dry milk. Both skimmilk and nonfat dry milk used in filled milk would offer essentially the same cost advantage as compared to whole milk.

(3) Vegetable Fat and Non-Dairy Protein Combination (Complete Synthetic)

A third type of fluid product which may be of more concern to dairymen in the longer run is a synthetic milk in which both butterfat and solids-not-fat have been replaced by other ingredients. The fat portion of this would be vegetable fat as just described. However, the protein portion would be soluble soya isolates, treated for flavor considerations, which are derived from soybeans. Sodium caseinate, a second derivative of skimmilk, may be used together with the soya protein. Currently, the price of soya proteins, which meet the minimum flavor requirements for use in substitute milk, is running substantially higher than the price of nonfat dry milk.

However, the protein content of these purified soya products is in the range of 90 to 95 percent protein, while nonfat dry milk is approximately 35 percent protein. Thus, from a cost standpoint, the ingredient cost for a complete synthetic milk is somewhat lower than the market cost for either filled milk or whole milk at the present time. In the longer run, it is projected that

the cost of soya proteins will decrease. However, synthetic milks do not measure up to natural milk nutritionally due to problems of incorporating proteins and calcium in the synthetic. While there continue to be some taste problems with the synthetic milk, these are gradually being resolved, and these synthetic milks are currently being marketed in some parts of the United States (Omaha, St. Louis).

Consumer Acceptance

In final analysis, it will be the consumer who determines whether or not filled milks and synthetic milks make a substantial impact in the dairy market. Consumer acceptance will hinge around (1) taste, and (2) price. In addition, we must recognize a consumer psychology that is (1) curious about and agreeable to imitation products, and (2) responsive to creative merchandising policies directed at promoting imitation products.

With respect to taste, the filled milks we are currently seeing in Ohio markets are widely recognized as tasting good. Many people either cannot or have difficulty in distinguishing filled milk from whole milk. Also, it has been observed that the consumer's primary flavor concern is that the imitation milk tastes all right -- not necessarily just right.

In regard to price, the built-in advantage of filled milks with lower fat costs can potentially lead to significant price differences between whole milk and filled milk. As indicated previously, the lower fat cost in filled milk can justify as much as an 8 cent per half gallon lower price on filled milk. Consumers will respond to this price difference. In recent market research, it was determined that 60 percent of the customers buying standard whole milk at food stores responded completely to price, and were not loyal to brand or quality considerations. It would seem probable that this type of price response can, at least, be partially extended to filled milks.

Legal Considerations

Some interests immediately look to the law as a means of limiting the impact of fluid milk substitutes. However, this attitude has been de-emphasized because of the margarine experience and the premise that fighting a defensive battle is not an effective way to cope with a problem.

On the Federal level, the Filled Milk Act of 1923 prohibits any interstate shipment of filled milk products. This regulation is limited to filled milks and does not extend to synthetic milks. The Food and Drug Administration is enforcing this law.

State laws vary in their restrictions. Some states prohibit the production and sale of filled milks. There is a general feeling, however, that such laws probably cannot stand under court tests, and that legislatures are not going to extend police powers to the restriction of what are widely considered to be safe and nutritious products.

In Ohio, the production and sale of filled milks and synthetic milks are permitted. In order to avoid deceiving consumers, however, substitute milks (1) must be labelled with the word IMITATION in the same size print as the name of the product, and (2) must list all ingredients including the percentage of fat.

Impact on Producers

At the present time, Class I milk prices approximating $6.00 per cwt. and Class II prices near $4.00 per cwt. are bringing producer prices close to $5.50 (75 percent Class I utilization) in Ohio markets. The potential effect of fluid substitutes may be related to this price structure. If 5 percent of the fluid milk market were to be taken up by synthetic milk in the next year (about the Arizona pace), producer prices would drop by 10 cents, even if prices did not change. The effect on producer prices due to filled milks would be less because

in filled milks only the replaced butterfat would drop from the Class I price to the Class II price. Of even greater concern though, is the possible undermining of class prices by substitutes. If butterfat (or skimmilk) in fluid milk gets displaced on any significant basis, 1.) negotiated Class I prices are jeopardized, 2.) Class I price differentials in Federal order markets must come under closer scrutiny, and 3.) the dairy support level, and thus Class II prices, may have to be lowered because of surplus butterfat.

It is for these reasons that milk producers have to be concerned about the appearance of fluid milk substitutes. While the current pace of marketing of these products may slow or fade away, the longer run economics of the situation indicate that substitute fluid milks are not a passing fancy, but are a major long run factor to contend with in the dairy industry.

Producer Response

The response of milk producers to the changing market must be positive. Four avenues of action appear to be in order. Three of these action courses are collective but require support from across the production sector. These include (1) support of study and adjustment of pricing programs designed to make milk (butterfat and skimmilk) more competitive price-wise; (2) support of advertising and promotion programs; and (3) support of research directed at finding new food uses for milk solids.

1. Pricing

Much interest is being directed at pricing adjustments as a means of competing with substitute milks. Much of this interest has been focused upon either (1) lowering butterfat differentials, or (2) costing milk used in Class I on a beverage basis rather than a butterfat-skimmilk basis. These two considerations are somewhat similar in principle. They would both maintain class prices but lower butterfat values. This would mean that skimmilk prices would necessarily have to be increased considerably. Thus, in adjusting milk pricing

so that butterfat would be more competitive with vegetable fat, milk proteins would become less competitive with soya proteins. This is a pricing dilemma that will have to be resolved. In the longer run, it may require lowering of class prices. In analyzing and acting on this complex pricing problem, milk producers must support their marketing leadership in working for the optimum pricing situation for all milk producers.

2. Advertising and Promotion

Market research has shown that producer support of advertising and promotion programs is a significant factor in expanding sales for milk and dairy products. Since individual producer financial support for advertising and promotion is generally on a voluntary basis, there is a substantial amount of non-participation, and the total promotional effort, therefore, becomes somewhat limited. The appearance of fluid milk substitutes is focusing attention on the broader support essential for such promotional efforts.

3. Product Research

Building a stronger market base by finding new food uses for milk solids is essential to the dairy industry. Some new items, such as low butterfat spreads, fortified skimmilks, smoked cheeses, and low fat ice creams, have aroused interest in the pay-off that research on such products can achieve. Also, new merchandising techniques (cheese packaging, ice cream novelties, etc.) reflect what merchandising innovations can accomplish in expanding the dairy market. Producer support for technical and marketing research designed to expand the milk market is necessary.

4. Production Efficiency

The fourth course of action is one in which each producer can involve himself directly and on an individual basis. This action is that of a milk producer increasing his production efficiency level (or lowering his cost of milk production)

to a point that will be competitive with substitute milk. At what cost or price level is this?

The ingredient costs for filled milk are currently about 9 cents per quart, or $4.20 per cwt.

Ingredient Cost For Filled Milk (Qt.)

Ingredient	Pounds	Rate	Cost
Skimmilk	2.0752	3.3¢	6.85¢
Vegetable Fat	.0699	30.0	2.10
Emulsifier	.0049	45.0	0.22
	2.15 lbs.		9.17

In the longer run, therefore, milk production costs in the range of $4.20 per cwt. may represent an approximate price that dairy farmers will have to recognize as essential to achieve in order to continue operations.

Ingredient costs for synthetic milks are potentially lower than those for filled milks. However, present technology limits the amount of vegetable protein that can be incorporated into synthetic milk due to severe taste problems. Also, it is difficult to incorporate calcium into synthetic milk on a basis that compares with natural milk. Therefore, there is a rather significant nutritional difference between cow's milk and synthetic milk. To the extent that this nutritional problem in synthetic milks cannot be resolved, the impact of synthetic milks on the dairy industry may be limited. However, the consuming public may be somewhat indifferent to the nutritional difference. Also, research efforts in food technology may in the future resolve the protein and calcium problems in synthetic milk.[2/]

The estimated ingredient costs for filled milks and synthetic milks point up the problem that milk producers may be confronted with in the future.

2/ Professor W. James Harper, Department of Dairy Technology, The Ohio State University has been very helpful in providing this technical information on substitute milks.

The question then becomes one of effecting a milk production enterprise that can be fully competitive in the total market.

In a broad sense, a dairy farmer has to have control over a certain amount of capital and labor in order to produce milk. These become the basic factors of production. His capital can take many forms. It can be land, buildings, equipment, cows, heifers, calves, or a multitude of supplies. His labor involves the hours of time that are used in producing milk. On a modern dairy farm, this labor may involve the time of employees as well as the time of the operator and his family. Very few farm accounts are kept which distribute the labor time among the various farm jobs.

Since this is the case, a recent Ohio study has been made in order to isolate the direct labor involved in producing milk. This study was carried on during 1965 and 1966. The first year, 60 farms completed records for the whole year, and 50 finished the second year. These farms were chosen because they were specialized, commercial dairy farms and because they agreed to cooperate with the study. They were not chosen because they were average or typical dairy farms. However, the sample was large enough and covered a sufficiently large geographical area so that it can be deduced that these farms are indicative of the trend and conditions on commercial dairy farms in Ohio.

Land, a specific type of capital, was separated from the dairy production part of the farm business by selling the crops to the dairy herd at prevailing market prices. The assumption behind this procedure was that a farmer does, in a sense, have this choice. He can sell his crops or he can feed them. It is assumed, furthermore, that if the dairy operator did not produce any of his feed, he could in turn purchase the required kinds and quantities at prevailing market prices. As might be suspected, feed does represent the largest expense. On an average farm within this group of farms, the cost of feed was $1.72 for each

hundred pounds of milk produced. On a percentage basis, feed represented 38.7 percent of the total cost.

Overhead or fixed expenses were another significant part of the expenses. They were $.85 per hundred weight or 19.2 percent of the total. These include: depreciation, interest, repairs to buildings and equipment used in milk production, taxes, and insurance. It was the objective of this study to represent current conditions as closely as possible. Therefore, an appraisal was made of the buildings and equipment in order to establish their current market value. This appraisal determined the depreciation rates and the amount of interest charge. Also, high producing cows were assigned a higher value than lower producing cows. Hence, the amount of depreciated cost was greater in high producing herds.

Operating expenses other than feed amounted to $.40 per hundred weight, or 9 percent of the total. These include the following routine expenses: feed grinding, veterinary, medicine, breeding fees, registration, dairy supplies, electricity, milk testing and death losses.

Thus, the total of feed, overhead, and other operating expenses amounted to $2.97 for each hundred pounds of milk.

Still, there is another very important ingredient or factor of production that has to be paid -- labor. How much is the labor that is used in producing milk worth? For this study, it was assumed that the labor was worth or should cost $2.50 per hour. At this rate, it approached an opportunity cost. In short, these men who were performing this labor could earn this much for their labor in nearby industries. If milk production is going to attract and keep labor, it must be competitive. In order to standardize the farms in the study, the same labor charge was made on each farm. On the average farm, it was found that 59 percent of an hour of direct labor was required to produce each hundred

pounds of milk. At this rate, the labor expense was $1.47 or 33.1 percent of the total bundle of costs. It should be added that no charge was made for labor other than those hours used in the care of the dairy herd and replacements.

By making a summation of these expenses, it can be seen that the average dairy farm operator in this study could produce milk for $4.44 per hundred weight.

Now, what did the most efficient or lowest cost producers do? Were their expenses substantially less? Briefly, the answer is yes. There is considerable evidence that these low cost producers skillfully used another factor of production -- management. Management is intangible and difficult to identify specifically. Yet, its effect can be clearly seen in reduced costs. In each of the major categories discussed previously, the actual milk production costs were lower. Table 1 indicates the differences in production costs between low cost producers and average producers.

Table 1

Cost of Producing Milk on 55 Ohio Dairy Farms in 1965 and 1966

	Low Cost Farmers	Average Farmers
Feed	$1.43	$1.72
Overhead	.73	.85
Other Operating Expenses	.37	.40
Direct Labor	.98	1.47
Total per CWT.	$3.51	$4.44
Average production per Cow	13,740	13,837
Average number of Cows	50.8	40.2

Feed was $1.43 per hundred on the low cost farms. These better managers had seen to it that there was less waste and that the combination of feed ingredients in the dairy ration was lower in cost yet capable of producing just as much milk as the average farmers had attained.

The overhead on these farms was cut to $.73 per hundred. This reduction was not accomplished by using inadequate housing and equipment but by making more use of all of the facilities. These low cost farmers had herds that averaged slightly more than 50 cows while the average farm had slightly over 40 cows. Thus, the better managers had spread common and necessary investments over more units. In short, they had attained some efficiencies by being larger.

The operating expenses other than feed were $.37 per hundred and were 7.5 percent lower than the average farms.

The benefits and effectiveness of superior management were most apparent in the labor requirements. On the low cost farms, it required only 0.39 hour of labor per hundred pounds. Multiplied by the $2.50 per hour rate, the labor cost on these farms stood at $.98 per hundred weight. Thus, the labor cost was reduced one-third.

On these low cost farms, the total cost of producing 100 pounds of milk was $3.51. This lower cost indicates that superior management is capable of earning a substantial income. This becomes apparent if the gross amount accruing to management is calculated. The cows were producing at a rate of 13,800 pounds per cow in a herd of 50.8. Thus, if good management is given credit for lowering the cost by $.93 per hundred, management on the low cost farms was responsible for a net gain in income of $6,520.

Although it is merely conjecture, it may be assumed that the benefits from better management could be carried farther. Herds could be larger, milk production per cow could be higher, overhead could be lower, and labor requirements

could be reduced. The exact saving is difficult to estimate, but it would probably approach 35 to 40 cents per hundred weight if all other things are held constant. Therefore, with present knowledge and effective management, a hundred weight of milk can be produced in Ohio at a total cost of about $3.10. In view of the substitute situation, with ingredient costs on filled milks in excess of $4.00 per cwt., it is clear that there is a large potential in dairy farming for reducing production costs and meeting the challenge that substitute dairy products pose.