Testimony on the Cost of Processing in Cheese, Whey, Butter and Nonfat Dry Milk Plants

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by

Mark W. Stephenson, Ph.D.
retired

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Introduction

Judge Strother and personnel of AMS Dairy Programs, I am appearing before you to offer a summary of recent research projects in which I collected data on and summarized the costs of processing in cheese, whey, butter and nonfat dry milk plants. I am not here to advocate for or against any particular policy action, but rather to offer my insights into the current cost environment for dairy processors. This is a summary of my work and does not represent an official statement of my previous employer, the University of Wisconsin.

I have a bachelor's and a master's degree in Dairy Science from Michigan State University and a second master's and doctorate degrees in Agricultural Economics from Cornell University. Over the course of my career I have conducted and published research on the cost of processing dairy products for 35 years.

Most recently, I have conducted research on the processing costs of Cheddar cheese, dry whey, butter and nonfat dry milk. These are the four products currently surveyed in the weekly National Dairy Product Sales Report[2] (NDPSR) and who's prices are used to determine the component values of butterfat, protein, other solids and nonfat solids used in the calculation of minimum class milk prices in all Federal Milk Marketing Orders.

In 2018 I entered into a Memorandum of Understanding with USDA, AMS to update the cost of processing of these four products. The final report was made available to USDA and distributed more widely in 2021.[3] That report has also been submitted as Hearing Exhibit 158 for the hearing record. The bulk of the data from plants participating in that project was largely from the 2019 calendar year. Prior to the 2021 report, the last time that I had conducted a cost of processing study on these four products was in 2006.[4]

[1] I retired from the University of Wisconsin in November, 2022 as the Director of Dairy Policy Analysis and the Director of the Center for Dairy Profitability.
[2] The National Dairy Products Sales Report is published weekly by the Agricultural Marketing Service of the U.S. Department of Agriculture. https://usda.library.cornell.edu/concern/publications/zs25x847n
[3] Stephenson, Mark W., "Cost of Processing in Cheese, Whey, Butter and Nonfat Dry Milk Plants". https://dairymarkets.org/cop/Report/2021_COP_Report.pdf
[4] Stephenson, Mark W., "Cost of Processing in Cheese, Whey, Butter and Nonfat Dry Milk Plants, Working Paper, Cornell Program on Dairy Markets and Policy. September 2006.

Shortly after that study, I offered testimony as to those results in a Federal Order hearing in Pittsburgh, Pennsylvania.[5]

More recently, the International Dairy Foods Association (IDFA) and the Wisconsin Cheese Makers Association (WCMA) asked that I update the 2021 study to capture the impact of inflation and supply chain disruptions since the pandemic. This has been done and the results shared in a final report of primarily 2022 calendar year data from participating plants.[6] A copy of that report has been submitted for the hearing record as "IDFA Exhibit 1".

I am here to provide results from the 2019 and the 2022 data and to answer questions as an expert witness regarding those two research projects.

The Survey Sample and Data Collection

Only plants who manufacture products collected in the NDPSR were solicited to participate in these studies. It is important to note that these plants may not be actual participants in the NDPSR but they need to be operations manufacturing products whose characteristics are consistent with the NDPSR products. As an example, exported nonfat dry milk might not be included in the NDPSR because the days between the contract and delivery dates disqualify the transaction. But, for my purposes, the cost of transforming raw milk into nonfat dry milk powder is still valid.

Participation in the survey is voluntary. I would offer this as both an observation and a potential criticism. I have pledged my adherence to participant anonymity and integrity of their individual data. However, I will offer the observation that in any of the cost projects there has been a great deal of variance across individual plants and that variability has become greater over the years that I have conducted cost studies.

As it is with dairy farms, and most other businesses, there is no single cost that represents all processors. There are however, statistical measures that are useful to summarize the observations. In my reporting I use product-weighted averages. But, because of the variability observed, it is fair to draw the conclusion that the sample matters. Self-selection to participate can alter weighted average values if the same plants are not participating across different research projects.

I do not have audit authority to verify the data submitted by participants. However, there are several key cross-checks in the data collection. Submitting intentionally deceptive costs would raise red flags and prompt questions from me. Follow-up emails or phone calls will usually clarify any data questions that might arise. I also look for statistical outliers across plants to ensure that data entries are as accurate as possible.

[5] Stephenson, Mark W., "Testimony on Cost of Processing in Cheese, Whey, Butter and Nonfat Dry Milk Plants". Federal Milk Marketing Order Hearing, Pittsburgh, PA. July 9, 2007.
[6] Stephenson, Mark W., Cost of Processing Cheese, Whey, Butter and Nonfat Dry Milk Plants, https://dairymarkets.org/IDFA/COP_Report.pdf

The Survey Instrument

Beginning with the 2006 cost project, I have used a custom computer program to generate and collect plant data. Prior to that time, paper surveys were used which yield a weighty document that may be sparsely filled out. That results because you need to ask all possible questions to cover the unique aspects of each plant. A computer program can begin by asking basic questions—like what products are produced in the plant?—and follow that up with only questions relevant to those products. The 2006 and 2019 projects utilized a stand-alone custom application, which participants used, to complete data entry. I developed an online web application for the 2022 project that produced a similar set of customized questions for participants. The papers noted in footnotes 3 and 6 include screen shots with example questions from those survey instruments.

Cost Allocation

It is important to understand what plant costs are included in the cost of processing. My objective is to determine the costs of product transformation from, but not including, raw ingredients to finished wholesale products. The costs of raw milk, purchased cream, nonfat dry milk, etc. are excluded. But non-dairy ingredients, such as salt or enzymes are included. Costs are inclusive through product packaging but do not incorporate post-packaging costs such as long-term storage, product aging, sales costs or product distribution. The costs are meant to represent the cost of transformation of milk, or milk ingredients, into the finished wholesale dairy product. An economic depreciation is included to cover consumed capital, and a return on the market value of assets is added to reflect opportunity costs.

Some processing costs are easily allocated to the product of interest. For example, the cost of cardboard for a 40 pound block is directly assigned to cheddar cheese. Other costs must be allocated across multiple products. I collect component values on all products produced at the plant. The weight of total component solids in a product becomes the basis for allocation. For instance, if there was 75,000 pounds of components in cheddar cheese produced at the plant and 25,000 pounds of components in mozzarella cheese, then 75% of the costs of salt used in the plant would be attributed to the cheddar cheese.

Other costs are more complicated to properly allocate. If a plant brings in only raw milk and produces butter and nonfat dry milk, then the labor cost in the churn room is directly allocated to the butter produced. But, if the plant has only one electric meter, the total electric costs are allocated by the pounds of components in the butter and NDM produced. This has been a standard practice utilized by the industry and previously used by the California Department of Food and Agriculture in their cost accounting for dairy plants.

I had also used this methodology in previous projects but found that in some cases it can produce misleading results. For instance, a butter-powder plant that brings in milk but may sell a considerable amount of skim or condensed milk, has not incurred much of the costs of final drying. The pounds of components are the same, but you are now

allocating a lower proportion of final costs to the butter and powder that was produced and too much to the skim and condensed. In the 2019 project, I employed a second weighting factor based on the degree of transformation of the product. Products like skim milk are lightly transformed while fully dried and bagged powder has incurred additional utility, labor, packaging, etc. costs. This additional methodology fully accounts for the total costs in the plant but, ceteris paribus, more costs are placed on powder than butter, and much less on the skim milk sold.

After the 2019 study was published, I heard from many folks in the industry that they were concerned about the new methodology and were not yet comfortable with its use. For the 2022 study, I have since gone back to the previous methodology using the pounds of components as the allocation factor and not the degree of transformation. Although I stand by the concept of further accounting for the degree of activity needed to produce a product, I believe that the industry needs to be comfortable with the methodology used.

Results

Table 1. Weighted Average Product Cost from 2006, 2019 and 2022 Plant Data.

	2008 Make Allowance	2006 Results (N=29)	2019 Results (N=57)	2022 Results (N=55)	06/19 Pct Change	06/22 Pct Change
Cheese	$0.2003	$0.1584	$0.2476	$0.2643	24%	67%
Whey	$0.1991	$0.1976	$0.2650	$0.3361	33%	70%
Butter	$0.1715	$0.1846	$0.1411	$0.3176	-18%	72%
Nonfat Dry Milk	$0.1678	$0.1662	$0.2933	$0.2750	75%	65%

Table 1 summarizes the three cost studies referenced in my testimony from the years 2006, 2019 and 2022. The table also provides the current make allowances which were last updated in 2008. The last two columns indicate the percent change from the 2006 data—first for the 2019 data and then for the most recent 2022 data.

Observations

The sample matters. In the 2019 data, there were 27 nonfat dry milk plants who had participated while in the 2022 data there were only 15. However, the average pounds of product per plant was much larger and total pounds of product reported for 2022 was slightly more than the previous study.

The 2022 data sample included 18 cheddar cheese plants versus 10 in the 2019 data. Like the NDM plants they were also much larger average size and represented a significant proportion of the NDPSR volume.

The butter data are the most puzzling. Although the number of participating plants are similar (13 versus 12 in the 2019 data) and the total volume of butter represented is similar between the two years, the plants participating are significantly different. The 2022 data represent both larger plants and smaller ones compared with the 2019 data where the size was more homogeneous. I believe that the different sample is most responsible for the very different results.

Like the butter plants, dry whey processing had a similar number of operations in the sample. Eight plants were included with the 2019 data and 9 with 2022 data but the volume was almost 50 percent greater with the most recent sample.

There may be a variety of reasons why the sample matters and we see such variation across the plants in the studies. New automation technology has become available which can reduce labor costs. And, there is considerable variation in per unit utility costs across plants. Further, larger multi-plant firms may have input purchasing cost advantages that smaller single-plant firms do not.

Plant ownership might suggest different objectives for firms. In a commodity-based industry, proprietary firms can only improve their profit margin by reducing supply chain and processing costs. Cooperatively owned plants certainly strive for profit for their members, but assuring a home for member milk may be an even stronger objective which may limit plant investment.

Concluding Comments

Because the sample can make a difference, it would be best if plants were compelled to participate. Ideally, the sample would be comprised of all plants with reportable product in the NDPSR. That way the price discovered in the survey for products would most closely correspond to the costs of transformation used in the make allowance. I would also suggest that any parameters in the product price formulas, such as make allowances and yield factors, have periodic assessment to assure validity of price announcements.

It has been 15 years since the make allowances in product price formulas were updated. It would be my opinion that this interval is too long between the assessment of processing costs. Per unit processing costs, such as the costs of a therm of gas or kilowatt hour of electricity, have fluctuated over the intervening years, but some costs such as wages have only increased. To some extent, labor used has been reduced by

substituting with automation and there have been energy recapture technologies employed in plants that we didn't see 15 years ago. Over that time, total manufacturing costs per pound have increased.

There are safety relief mechanisms in Federal Orders that are only expected to be employed when the system isn't working properly. One of those is de-pooling of milk. De-pooling can happen for various reasons, but one of them is when processors routinely find that obligations to pay the minimum price for milk is more than they can recover from their product prices. This happens when the make allowance is inadequate. The relief is to opt out of regulation and pay what you can afford. We have seen much more unregulated milk in the last several years.

Table 1 shows that there are surprisingly uniform increases in the cost of processing from the 2006 data to the 2022 data of somewhere around 65-70 percent across all four products. An increase in the make allowances reflecting contemporary costs would do much to return product price formulas to the functionality they had in 2008 when they were last updated.