



Food & Beverage White Paper



Content Created for Junction Solutions, Microsoft Dynamics AX Gold Partner



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A Delicate Dance of Supply & Demand, Part 1

A Primer on Dairy Industry Complexity

ABSTRACT

It goes without saying that the dairy industry is not for the faint of heart. For farmers, it constitutes one of the most grueling and relentless professions on earth. In the marketplace, the past decade has ushered in a harrowing roller coaster ride of soaring fuel and feed prices coupled with plummeting dairy sales prices that have crushed many industry veterans.

The fact remains, however, that none of these challenges can be reasonably discussed or addressed without a basic understanding of the foundational complexity and uncertainty that have arisen out of around government and regulatory intervention in the industry based on the historic nutritional importance of dairy products and the inherent volatility of their supply and demand. Part 1 of this white paper is intended to provide this baseline understanding of the historic and present-day challenges players in the industry face that are largely the product of governmental involvement and outside their individual control.

INTRODUCTION

Today's dairy industry is faced with a broad range of challenges affecting virtually every aspect of its operations. Because the historic and present-day complexities of the dairy industry are so vast, Part 1 of this white paper series attempts to offer a context within which a reasonable discussion around these issues may take place, serving as a primer outlining many of the interwoven struggles that fall largely outside the control of individual dairy producers and processors – coming instead from state and federal government involvement in the industry.

The discussion begins with a high-level introduction to the players in the dairy supply chain, followed by a review of several areas of complexity, including:

- External pricing systems (specifically, price supports, import restrictions and quotas, and marketing orders)
- Evolving public policies (historic and present day)
- Inputs and margins (the “Milk-Feed Ratio” and the “Ethanol Effect”)

While this discussion will by no means be exhaustive, it should provide a baseline from which further examination of the industry can take place—specifically with regard to the more traditional business challenges it faces, such as domestic and global competitive pressures, shrinking margins, and processing complexity.

These more straightforward issues will be covered in Part 2 of this white paper series, along with some of the industry-specific technologies that are bringing with them tangible competitive advantage for adopters.



DAIRY INDUSTRY SUPPLY CHAIN

At the most basic level, the dairy supply chain begins with the farmers and agricultural suppliers who produce raw milk and ends with the processors, institutions, and consumers who utilize products that were created in the production chain, with raw milk, processed milk, and by-products serving as ingredients in other processing chains.

The supply chain for unprocessed milk may include cooperatives and other supplier organizations that receive milk from the original producers, and/or buyers, wholesalers, or other intermediary operators who sell product either to the small unprocessed milk consumer base or, far more frequently, to milk processors who may then sell their product directly to consumers, or to distributors, retailers, further processors, or dairy product factories, all of whom will ultimately sell their finished goods to the end consumer.

While dairy farms often focus exclusively on the production and processing of a single product—raw milk—that milk is often then sold into secondary stages of the production chain to fulfill requirements around a range of dairy products that are so broad, diverse, and growing as to be almost limitless, each of which brings with it unique requirements for milk solids, proteins, and volume as well as its own distinct recipe for processing.

Because of the interdependent and overlapping environments in which producers and processors must operate, both will be discussed in this paper.

EXTERNAL PRICING SYSTEMS

No discussion of the challenges associated with dairy profitability would be complete without mention of the extraordinarily complex and often polarizing public and private pricing systems that have evolved in the U.S. whose end goal has been to provide the public with the milk and associated dairy products it needs while ensuring dairy producers and processors receive sufficient gains to continue to meet consumer demand.

The USDA currently defines the government and private components that make up the dairy pricing systems as including milk price supports, federal milk marketing orders, import barriers, export subsidies, domestic and international food aid programs, state-level milk marketing programs, and multi-state milk pricing organizations, as well as dairy cooperatives and futures markets.^{1,1} For the purposes of this paper, discussion will focus on price supports, import restrictions and quotas, and marketing orders.

Price Supports

Since 1949, dairy price supports have played a pivotal role in the pricing of milk and dairy products, with support prices serving as the foundation for the price structure for all bulk milk sold by farmers either

1 Of these components, price supports, import restrictions, and marketing orders are discussed in greater detail in later sections due to their substantial and direct impact on dairy pricing and profitability.

2 A task later taken over almost entirely by the Dairy Export Incentive Program



to processors or cooperatives. Along with price supports, the USDA Commodity Credit Corporation (CCC) was established in part to buy as much butter, nonfat dry milk, and cheddar cheese as manufacturers were able to produce at designated support prices, removing a large degree of surplus from the market.²

This effectively meant that support prices created a pricing floor not only for milk, but for all dairy products. It should be noted, however, that recent history has for the most part witnessed market-based milk pricing substantially above support levels.ⁱⁱ

While the U.S. Secretary of Agriculture was initially allowed substantial latitude to set support prices, which could range from 75 to 90 percent of parity³, the parity pricing standard was replaced in 1981 with a standard based on dairy surpluses and CCC costs. The Farm Act of 1996 further affected the model, setting in motion an incremental downward trend in support pricing.ⁱⁱⁱ

In 2002, Congress passed dairy income supports to provide cash payments to farmers during periods in which prices fell below target rates; paradoxically, these supports are seen by some as linked to overproduction that has placed further downward pressure on dairy prices.^{iv}

Import Restrictions & Quotas

Because the U.S. dairy price support levels have largely exceeded international market pricing levels for most manufactured dairy products (e.g., butter, cheese, dry milk powders) since World War II,

the government also authorized import restrictions on dairy products in an effort to avoid indirectly subsidizing foreign, especially European, dairy suppliers who had benefitted heavily from subsidies at home that enabled them to export low-cost manufactured dairy products and compete at far lower prices than domestic U.S. suppliers. Dairy quotas were originally put into place in 1951 to avoid such a scenario.^v

Since that time, the U.S. has participated in a number of multilateral trade negotiations that have affected imports of dairy commodities, including the General Agreement on Trade and Tariffs (GATT) in 1947 and its successor the World Trade Organization (WTO) in 1994.

The Uruguay Round of the WTO brought agricultural trade issues into the spotlight, and transitioned many non-tariff trade barriers to tariff-rate quotas (TRQ), which in the case of dairy, allowed for a low-tier tariff rate for a specified import quantity, above which a higher-tier tariff rate would apply. Subsequent import trade negotiations, including the North American Free Trade Agreement (NAFTA), set out specific dairy provisions captured in bilateral and multilateral agreements.^{vi}

Marketing Orders

Milk marketing orders came into play in the depression era of the 1930s primarily to address marketing of raw Grade A⁴ milk from the producer to the processor, and linked pricing for specified categories of milk with wholesale prices for associated manufactured dairy goods.

The intent of these orders has always been to provide an orderly and efficient means to transition milk from suppliers to processors, and



ultimately to consumers, in desired quantities at desired times, while also attempting to address milk’s inherent “flow commodity” challenges with regard to supply/demand and price volatility.^{vii}

At the most basic level, marketing orders have set minimum prices that producers are paid by handlers (usually processors) for fluid grade milk.^{viii} This said, it is important to note that these minimums are often exceeded by market prices. Marketing orders also allow for government regulation of Grade A milk, with prices set at the processing or manufacturing plant where milk is sold rather than at the farm from which it originated.

Out of this basic structure, a milk price classification system was developed that linked minimum pricing levels paid to producers by handlers/processors to the end use of the milk. Using this system, farmers are paid what is known as the “blend” price – which the USDA defines as “a weighted average of class prices, with weights

being the utilization (percent) of milk in each class in the specific market.” Prices reflected in dairy marketing orders are determined by a set calculation schedule that takes into account the inherent dynamic nature of dairy supply as well as demand.^{5, ix}

More recently, the 1996 Farm Act reformed the system of milk marketing orders, with an emphasis on consolidation, classified pricing, replacement of the basic formula price, and streamlining and standardization of terms, definitions, and provisions. The USDA has called the changes “a move toward a more market-oriented dairy industry,” while allowing the

underlying goal of the system to remain intact.^x Most of today’s milk is still produced under federal marketing orders, with much of the remainder produced under similar state systems.^{xi}

It remains to be seen how the proposed 2012 Farm Bill and component Dairy Security Act may affect the system of marketing orders moving into the future. It is worth noting that past marketing orders have included protections around milk prices rather than margins⁶; the proposed legislation’s shift to margin protection appears to be an acknowledgement of the devastating impact sky-high corn feed prices⁷ have had on producers in the dairy industry.

PUBLIC POLICY

At a fundamental level, public policies over federal and state intervention in the dairy industry have occurred based on the nature of milk as a “flow commodity” that is uniquely complex in that it must be produced daily,

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- 3 Defined as the amount deemed to provide a commodity unit with the same purchasing power it had during a specified base time period
 - 4 Grade A milk is determined to be of sufficiently high quality that it can be processed and sold as a fluid milk product or for use in any other ancillary dairy product.
 - 5 It is important to note that dairy marketing orders do not directly regulate farmers or constrain individual production, nor do they guarantee fixed minimum production pricing or minimum blend pricing, because the handlers/processors of the purchased milk can determine utilization based on known or anticipated demand by their customers.
 - 6 Essentially the difference between feed costs and milk prices
 - 7 Exacerbated by mandated use and subsidized production of ethanol



taken to market at least every other day, cannot be effectively stored long-term in its original state, and has multiple uses, all of which have different associated values. This combination of factors contributes to difficulty in pricing milk efficiently in the same manner as most other commodities, due also to short-term price fluctuations associated with seasonal variability in demand.^{xii}

Whatever one's position may be on the varied and tangled set of regulatory and policy factors that impact the dairy industry, there can be little question that they add an almost mind-boggling degree of complexity to the issues of milk pricing and the related challenges around profitability for dairy producers and processors. The high-level discussion in this section is intended to provide a brief historic snapshot of dairy policy, followed by a summary of current legislation under discussion with potential to drastically impact existing policies and pricing systems.

Historic Overview

By the 1920s in the U.S., a classified pricing system for milk existed in most primary markets, whereby the cost of fluid grade milk was determined based on its use. Milk that would be sold as fluid milk brought an understandably higher price based on its increased perishability and handling costs associated with this end use over that of other types of dairy products. As the Great Depression unfolded in the 1930s, prices for agricultural goods including milk plummeted, prompting farmers to petition the government for price stabilization assistance; the response was the Agricultural Assistance Act of 1933, which enabled the federal government to enter into agreements with milk handlers and processors to raise its price. The Act was revised in 1935, adding in additional

requirements around quality standards, and in 1937 the Agricultural Marketing Agreements Act was passed in an effort to raise producer prices, becoming the foundation for today's milk marketing order system.^{xiii}

With the outbreak of World War II in the 1940s, higher wartime incomes and requirements to feed military allies as well as U.S. troops resulted in spiking demand for milk and dairy products that would prompt further federal intervention, with the government guaranteeing producers higher prices for increased production. At the same time, government subsidies paid to milk processors controlled pricing to the consumer. A formal and permanent system of price supports was then enacted in the Agricultural Act of 1949.^{xiv}

While it is true that both federal and state policies, in the form of marketing orders and other systems, have substantially affected milk and dairy pricing since the 1930s, the Farm Act of 1996 made sweeping changes in governmental policies and programs around dairy, including a call to abolish the milk price support program (as it had been historically operated) by the year 2000.^{xv} The 2003 Farm Bill⁸ put in place a two-pronged system affecting the dairy industry: the Dairy Product Price Support Program and the Milk Income Loss Contract (MILC) program.^{9 xvi}

Today's Debate

More recently, the Dairy Security Act component of the 2012 Farm Bill¹⁰ (under Congressional review at the time of writing) is considered to propose the most sweeping agricultural reforms in decades. Seeking to



replace the Dairy Product Price Support and MILC programs put in place in 2003, the bill includes two interrelated components hotly debated not only in the legislature, but also within the dairy industry itself¹¹: the Dairy Production Margin Protection Program and the Market Stabilization Program.^{xvii} The policies would work in tandem for producers who opted in, with a requirement that farmers electing to participate in the Dairy Production Margin Protection Program would also be part of the Market Stabilization Program.^{xviii}

The margin protection portion of the legislation would essentially provide “insurance” to farmers against low margins (at times of low milk prices, high feed costs, or both) with additional coverage available if they chose to purchase it.¹² The corresponding market stabilization component of the legislation would require participating producers to limit milk supplies to processors under certain market scenarios.^{xix}

8 The U.S. Congress passes a legislation bundle every five years, the terms of which are collectively referred to as the “Farm Bill.” The legislation is intended to set policy with regard to agriculture, nutrition, conservation, and forestry.

9 Both of which were intended primarily to protect dairy producers with fewer than 200 cows

10 Known formally as the Agriculture Reform, Food and Jobs Act of 2012 (S. 3240)

11 Industry experts and economists have come to different conclusions as to the effects the two programs would have on the dairy industry as a whole, and on producers and processors individually. This issue has placed the International Dairy Farmers Association (IDFA) and the National Milk Producers Federation (NMPF) on opposite sides, with the IDFA opposing the legislation and the NMPF in favor.

12 The DSA includes margin protection mechanisms allowing participating dairy producers to get a \$4 per hundredweight margin protection at no cost on 80 percent of their highest annual milk production for any of the past three years. This has prompted a scramble among many producers to boost production in order to qualify for larger allowances should the program be implemented.

Like the MILC program, these policies were designed to provide greater protection for smaller producers, with premium rates for the initial 4 million pounds of annual milk production available at significantly lower cost than for coverage in excess of that production quantity.^{xx, xxi, xxii}

INPUTS & MARGINS

Adding to the business challenges associated with trying to ensure profitability amidst weighty competitive pressures and the complexity of external milk pricing systems, the dairy industry is also struggling to operate profitably with margins that have become almost nonexistent. The recent past has brought to dairy producers and processors higher commodity prices for feed and grain; higher fuel and energy costs; and higher packaging materials costs for paper, plastic, and metal.

This discussion of suffocating margins begins with an introduction to dairy profitability calculations, followed by a brief discussion of how margins are being affected by feed costs, energy requirements, and the size/capacity of dairy operations. A startling statistic puts into perspective the severity of the margin loss threatening producers in the dairy industry: U.S. dairy farmers currently receive \$15 to \$17 per 100 pounds of milk, for which they have incurred a production cost of between \$16 and \$18.^{xxiii} Between 2007 and 2009, these same producers saw a decline in their net worth of more than \$20 billion, with thousands leaving the industry entirely after soaring feed prices destroyed any margin they might otherwise have had.^{xxiv}



Calculating Profitability: The Milk-Feed Ratio

The Milk-Feed Ratio is a standard (albeit complex) measure by which dairy production profitability has historically been determined.¹³ Simply stated, the Milk-Feed Ratio assesses how much feed (protein) is required to produce a single pound of whole milk, with profitability determined when the ratio reaches 3.0 or higher. Highlighting the challenges for the dairy industry in balancing feed costs, production, and pricing, it is interesting to note that even at some of the highest historic levels of milk pricing, the Milk-Feed Ratio did not reach 3.0 due to the high costs of purchasing dairy feed; conversely, the ratio also often remained below 3.0 even when feed prices dropped, because milk prices had also fallen.^{xxv}

Feed Costs and the “Ethanol Effect”

A large proportion of dairy farmers’ production costs are related to feed, the primary sources of which are corn and alfalfa hay, with soybeans making up a smaller component. Over the past several years drastic changes have taken place in the price of corn, much of which is linked to the status of ethanol, whose use has been federally mandated and (until 2012) production subsidized for more than 30 years.¹⁴

13 The Milk-Feed Ratio is the calculation of “the number of pounds of 16 percent protein mixed dairy feed equal in value to one pound of whole milk,” with a ratio of 3.0 or higher indicating that is it profitable to buy feed and produce milk.

14 Ethanol subsidies in the form of tax credits are estimated to have exceeded \$6B in 2011 alone; these subsidies, along with import tariffs on ethanol were ended December 31, 2011; however, legislative requirements around mandated use of bio-fuels, which include ethanol, remain in the Renewable Fuel Standard.

Up from 5 to 6 percent six years ago, 40 percent of today’s domestic corn production in the U.S. goes to ethanol, with this increasing demand more than doubling its price over the same period.^{xxvi}

THE BOTTOM LINE

The uniqueness of the dairy industry in terms of complexity and uncertainty is unlikely to change. Indeed, within the range of challenges producers and processors face every day, few are within their control. Regardless, however, the historic and present-day perspectives on these unique challenges associated with substantial governmental involvement are critical to both an understanding of the underlying industry environment as well as the knowledge of some of the immovable parameters within which more traditional business challenges must be discussed and addressed to be of value.

Building on this context, Part 2 of this white paper series will focus on the more standard business challenges faced by the dairy industry, including domestic and global competitive pressures, shrinking margins, and processing complexity. These more straightforward issues will be covered, along with a discussion of some of the industry-specific technologies that are delivering tangible competitive advantage for adopters.



Endnotes

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