



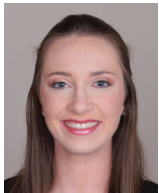
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# Why Milk Components Matter More Than Milk Production



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## Key Points:

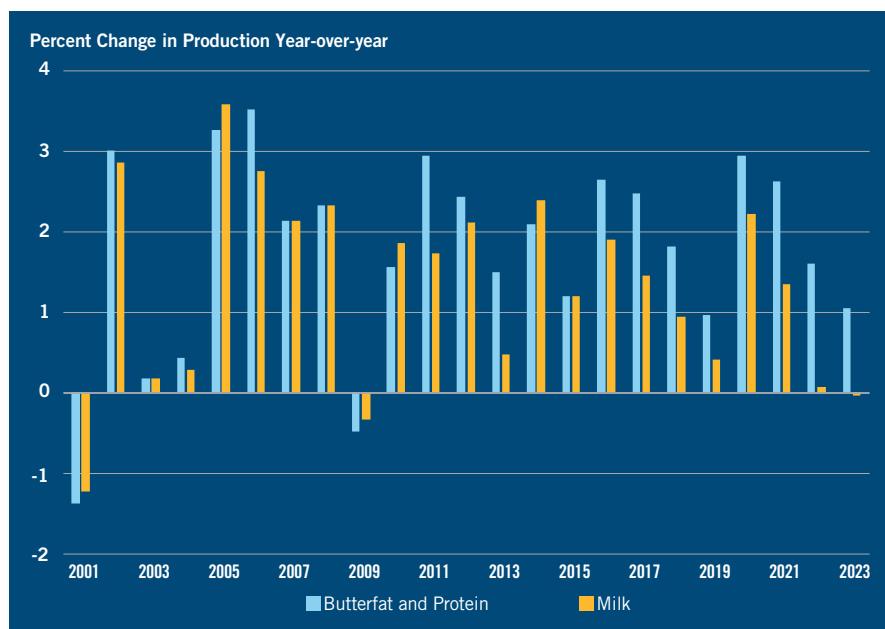
- Since the first release in 1924, USDA's Milk Production reports have been the gold standard for tracking milk available for processing. However, changes in milk composition mean the report today provides an incomplete picture for understanding whether production is growing or declining, and by how much.
- Milk composition had been stable for decades but in 2011 milk composition of butterfat and protein started to grow. While milk production grew by 16.2%, protein jumped 22.9% and butterfat bounded 28.9% higher by 2023.
- The production trend has doubled down as U.S. milk production on a liquid basis has been down 14 straight months through August 2024. At the same time milk component production has grown in 12 of those 14 months.
- Ultimately, component growth matters just as much as liquid volume growth as over 80% of U.S. milk production goes into manufactured dairy products and less than 20% moves into the fluid beverage category.
- Cheese is a prime example of a product that had benefitted from milk's growing component yields. In 2010, 100 pounds of milk from the typical U.S. dairy farm yielded a bit more than 10 pounds of cheese. By 2023, higher butterfat and protein content boosted that yield by almost 11%.
- USDA's Milk Production report is an irreplaceable source of farmgate production available for processing. But with composition growing at a different rate than volume, the report as it now exists, provides a picture that is at best incomplete and at worst misleading. An improved report would also track milk components, specifically butterfat and protein.

## U.S. dairy processing continues to evolve

The dairy product category is dynamic and growing with over \$76 billion in annual U.S. sales, making it the largest category in retail, according to recent Circana sales data. However, these dairy product sales look much different than in generations past. U.S. fluid milk sales in 2023 receded to 42.8 billion pounds, levels not seen since 1954 when the U.S. population was less than half it is today. Yet, the dairy category continues to grow because over 80% of U.S. farmgate milk now goes into manufactured dairy products such as cheese, whey, butter, nonfat dry milk, yogurt,



### EXHIBIT 1: Milk components drive dairy’s growth these days



Source: USDA-AMS, USDA-NASS

While nearly everyone in the industry forecasted that U.S. milk production would keep growing, milk production began stalling in 2022 and has held relatively flat ever since. Yet, the U.S. continues to produce more manufactured dairy products with each passing year to meet consumer demand for products with higher butterfat and protein levels. That’s possible because milk from the nation’s dairy farms yields more dairy products annually due to higher concentrations of protein and butterfat. Given this trend, the industry needs more reliable data to account for farmgate milk. It’s also critically important for processors’ planning.

ice cream and other products that depend heavily on milk components, not the fluid portion. These shifting tides mean that milk solids, not milk volume, matter more to dairy processors as consumers are more likely to eat than drink their dairy.

U.S. domestic markets aren’t the only category experiencing seismic shifts. These days U.S. dairy product export sales represent a growing category that now accounts for 16% to 18% of the U.S. milk supply on an annual basis. This market was virtually nonexistent prior to 1995. Manufactured dairy products dominate these export opportunities and create more demand for milk components.

Opportunities for growth both home and abroad are among the reasons domestic and international dairy processors are investing over \$7 billion in new dairy processing assets in the coming years. Nearly all projections had forecasted that the U.S. would have more growth upside when compared to the world’s two other major dairy product exporters – New Zealand and the European Union.

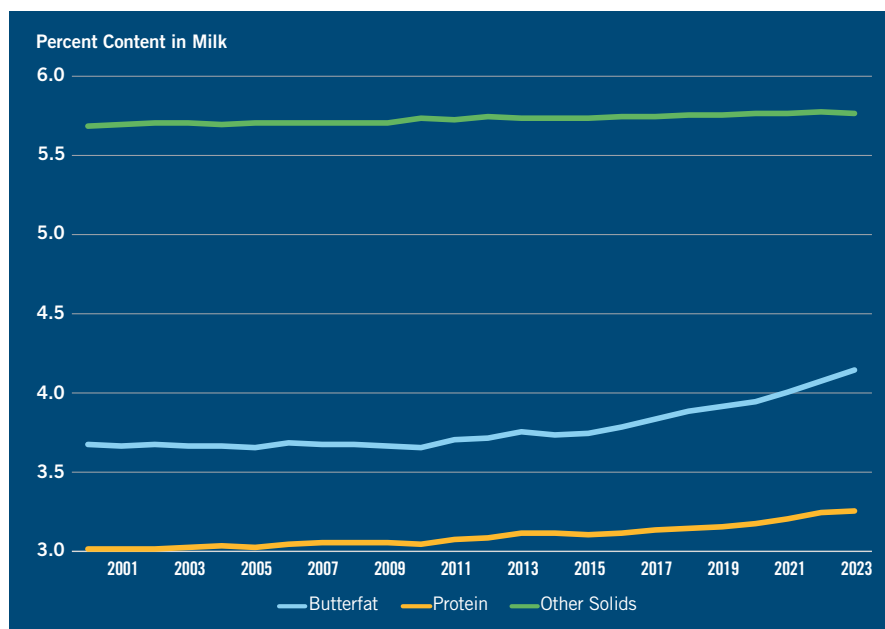
### Milk volume and components were once synonymous

USDA released its first Milk Production report in 1924, and it’s been a guide for dairy farmers, processors, marketers and retailers alike to track milk supplies and project potential dairy product output and price expectations. As the industry continued to grow, butterfat composition was largely an afterthought. Butterfat levels held extremely consistent from 3.65% to 3.69% from 1966 to 2010. If milk volumes went up, so did butterfat, and that meant growth in milk and butterfat production were synonymous for six-plus decades.

While protein reporting didn’t come on the scene until the late 1970s, those levels largely followed butterfat patterns. The nation’s collective bulk tank of milk yielded the same dairy product numbers for every hundredweight (cwt.) of milk because solids levels remained steady. The industry’s reporting metrics continued to hum along into the new century (*Exhibit 1*). Shifts in both milk production and milk solids mirrored one another, with annual percentage changes matching as if identical twins.



## EXHIBIT 2: Growing butterfat and protein percentages are fueling component gains



Source: USDA-AMS, USDA-NASS

In addition to butterfat and protein, a third category of milk components is reported as “other solids” on milk checks, in processing plant data and in FMMO reports. The other solids portion of milk includes lactose and important minerals such as calcium and phosphorus. In current markets, lactose has far lower value than butterfat and protein and accounts for about 5% of milk check revenue. Additionally, the other solids category held in a narrow range, from 5.69% to 5.78% from 2000 to 2023. The other solids category made little impact on the growth in milk solids, according to USDA-AMS data.

However, those “twins” started growing at different rates as the butterfat and protein portion in milk solids production began to outpace milk production in 2011. Since then, milk component production failed to surpass milk production in only two years -- in 2014 and 2015 butterfat and protein percentages were essentially flat.

That’s just the beginning of the unfolding story. Butterfat and protein levels in farmgate milk climbed significantly during the ensuing years. Butterfat moved from 3.70% in 2011 to 4.15% by 2023, according to data from USDA’s National Agricultural Statistics Service (NASS) (*Exhibit 2*). (For a more in-depth information about growth in butterfat, read CoBank’s November 2023 research paper, *The Butterfat Boom Has Just Begun.*) Likewise, protein levels in Federal Milk Marketing Orders (FMMOs) using Multiple Component Pricing (MCP) climbed from 3.08% to 3.26% during the same time span according to USDA’s Agricultural Marketing Service (AMS) gathered via the FMMO system.

### Butterfat and protein propel dairy’s growth

Taking a step back from annual comparisons and looking at a wider multi-year observation illustrates just how much has changed since 2010. From 2000 to 2010, productivity gains for milk, butterfat and protein held in a tight window ranging from 13.8% to 15.4% (*Exhibit 3*). During the next 13 years, from 2011 to 2023, milk grew just 16.2%. But for components, the story took a dramatic turn: Protein jumped by 22.9% and butter catapulted by 28.9%.

Like a long train descending a steep mountain pass, these component trends have continued picking up momentum despite stalled farmgate milk production in the past two years. That’s important to note because if 2024 U.S. milk production finishes down for the second straight year, the 2023-to-2024-time span will be the first time since the late 1960s that U.S. milk output declined for back-to-back years. However, milk moving from farm to processor looks vastly different than those days as it contains far more solids. That’s why U.S. dairy product output continues to grow.

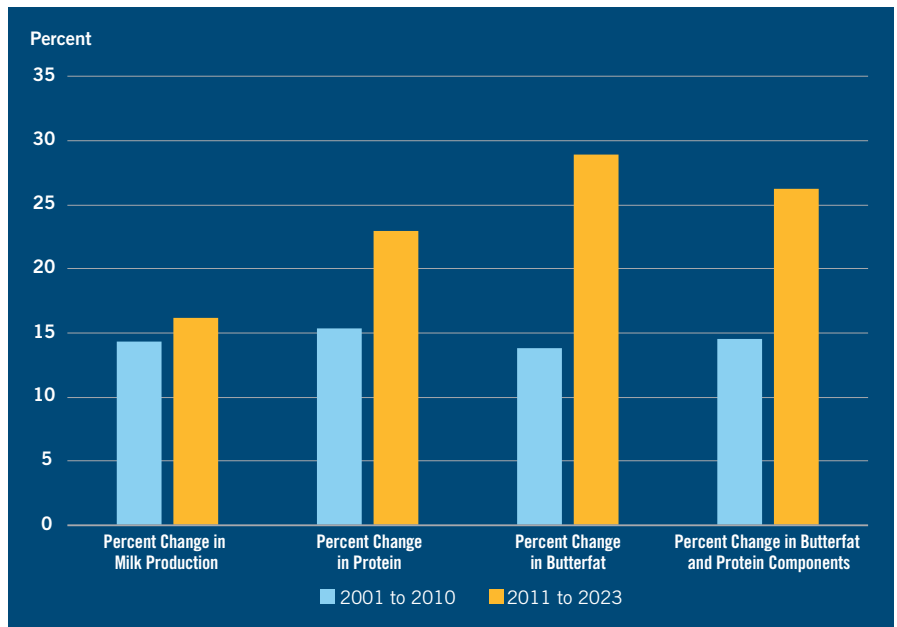


**EXHIBIT 3: Butterfat and protein are pivotal to dairy’s production growth**

The trend is accelerating, as U.S. milk production has been down for 14 consecutive months dating back to July 2023 (*Exhibit 4*). While that would have been alarming decades ago, milk component production has grown in 12 of those 14 months largely due to growing butterfat and protein percentages in the shipped milk, which are multiplied into more pounds of components.

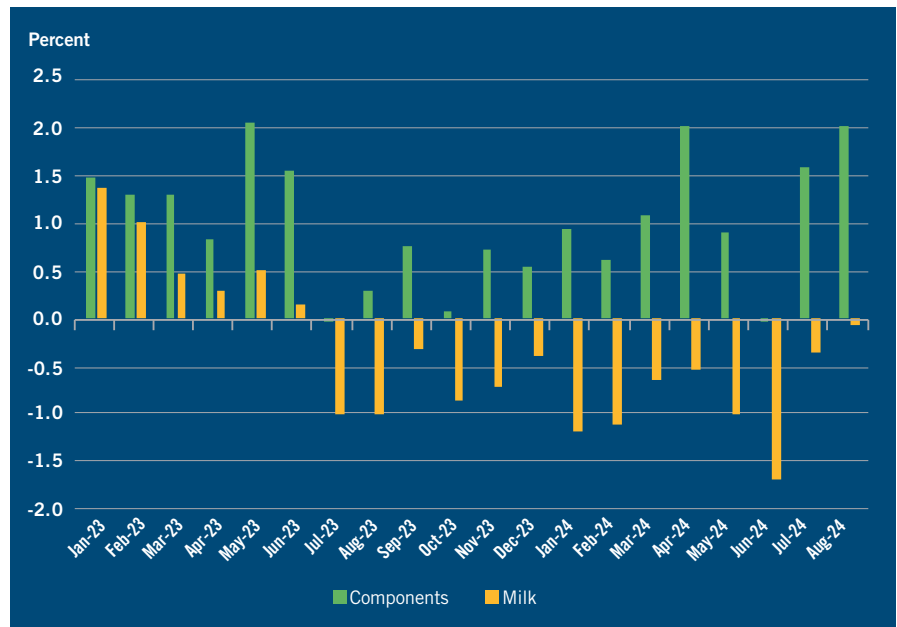
The growth in milk components has multiple drivers. Chief among them are MCP provisions that establish values for 92% of the nation’s milk. While California imposed a milkfat and solids nonfat pricing system in the 1960s, protein pricing first appeared in the Great Basin (Utah) FMMO in 1988, and others followed. Then, the major milk pricing reforms in 2000 that introduced end-product pricing formulas accelerated MCP payments throughout most of the country. Since 2021, butterfat payouts have ranged from 32% to 63% of the total minimum producer price required under Federal Orders and protein accounted for the vast majority of the remaining component payments from processors to producers.

Another point that accelerated higher component density in milk was when many processors established base excess plans that either limited the amount of milk volume that a farm could ship or created economic deterrents that ultimately curbed shipments. While milk pounds shipped as measured by hundredweights were



Source: USDA-AMS, USDA-NASS

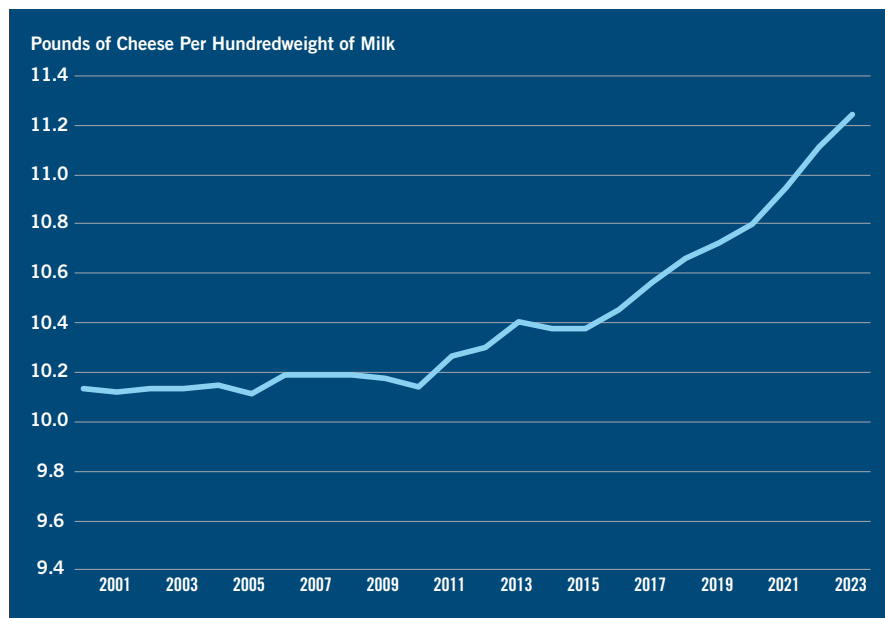
**EXHIBIT 4: Percent change in component and milk production compared to same month prior year, 2023-2024**



Source: USDA-AMS, USDA-NASS



### EXHIBIT 5: Higher components have created higher cheese yield



Source: USDA-AMS, USDA-NASS

### Drilling deeper into cow productivity

It's just as important to not miss the forest for the trees, as it is to view only milk production as the baseline for cow productivity. As a herd, U.S. dairy cows have done well. But, on an individual basis, efficiency in producing more solids per pound of milk given per cow matters more than milk volume. Percent change in milk, butterfat, and protein production per cow from 2001 to 2010 was nearly identical. Their annual growth rate hovered between 1.4% to 1.6% for each of those factors (*Exhibit 6*).

curtailed in recent years to some processing plants, no thresholds were placed on milk components in most areas (although a few cheese plants did limit solids production). So, dairy producers began shifting strategies to ship more milk components to improve milk checks.

Then, there's the most important driver: consumer demand. Cheese now accounts for nearly 43% of the U.S. milk supply on a milk solids basis, up from 37.7% in 2000. Farmgate milk has yielded more cheese from every hundredweight of milk as cheese yield grew from 10.14 pounds in 2010 to 11.24 pounds in 2023 (*Exhibit 5*). That's a remarkable 10.8% improvement from a hundredweight of milk. In the future, higher protein content will further drive cheese yields.

Like cheese, yields for butter containing 80% butterfat grew from 4.39 to 4.98 pounds for every hundredweight from 2010 to 2023. That's a 13.4% improvement in butter yield from every hundredweight produced by U.S. dairy farms. With rising protein levels in milk, nonfat dry milk (NFDM) yields moved from 8.80 to 9.13 pounds per hundredweight from farmgate milk during the same time for nearly a 4% improvement.

However, in 2011 total milk per cow decoupled from components and showed slower growth. In fact, 2015 was the last time the three metrics – milk, butterfat and protein – yielded a similar annual growth. Since then, they've been shifting further apart. From 2016 to 2023, milk production netted a 0.9% average annual growth rate, while protein measured 1.5%, and butterfat at 2.2%. Certainly, component pricing factors and milk check incentives led the change.

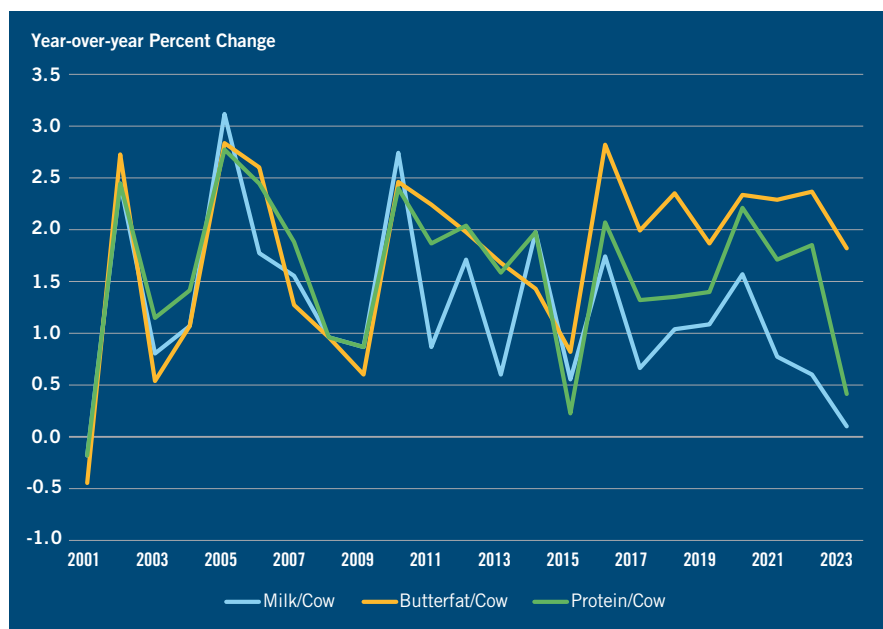
Farmers have improved cow productivity by refining rations, enhancing ration ingredients, improving genetic selection and genomics, stepping up forage quality and providing better cow comfort. Also, genetic improvement within breed – not changing breed composition – has had a greater impact on components. According to sales data from the National Association of Animal Breeders (NAAB), from 2000 to 2023 Holstein semen sales dropped from 92.6% to 82.3% of all semen sales and Jersey semen sales grew from 5.8% to 14.2%.

In 2023, dairy cow productivity, as measured by butterfat and protein, did slow somewhat. The lack of heifer replacements has stunted dairy cow productivity as culling has been down every week since September 2023. This has left lower-tier cows in some herds, which





### EXHIBIT 6: Per cow milk production and components drift apart



Source: USDA-AMS, USDA-NASS

can bring down strong production averages. Additionally, as replacement prices gain upward momentum in markets with \$3,000 per head values at multiple auctions across the country, this trend isn't likely to slow down anytime soon. New replacement heifers bring in the next generation of improved genetics, which can further capitalize on milk component production.

#### Current data limitations

USDA's Milk Production report, typically released the third week of the month, continues to provide outstanding perspective on milk volume. However, it would be far more robust with milk component production data. Butterfat percentages for the top 24 states come out one week later in USDA's Agricultural Prices report. Pairing that information would be a strong start to publishing more robust metrics.

Obtaining protein data gets a bit trickier as USDA's Supply and Utilization report tracks skim solids but not protein. For this report, we used FMMO data published by USDA-AMS. From 2000 to 2023, that data tracked between 60% to 73% of the U.S. milk supply. However, data collection varies from month-to-month and

year-to-year. In California, for example, milk that is depooled from federal orders does not get reported in the protein data. Also, Idaho, the nation's fourth largest dairy state, is not in the FMMO system.

To be fair, however, all USDA data is an estimate to some degree and developed from multiple data sources. In the same vein, while FMMO data is solid accounting data, its problem is that the data is incomplete and does not reliably draw from the same set of farmers every month. With that in mind, the best plan would be for USDA-NASS to obtain protein data at the same time it collects milkfat data for its

Agricultural Prices report. Taking it one step further, the butterfat, protein and nonfat solids component data could then be reported in its monthly Milk Production report.

#### A look to the future

Higher milk solids production likely represents a permanent paradigm shift given consumer demand for manufactured dairy products. If that shift happens, the dairy industry must account for further considerations. Hundredweights drive capital retains, equity retains, and 13th milk checks for cash dividends and patronage for cooperatives. Those same hundredweights fund the dairy checkoff and some other industry organizations. By improving market information, more accurate and timely reports on milk component data may be important for risk management strategies for producers, processors, and retailers alike.

For dairy processing, fluid milk continues to lose market share and the water portion of farmgate milk is a growing expense category due to transportation costs and dispelling of the water. On the flip side, valuable milk solids needed for dairy product manufacturing grows



each year. With multiple component pricing, markets have the tools to send signals to buyers and sellers about components' worth. But good pricing also requires good market information.

Long-term, the collective U.S. dairy industry would benefit from more component data collection and timely reports of that data. That's important to the dairy industry because consumers both at home and abroad

continue to eat more milk solids found in manufactured dairy products and drink less fluid milk with each passing year. Ultimately, if U.S. dairy farmers are tracking their individual component levels and similar data is available from processing plants, the U.S. dairy industry should be able to track those solids on a national level, too. Getting market signals right helps us focus on what is needed and making the most of what the market wants. ■

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