Supply and Price Determinants in the United States Dairy Sector

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Federal Milk Marketing Orders

In 1933, the Agricultural Adjustment Act allowed the Federal government to regulate milk handling (Townsend et al., 2017). Following this, in 1937, the Agricultural Marketing Act authorized the establishment of the Federal Milk Marketing Orders, which set the minimum prices that producers can receive for their milk (Townsend et al., 2017). Initially, there were 31 regional federal orders before the Secretary of Agriculture was required to consolidate these areas to 11 regions as a result of the 1996 Farm Bill (Townsend et al., 2017). In 2025, 11 regions remain within the Federal Milk Marketing Orders, as shown in Figure 1. California was most recently added as Federal Order 51 in 2018 as a result of the 2018 Farm Bill (Nepveux, 2019). With the addition of California, the Federal Milk Marketing Order now applies to about 80 percent of all the United States' milk production (Greene, 2025). My objective is to describe marketing orders and their use in the United States.

In each marketing order, prices are pooled together and producers share in the profit of milk sales in their area (Nepveux, 2019). One of the largest differences between the regions is what factors the milk pricing regulations are based on. In the Appalachian, Arizona, Florida, and Southeast areas, butterfat and skim pricing determine the milk pricing regulations, and protein is not a factor (Nepveux, 2019). Furthermore, in areas where prices are based on components, butterfat, protein, non-fat solids, and other solids are the factors determining the value of milk (Nepveux, 2019). This difference in component pricing is determined by the end-use of milk in that region, but still allows for farmers to share a uniform base price. In total, seven states have state-regulated milk marketing orders or milk pricing programs that do not explicitly abide by the federal orders (Greene, 2025). In Figure 1, the areas that a Federal Order does not cover are regulated by the state or are unregulated.
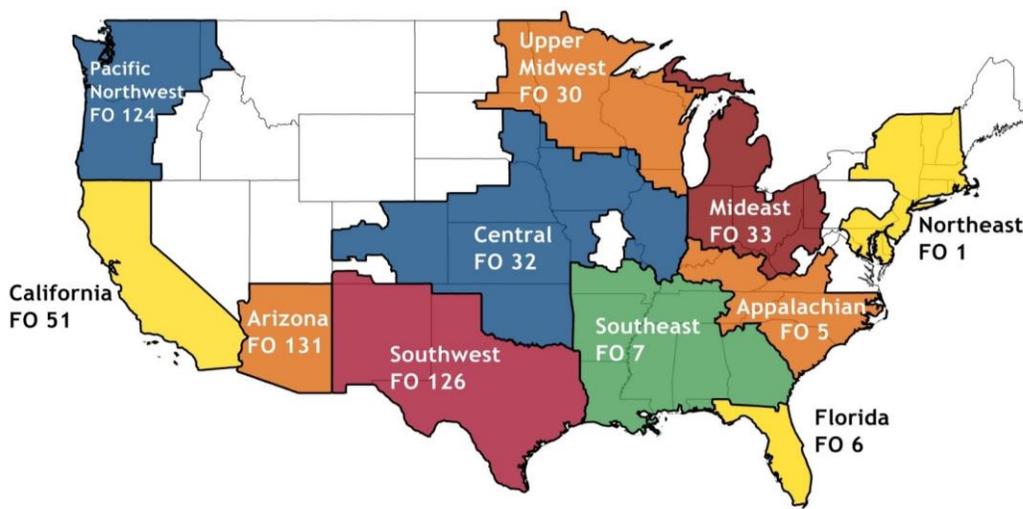

Figure 1. Map of Federal Milk Marketing Orders (Source: USDA, AMS)

As outlined by the USDA and the Code of Federal Regulations (CFR), there is a detailed process that must be followed to propose any changes to the federal orders. In short, the USDA must receive a proposal and, if deemed necessary, hold a public hearing to collect written and oral testimony from witnesses such as producers, handlers, and cooperatives (USDA, 2018). Following the hearing process, records must be made publicly available, participants may submit post-hearing briefs, and the USDA must issue a recommended decision (USDA, 2018). Following the recommended decision, comments and exceptions may be filed before the USDA is to issues a final decision to be voted on by milk producers (USDA, 2018). The most recent federal order revisions were officially issued on January 17, 2025, following an over 15-month amendment process (USDA, 2025b). In 2025, the federal orders focus on the three goals of establishing uniformity amongst prices, ensuring proper payment to dairy producers, and providing marketing information (USDA, 2019). Milk as a commodity requires unique marketing conditions due to the perishability of the product and continuous production. Unlike field crops, milk is produced daily and is constantly moving between producers, handlers, and consumers. Figure 2 shows the trend of milk production per quarter across the United States from 2020 through 2024. Most notably, there is a peak in milk production during the spring and summer months and a sharp decline during the winter. Inversely, the demand for milk is often higher in the fall and winter as students are in school and slows during the spring and summer (Greene, 2025). The Federal Milk Marketing Orders allow for a steady supply of milk throughout the year to meet the changing demand for the highly perishable product.
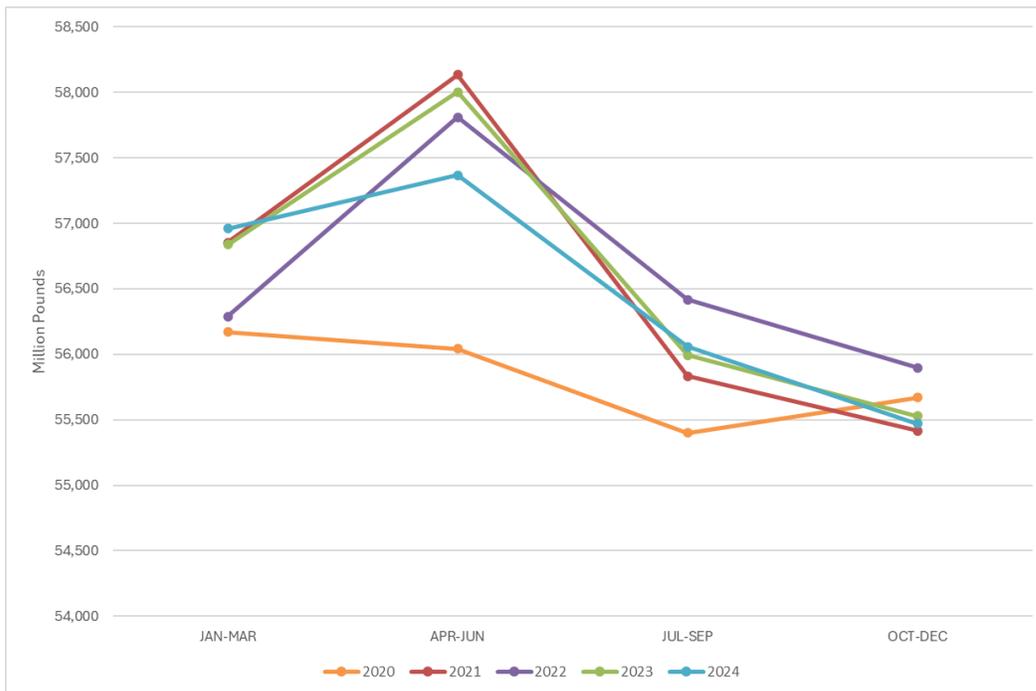
Figure 2. Milk production per quarter (Source: USDA, ERS)

Milk Pricing

In the United States, milk is broken into four classes, each with a different end-use and pricing equation: Class I is fluid milk, Class II is milk used to make soft dairy products such as ice cream, cottage cheese, or yogurt, Class III is milk used to make hard cheese products, and Class IV is milk used to make butter and powdered dry milk products (USDA, 2019). The components of each class

price include the commodity prices and component prices. Each week, dairy handlers and manufacturers are required to report sales data to the United States Department of Agriculture (USDA) of wholesale butter, cheddar cheese, nonfat dry milk, and dry whey (Nepveux, 2019). The prices reported for these four commodities are used to determine the component prices of protein, butterfat, nonfat solids, and other solids (Nepveux, 2019). These component prices are then used to determine class prices based on the value of the milk, depending on how it is used. Figure 3 shows the commodity and component price factors that are used in determining each of the four class prices.
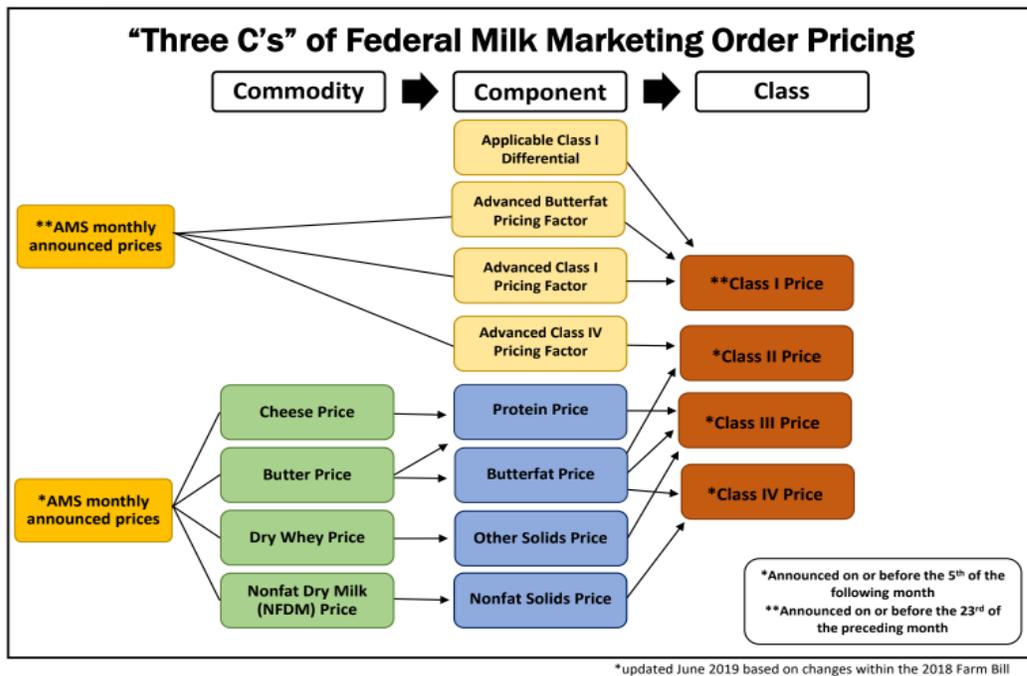

Figure 3. Commodity, component, and class prices (Source: taken from USDA, AMS)

Milk is made up of water, milk fat, and skim solids, which include protein, lactose, minerals, and trace elements (Terán & Cessna, 2021). The component prices derived monthly are used in the formula of each class of milk to compute the skim milk and butterfat prices. In each equation, the skim milk price is multiplied by 0.965, and the butterfat price is multiplied by 3.5. This reflects the standardized hundredweight (cwt) basis that assumes 100 pounds of milk is made up of 96.5 percent skim milk and 3.5 percent butterfat (Greene, 2025). It is important to note that the final class prices, as they are announced, are per 100 pounds or cwt, while component prices are per pound (USDA, 2015). All four class pricing formulas can be found in Appendix A. The basis of all of the pricing formulas that utilize milk component values includes the wholesale product prices, yield of the finished product based upon the amount of components used to make it, and the make allowance for producing that product (Jesse & Cropp, 2008). Figure 4 shows the basic formula for component pricing that is utilized in determining each of the class prices. The commodity prices used in these calculations are announced weekly by the United States Department of Agriculture after collecting dairy product sales information from dairy processors and handlers (USDA, 2025a). This sales data is collected on butter, cheddar cheese, dry whey, and nonfat dry milk.

Component Value = (Commodity Price - Make Allowance) x Yield

Figure 4. Component pricing formula (Source: Nepveux, 2019)

The make allowance is subtracted from the commodity price and accounts for the manufacturing cost of the final product. Dairy processors and handlers, in addition to paying producers for the milk, have to account for the expenses of labor, packaging, utilities, and more to create the final products (Stephenson, 2021). Figure 5 shows the current make allowance per pound for each of the four commodities and the yield factor.

Commodity	Make Allowance per Pound	Yield Factor
Cheese	$0.2519	1.383
Butter	$0.2272	1.211
Nonfat Dry Milk	$0.2393	0.990
Dry Whey	$0.2668	1.030

Figure 5. Make allowance and yield factor for commodities (Source: USDA, 2025b)

The yield factor accounts for the amount of the given commodity that can be made from one pound of the component. For example, looking at the equation in Figure 6, the yield factor is 1.211, which aligns with Figure 5. This value assumes that 1.211 pounds of butter can be made from one pound of butterfat. Typically, butter that is produced in the United States is 80 percent butterfat, implying that the yield factor would be 1.25 (Jesse & Cropp, 2008). The given yield of 1.211 accounts for the assumption that some butterfat will be lost in manufacturing (Jesse & Cropp, 2008). While the values differ, the four yield factors all take into account the loss of the component during production.

> **Butterfat Price = (Butter price - $0.2272) x 1.211**

Figure 6. Butterfat price equation used in Class I, Class III, and Class IV milk pricing

Another Class I price factor is the Class I differentials. Class I differentials, also referred to as Producer Price Differential (PPD), are a value added to the base Class I milk price to encourage the movement of milk from high supply to low supply areas. These values can vary by the county in which the processor is located in where that milk is received (Townsend et al., 2017). The highest Class I differential can be observed in the southernmost part of Florida, where there is a high consumer demand, but low production or processing capacity (Munch, 2023). Inversely, in the Midwest, the differential is significantly lower due to the higher supply combined with the relatively low population and demand (Munch, 2023). Before the 2025 Federal Milk Marketing Order revisions, the highest Class I differential observed in the United States was $6.00, and the lowest was $1.60 (Munch, 2023). However, as of June 1, 2025, updated Class I differentials have been put into place to reflect increased transportation costs and ensure that the dairy supply across the country can remain stable with an inconsistent distribution of producers.

United States Dairy Capacity and Use

In the United States, there is a higher milk supply than there is domestic demand for dairy products. Looking at the dairy balance sheet equation, in Figure 7, it is clear that exports are an essential component of the United States dairy market to ensure milk prices that sustain the dairy

producers and processors. Breaking down this equation, beginning stocks include the remaining milk supply from the end of the previous year. This is then added to the production for the year being calculated, less the farm use. Farm use includes milk used to feed calves and youngstock, as well as household farm use. The net value of imports minus exports is then added. From 2018 to 2024, the value of dairy imports in the United States fluctuated between 2.2 and 5.7 billion pounds below the value of annual exports (USDA, 2025c). Today, about 18 percent of the United States' milk production is exported (IDFA, 2025). This accounts for just over one day's worth of milk production per week.

> **Milk supply = beginning stocks + production - farm use + (imports - exports)**

Figure 7. Dairy balance sheet equation (Source: USDA, 2025c)

In 2024, dairy exports reached a value of 8.2 billion dollars, with 40 percent of the exports going to Mexico and Canada (IDFA, 2025). Figure 8 shows the United States dairy exports from 2011 to 2024, with 60,558 million pounds of dairy products being exported in 2024 (USDA, 2025c). Due to the relatively short shelf life of dairy products, the largest number of exports comes from dry skim milk products, butter, and cheese. In 2022, 69 percent of all dry skim milk products were exported, along with nine percent of butter production and about seven percent of cheese production (Ufer, 2023). While they are less perishable than fluid milk products, a majority of butter and cheese production is kept for domestic use. It is valuable to note that while a relatively low percentage of United States cheese production was exported in 2022, the United States ranked second in cheese exports worldwide (Ufer, 2023).
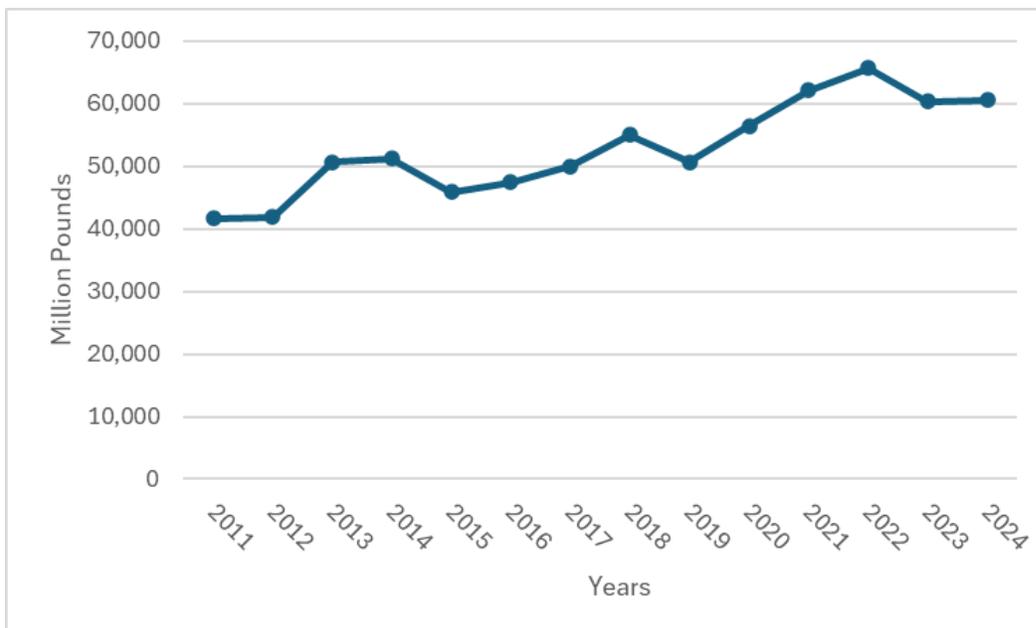

Figure 8. United States' annual dairy exports from 2011 to 2024 (Data from USDA, ERS)

Looking closer at the domestic milk production, about 80 percent of the milk is used for dairy food products, and 20 percent is used for fluid milk beverages (CoBank, 2024). Figure 9 shows the annual milk production in the United States from 2000 projected through 2034. This increase and projected growth in production allow for the domestic dairy industry to expand in the global market by continuing to increase exports and producing high-component dairy products.
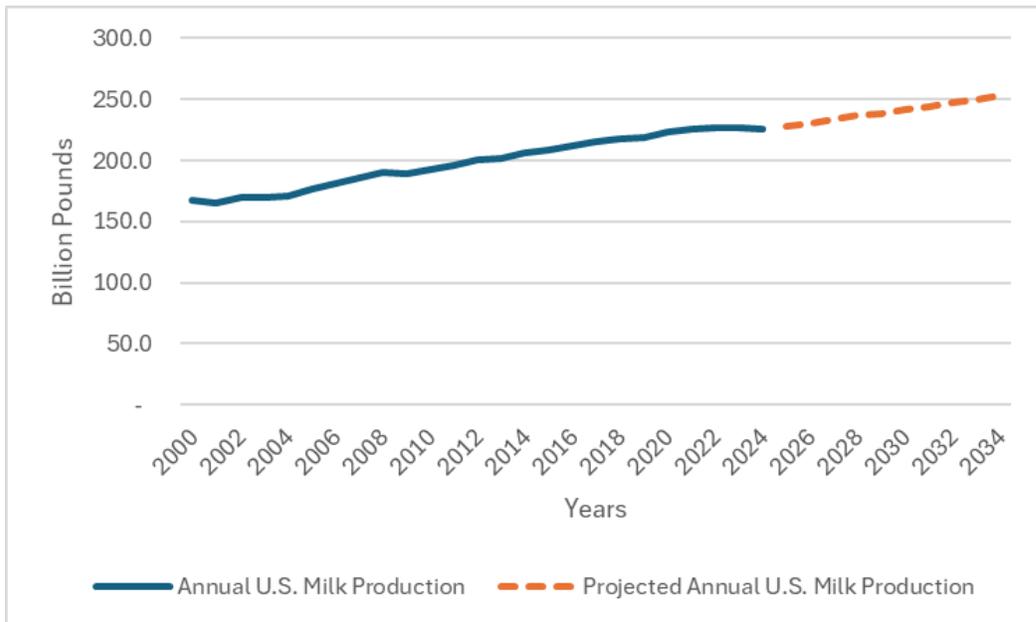
Figure 9. United States milk production from 2000 to 2034 (Data from USDA, ERS)

As analyzed above, class milk pricing relies on components, especially in Class III and Class IV prices, where the milk is being utilized for products that require a higher fat or protein percentage. On dairy farms across the country, it is noticeable that farmers are capitalizing on their ability to improve profits with increased component production. This does not necessarily mean an increase in the volume of milk that is being produced on the farm, but rather, an increase in fat and protein yield. When farmers receive their milk checks, there are often seven main components to the price they receive. These include the butterfat price, protein price, other solids price, Class I price differential, volume premiums, quality premiums, and market over-order premiums (Bailey, 2005). The butterfat, protein, and other solids prices are set within the Federal Milk Marketing Order price system, and the Class I price differential is determined under the Federal Orders for the county in which the milk is processed. The quality premiums are measured by the Somatic Cell Count in the milk as it leaves the farm and, along with the volume premiums, are impacted by the producers. The influence that components have on a farmer's milk check has drastically altered the way that producers maximize their production and profit. For example, the monthly average fat test increased from 4.21 percent in October of 2023 to 4.26 percent in October of 2024 (Polzin, 2024). Similarly, protein test values increase from 3.32 percent in 2022 to 3.34 percent in 2023 and 3.36 percent in 2024 (Polzin, 2024). Figure 10 shows the average milk production per cow from 2000 projected through 2034.

With increased feed efficiency, milk production, and components in milk, dairy farmers can continue to utilize component pricing within the Federal Milk Marketing Orders to maximize their milk check. This system allows for not only increased profitability for producers, but also encourages a steady supply of milk and dairy products for consumers year-round.
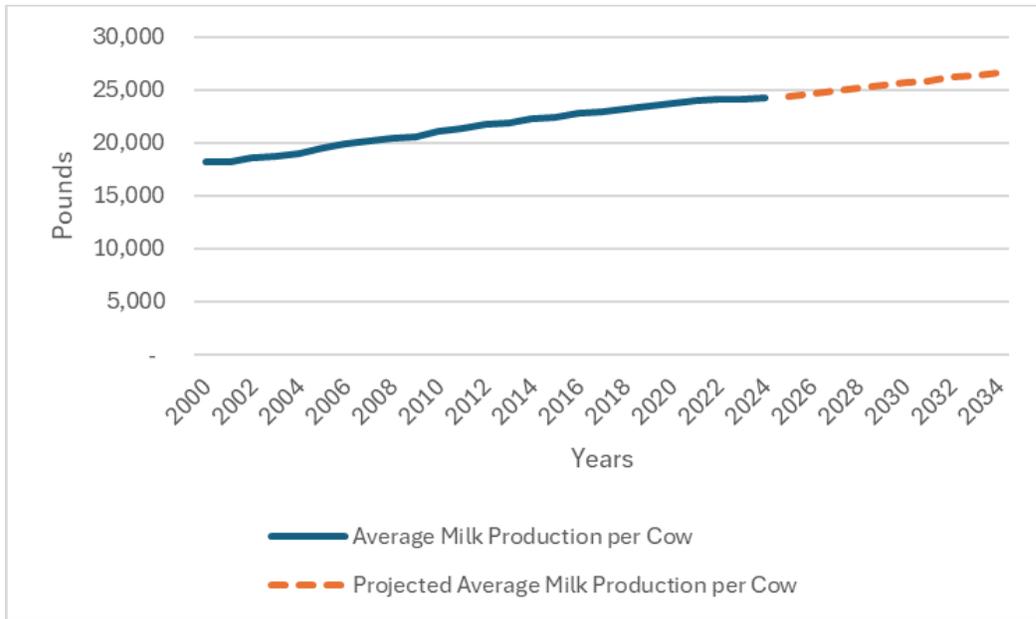
Figure 10. Milk production per cow from 2000 to 2034 (Data from USDA, ERS)

Appendix. Milk Pricing Formulas

Class I (fluid milk) = (Class I skim milk price *($/cwt)* x 0.965 *(cwt skim/cwt milk)*) + (Class I butterfat price *($/lb)* x 3.5 *(lb butterfat/cwt milk)*) + Class I Zone Differential
- Class I Skim Milk Price *($/cwt)* = Higher of advanced Class III or IV skim milk pricing factor *($/cwt)*
- Butterfat Price *($/lb)* = (Butter price *($/lb)* - $0.2272 *($/lb)*) x 1.211 *(lb butter/lb butterfat)*

Note: $0.2272 is the make allowance for producing one pound of butter. 1.211 is the number of pounds of butter that can be made from 1 pound of butterfat.

Class II (soft products) = (Class II skim milk price *($/cwt)* x 0.965 *(cwt skim/cwt milk)*) + (Class II butterfat price *($/lb)* x 3.5 *(lb butterfat/cwt milk)*)
- Class II Skim Milk Price *($/cwt)* = Advanced Class IV skim milk pricing factor *($/cwt)* + $0.70 *($/cwt)*
- Class II Butterfat Price *($/lb)* = Butterfat price *($/lb)* + $0.007 *($/lb)*

Note: $0.70 is the Class II skim milk differential ($/cwt) and $0.007 is the Class II butterfat differential ($/lb).

Class III (cheese) = (Class III skim milk price *($/cwt)* x 0.965 *(cwt skim/cwt milk)*) + (Butterfat price *($/lb)* x 3.5 *(lb butterfat/cwt milk)*)
- Class III Skim Milk Price *($/cwt)* = (Protein price *($/lb)* x 3.1 *(lb protein/cwt skim)*) + (Other solids price *($/lb)* x 5.9 *(lb other solids/cwt skim)*)

Note: 3.1 is the standard number of pounds of protein in 100 pounds of milk, and 5.9 is the average number of pounds of other solids in 100 pounds of milk.
- Protein Price *($/lb)* = ((Cheese price *($/lb)* - $0.2519 *($/lb)*) x 1.383 *(lb cheese/lb protein)*) + (((Cheese price *($/lb)* - $0.2519 *($/lb)*) x 1.589 *(lb cheese/lb butterfat)*) - Butterfat price *($/lb)* x 0.91 *(lb butterfat in cheese/lb butterfat used)*) x 1.17 *(lb butterfat/lb protein)*)

Note: $0.2519 is the make allowance for producing one pound of cheese. 1.383 is the number of pounds of cheese that can be made from one pound of protein. 1.589 is the number of pounds of cheese that can be made from one pound of butterfat. 0.91 accounts for the amount of butterfat that is retained in the cheese manufacturing process. 1.17 assumes standard milk components of 3.5 pounds of butterfat and 2.99 pounds of protein per cwt.
- Other Solids Price *($/lb)* = (Dry whey price *($/lb)* - $0.2668 *($/lb)*) x 1.03 *(lb dry whey/lb other solids)*

Note: $0.2668 is the make allowance for producing one pound of dry whey. 1.03 is the number of pounds of dry whey that can be made from one pound of other solids.
- Butterfat Price *($/lb)* = (Butter price *($/lb)* - $0.2272 *($/lb)*) x 1.211 *(lb butter/lb butterfat)*

Note: $0.2272 is the make allowance for producing one pound of butter. 1.211 is the number of pounds of butter that can be made from one pound of butterfat.

Class IV (butter/nonfat dry milk) = (Class IV skim milk price *($.cwt)* x 0.965 *(cwt skim/cwt milk)*) + (Butterfat price *($/lb)* x 3.5 *(lb butterfat/cwt milk)*)
- Class IV Skim Milk Price *($/cwt)* = Nonfat solids price *($/lb)* x 9.0 *(lb nonfat solids/cwt skim)*

Note: 9.0 is the standard number of pounds of nonfat solids in 100 pounds of milk.

- Nonfat solids price *($/lb)* = (Nonfat dry milk price *($/lb)* - $0.2393 *($/lb)*) x 0.99 *(lb nonfat dry milk/lb nonfat solids)*

Note: $0.2393 is the make allowance for producing one pound of nonfat dry milk. 0.99 is the number of pounds of nonfat dry milk that can be made from one pound of nonfat solids.

- Butterfat price *($/lb)* = (Butter price *($/lb)* - $0.2272 *($/lb)*) x 1.211 *(lb butter/lb butterfat)*

Note: $0.2272 is the make allowance for producing one pound of butter. 1.211 is the number of pounds of butter that can be made from one pound of butterfat.

Source: USDA, AMS

Glossary

Handlers: Dairy manufacturers are responsible for providing payment to dairy producers and reporting sales data in order for the USDA to report commodity prices. Also referred to as processors.

Producers: Dairy farmers who collect milk checks based on the volume of milk produced on the farm. Milk checks are paid by the handlers/processors and are based on the Federal Milk Marketing Order price formulas.

Butterfat/milk fat: Fat that is naturally occurring in milk. The standard amount of butterfat in milk used in Federal Milk Marketing Order pricing is 3.5 percent.

Skim solids: Made up of protein, lactose, minerals, and trace elements. Also referred to as solids-not-fat.

Hundredweight: 100 pounds of milk. Abbreviated as cwt.

Milk price: Milk prices, as referred to in this report, are the price and price factors that determine the value of the milk check received by dairy producers. This is not directly related to the retail price of milk or dairy products.

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