

WHAT IS A DAIRY SURPLUS

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Recent farm bills have utilized a trigger mechanism which ties milk price support levels to CCC purchases. For example, the 1985 farm bill specified if annual purchases of dairy products were anticipated to be greater than the milkfat equivalent of 5 billion pounds, the price support would be reduced by 50 cents per cwt through 1990. The 1990 farm bill modified the trigger mechanism using anticipated purchases of greater than the total milk solids equivalent of 5 billion pounds as the criterion for \$0.25 to \$0.50 reductions in the price support. However, if projected purchases are less than the total solids equivalent of 3.5 billion pounds, then the support price will be increased \$0.25, while if they are between 3.5 and 5 billion pounds, no price support adjustment is made.

Current legislation more or less implies that any purchase over five billion pounds milk equivalent is too much. Not everyone agrees. By tying price changes to CCC purchases, the question "what is a dairy surplus?" is raised. This paper examines the issues and controversies surrounding the definition of dairy surpluses.

Surpluses Defined

In the dairy industry, the concept of surplus has many meanings. Sometimes "surplus milk" is referred to as anything in excess of a market's fluid milk or Class I utilization plus a 20 to 30 percent reserve. This fluid surplus concept is too narrow to apply to price support program issues. At other times, statements are made that if a given state or region produces more total quantity than it consumes, then that area has a surplus. Closely related, the existence of sales to the CCC is used as an indication of surplus conditions in an area. These latter two concepts of surplus are misnomers because at least the market for manufactured products (butter, NFD, and cheese) is national in scope. Accordingly, the quantity of milk produced and the mix of products made and consumed in a state or region may not match. There is a difference between a general surplus of milk versus a surplus of an individual product made from milk. For example, the Northeast is a substantial net importer of dairy products; yet, from

time to time, it does make sales to the CCC. What policymakers are most concerned about is the existence of a national surplus.

In a market economy, the supply of and the demand for a particular product interact to generate a market clearing price. At that price, all of the product brought to the market is consumed by the market. If, however, factors interfere with the unrestricted operation of a market, a market clearing solution may not result. In the dairy industry, if the dairy price support level is set above the market clearing price, more milk will be supplied than will be purchased by commercial customers. The amount of this extra supply is referred to by economists as surplus.

Surpluses arise from two interacting forces. When the price support is above the market clearing level, consumers will buy less product than they would have at the market clearing price. Simultaneously, at the higher prices, producers will want to supply more. Solutions to surplus problems, therefore, usually involve discussion of methods to increase consumption and reduce the excess production.

Table 1 highlights commercial demand and government purchases for the U.S. dairy industry over the last few years.

Table 1. Milk Supply, Demand, and Net CCC Removals, 1985-92.¹

Year	Total Milk Production	Commercial Disappearance ²	CCC Net Removals ²	
			Amount	Percent of Production
(billion lbs.)				
1985	143.0	130.3	13.4	9.4
1986	143.1	133.0	10.8	7.5
1987	142.7	135.6	6.9	4.8
1988	145.2	136.5	9.1	6.3
1989	144.2	135.4	9.4	6.5
1990	148.3	138.9	9.0	6.1
1991	148.5	139.4	10.4	7.0
1992	151.7	142.0	10.0	6.6

¹Calendar year basis.

²Milk equivalent, milkfat basis.

Source: Dairy Situation and Outlook, USDA/ERS, various issues.

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The supply of milk (total U.S. production) was 151.7 billion pounds in 1992. Commercial disappearance, the purchases of milk and dairy products by U.S. consumers, represents the demand for dairy products, but includes some government-induced demand such as school lunch and distribution programs. It amounted to 142.0 billion pounds in 1992. After taking into account much smaller quantities of consumption on farms, imports, and changes in commercial stocks, any milk left over is sold to the CCC as a storable dairy product and is reported as CCC net removals. In the last four years, CCC net removals have ranged from 6.1 to 7.0 percent of total U.S. production (milk equivalent, milkfat basis).

The numbers in Table 1 are used by most dairy industry observers to describe the balance between milk supply and demand. However, these numbers are not as straightforward as they seem. There are many factors complicating the reporting of milk production and commercial use of milk data. Some milk produced is used on farms and never sold. Some milk produced in one year is made into manufactured products that are not sold until the next year. Therefore, data must be adjusted for inventory changes. Imports are another source of dairy products available for commercial sale. Also, the industry may buy back some of the CCC's stocks when it is short. For these and other reasons, the CCC net removals are not the result of the simple subtraction of commercial use from production.

The complications and controversies surrounding the nature of a dairy surplus arise from the basic nature of milk. First, milk is perishable. For milk to be stored, it must be processed into a storable product (e.g., butter, NFDM, and cheese). In addition, milk production and consumption have seasonal variations. More milk is produced in the spring of the year, while peak consumption occurs during the fall. This requires that excess production from one time period must be stored and sold in another time period. Second, milk contains specific components (milkfat, protein, etc.). Of the hundreds of products made from milk, most have different combinations of milk components. Therefore, the milk composition of the end products purchased by consumers may not match the total component supply produced. Third, there are government programs which may be interpreted as being surplus removal or commercial demand enhancing depending on the political preference and the purpose for which it is used. All of these factors mean that straightforward supply-demand-surplus analyses oversimplify the surplus definition in the dairy industry. A few of the complications in defining dairy surpluses are discussed below.

Needed Reserves?

If the industry is so complex and difficult to balance, it is prudent for someone to carry reserve supplies to act as a stabilizing influence. Private firms carry sufficient reserves to satisfy their daily and seasonal needs. They refer to

reserves as stocks or inventories. The level of private reserves will be influenced by price expectations as well as needs.

There is substantial controversy over whether the private sector can be depended on to hold sufficient stocks of food. In wheat, reserve stocks are explicitly held by the government. Although seldom recognized as such, the price support program serves the same function for manufactured dairy products.

Dairy stocks perform the additional function of providing price stability. Thus, in recent years as the level of price supports and CCC stocks of cheese and NFDM have declined, prices have become much more unstable. Thus, price stability is not only a function of the price support level, but also of stocks. How big should a market stabilizing reserve be allowed to get before it becomes a surplus? Should the reserve be measured on an individual product basis or across all products on some type of milk equivalent basis? Should it include both private and publicly held (CCC) stocks? At what level should reserves trigger price support decisions?

There can be two kinds of temporal surpluses in the dairy industry; intra-year and inter-year surpluses. Surpluses occur within a year because milk production and consumption do not follow the same cyclical pattern. Milk must be processed in surplus production times (spring) and stored for sale during peak demand periods (fall). The seasonal balancing process requires that there be excess processing capacity within the dairy industry. These kinds of intra-year surpluses are a natural part of the dairy industry.

It is difficult to "fine tune" the large, complex U.S. dairy system. Variability in weather, feed conditions, and other factors can alter the supply and demand for dairy products significantly within short time periods. Supply variability in the face of a dairy demand, which tends to respond sluggishly to price changes, means that a little bit of extra milk supply (or a shortage) can cause significant decreases (or increases) in milk prices. To prevent major market disruptions, some reserve capacity is needed to make market operations stable and orderly both within and across years. If the orderly operation of the U.S. milk markets depends on the government carrying reserves, should those reserves be counted as dairy sector surpluses? If not, how large should these "reserve surpluses" be? Who should decide the appropriate level of "needed" reserves, and how should it be calculated?

The U.S. Congress has established, from a policy perspective, the level of reserve supplies that are considered necessary. The Provisions of the Food, Agriculture, Conservation, and Trade Act of 1990 allowed for price support cuts when surpluses exceed 5 billion pounds total solids basis and allows for price support increases when government surplus purchases drop below 3.5 billion pounds. Therefore, the implications of the current standard is that if surplus pur-

chases fall between 3.5 and 5 billion pounds, supply and demand are in balance.¹

Dairy Surplus and Milk Equivalent Accounting

The CCC does not buy milk. It buys butter, NFD, and cheddar cheese to support the farm price at its prescribed level (see Leaflet P-1 for a discussion of government support operations). Formulas are used to determine the amount of milk needed to make these products. To accomplish this, the USDA uses milk equivalent accounting.

The traditional milk equivalent accounting formula converts milk product weights to a milk equivalent on the basis of how much milkfat they contain. Nearly all milk equivalent statistics reported have been calculated on this milkfat basis for many years. For example, the USDA assumes that it requires the milkfat from about 21 pounds of milk to produce one pound of butter. Therefore, the milk equivalent of one pound of butter is 21 pounds. Similarly, it assumes that 10 pounds of milk are required to produce one pound of cheddar cheese. On the other hand, nonfat dry milk contains no milkfat, yet it obviously requires milk to produce NFD.

To calculate a milk equivalent for an amount of NFD, one must base the equivalency on the nonfat component of milk, often referred to as solids-not-fat (SNF). By this measure, USDA assumes that 11.58 pounds of milk are needed to produce one pound of nonfat dry milk. But note that in contrast, by this measure butter manufacture requires no milk for measuring “surplus” an equally incongruous fact! The 1990 farm bill changed the basis for milk equivalent accounting from milk fat basis to total solids basis due to the problem of accounting for NFD sales as surpluses.

A milk equivalent total can vary substantially depending on the accounting method used. A solids-not-fat basis would weight CCC purchases of nonfat dry milk purchases heavily and butter purchases lightly. Conversely, using the milkfat basis to convert to milk equivalents heavily weights butter while giving no weight to nonfat dry milk purchases. The total solids approach gives more equal weights to milkfat and SNF as these components appear in milk.

A hundredweight of milk yields the joint products of butter and nonfat dry milk. If customers demand both products proportionate to production, CCC milk equivalent accounting poses few problems. However, if demand patterns are such that the commercial markets desire more of one product, problems arise.

Recently, the commercial market for nonfat dry milk has been strong relative to butter. Consequently, NFD has not been sold to the CCC in significant quantities. However, milkfat demand has been weak and the CCC has been sold large amounts of butter. Using the milkfat equivalent basis for calculating surplus levels, it appears that milk equivalent

dairy surpluses are mounting rapidly. In reality, most of the dairy surplus has been in the form of butter (Table 2).

Table 2. Ending Government Stocks of Butter, American Cheese, and Nonfat Dry Milk, 1975 to 1992.

Year	Butter	Nonfat American Cheese	Dry Milk
(million product pounds)			
1975	5.0	2.0	421.8
1976	19.1	1.6	386.6
1977	150.7	60.5	617.2
1978	191.8	29.7	545.0
1979	152.6	2.8	392.7
1980	268.2	168.6	501.7
1981	381.9	515.4	803.0
1982	438.7	646.8	1188.7
1983	463.5	793.3	1330.3
1984	272.8	620.8	1186.6
1985	180.7	543.7	932.9
1986	219.8	420.1	628.9
1987	96.3	81.2	112.1
1988	173.3	36.7	8.0
1989	222.6	6.6	.1
1990	365.2	2.6	28.7
1991	520.5	25.7	189.0
1992	477.5	12.7	7.7

Source: Dairy Situation and Outlook, USDA/ERS, various issues.

Table 3 compares the CCC net removals for the past seven marketing years using a milkfat, a solids-not-fat, and two total solids based measures for calculating milk equivalencies. The first total solids measure (composition weighted) is the new basis for calculating milk equivalent as stated in the 1990 farm bill. It is a weighted average of the milkfat and SNF-based equivalents, with weights approximating the relative proportions of milkfat and solid-not-fat in whole milk. The second total solids measure also is a weighted average of the milkfat and SNF-based totals. In this case, the weighting scheme changes each year with the relative dollar values the CCC assigns to butter and nonfat dry milk when the CCC purchase price calculations are made.

In the first three market years in Table 3, the CCC surplus purchases did not differ significantly across milk equivalent accounting formulas. In the 1986-87 marketing year, the CCC purchased relatively more nonfat dry milk and, therefore, milk equivalent surpluses look larger when measured on either a solids-not-fat basis or a total solids basis than a milkfat basis. Total solids based on composition or value result in similar milk equivalents. However, for marketing years 1987-88 through 1991-92, milkfat-based totals are much larger than the SNF total. Surpluses appear quite large when milkfat-based accounting is used because milkfat equiva-

¹ See Leaflet P-6 for a discussion of adjusting support prices according to supply and demand. See Leaflet P-4 for a discussion on the uses of government stocks.

Table 3. CCC Net Removals, 1985-86 to 1991-92.¹

Fiscal Year ²	Total Solids Basis			
	Milkfat Basis	Solids-Not-Fat Basis	Composition Weighted ³	Value Weighted ⁴
	(billion lbs., milk equivalent)			
1985-86	12.5	16.4	14.9	14.5
1986-87	5.4	8.8	7.5	7.1
1987-88	9.9	7.3	8.3	8.6
1988-89	9.6	0.5	4.1	5.0
1989-90	8.4	0.3	3.5	4.3
1990-91	10.4	4.9	7.1	7.6
1991-92	10.2	1.7	5.1	5.9

¹All values were calculated by the authors using net CCC removals provided by ASCS.

²October 1 to September 30.

³Component weights of 60 percent and 40 percent for solids not-fat and milkfat, respectively.

⁴Weighted average of milkfat-based equivalent and SNF-based equivalent, where weights vary each year according to proportion of the total value of butter and NFDM that CCC assigns to each product when calculating CCC purchase prices.

lent accounting weights butter heavily. Because commercial markets have taken most of the NFDM produced between the middle of 1988 and 1990, surpluses measured on a solids-not-fat basis are very small for the 1988-89 and 1989-90 period. Value weighted total solids result in milk equivalents very close to composition weighted total solids.

Are the traditional, milkfat-based net removals shown in the second column of Table 3 really surpluses? Nearly all the milk solids identified as milk equivalent net removals in 1988-89 were needed to satisfy the commercial markets for nonfat dry milk powder as indicated by the product removals (Table 2). In other words, in order to meet the commercial demand for dairy products, a large part of the 8 to 9 billion pound “surplus” is actually not a surplus of milk; it is a surplus of butter. Using a milkfat equivalency accounting system under these market conditions gives the incorrect impression that the dairy industry is out of equilibrium and is producing large milk surpluses. This suggests that price policy might focus on reducing butter surpluses, not overall milk production.

With respect to total solids measures, either a composition or value weighted total solids measure clearly reduces the distortions that the milkfat-based or SNF-based measures show when CCC purchases are unbalanced between butter and nonfat dry milk. When purchases are in fairly close balance, the differences in milk equivalent accounting are probably not terribly important. A composition weighted approach is more intuitively appealing if the objective is purely to measure milk equivalent quantities. A value weighted approach may more accurately depict the magnitude of a surplus relative to the more narrow interest of CCC program costs.

Dairy farmers’ incomes are affected by price support decisions. The price support decision has been based on the

stated level of dairy surpluses. Under recent market conditions, using the milkfat equivalent accounting method implied a support price cut while, in several years, the use of a total solids alternative did not. Because nearly all dairy statistics reported on a milk equivalent basis have been calculated using a milkfat equivalent formula, changing the way we account for milk equivalents runs counter to the longstanding tradition and affects how we measure all dairy product sums, e.g., imports, stocks, and commercial demand. The important point is that one be aware of the alternative measures of milk equivalent, their meaning, and the conditions under which they are useful.

Dairy Surpluses are Required for Food Programs

Dairy products acquired by the CCC are high quality and nutritious foods. Although they have been processed into storable forms, they will eventually spoil. Over the years, a significant number of domestic and international feeding and trade programs have institutionalized the use of surplus dairy products. Thus, if the CCC does not purchase dairy products, people currently receiving surplus dairy products would lose access to a valuable source of nutrition. Therefore, some argue that a portion of the USDA surpluses are “required” for government domestic and international feeding programs, and because these products are “needed,” they should not be counted as dairy surpluses.

Donations historically have been the dominant means of using surplus dairy products (see Leaflet P-4 for additional details on donations and the general use of CCC stocks). In the past, donations were made primarily through international programs. As dairy surpluses grew, Congress provided new programs so that dairy surpluses could be used more in domestic donation programs. The agencies and people receiving these stocks find them very helpful in their programming efforts. With few exceptions, these feeding programs only have access to dairy products when the CCC provides them at no cost. With the dramatic reductions in CCC stocks of cheese and NFDM during the mid-1980s, some distribution channels serving the needy were no longer able to get all of the dairy products they wanted. If people going without dairy donations express their desire for dairy products, are these products really in surplus?

Domestic and foreign feeding-export programs were established expressly for disposing of surplus products and were not intended to be permanent government-subsidized food markets. Also, some people who receive donated dairy products substitute the donated products for some other commodity or dairy product they currently are eating. A 1984 analysis by the U.S. General Accounting Office indicated that 30 percent of the surplus cheese distributed through domestic feeding programs displaced commercial market cheese sales.²

²U.S. General Accounting Office. Improved Administration of Special Surplus Dairy Product Distribution Program Needed.” Report by the Comptroller General of the United States, Washington D.C.: GAO/RCED-84-58, March 14, 1984.

A similar question arises with regard to Dairy Export Incentive Program (DEIP) sales. The products exported under DEIP are included in calculations of the dairy surplus for purposes of the price support decision. In other words, they are included in the dairy surplus. This assumes that if the DEIP subsidy had not been made, the products would have been purchased by the CCC. This generalization may not be valid for all individual products at all times, although it is certain that there is a strong connection between the two.

Pounds or Dollars?

The price support trigger has been established on the basis of milk equivalent pounds. However, the major policymaker focus in recent years has been the federal budget — dollars spent on dairy programs.

Generally, CCC purchases and government expenditures are correlated, but they do not rise and fall on a one-for-one basis. When producers pay assessments to fund their price support program, net expenditures are lower than the CCC purchase level would suggest. Milk Diversion Program (MDP) and Dairy Termination Program (DTP) expenses caused net expenditures to increase even as the programs actually held purchases down. Again, the important point involves using the surplus measure that is most appropriate considering the purpose.

Similarly, in the situation where the government is purchasing only butter, the surplus volumes indicate a higher surplus than would be indicated by the government expenditures on the dairy price support program, particularly as butter purchase prices have declined relative to powder and cheese (Table 4).

Beginning in 1987-88, dairy program expenditures as a percent of farm cash receipts for milk declined dramatically. This reflects the fact that the USDA recently has reduced the amount of support to the dairy industry. If the dairy industry price support program was judged by its contribution to lowering U.S. government expenditures, using program expenditures as a percent of farm cash receipts for milk implies significant improvement. Measuring that same surplus on a physical quantity (billion pounds) basis implies a different performance level. Once again, the meaning of a dairy surplus is less obvious and straightforward than many observers recognize.

Conclusions

The question “what is a dairy surplus?” will continue to be part of the dairy policy debate. Clearly, dairy surplus measurement is not as simple and clear cut as many believe. However, as long as the dairy price support is above the long-run market clearing price, milk surpluses will be produced. The form of those surpluses and how they are measured is a very important policy issue.

Table 4. Net Expenditures Under the Dairy Price Support Program, 1985-86 to 1991-92.

Marketing Year	Net CCC Purchases ME Milk Fat Basis (billion lbs.)	Net Expenditures (millions of \$) ¹	Expenditures as a Percent of Farm Cash Receipts for Milk (%) ²
1985-86	12.5	2,337	13.4
1986-87	5.4	1,166	6.5
1987-88	9.9	1,295	7.5
1988-89	9.6	658	3.6
1989-90	8.4	505	2.4
1990-91	10.4	839	4.6
1991-92	10.2	232	1.2

¹ASCS Commodity Fact Sheet, various issues, USDA, Agricultural Stabilization and Conservation Service. Net expenditures include MDP and DTP payments and assessment revenue, as well as expenses and income associated with purchases of dairy products.

²Agricultural Outlook, various issues, USDA, Economic Research Service.