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Dairy

Background for 1990 Farm Legislation

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Dairy: Background for 1990 Farm Legislation. By Richard F. Fallert, Don P. Blayney, and James J. Miller. Commodity Economics Division, Economic Research Service, U.S. Department of Agriculture. Staff Report AGES 9020.

Abstract

The U.S. dairy industry is primarily a domestic industry with both imports and exports hovering around 2 percent of U.S. milk production. After a period of relatively high dairy price supports in the late 1970's and early 1980's which distorted milk prices and generated substantial excess milk supplies, the industry spent most of the 1980's attempting to reduce dairy program purchases and Government costs. Continuing issues are the appropriate price support level, the degree of automatic price adjustment, and the proper formula or mechanism for attaining it.

Keywords: Costs and returns, dairy programs, domestic use, milk marketing orders, milk pricing, price supports, program effects, world trade.

Foreword

Congress will soon consider new farm legislation to replace the expiring Food Security Act of 1985. In preparation for these deliberations, the Department of Agriculture and many groups throughout the Nation are studying preceding legislation to see what lessons can be learned that are applicable to the 1990's. This report updates **Dairy: Background for 1985 Farm Legislation** (AIB-474) by Richard F. Fallert, James J. Miller, and Lynn G. Sleight. It is one of a series of updated and new Economic Research Service background papers for farm legislation discussions. These reports summarize in a nontechnical form the experience with various farm programs and the key characteristics of the commodities and the farm industries which produce them. For more information, see the Additional Readings listed at the end of the text.

Washington, DC 20005-4788 March 1990

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Summary

Dairy products account for about 13 percent of total cash receipts from all farm commodities. In 1988, cash receipts from dairy products totaled $17.7 billion, ranking second only to cattle and calves with $36.3 billion. Soybeans and corn followed dairy products in cash receipts with $12.4 and $10.1 billion, respectively.

Although milk is produced and processed in every State, over half of total 1989 U.S. milk production came from Wisconsin, California, New York, Minnesota, and Pennsylvania. Two-thirds of the total milk supply was produced in 10 States.

Substantial structural change is taking place in the dairy industry at both the farm and processing levels. The number of farms with milk cows dropped from 2.8 million in 1955 to around 205,000 in 1989; commercial dairy farms declined from 600,000 to around 160,000. The number of milk cows declined from 21 million in 1955 to 11.1 million in 1975, and 10.1 million in 1989. A 143-percent increase in milk production per cow enabled milk production to more than keep pace with commercial needs over the 1955-89 period.

A regional shift in milk production from the traditional dairy areas of the Upper Midwest and Northeast to the West and Southwest began about three decades ago and has accelerated in the last 20 years. Wisconsin is still far ahead as the number one milk producing State, but California is closing the gap.

Federal dairy programs play an important role in the pricing and marketing of milk in the United States. The major dairy programs are dairy price supports, Federal milk marketing orders, import restrictions, and State regulations. Recent legislation has been enacted to address the problems of excess milk supply and large Government purchases and costs associated with the dairy price support program, and to adjust minimum fluid milk prices in Federal milk marketing orders.

The U.S. dairy industry is primarily a domestic industry. Restrictive import quotas are used to prevent lower cost and subsidized dairy products from undercutting U.S. dairy price supports. The import quotas on manufactured dairy products limit imports to about 2.5 billion pounds milk equivalent, just under 2 percent of U.S. milk production in 1989. Exports of as much as 2 percent of U.S. milk production have historically been concessional sales or food aid donations from Government supplies. However, international dairy markets, especially for nonfat dry milk, changed dramatically in 1988. The primary reason for this new situation--in which prices of milk powders, casein, and cheese rose substantially--was European Community (EC-12) and U.S. efforts to reduce dairy surpluses and stocks.

The rather sudden availability of an international market for U.S. dairy products--especially nonfat dry milk--added a certain amount of volatility to the domestic industry. The Minnesota-Wisconsin (M-W) price, for example, reached an all-time high of $14.93 per cwt in December 1989. This was $3.81 (34 percent) above the December 1987 price of $11.12. Strong international markets and prices, however, will depend to a large extent on the maintenance of export "discipline" by the EC-12.

Research indicates that in the absence of subsidized milk production and exports, the United States can compete in world dairy markets. New Zealand has a clear advantage over the United States in milk production, due to its pasture-based system. However, additional pasture resources for dairying are limited. Overall, milk production costs in the United States appear to be in the middle-range of cost estimates in major milk producing countries. This competitive situation for the United States can be influenced by dairy policy. In general, countries that rely on milk supply management programs are put at a disadvantage in international markets as opposed to more market-oriented policies.

Over much of the period since the late 1970's, Government dairy programs have resulted in excess resources being used in milk production and processing. With reduced price supports, the dairy diversion and dairy termination programs, and strong international markets, the industry should enter the 1990's in a better supply-demand balance than in recent years.

Dairy

Background for 1990 Farm Legislation

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Introduction

Federal dairy programs play an important role in the pricing and marketing of milk and dairy products. Most Federal regulation evolved from legislation enacted in the 1930's and 1940's. The Agricultural Act of 1949 established the permanent program of dairy price supports and is still part of the law. The Agricultural Marketing Agreement Act of 1937 provided for classified pricing and revenue pooling in fluid milk markets under Federal milk marketing orders.

While there have been significant changes in provisions of Federal milk marketing orders, the basic structure of the dairy price support and import control programs remained nearly the same from 1949 to 1981. Since 1981, major departures from traditional dairy price support policy have occurred, including the severing of price supports from parity, the addition of voluntary supply-management provisions to the dairy price support program, and implementation of a flexible dairy price support mechanism.

Much of the 1982, 1983, and 1985 dairy program legislation evolved from an attempt to address the problems of excess milk supplies and large Government purchases and costs resulting primarily from the high level of minimum price support with midyear adjustments from 1977 to 1980. The higher prices--coupled with reduced risk and uncertainty, lack of alternative uses for farm resources, increased productivity in the dairy sector, and relatively low feed prices--resulted in over 10 percent more milk by 1983 than consumers were willing to buy at the supported prices. A challenge for the 1990's will be to avoid the temptation of using the dairy price support and Federal milk marketing order programs as income-enhancing mechanisms. As history has shown, this would hold and attract even more resources into the dairy industry.

Structure of the Dairy Industry

Dairy products account for about 13 percent of total cash receipts from all farm commodities. In 1988, cash receipts from dairy products totaled $17.7 billion, ranking second only to cattle and calves with $36.3 billion. Soybeans and corn followed dairy products in cash receipts, with $12.4 and $10.1 billion, respectively.

Milk, which is bulky, highly perishable, and subject to bacterial and other contamination, must be produced and handled under sanitary conditions and marketed quickly, either for drinking or for manufacture into storable dairy products. Price is the fundamental coordinator of activities in milk production, assembly, processing, and distribution. Prices--even though influenced by Government programs--allocate raw milk supplies among competing demands and provide production and marketing signals to dairy farmers and processing and marketing firms.

The ability of market prices to efficiently coordinate economic activities depends in part on the inherent characteristics of milk and its products. Government involvement attempts to overcome certain market deficiencies created by these characteristics. These factors are not unique to milk; but, in combination, they create unique conditions and problems. These characteristics include:

- Extreme perishability of the raw product, with a high potential for transmitting diseases, requiring rapid product movement, refrigeration, and heat treatment;
- Highly inelastic demand--low quantity response to price changes;
- Bulkiness due to its high water content (87 percent);
- Production through a continuous biological process, creating (among other effects) a need for skilled workers every day;
- Unsynchronized seasonality of production and demand;
- Biological lags in output (about 36 months from the time a cow is bred until the heifer enters the milking herd); and
- Joint assembly and hauling of milk for most dairy farmers.

Milk Production

Although milk is produced and processed in every State, over half of total 1988 U.S. milk production came from Wisconsin, California, New York, Minnesota, and Pennsylvania (fig. 1). Over two-thirds of the total milk supply was produced in 10 States. Large drylot dairy farms with 1,000-2,000 cows are common in

Florida and the Southwest (southern and central California, Arizona, and New Mexico), but dairy operations of this type are rare elsewhere (app. table 1).

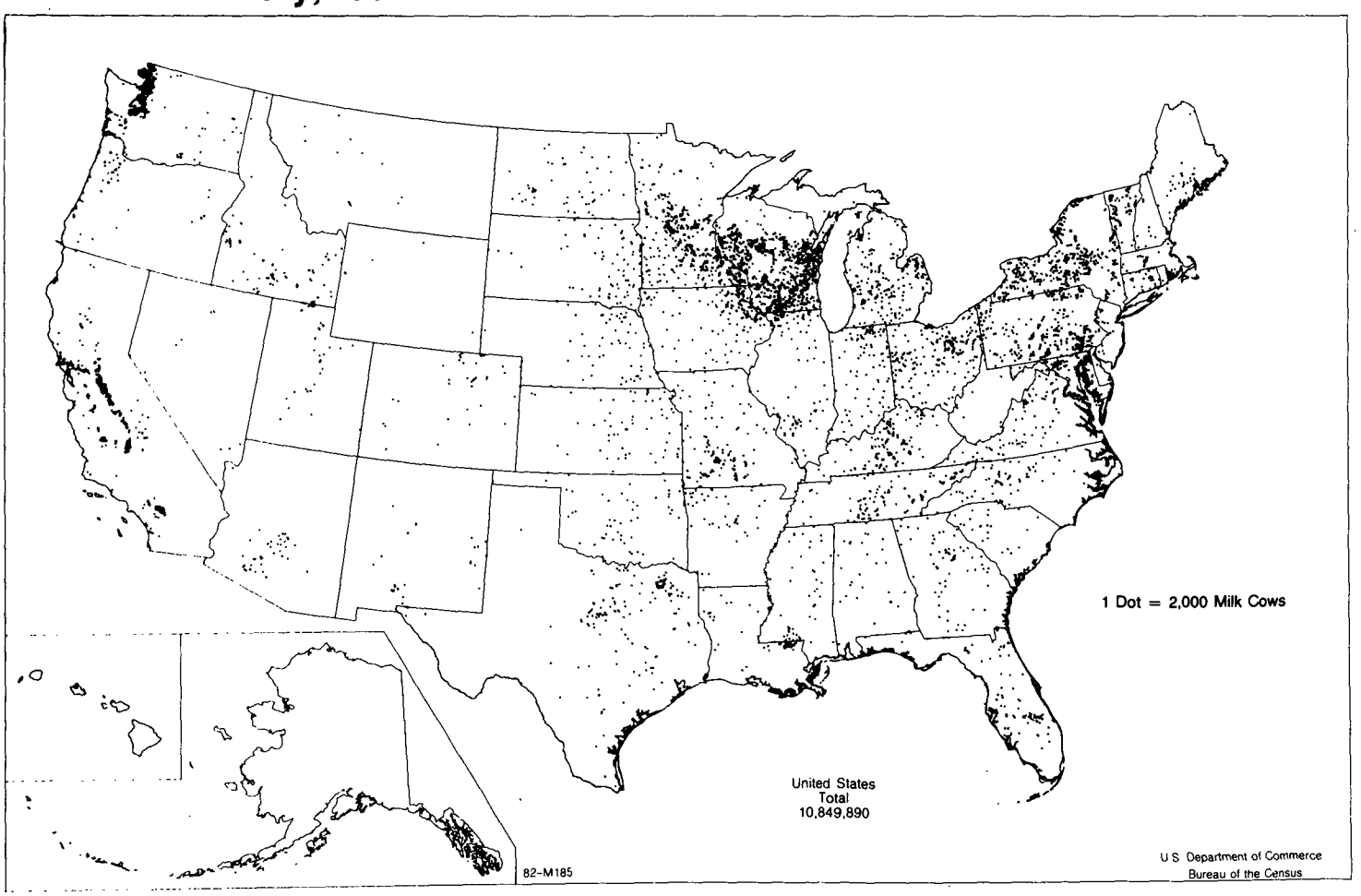
Structure

The number of farms with milk cows declined from 2.8 million in 1955 to about 205,000 in 1989 (table 1). The number of milk cows declined from 21 million in 1955 to 11.1 million in 1975, and 10.1 million in 1989. A 144-percent increase in milk production per cow enabled production to more than keep pace with commercial needs over the 1955-89 period.

Along with the aggregate structural changes, regional shifts in milk production from the more traditional dairy areas of the Upper Midwest and Northeast to the West and Southwest have been observed. The shift began about three decades ago and has

Figure 1

Milk cow inventory, 1982



1982 CENSUS OF AGRICULTURE

Table 1--Dairy industry changes, 1955-89

Item	1955	1975	1989	Change per year 1955-75	Change per year 1975-89
		Thousand		Percent 1/	
Cows	21,044	11,139	10,127	-3.1	-0.7
Farms with milk cows	2,763	444	2/205	-8.7	-5.4
		Number			
Average cows per farm	8	25	49	5.9	4.9
		Pounds			
Milk per cow (annual)	5,842	10,360	14,244	2.9	2.3
		Million pounds			
Total milk production	122,945	115,398	145,252	-.3	1.7

1/ Compound annual rate.
2/ Commercial dairy farms (farms with 10 or more milk cows) are estimated at around 160,000 in 1989 with an average of around 65 cows per farm.

Source: U.S. Dept. Agr.

accelerated in the last 20 years. Wisconsin is still far ahead as the number one milk producing State, but California is closing the gap. Population is shifting from the "frostbelt" to the "sunbelt" and may explain part of the milk production shifts. However, other factors, such as a milder climate requiring less overhead in buildings, better control of hay and forage quality, and specialization in strictly milking and managing cows, may be important factors. In addition, the large drylot operations of 1,000 cows or more seem to show economies of specialization allowing more intensive use of facilities and thereby reducing overhead costs.

The size distribution of dairy farms has changed over the last three decades (table 2). In 1959, 86 percent of the farms with milk cows had fewer than 20 cows. By 1987, only 33 percent fell in this category and they had only 3 percent of the milk cows. In contrast, only 7,172 farms (0.4 percent) had 100 or more cows in 1959, but in 1987, about 10 percent of the herds were in this category and had 42 percent of the milk cows. The average herd

size on all farms with milk cows was 50 in 1987. The average herd size on farms with 5 or more cows was 63 (app. table 1).

If only herds with 5 or more milk cows are considered as commercial dairy farms, 57 percent of the commercial dairy farms had between 5 and 50 milk cows and had 26 percent of the total commercial dairy cow herd in 1987. In contrast, commercial dairy herds with 200 or more milk cows represented about 3 percent of the total commercial herds, but had 24 percent of the commercial dairy cows.

In the Southwest (Arizona and California), 28 percent of the commercial herds had 500 or more cows and accounted for 64 percent of the total cows in commercial dairy herds (app. table 1). In contrast, only 3 percent of the cows in herds with 5 or more cows were in commercial herds of 200 or more cows in the Lake States (Minnesota and Wisconsin), while 82 percent were in the 20-99 category.

Herd size reflects only the size of the dairy enterprise, not the size of the whole farm operation. In the Southwest, for example, most farms specialize only in milking cows. Most feed (both forage and concentrate) is purchased, with much of the forage in the region produced under irrigation on specialized hay-producing farms. In other regions, where herds are smaller, a larger proportion of the feed is grown on the farm and other farm enterprises are important to the overall farm operation. Some

Table 2--Farms reporting milk cows and number of cows, by herd size, selected years 1/

Herd size (cows)	1959	1964	1969	1974	1978	1982	1987
Farms reporting milk cows (number):							
1-19	1,706,395	947,236	402,022	224,277	167,840	166,078	65,678
Percent	85.9	77.2	64.1	55.5	50.3	41.8	32.5
20-49	242,733	228,911	171,996	118,706	101,195	88,548	67,622
Percent	12.2	18.7	27.4	29.4	30.4	31.9	33.5
50-99	30,018	40,549	42,426	46,266	48,138	53,334	48,310
Percent	1.5	3.3	6.7	11.5	14.4	19.2	23.9
100 plus	7,172	9,622	11,059	14,505	16,312	19,650	20,335
Percent	.4	.8	1.8	3.6	4.9	4.1	10.1
Total	1,986,318	1,226,318	627,503	403,754	333,485	277,610	201,945
Percent	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Milk cow numbers (1,000 cows):							
1-19	NA	4,489	2,165	1,072	735	538	347
Percent		28.7	17.6	10.1	7.1	5.0	3.4
20-49	2/ 13,831	6,832	5,315	3,793	3,300	2,949	2,301
Percent	2/ 82.2	43.6	43.2	35.6	31.9	27.2	22.9
50-99	1,785	2,571	2,700	2,973	3,121	3,474	3,169
Percent	10.6	16.4	22.0	27.9	30.1	32.0	31.5
100 plus	1,208	1,768	2,112	2,817	3,199	3,875	4,254
Percent	7.2	11.3	17.2	26.4	30.9	35.8	42.2
Total	16,824	15,660	12,292	10,655	10,355	10,836	10,071
Percent	100.0	100.0	100.0	100.0	100.0	100.0	100.0

NA = Not available.
1/ Does not include Alaska and Hawaii. 2/ Herd size 1-49.
Source: Derived from published U.S. Census of Agriculture data.

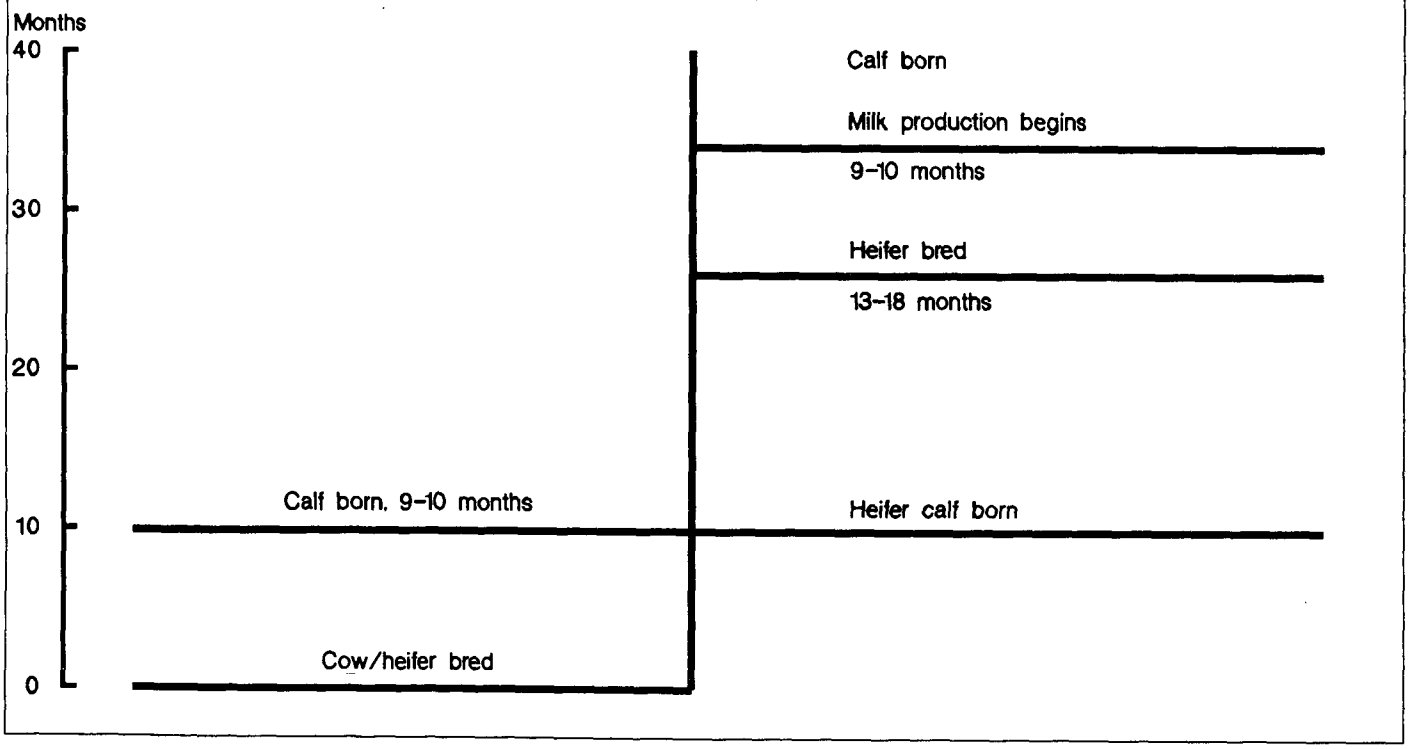
dairy farmers in these regions expand herd size and specialize the dairy enterprise by shifting from grain to forage production and purchasing more of their concentrates.

Supply Adjustment

Major expansion of the milk supply is a long-term process, mainly because of biology. It takes an average of 27 months from birth until a heifer enters the milking herd (fig. 2). Contraction of milk supply is also a relatively slow process, impeded by the heavy fixed investment in specialized facilities and lack of alternative farm opportunities and off-farm employment for dairy farmers in some major dairy areas such as Wisconsin and the Northeast. Changes in feeding and culling rates can alter milk production to only a limited extent. These production lags make milk supply relatively unresponsive to price changes over periods of less than a year.

The milk supply is more responsive to price changes in the long run. Most of the inputs--feed concentrates, labor, and equipment--can be acquired in greater volume for dairy production at modestly higher prices. High-quality forage appears to be an exception and a limiting factor for expanding milk production in some areas.

Figure 2
Dairy sector biological lags



In the long run, a 10-percent change in farm milk price would change milk production about 5 percent in the same direction. The adjustment seems to be spread over a 4-year period, with very little change occurring during the year of the price change. During periods of milk price increases, U.S. milk production can be expected to increase 6 percent for every 10-percent increase in farm-level milk prices. However, when milk prices are decreasing, U.S. milk production can be expected to decrease only 4 percent for every 10-percent decrease in the farm milk price. Considerable regional variation exists, ranging from a change of 3 percent in the Southwest to 7 percent in the Southeast assuming a 10-percent change in price. The traditional dairy regions of the Northeast and Upper Midwest are close to the national average.

Two major implications for U.S. dairy price support policy are that: (1) most of the supply adjustment occurs in the first and second year after a price change, not in the year of the change; and (2) with decreasing prices, it takes more time to achieve a supply/demand balance.

Revenues, Costs, and Returns

Dairy enterprise returns above cash expenses and replacement costs are estimated to be $0.98 per cwt of milk in 1989 compared with $0.87 in 1988 and $1.56 in 1986 (app. table 3). Total cash expenses are estimated at $11.84 per cwt in 1989, compared with $10.92 in 1988 and $10.29 in 1986. Feed costs, normally about 50 percent of cash expenses, increased to $6.55 per cwt in 1989 (55 percent of cash expenses), compared with $5.89 in 1988 and $5.06 in 1986. The relatively high feed costs in 1988 and 1989 are primarily the result of the 1988 drought.

Returns consist of all current cash receipts generated from producing and marketing both milk and secondary products. Gains or losses occurring from asset appreciation or reduction are not included. Cash receipts are a function of both price (which may be heavily influenced by Government programs) and production per cow. Receipts from secondary products typically include items such as the sale of breeding or culled livestock.

Cash expenses consist of both variable expenditures (those incurred only when production takes place in a given year) and fixed expenditures (items including taxes, insurance, overhead, interest, rent, and leasing costs for which the operator or landlord would be responsible whether or not production occurs). Replacement costs represent an imputed charge sufficient to maintain average machinery, equipment, and purchased breeding livestock investment and production capacity through time. The replacement charges are based on current prices of these capital assets.

Cash expenses are influenced by Government programs and policies. For example, the feed grain program affects the cost of dairy feeds. The availability of water at an affordable price affects the cost of forage in some regions, especially in irrigated

western regions. Conservation and disaster relief programs also affect the dairy farmer. Agricultural credit policy can affect interest rates as well as availability of credit for entry into dairying or expansion of an existing operation. Federal and State tax policy can also affect entry, expansion, or renovation decisions. Decisions of nonfarm investors are especially influenced by tax policy. Also, macroeconomic policy decisions, as they affect interest rates and agricultural trade, are becoming increasingly important to the well-being of dairy farmers and to agriculture in general.

A recurring problem of dairy programs is that benefits are often capitalized into asset values, especially cattle. An example of relatively high net returns, associated with the capitalization of program benefits into asset values, is the rise in replacement dairy cow prices to over $1,000 in 1979 from under $700 in 1978 and even lower prices in prior years (table 3). The difference between dairy cow prices and slaughter cow prices increased from $233 in 1978 to $443 in 1979.

This difference reached a peak of nearly $700 in 1981, and then declined in the mid-1980's as the supply of replacements expanded coupled with dairy farmers facing lower immediate and anticipated returns. Both dairy cow prices and slaughter cow prices increased again in the late 1980's.

Some entering dairy farmers, and those who expanded their dairy operations substantially during the late 1970's period of relatively high dairy cow prices, probably faced financial difficulty as the industry came closer to a workable supply-demand balance. This capitalization phenomenon also causes problems in costs and returns analyses and in attempts to assess industry well-being.

Another factor in the persistence of excess milk supplies in the 1980's was the apparent increase in dairy productivity and the willingness of U.S. dairy farmers to produce more milk in spite of lower real (adjusted for inflation) prices (fig. 3). One effect of this phenomenon is that it has made the U.S. dairy industry more competitive in world markets. A key question for the 1990's is whether these milk supply shifts will continue. The drought of 1988 and wet weather conditions in parts of the country in early 1989 both adversely affected forage quality and milk production per cow. However, given normal weather conditions and the likely emergence of new technology such as bovine somatotropin (bST), the trends initiated in the 1980's are likely to continue.

Emerging Production Issues

A major emerging issue related to milk production is the use of bovine somatotropin (bST). bST is a naturally occurring protein in dairy cattle which has been linked to milk production. Recombinant DNA technology has made the production of a synthetic bST possible at reasonable cost. Herd trials have shown that

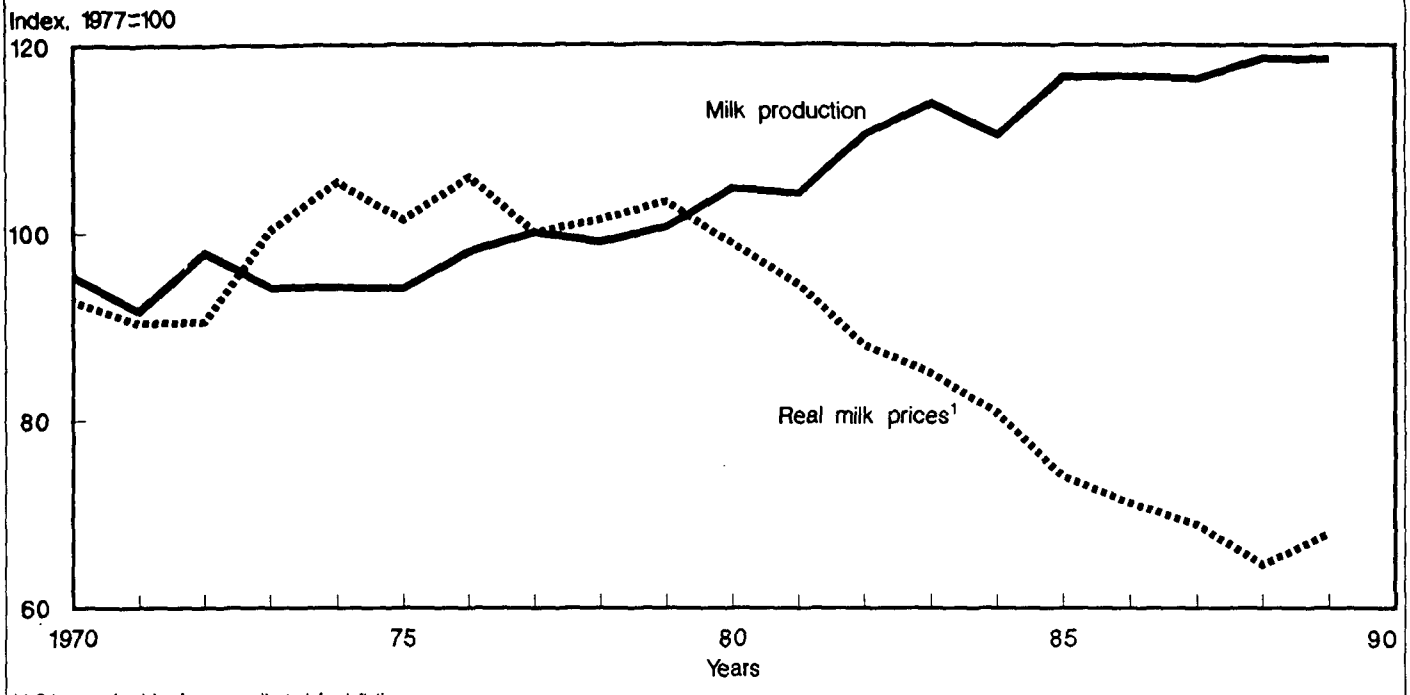
Table 3--Dairy cow and slaughter cow prices, 1970-89

Year	Dairy cow prices 1/	Slaughter cow prices 2/	Difference between prices of dairy & slaughter cows
		Dollars per head	
1970	332	256	76
1971	358	259	99
1972	397	303	94
1973	496	394	102
1974	500	307	193
1975	412	253	159
1976	476	304	172
1977	504	304	200
1978	674	441	233
1979	1,044	601	443
1980	1,195	549	646
1981	1,201	503	698
1982	1,100	480	620
1983	1,020	472	548
1984	895	478	417
1985	861	460	401
1986	821	446	375
1987	917	538	379
1988	986	567	419
1989	1,027	589	438

1/ Price per head received by farmers. Agricultural Prices. U.S. Dept. Agr., National Agricultural Statistics Service, various issues.

2/ Hundredweight price of utility cows at Omaha times 12 cwt per cow. Livestock, Meat and Wool Market News: Weekly Summary and Statistics. U.S. Dept. Agr., Agricultural Marketing Service, various issues.

Figure 3
During the 1980's, farmers continued producing more milk even as real prices declined



1/ Price received by farmers, adjusted for inflation.
Source: Dairy Situation and Outlook, DS-414, U.S. Dept. Agr., Econ. Res. Serv., Apr. 1988.

injections of bST increase milk production. The increased milk production is not without costs; additional nutrients and more management expertise are required to obtain the most benefits from bST. Studies suggest that even with additional feed and management costs, dairy farmers can obtain more milk at less cost per cwt using the product.

bST is the latest in a series of output-enhancing and cost-reducing technologies in the dairy industry. The bulk tank, improved parlor designs, automatic feeding systems, artificial insemination, DHIA (dairy herd improvement associations), embryo transfers, and 3X (three times per day) milking have all contributed to increased production and reduced milk production costs. The major difference in the case of bST is its biotechnological origin, and its appearance at a time when the industry had just come out of a lengthy debate concerning surplus milk production.

As of January 1990, bST was not yet commercially available. The Food and Drug Administration (FDA) must certify the safety and efficacy of the product prior to commercial release. Safety of milk and meat consumption by humans as well as safety of bST use on cows, in the environment, and in bST manufacturing must be assured. As of this time, only the safety of meat and milk consumption from bST-treated cows has been determined. Completed review of the product is likely in the early 1990's.

There is much debate as to the need for a product such as bST. Some farmers, consumer groups, dairy cooperatives, and State legislators have taken stands opposing bST. National policymakers have also expressed some concerns. Economic analyses of the effects of the product are, by necessity, speculative. Analyses over time suggest that the impacts on the industry will be more modest than early studies suggested. As the latest in a long series of technological advances in the industry, bST reinforces, but does not fundamentally change, long-term trends in the dairy industry.

Demand for Dairy Products

Milk demand is comprised of the purchases of many products, primarily fluid milk, cheese, butter, and nonfat dry milk. In periods when the industry is near a supply-demand balance, about half of the milk supply is used in fluid milk products and the remainder in manufactured dairy products. The roles of the various dairy products in the diet differ as to trends in their use. Thus, the demand for raw milk depends on both the product mix at a given time and the demand characteristics of individual products.

Changes in Commercial Use

Per capita commercial use of all dairy products has shown little change since 1970 (app. table 5). This is in contrast to the downward trend of more than 1 percent per year during the 1960's. Total commercial disappearance in 1988 was 26 percent greater than in 1970, primarily due to increased population. Per capita fluid milk sales have decreased by an average of 2.7 pounds (about 1 percent) per year, reflecting an annual 6.5-pound average drop in whole milk use partially offset by a 3.8-pound increase in sales of lowfat milk.

The downtrend in fluid milk sales was accelerated during the 1970's and 1980's by changes in the age distribution of the population. The population bulge resulting from the post-World War II baby boom has moved beyond the peak milk-consuming ages to the lowest consuming age bracket. Consumers began shifting from whole milk to lowfat milk in the early 1960's. In 1970, lowfat milk accounted for 19 percent of fluid milk sales and by 1988 it reached 53 percent. The past erosion of the fluid milk market has been fairly steady despite declining relative milk prices. However, demographic shifts indicate that the rate of decline in use per person might slacken.

Growth in commercial cheese use has been very important to the dairy industry over the past 25 years. Cheese production has used more than a fourth of the market supply of milk in recent years, compared with less than an eighth in 1960. Per capita consumption of American cheese grew about a fourth of a pound each year during 1970-88, while consumption of other varieties rose about half a pound per year. Over half the growth in sales of other cheese varieties (about a third of the total growth) came from mozzarella, used in making pizza. Most of the

expansion in cheese sales has been in natural forms; per capita sales of processed cheese items have risen only slightly.

Among the attributes of cheese that appear to be aligned with changing life-styles are convenience in use, the range of flavors and textures, storability, and affordability. Increased consumption of food away from home, such as pizza and salads, has also increased cheese sales. Acceptable alternative cheeses have been developed for consumers concerned about the high fat or salt content of some traditional varieties.

Demand for butter appears to have stabilized since the early 1970's after declining for decades. Changes in use over the past two decades seem to have been related mostly to changes in butter prices relative to margarine. Per capita sales will most likely be fairly stable at slowly declining relative prices. Both butter and cream demands are potentially vulnerable to concerns raised by recent dietary studies.

Progressive replacement of butter by margarine has apparently ended. Since 1974, market shares of butter and margarine have fluctuated but have shown little trend. Civilian per capita butter consumption appears to have stabilized at about 4.5 pounds and margarine at about 10.5 pounds. Butter sales, however, are still sensitive to relative prices of the two products.

Commercial use of nonfat dry milk has decreased. Per capita sales in 1988 were less than half those of 1970. Sharp declines were registered for almost every significant end use.

While nonfat dry milk sales have declined, production and use of whey products--particularly whey protein concentrates--have expanded. Increased cheese production and environmental regulations that limit whey disposal have combined to enable whey protein concentrates to fill the role (formerly held by nonfat dry milk) of an inexpensive source of very high quality protein. Increased demand for whey products has only a minor impact on overall milk demand since it primarily involves recovery of milk components not currently used.

Since 1970, per capita use of ice cream has remained unchanged, while per capita sales of ice milk and sherbet have slipped slightly. Use of mellorine (frozen dessert made with vegetable oil) has decreased substantially.

The Dairy and Tobacco Adjustment Act of 1983 authorized a dairy product promotion and research program. It is designed to strengthen the dairy industry's position in the marketplace and to maintain and expand domestic and foreign markets and uses for U.S. fluid milk and dairy products. The program is funded by an assessment of 15 cents per cwt on all commercially marketed milk. Collections under the program for 1988 totaled approximately $215 million.

Consumption Response to Changes in Prices and Incomes

Dairy product sales respond relatively little to price changes, at least in the short run. A 10-percent decline in retail prices will increase sales of fluid milk by only about 2 percent. Butter and cheese sales would increase the most, perhaps 7-8 percent, with other products falling in between. Total commercial use would be expected to rise about 3 percent if retail prices fell 10 percent.

This low level of shortrun demand response to price changes (price inelasticity) has several ramifications. First, small variations in milk output will result in substantial price movements as long as prices are determined by the market. Second, total consumer expenditures for dairy products vary directly and almost proportionately with price level. For example, a 10-percent increase in retail prices will result in a decrease in consumption of 3 percent and an increase in consumer expenditures of about 7 percent. Third, the small consumer responses to price are difficult to observe because they can easily be veiled by demographic changes, changes in consumer preferences, and other factors. According to economic theory, consumers are more responsive to prices in the long run than in the short run.

Some dairy products are affected more by incomes and general economic conditions than others, although the effects are relatively small in all cases. In general, fluid milk sales are not changed significantly by income changes. Butter consumption and cheese consumption are both positively related to income, but the effect is small. Sales of both of these products in recent years have varied with the state of the economy.

Substitute Products

Substitute dairy products have significantly affected demand for butter and, to a lesser extent, cheese. Margarine had taken most of the table spread market by the early 1970's. More recently, imitation cheese (cheese made with vegetable fat and casein) had absorbed part of the growth in the cheese market. Census of Manufactures data indicate that cheese substitutes (products substituting for natural and processed cheese) totaled 449.4 million pounds in 1987, compared with 227.1 million pounds in 1982. This was about 8 percent of total cheese production in 1987 and 5 percent in 1982.

Other substitute products have had only slight effects on dairy product demand. Whipped toppings and coffee whiteners have significant markets but cream sales have grown slightly since the introduction of these substitutes. Sales of products such as filled and imitation milk, vegetable fat frozen desserts, and filled evaporated milk have fallen after some initial success.

Processing

The dairy processing industry has undergone marked change in recent decades, with substantial gains in efficiency and reductions in real costs. Changes in the industry in recent decades include: fewer but larger plants, increased importance of producer cooperatives, and regional shifts precipitated by population shifts and shifts in milk production in excess of fluid sales. The number of plants producing cottage cheese and butter dropped over 90 percent from 1950 to 1988. Hard cheese and ice cream plants declined by approximately three-fourths and nonfat dry milk plants by over 80 percent (table 4). In 1988, average output per plant was over 15 times the 1950 level for butter and cheese, about 7 times for nonfat dry milk and ice cream, and 18 times for cottage cheese. Automation and technological advances, such as continuous churns, have increased economies of size in processing. However, changes in assembly and distribution costs were probably of equal importance.

Dairy producer cooperatives have become an important part of the manufactured dairy products sector. Between 1973 and 1987, cooperatives' share of total production rose from 35 to 45 percent for cheese and from 85 to 91 percent for dry products, while increasing from 60 to 83 percent for butter. Cooperatives' share of fluid products and cottage cheese stabilized at about 14 percent and 13 percent, respectively, while their share of ice cream was about 8 percent in 1987 (app. table 6).

Important factors underlying the increased role of cooperatives include the transfer of the fluid milk procurement and daily and seasonal balancing functions to cooperatives, a perceived need for cooperatives to assure members of an outlet for all their milk, a desire to control more of the value added to milk, and the tendency of large traditional dairy corporations to specialize in dairy merchandising and to diversify into other

Table 4--Number of dairy product manufacturing plants, selected years

Product	1950	1970	1980	1983	1988
			Number		
Hard cheese	2,158	963	737	696	573
Butter	3,060	622	258	222	165
Nonfat dry milk (human food)	459	219	113	101	76
Hard ice cream	3,269	1,628	949	862	765
Cottage cheese curd	1,900	593	269	240	185

Source: Dairy Products, Annual Summary. U.S. Dept. Agr., National Agricultural Statistics Service, various issues.

products. As indicated above, cooperative integration into fluid and soft manufactured products has been considerably more modest.

Supermarket chains have also increased their manufacturing capacity, with fluid milk processing increasing from 3 percent of total sales in 1964 to almost 18 percent in 1980. Their share of relatively modern capacity is considerably higher, but food chain involvement in fluid milk processing seems to have declined somewhat since 1980 as a result of a few chains selling off bottling plants.

The dairy industry moved from a relatively well-balanced supply-demand situation in 1978, when dairy product removals by the Commodity Credit Corporation (CCC) were 2.3 percent of total milk marketings, to a point where over 12 percent of U.S. milk marketings were purchased by CCC in 1983. From 1984 through 1989, the average was 6.8 percent (app. table 7). In the process of generating excess milk supplies, both the milk production and processing sectors attracted additional fixed resources which increased capacity. In the mid-1980's, a financial and structural adjustment was necessary, especially in the milk production and manufactured dairy products industries, to achieve an overall supply-demand balance.

Structural adjustment especially affected the manufactured dairy products industry. Excess capacity developed because fluid milk consumption remained relatively stable while total milk marketings increased from 119 billion pounds in 1978 to nearly 143 billion pounds in 1989. The effect has varied across regions since the buildup of milk supplies was not geographically uniform. The Southeast, Corn Belt, and Plains regions increased production relatively little compared with the major milk production States of New York, Pennsylvania, Wisconsin, and California. Milk production generally shifted toward the West and Southwest, especially California.

Limited plant capacity curtailed expansion of milk production in California during the early 1980's. However, even though large quantities of California butter, nonfat dry milk powder, and cheese were sold to the CCC, a high proportion of cheese consumed in California was imported from out-of-State, especially from Wisconsin. The California dairy industry has since moved to increase its cheese manufacturing capacity. In turn, California milk production increased 43 percent from 1980 to 1989, while U.S. milk production increased 12 percent over this same period.

Milk production shifts and aggregate levels cause some adjustment problems for the fluid milk processing industry in some regions, but the manufactured dairy products industry is generally affected the most. This is because fluid milk product sales are fairly stable, accounting for about half of overall milk supplies. Therefore, reductions/increases in milk production will result in drops/jumps of twice that proportion in milk supplies available for processing into manufactured dairy products.

Trends in World Dairy Trade

International trade of agricultural commodities is under continual debate. But the current round of multilateral trade negotiations under the auspices of the GATT (General Agreement on Tariffs and Trade) has made agricultural trade a high-priority issue.

Every major developed dairy-producing nation operates government programs regulating its domestic dairy industry. Many subsidize part or all of domestic production, imports are commonly restricted, and exports are frequently subsidized. There have been significant strides taken in some major producing countries to address dairy industry problems in the last several years, mostly to reduce the burdens of excess milk supplies and the associated costs to government of handling the excess. The implementation of production quotas in the European Community (EC-12) in 1984 and legislation authorizing the milk diversion program and the dairy termination program in the United States are examples of alternative approaches for attacking the excess supply issue. In addition to the voluntary supply management programs, the United States implemented a flexible dairy price support mechanism.

Dairy trade is small relative to total world milk production. World milk production in 1988 was approximately 430 million metric tons, an estimate that covers about 90 percent of world production. From 1985 to 1988, world production grew by just over 3 percent. If intra-EC trade is excluded, about 5 percent of world production (milk equivalent) is traded, a world market slightly greater than 40 percent of 1988 U.S. milk production.

High dairy price supports in many countries tended to stimulate production to the extent that subsidized exports were required to maintain domestic dairy programs. The subsidized sale of butter by the EC to the Soviet Union is one example. The implementation of production quotas in the EC in 1984, which did not lower price supports, dramatically reduced the world's largest dairy product surpluses.

From 1985 to 1988, exports of the three major manufactured dairy products--butter, cheeses, and nonfat dry milk (NFDM)--were made primarily by countries with high dairy price support: the EC, other Western European nations, Canada, and the United States (table 5). An interesting feature of the data is that although surpluses of dairy products have been reduced in the European Community, it is still the major exporting area for the three major manufactured dairy products. U.S. participation in international markets, based on export shares, has fallen as butter and NFDM exports have declined.

As a result of export subsidies, international prices for manufactured dairy products were below what they would have been

Table 5--Average exports and market shares for butter, cheese, and nonfat dry milk, 1984-88

Item	Butter			Cheese			Nonfat dry milk		
	1984-85	1986-87	1988	1984-85	1986-87	1988	1984-85	1986-87	1988
	1,000 metric tons								
Average annual exports 1/	853	902	1,050	858	811	830	1,186	1,144	1,206
	Percent								
Shares: 1/									
EC 2/	45	51	57	48	45	46	26	29	51
Other Western Europe	5	4	3	20	19	18	5	4	2
United States	8	4	2	3	3	2	31	35	16
Canada	*	*	0	1	1	1	6	5	5
New Zealand	25	25	23	7	8	13	20	16	15
Australia	2	9	5	11	12	9	6	7	6
Total	88	93	90	90	88	88	94	96	96

*=Less than 0.5 percent.

1/ Excluding intra-EC trade.

2/ EC-10 in 1984-85, expanded to EC-12 in 1986 with inclusion of Portugal and Spain.

Source: World Dairy Situation. Circular Series FD 2-89. U.S. Dept. Agr., Foreign Agricultural Service, Nov. 1989.

in the absence of such subsidies. As surplus products available for exports have declined, international prices have strengthened considerably (table 6). The announced government purchase prices by the CCC in 1988 for butter, $2,900 per metric ton, and cheese, $2,540 per metric ton, were closer to international prices than in previous years. The U.S. price of $1,600 per metric ton for NFDM was actually below the international price which resulted in the commercial export of NFDM without government assistance.

Restrictive import quotas have been used by the United States to prevent lower cost and subsidized dairy products from undercutting U.S. dairy price supports. The import quotas on manufactured dairy products, which have essentially been fixed since the Tokyo round of GATT, limit imports to about 2.5 billion pounds milk equivalent, just under 2 percent of U.S. milk production in 1989. Under restrictive import quotas, consumers pay more for all dairy products than they would under lesser restrictions. The dairy product quotas, authorized by Section 22 of the Agricultural Adjustment Act of 1933, as amended, may be implemented, adjusted, or eliminated only by the President, usually based on the findings and recommendations of the International Trade Commission (ITC).

Imports of butter, NFDM, and American-type and processing cheeses compete directly with domestically produced products and displace

Table 6--International prices for butter, cheese, and nonfat dry milk, f.o.b. Northern Europe and selected world ports

Period	Butter	Cheese	NFDM
	U.S. dollars per metric ton		
1985:			
Spring	950-1,050	1,100-1,250	600-680
Fall	1,000-1,050	1,150-1,275	600-650
1986:			
Spring	1,050-1,150	1,100-1,200	680-720
Fall	800-1,100	1,000-1,100	680-720
1987:			
Spring	750-1,100	900-1,200	760-840
Fall	900-1,150	1,000-1,300	890-1,150
1988:			
Spring	1,150-1,350	1,250-1,500	1,150-1,550
Fall	1,350-1,500	1,800-2,050	1,750-2,050
1989:			
Spring	1,650-1,900	1,750-1,950	1,750-2,000
Fall	1,800-2,000	2,000-2,150	1,750-1,900

Source: World Dairy Situation. Circular Series FD2-89. U.S. Dept. Agr., Foreign Agricultural Service. Nov. 1989.

them roughly pound-for-pound. Specialty cheese, the bulk of U.S. dairy product imports, compete less directly with domestically produced cheeses. It is unlikely that restricting imports of some specialty cheeses would result in increased sales of similar domestically produced cheeses of the same magnitudes.

Imports of casein are problematic. For some food products, there is direct substitution of imported casein for domestically produced dairy products such as nonfat dry milk. Restricting casein imports which enter nonfood uses--for example, glue and paint production--would not contribute to an increase in demand for U.S. domestic dairy products because there is no casein production in the United States and other dairy products are not good substitutes for casein in industrial uses.

Policy actions by major developed dairy-producing nations affect the international dairy trade more than any "market" determinations. The small size of international trade relative to the domestic dairy industries of these countries contributes to the dependence. The environment generated by the current multilateral trade negotiations has in turn led to a situation where the debate on U.S. domestic dairy policy and programs will include both domestic and international issues more than ever before.

International Trade Outlook

The current situation in international dairy markets owes much to the policy actions of two of the major developed dairy-producing areas: the European Community (EC-12) and the United States. The implementation of production quotas in the EC-12 and the implementation of voluntary supply management programs and a flexible dairy support mechanism in the United States led to reduced stocks in both areas. As stockpiles decreased, international prices strengthened to the extent that the United States was able to export dairy products, particularly nonfat dry milk, on a commercial basis (with no Government subsidy).

The rather sudden availability of an international market for U.S. dairy products added a certain amount of volatility to the domestic industry. With a continuation of program provisions implemented under the 1985 Act, the United States would periodically have commercial export opportunities. Those opportunities would depend to a large extent on the maintenance of export "discipline" on the part of the EC-12. Even if domestic supply shifts in the United States were to ease, the international prices for dairy products would provide a realistic floor under domestic U.S. prices.

History of Dairy Programs

The U.S. dairy industry, while subjected to more Government participation or regulation than most other domestic agricultural industries, is less regulated than the dairy industries in many other developed countries. The price support program authorized by the Agricultural Act of 1949 and the Federal milk marketing order program authorized by the Agricultural Marketing Agreement Act of 1937 are the principal domestic dairy programs. With relatively high support prices compared with world prices, and because exports are subsidized by many countries, import quotas are imposed to keep imports of dairy products from overwhelming the dairy price support program. Federal policy has also fostered the growth of dairy cooperatives to promote the balance of market power between dairy farmers and those who buy from them.

The Dairy Price Support Program

The dairy price support program supports the milk price received by farmers through purchases of butter, nonfat dry milk, and American cheese. Purchase prices for the products are set at levels designed to enable manufacturers to pay farmers the announced support price for milk in surplus production periods.

In the Agricultural Act of 1949 and subsequent amendments to that act, Congress specified three major guidelines for the operation of the price support program. First, it provided for minimum and maximum levels at which farm milk prices were to be supported based on parity price guidelines. For many years, the minimum support price was 75 percent and the maximum was 90 percent of

parity. (Legislation in 1981 departed from the parity concept for the first time and parity has not been used as a basis for establishing dairy price supports since then.)

Second, the program authorizes the Secretary of Agriculture to determine the specific price support level within the minimum and maximum prices specified in the legislation. The objective of the support program is to support the price of milk at a level that will assure an adequate supply of "...milk to meet current needs, reflect changes in the cost of production, and assure a level of farm income adequate to maintain productive capacity sufficient to meet anticipated future needs."

Third, the legislation specified that the price of milk would be supported through purchases of milk and milk products. Since milk is a bulky, perishable product, the Government cannot reasonably buy raw milk. Therefore, the U.S. Department of Agriculture, through the CCC, purchases all the butter, nonfat dry milk, and cheese offered by processors at announced prices. These products are widely produced and take about two-thirds of the milk used in manufactured dairy products. The prices received by individual dairy farmers depend upon many factors other than the support level, including plant location, product manufactured, quantity of milk delivered, local competition, and plant operating efficiency.

The purchase prices announced by the CCC for butter, nonfat dry milk, and cheese include "manufacturing (make) allowances" or margins to cover the costs of processing milk into these products. These margins are administratively set at a level which should allow processors to pay, on average, dairy farmers at least the announced support price for Grade B milk. Prices to farmers for manufacturing grade milk are free to move above the support level if supply and demand conditions warrant. This occurred in the short-supply portion of the marketing season of most years until 1980 and, at times, even during the flush season.

In 1989, manufacturing grade milk prices ran substantially above the support level. They were below the support level, however, during much of the early and mid-1980's. The short-supply season usually occurs in October and November when milk production reaches a seasonal low point and fluid product demand is seasonally highest. The flush season normally occurs in May and June when milk production reaches its seasonal peak and fluid milk product sales are declining seasonally.

The Food and Agriculture Act of 1977 provided that, for the 2 marketing years beginning October 1977, the Secretary would adjust the support price of milk semiannually after the beginning of the marketing year to reflect any estimated change in the parity index during the semiannual period. These provisions were extended in 1979 for 2 more years.

Before 1977, support prices were set annually for the upcoming marketing year. However, support prices during the mid-1970's

generally were also raised during the year to account for rapid inflation. The Food and Agriculture Act of 1977 required a midyear adjustment in the support price to reflect changes in the parity index during the first 6 months of each marketing year. This had the effect of raising the support prices in the middle of the marketing year to reflect increases in the index of prices paid by farmers. At the administration's request, the first step toward bringing supplies back into line with consumption was taken when legislation was enacted on March 31, 1981, which rescinded the scheduled April 1, 1981, increase in the support price. Figure 4 shows the effects on cow numbers of the income-enhancing features of the Food and Agriculture Act of 1977 and the various steps required in later years to bring the industry closer to market equilibrium.

The Agriculture and Food Act of 1981, passed at a time of large surpluses, used a set of triggers relating the minimum support level to the size of CCC purchases. This was a major departure from traditional price support policy under which price changes were tied directly to parity. As long as large CCC purchases continued, the support prices were specified in dollar terms with the 1981-82 price at the 1980-81 level of $13.10 per cwt, which was 72.9 percent of parity in September 1981, and modest

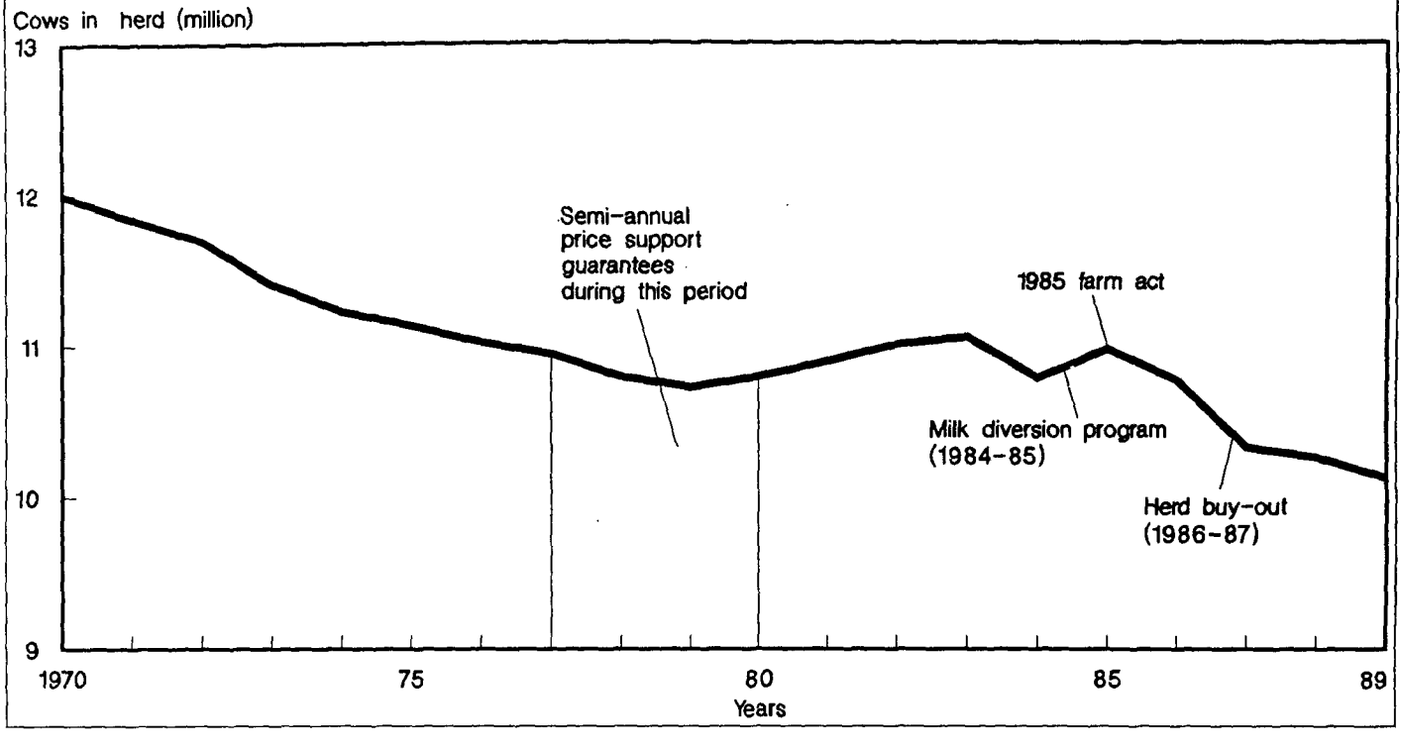
FEDERAL PRICE SUPPORT PURCHASES

The Federal Government supports milk prices through purchases of butter, nonfat dry milk, and cheddar cheese. The following example illustrates the connection between the prices USDA pays for these dairy products and the price support rate for milk, which was $10.10 per hundredweight (cwt) effective January 1, 1990.

Smith and Jones are average dairy farmers living near Plainville, USA. Smith sells milk to the local processing plant that makes butter and nonfat dry milk. For each hundredweight (100 pounds) of milk he sells, the plant makes 4.48 pounds of butter and 8.13 pounds of nonfat dry milk. With the CCC prices of butter and nonfat dry milk set at $1.0925 and 79 cents per pound, respectively, the products made from Smith's 100 pounds of milk are worth $11.32. However, the plant's allowance for the cost of manufacturing these products is $1.22 per cwt, leaving $10.10 to Smith for his milk.

Jones sells milk to the cheese plant on the other side of town. For every hundredweight of milk purchased, the plant manufactures 10.1 pounds of cheese with some whey solids left over. The CCC pays about $1.11 per pound for the cheese. The fat in the whey solids is worth 27 cents, making the market value of the products made from Jones' milk equal to $11.47. Since the plant's allowance for manufacturing the cheese is $1.37 per cwt, Jones receives $10.10 per cwt for the milk.

Figure 4
Milk cow numbers affected by prices and policy actions



increases thereafter. Only if surpluses declined to stated levels would supports at 70-75 percent of parity be required.

With continued surpluses, legislation was enacted in 1982 which froze support prices for 2 years and provided for deductions totaling $1 per cwt from milk producers' marketing receipts to partially offset rising Government costs. The 1983 Dairy and Tobacco Adjustment Act lowered the minimum price support level from $13.10 to $12.60 effective December 1, 1983. It allowed for a further reduction in support of 50 cents per cwt on April 1, 1985, if net Government purchases in the succeeding 12 months were projected to be above 6 billion pounds milk equivalent. It further allowed the Secretary to reduce the support price another 50 cents on July 1, 1985, if net Government purchases in the succeeding 12 months were projected to be above 5 billion pounds. Alternatively, the Secretary had authority to increase the support levels by not less than 50 cents per cwt on July 1, 1985, if net Government purchases in the next succeeding 12 months were projected to be 5 billion pounds or less milk equivalent.

The 1983 Act also amended the 1949 Act to provide for a milk diversion program. For the period December 1, 1983, through March 31, 1985, a mandated assessment of 50 cents per cwt was made on all milk marketed for commercial use by U.S. producers in the 48 contiguous States. The funds collected were used to partially offset the cost of the program. Producers who elected to participate in the program and reduce their milk marketings

between 5 and 30 percent below their base period production were paid $10 per cwt for these reductions. The 1983 Act also authorized a nonrefundable 15-cent-per-cwt assessment on milk marketed by producers to finance a dairy product research and promotion program.

The 1949 Act was again amended by the Food Security Act of 1985 authorizing a voluntary dairy termination program, also known as the whole-herd buyout, in which producers could submit competitive bids during the period of April 1, 1986, through September 31, 1987, to remove milk production for at least 5 years.

The 1985 Act continued the dairy support price of $11.60 per cwt for milk containing 3.67-percent milkfat (originally established at this level on July 1, 1985) for calendar year 1986 and established the support price at $11.35 per cwt for January 1 through September 30, 1987, and $11.10 per cwt for October 1, 1987, through December 31, 1990.

Changes in dairy price supports on January 1, 1988, 1989, and 1990, were linked to projected annual Government purchases. The Secretary of Agriculture is to reduce the support price 50 cents per cwt if net price support purchases in any of these respective calendar years are projected to exceed 5 billion pounds milk equivalent or increase the support price 50 cents per cwt if net purchases are projected at not more than 2.5 billion pounds milk equivalent. Because it was estimated that net purchases would exceed 5 billion pounds in calendar year 1988, the support level was reduced to $10.60 per cwt on January 1, 1988.

Other provisions of the 1985 Act included a 40-cent per cwt assessment on all milk marketed within the 48 contiguous States during April 1 through December 31, 1986, and 25 cents per cwt during January 1 through September 30, 1987. However, to reduce outlays required by the Balanced Budget and Emergency Deficit Control Act of 1985 (The Gramm-Rudman-Hollings Act), the Food Security Improvement Act of 1986 further amended the 1949 Act to provide an additional 12 cents per cwt deduction for the period April 1, 1986, through September 30, 1986. The Omnibus Budget Reconciliation Act of 1987 required a 2.5-cent per cwt assessment for calendar year 1988.

The 1985 Act required the Secretary to offer at least 1 million pounds of surplus nonfat dry milk on a bid basis for manufacture into casein 1/, and to establish a program to encourage additional exports of dairy products. To avoid burdensome supplies, the Secretary was also provided the option to establish a milk diversion or milk production termination program for calendar years 1988, 1989, or 1990.

1/ Due to the lack of interest on the part of the dairy industry, this program was discontinued in marketing year 1987-88. CCC accepted only one offer in 1986-87, totaling 79,926 pounds of nonfat dry milk.

The 1985 Act also legislated higher minimum Class I differentials in 35 of the 44 Federal milk orders that were operating in May 1986 (table 7). Most of these increases were in milk-deficit southern markets.

Drought relief legislation passed in mid-1988 prohibited any January 1, 1989, reduction in the support price. It also required a 50-cent increase on April 1, 1989, to be followed by a 50-cent reduction on July 1, 1989. The support price was reduced to $10.10 per cwt on January 1, 1990. See the box for highlights of price support actions over the past two decades.

MAJOR PRICE SUPPORT ACTIONS, 1970-90

1970-72	Support prices set at levels above the minimum of 75 percent of parity.
1970	The Agricultural Act of 1970 suspended the obligation to support prices of farm-separated cream.
1973	The Agricultural and Consumer Protection Act of 1973 set a minimum support level of 80 percent of parity through March 1974.
1974-77	Support prices adjusted frequently because of rapid inflation. No support price lasted more than 9 months. Support prices set at 80 percent of current parity.
1977	The Food and Agriculture Act of 1977 set a minimum of 80 percent of parity. It also required that the support price be adjusted semi-annually to reflect changes in prices paid by farmers. These provisions were to be in effect for 2 years.
1979	The support price provisions of the 1977 Act were extended for 2 additional years.
1981-82	The support price was frozen at $13.10 per cwt in effect since October 1, 1980.
1981-83	The Omnibus Budget Reconciliation Act of 1982 authorized a 50-cent deduction on all milk marketed that was first collected in April 1983. An additional 50-cent deduction, implemented on September 1, 1983, was refundable to producers who reduced marketings by a specified amount.
1984-85	The Dairy and Tobacco Adjustment Act of 1983 lowered the support price to $12.60 effective December 1, 1983. A 50-cent deduction was continued through March 1985. A dairy diversion program, operated between January 1984 and March 1985, paid contracting producers $10 per

Most of the legislative changes made during the early and mid-1980's were attempts to reduce the supply of excess milk and cut Government purchases and costs. In 1983, dairy farmers produced over 10 percent more milk than consumers were willing to buy at the supported prices. However, with strengthening international dairy product prices, the United States has become a significant participant in international markets and the persistent excess milk supply problem has been reduced. However, commercial export sales of manufactured dairy products by the United States will likely continue to be dependent on policy actions taken by both the United States and other countries, particularly the EC.

cwt for reductions from base milk marketings. The support price was reduced 50 cents on both April 1, 1985, and July 1, 1985, because purchases were projected to exceed trigger levels.

1986-90 The Food Security Act of 1985 set the support price at $11.60 for calendar 1986, $11.35 for January-September 1987, and $11.10 thereafter. On January 1 of 1988, 1989, and 1990, the support price had to be adjusted by 50 cents if projected removals exceeded 5 billion pounds or were less than 2.5 billion pounds. The first such reduction was implemented on January 1, 1988. Deductions were set at 40 cents during April-December 1986 and at 25 cents during January-September 1987. Additional deductions, authorized to help reduce budget deficits, were 12 cents during April-September 1986 and 2.5 cents during calendar 1988.

A January 1, 1989, support price reduction was prohibited by drought relief legislation passed in mid-1988. It also required a 50-cent increase on April 1, 1989, followed by a 50-cent reduction on July 1, 1989. On January 1, 1990, the support price was reduced another 50 cents to $10.10 per cwt.

The Food Security Act also authorized the dairy termination program. Producers whose bids were accepted agreed to slaughter or export all female dairy cattle, have no interest in milk production or dairy cattle for 5 years, and ensure that their facilities were not used for these purposes during that time. Those producers, who had marketed more than 12 billion pounds of milk during 1985, left the industry during April 1986-August 1987.

The act increased Class I differentials in most Federal milk marketing orders, effective May 1, 1986. These differentials were not to be altered for a period of 2 years. As of February 1990, the congressionally mandated differentials remained in place.

Table 7--Class I differentials under the 1985 Food Security Act 1/

Federal order	Differential		Increase
	Pre-Food Security Act	Food Security Act	
	Dollars per cwt		
New England	3.00	3.24	0.24
New York-New Jersey	2.84	3.14	.30
Middle Atlantic	2.78	3.03	.25
Georgia	2.30	3.08	.78
Alabama-West Florida	2.30	3.08	.78
Upper Florida	2.85	3.58	.73
Tampa Bay	2.95	3.88	.93
Southeastern Florida	3.15	4.18	1.03
Upper Michigan	1.35	1.35	0
Southern Michigan	1.60	1.75	.15
E. Ohio-W. Pennsylvania	1.85	2.00	.15
Ohio Valley	1.70	2.04	.34
Indiana	1.53	2.00	.47
Chicago	1.26	1.40	.14
Central Illinois	1.39	1.61	.22
Southern Illinois	1.53	1.92	.39
Louisville-Lexington-Evans	1.70	2.11	.41
Upper Midwest	1.12	1.20	.08
Eastern South Dakota	1.40	1.50	.10
Black Hills	1.95	2.05	.10
Iowa	1.40	1.55	.15
Nebraska-Western Iowa	1.60	1.75	.15
Kansas City	1.74	1.92	.18
Tennessee Valley	2.10	2.77	.67
Nashville	1.85	2.52	.67
Paducah	1.70	2.39	.69
Memphis	1.94	2.77	.83
Central Arkansas	1.94	2.77	.83
South West Plains	1.98	2.77	.79
Texas Panhandle	2.25	2.49	.24
Lubbock	2.42	2.49	.07
Texas	2.32	3.28	.96
Louisiana	2.47	3.28	.81
New Orleans-Mississippi	2.85	3.85	1.00
Eastern Colorado	2.30	2.73	.43
Western Colorado	2.00	2.00	0
S.W. Idaho-E. Oregon	1.50	1.50	0
Great Basin	1.90	1.90	0
Lake Mead	1.60	1.60	0
Central Arizona	2.52	2.52	0
Rio Grande Valley	2.35	2.35	0
Puget Sound-Inland	1.85	1.85	0
Oregon-Washington	1.95	1.95	0

1/ Increased differentials effective May 1, 1986. May be changed by normal procedures after May 1, 1988.

Dairy Program Costs

Nominal costs for price supports ranged from $69 million to $612 million between 1952-53 and 1972-73, averaging $325 million for the period (app. table 8). Over the 1970's, outlays fluctuated, with greater variability in milk production. Since 1979-80, program costs have exceeded $1 billion in each year. In the 1982-83 marketing year, costs reached a record $2.6 billion, about 13 percent of total cash receipts from farm marketings of milk and cream, or an average of about $13,000 per commercial dairy farmer. Program costs for the 1988-89 marketing year were down to $698 million or an average of around $5,000 per commercial dairy farmer.

Dairy Price Support Program Issues

Since 1981, three major departures from traditional dairy price support policy have occurred. First, price supports were removed from parity. Second, voluntary supply management provisions were added. Finally, changes in dairy price supports on January 1, 1988, 1989, and 1990 were linked to projected annual Government purchases. Provisions of the Food Security Act of 1985 expire on December 31, 1990. The issues of whether or not the Congress will continue the flexible dairy price support program provisions or continue the Secretary of Agriculture's authority to establish another milk diversion or dairy termination program are problematic. Also, the mechanism by which price support level changes are triggered will likely be under scrutiny. The amount of discretion the Secretary is given on establishing the relative prices of butterfat and solids-not-fat may also be an issue.

The Federal Milk Marketing Order Program

The basic legislation of Federal milk marketing orders traces to the Agricultural Marketing Agreement Act of 1937 and to some extent the preceding Agricultural Adjustments Acts of 1933 and 1935. This basic legislation stemmed from the perceived need to provide milk producers some assistance in achieving and maintaining a degree of bargaining power over the prices they received for milk. The major objectives of the program, as stated in the 1937 Act, were: to establish and maintain orderly marketing conditions for agricultural commodities in interstate commerce; establish parity prices for farmers; protect the interest of the consumer; and avoid unreasonable fluctuations in supplies and prices.

Objectives, such as "orderly marketing," "parity prices," "interests of consumers," and "adequate supply," are general terms lacking specificity. The term "orderly marketing" is usually associated with stabilizing fluid milk prices, providing secure and dependable markets for individual Grade A farmers producing milk primarily for the fluid milk market, and improving the balance of market power between farmers and handlers. "Adequate supply" is usually associated with maintaining a reserve of Grade A milk for the fluid milk (beverage) market on a

seasonal, weekly, and daily basis that can be relied upon when the Grade A milk supply is short relative to fluid demand.

Minimum prices that must be paid by processors to dairy farmers or their cooperatives are set for Grade A (fluid grade) milk in markets where producers have elected to come under a Federal milk marketing order. The 41 Federal milk marketing orders operating on January 1, 1990, regulate the handling and pricing of about 70 percent of all milk sold to plants and dealers, and about 80 percent of the Grade A milk marketed in the United States (fig. 5). About 90 percent of the Nation's milk supply is Grade A and about 45 percent of all Grade A milk that is sold is used for fluid milk products (beverage milk). Federal orders regulate only Grade A milk (meeting the higher standard for fluid milk products).

Two major provisions of Federal milk orders are:

- o Classified pricing of milk according to use, and
- o Pooling or combining all revenue from the sale of regulated milk from which a single uniform or blend price is paid to producers.

Milk used for fluid products is designated Class I. Most orders have two other classes: Class II includes milk used for soft products including fluid cream, ice cream, cottage cheese, and yogurt; while Class III includes milk used for hard products including cheese, butter, and nonfat dry milk (fig. 6). Minimum class prices are established for all of the 41 Federal marketing orders on the basis of specified relationships to the average price of manufacturing grade milk in Minnesota and Wisconsin (M-W price), so they will automatically reflect changes in support prices when market prices are at or below support. With a few minor exceptions, Federal order prices for Grade A milk used in manufactured products are set at or near the M-W price base. Minimum prices for milk used in Class I (fluid milk products) are higher by fixed differentials unique to each Federal order.

Federal orders provide more equal treatment for producers and handlers (processors) who are similarly situated. For producers, marketwide pooling yields the same price to all producers at a given location. For handlers, classified pricing means the same price for milk in a given use at a given location.

The costs of operating a fluid milk market must be covered somehow and the costs must come out of the returns from fluid use, since the value of surplus milk used in manufactured products is no higher than the value of manufacturing grade milk. The above is the economic rationale for market orders. In addition, Federal orders can be used to raise returns to producers, either all or those in certain regions. Raising prices and returns above cost-justified levels will increase production and surpluses, as we saw in the 1980's. Thus, either lower prices or supply control systems are needed to achieve a reasonable supply-demand balance.

Figure 5

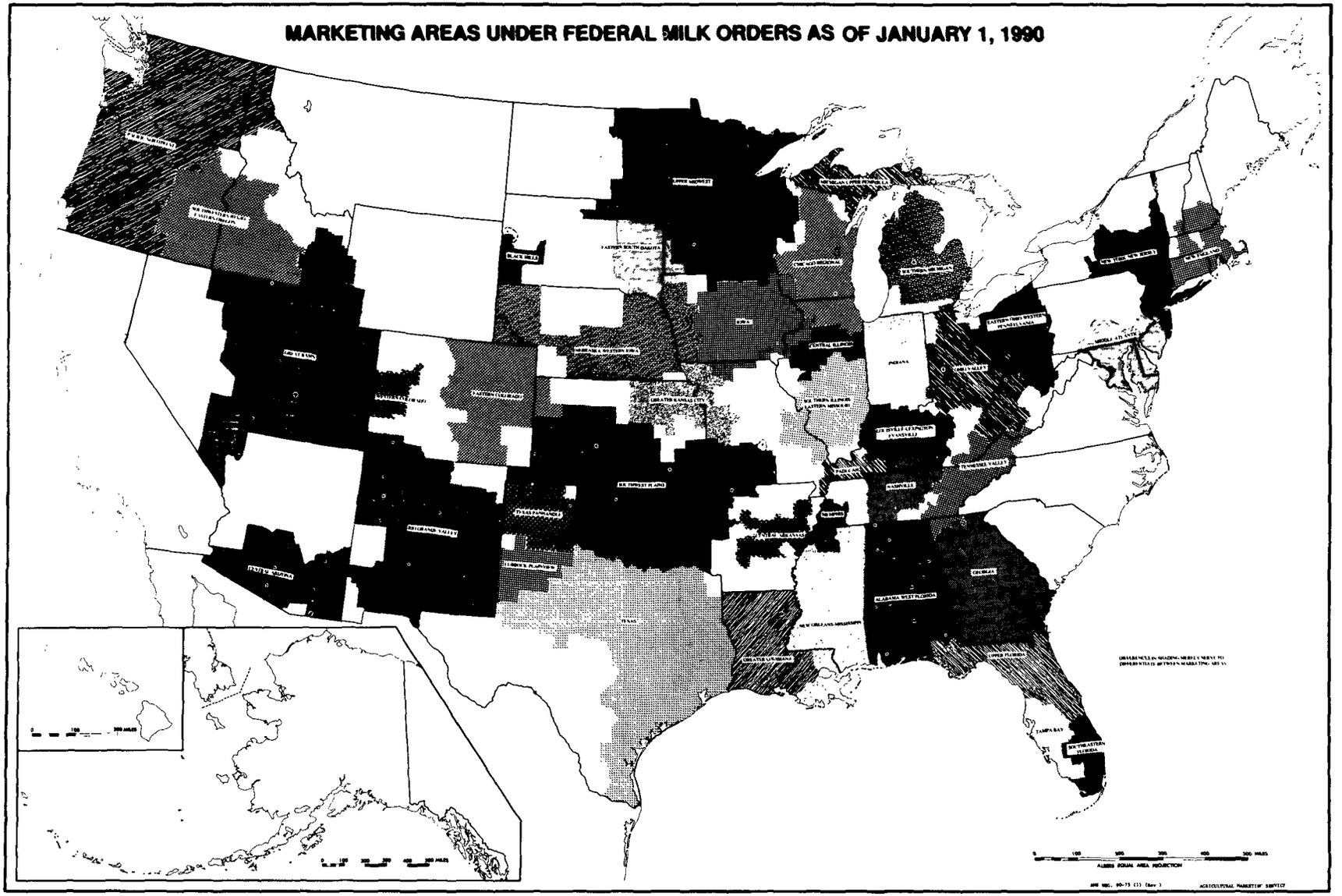
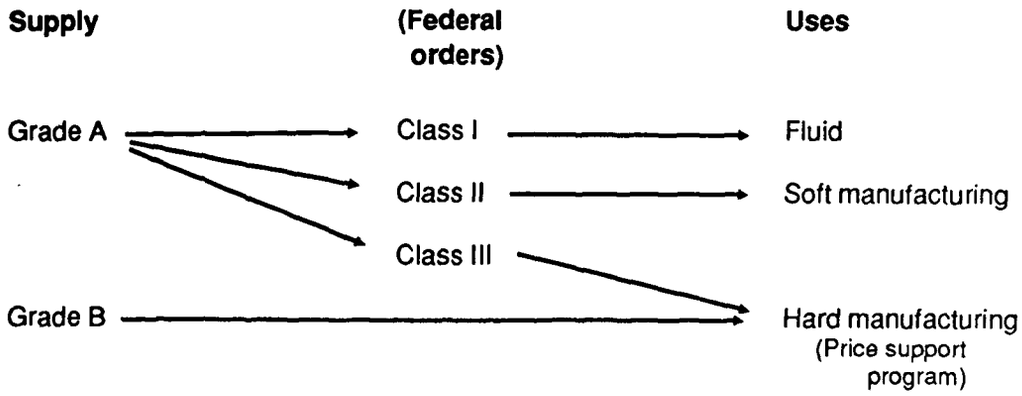

MARKETING AREAS UNDER FEDERAL MILK ORDERS AS OF JANUARY 1, 1990
ALBERS EQUAL AREA PROJECTION

Figure 6

Milk quantity flows



Since the 1950's, new interstate highways and improved transportation systems have allowed milk to be moved over longer distances. This has made fluid milk markets more interdependent and regional in nature. When Federal order pricing provisions were changed in the late 1960's to reflect this greater mobility, the Upper Midwest had the largest overall reserve supply of Grade A milk. Dairy farmers there produced more milk than could be consumed in the region. Over time, however, other areas of the country--such as southwest Missouri, Kentucky-Tennessee, and the Northeast--began developing Grade A milk supplies in excess of local fluid milk needs.

The 1985 Food Security Act legislated higher minimum Class I differentials in 35 of the 44 Federal milk orders that were operating in May 1986 (table 7). The higher Class I prices were raised the most in southern milk-deficit markets east of the Rockies. Until these changes became effective May 1, 1986, the basic structure of minimum Class I differentials, especially the portion designed to reflect transportation costs between markets, had remained unchanged since 1968.

The geographical structure of Class I differentials prior to May 1, 1986, corresponded closely to a basing point system with Eau Claire, WI, as the base. Moving from Eau Claire, minimum order Class I prices increased at a rate of about 15 cents per cwt per 100 miles, which was less than half of actual transportation costs since the increased fuel costs in the mid-1970's. Actual Class I prices paid by handlers usually exceed the minimum order prices in most markets by the amount of over-order payments negotiated between cooperatives and fluid milk processors. This price premium reflects the fine-tuning of prices to cover transportation costs not covered in Federal order minimum prices; additional costs of standardizing milk to a customers' needs in form, time, and place; and, in some cases, a pure negotiated price premium that may not be cost-related.

Multiple Price Basing Points

Since the late 1960's and continuing through the 1980's, Eau Claire, WI, has been considered the focal point of Grade A milk supplies in excess of that area's needs for fluid consumption plus necessary Grade A reserves for weekly and seasonal needs throughout the United States. This area serves as a source of Grade A milk supplies for other fluid milk markets east of the Rockies. Milk prices to farmers in more distant markets are generally higher than in the price basing point area because of costs of transporting supplemental milk supplies from the base point area to these milk deficit areas.

Some studies have concluded that since the late 1960's several other areas have developed sufficient excess supplies of Grade A milk to also be considered price basing points or primary supply areas. Primary supply areas are defined as those capable of sustaining a manufactured dairy products industry after demands for fluid markets, including adequate Grade A reserves, are met.

A September 1988 USDA study (McDowell, Fleming, and Fallert) concluded that six regions having less than 60 percent Class I (fluid) use could serve as price-basing points along with the current Eau Claire, WI, basing point. Under this multiple basing point system, the regional price structure for producers, processors, and consumers changes substantially. Lowering effective Class I prices in the six additional basing points also significantly reduces effective Class I differentials in the remaining regions.

Establishing additional basing points allows deficit regions to import needed supplies from closer sources. Interregional shipments are reduced and milk available for manufacturing drops 2-3 percent nationally. Milk available for manufacturing drops the most in the Northeast and Southern Plains regions but rises in the Mid-Atlantic region, Lake States, and Northwest.

Federal orders do not directly determine or control the uses or movement of milk. Rather, processors direct milk flows to the uses based on known and anticipated orders from their customers for fluid milk products (mostly Class I). The prices processors must pay for milk going into different uses obviously influence the quantities used.

A continuing problem is the extent to which marketing order minimum prices should cover services that cooperatives or marketing agencies perform in seasonal, weekly, and daily balancing of milk supplies for fluid milk markets. In some areas, the costs of providing the services are covered by over-order payments negotiated primarily between cooperatives and proprietary handlers (fluid milk processors).

Many of the balancing functions, such as shifting milk among packaging plants as needs vary, or importing supplemental supplies from distant markets, are marketwide services performed to assure that milk will be available to meet fluid demand that

fluctuates daily and seasonally. They are performed mostly by large, full-service producer cooperatives. Under current Federal order provisions, marketwide pool revenues are distributed by paying each farmer delivering milk to a handler fully regulated in a market a weighted average or blend price. This price is also subject to location and butterfat adjustments, but without regard to who provides the marketwide balancing services. In some instances, this creates substantial inequity between members of a balancing cooperative and other producers. Over-order payments are generally needed to offset at least a portion of these added costs.

In earlier years, numerous barriers to movement of milk between areas were erected by sanitary regulations and product specifications of State and local health authorities and by other regulations. Almost all of these barriers to milk movement have been removed. Federal orders do not explicitly restrict the movement of milk, although order prices and provisions relating to unregulated raw milk may have some constraining effect.

Federal Order Issues

The Federal Milk Marketing Order (FMMO) system was instituted to assure adequate supplies of high-quality milk (Grade A) to

UNDERSTANDING MARKETING ORDER PRICING

Federal milk marketing orders set the minimum prices that processors must pay for milk based on how it is used. However, those minimum prices are not paid directly to producers. Instead, receipts are pooled by a market administrator, and producers receive a weighted-average, or blend, price based on how the milk was used by processors during each month. To understand more clearly how orders work, consider this hypothetical Omaha order.

In this May 1989 example, there were three processing plants in the Omaha area regulated by the order. The cheese plant northwest of the city bought milk from dairyman Clark. Because it was regulated by the Omaha order, the plant had to pay the Class III price of $11.10 per cwt for milk, the same amount that unregulated processors in Minnesota and Wisconsin paid for Grade B milk (the M-W price).

East of town, another processing plant manufacturing ice cream bought milk from Clark's neighbor, Thompson. Like the cheese plant, the ice cream manufacturer was regulated by the order. Since ice cream is a soft dairy product, the plant paid the Class II price of $11.30 per cwt for milk. The price was calculated using a product price formula and usually ranges from 5 to 30 cents over the M-W price.

A fluid processor south of the city bought milk from Miller. The marketing order required the plant to pay the Class I price of

consumers at reasonable prices, improve dairy farmers' incomes, and provide stability and orderliness in fluid milk markets. However, some studies indicate that the system could be modified so that it is more competitive and so that it increases economic efficiency while maintaining market stability and reducing risk. Possible issues or areas of distortion include the overall Class I pricing structure, which may be contributing to unneeded pooling of Grade A milk, encouraging inefficient regional milk production, and discouraging the least cost shipment of milk. Other areas of interest may be pool plant performance standards, treatment of "other source" milk (down allocation and compensatory payments), especially for reconstitution, and the number and size of orders which can lead to artificial trade barriers or marketing inefficiencies. Classification and appropriate pricing of Class II products (fluid cream, ice cream, cottage cheese, and yogurt) may become an issue.

Emerging processing technologies such as reverse osmosis (RO), which remove water from milk and lower transportation, storage, and handling costs, may require changes in both the Class I pricing structure and market order provisions applied to milk-derived ingredients that are used in reconstituted milk. The current provisions often make traditional reconstituting

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$12.75 per cwt. This was the sum of the Class I differential of $1.75 and the March M-W price of $11.00 (there is a 2-month lag in this calculation).

Even though the producers sold to different types of plants, they all received the same price for their milk. The monthly blend price was calculated by multiplying the amounts used in each of the classes by their respective prices. Assume the cheese plant bought 80,000 cwt of milk, the ice cream plant purchased 12,000 cwt, and the fluid milk processor, 48,000 cwt. Thus, the total volume and value of milk purchased during May was:

Class III	$11.10	x	80,000 cwt	=	$888,000
Class II	$11.30	x	12,000 cwt	=	136,000
Class I	$12.75	x	48,000 cwt	=	612,000
	Totals		140,000 cwt		$1,636,000

To calculate the blend price, total value is divided by total volume. Therefore, no matter where they sold their milk, Clark, Thompson, and Miller all received $11.69 per cwt for the milk they sold during May.

In reality, most plants produce more than one product and over the year at least some milk must be sold to be used in beverage products or some bulk milk must be sold to fluid processing plants as Class I in order to qualify as a "pool plant" under a Federal order. In any event, this same pooling concept applies to both the costs of processors and the receipts of Grade A dairy farmers. "Pool plant" rules vary by individual Federal orders and months of the year.

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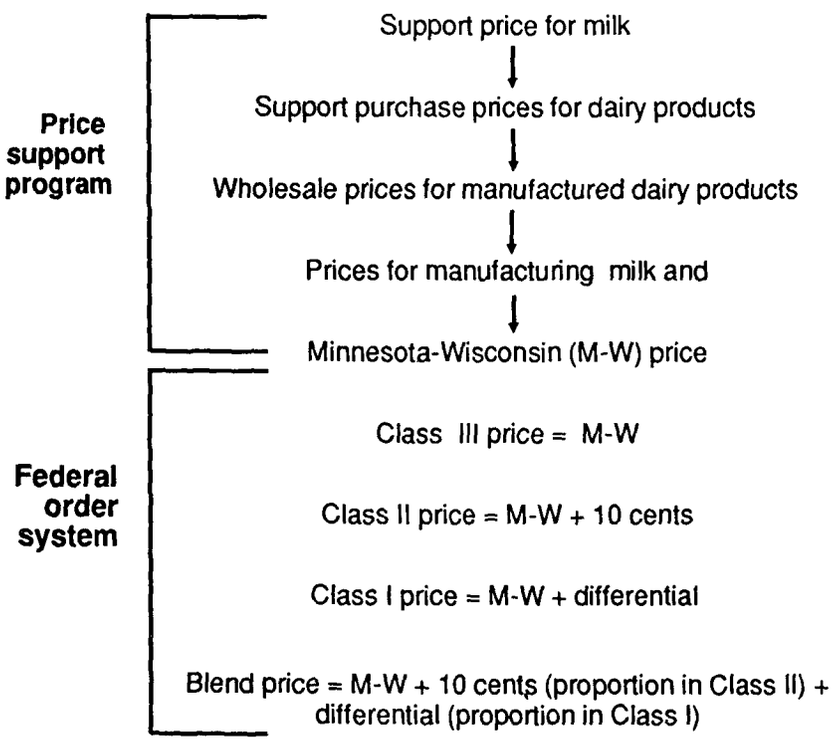
ingredients, nonfat dry or condensed milk, more costly than without regulation. The pricing and accounting provisions are intended to balance costs among handlers. They also keep unregulated reconstituted milk from displacing locally produced Grade A milk in higher valued uses, and thus lowering local producer blend prices. Establishing FMMO provisions to accommodate emerging technology and still provide for appropriate costs among handlers and equitable returns to producers in different regions while at the same time promoting overall economic efficiency and market stability will be a challenge for the 1990's.

Relationship Among Programs

The Federal milk marketing order program and the price support program have become closely interrelated in recent years, principally through milk order class prices being based upon the M-W base price with Class II and Class I prices being set at given differentials above the M-W price (fig. 7). Since the M-W price reflects the market value of manufacturing grade milk, it tends to represent the supply/demand balance for the entire milk industry. When market prices are above the support level, the price support program is relatively inert. On the other hand, when milk prices fall to or below support level, the

Figure 7

Price linkages between the price support program and Federal orders



CCC's offer to purchase butter, cheese, and nonfat dry milk tends to prevent further decline and undergirds the M-W price and thus all milk prices. In this situation, changes in the support price have a direct effect on all milk prices. The M-W price, as the prime mover of class prices in all Federal order markets, provides a coordinating link between the milk order and price support programs, assuring that minimum class prices will not continue rising at a time when increasing Government purchases might require a reduction in the support price. The main changes in class prices since 1968--except for the higher minimum Class I differentials legislated by the 1985 Food Security Act--have been through market and Government actions under the price support program as reflected in the price paid for manufacturing grade milk.

Effects of Dairy Programs

Both the price support program and the Federal milk marketing order program could possibly improve the performance of the industry over a system devoid of Government involvement if these programs were used as price and market stabilizing mechanisms rather than for income enhancement. Both of these programs have been periodically used as income-enhancing tools, but in substantially varying degrees. Import restrictions, however, enhance prices and returns to dairy farmers and raise milk and dairy product prices to consumers.

Programs to enhance income may cause inefficient use of resources and, thus, represent net losses to society. There is also a redistribution of income among producers and from consumers and taxpayers to producers. The extent of this redistribution depends upon the degree of income enhancement and the program provisions used. The degree of price enhancement versus stability has usually been the result of policy or administrative decisions rather than being an integral feature or shortcoming of the programs themselves.

In general, these same observations apply to the costs and benefits of the Federal milk market order program. An important difference, however, is that many changes in milk market order provisions are, or can be, made through the public hearing process in which producers, fluid milk processors (handlers), and consumers all have an opportunity to present their respective positions on specific problems and issues.

Prior to the paid milk diversion program under the Dairy and Tobacco Adjustment Act of 1983, and the dairy termination program under the Food Security Act of 1985, there had been no supply control provisions in the dairy programs. Increased revenues to dairy producers through the programs were realized from higher milk prices to farmers which, in turn, increased milk production.

Price Support Program

Producers

The dairy price support program benefits producers by smoothing out price variations and providing a market for milk at an assured price. In most years, especially since 1979, dairy producers have benefited more from the higher price received for dairy products moving to the CCC under the price support program than they would have by relying solely on the commercial market. Price supports undergird all prices received by dairy farmers, both Grade B and Grade A producers.

Gruebele (1978) concluded that, during the 1950-75 period, elimination of the price support program for dairy products would likely have reduced the milk price to farmers by 7 percent and milk production by 1.8 percent. If price supports had been removed during the 1976-80 period and import restrictions had remained in effect, milk prices to farmers probably would have been 2.8 percent lower and production down 0.8 percent. Disregarding the effects of import quotas, he concluded that the price support program was more of a price-stabilizing than a price-enhancing policy except for isolated periods.

One example of a price-enhancing period in the 1980's appears to have been 1980-83 when the CCC purchased an average of 13.2 billion pounds (milk equivalent), or 10 percent of marketings. Given the lags in milk supply response, the actual price-enhancement probably began in the late 1970's. The effects of price enhancement in the early 1980's, and to a more limited extent in the mid-1980's, caused industry adjustment problems throughout the decade (fig. 4).

Since passage of the Agriculture and Food Act of 1981, dairy price support changes have not been tied directly to parity. This has resulted in a downward trend in dairy price supports from a high of $13.49 per cwt in September 1981 to a low of $10.10 in 1990. In conjunction with the milk diversion and dairy termination programs and a strengthening in international markets in mid-1988 through 1989, dairy price support purchases have declined, but are still substantial and of concern.

Increased returns to individual farmers from higher milk prices resulting from the dairy price support program depend on the volume of individual farm marketings. If a support price increase of 50 cents per cwt were to increase the farm price 50 cents per cwt, the annual gross revenue on a farm with 10 milk cows would be increased around $725; for a farm with 500 milk cows, about $36,000 a year. For a farm with 3,000 milk cows, gross revenue would increase about $218,000.

Milk price enhancement and program benefits generally become capitalized into asset values such as dairy cow prices and the price of land suited to dairying. This increases milk production costs and makes the United States less competitive in world markets. Capitalization of current and expected program benefits

has varied effects on individual producers. It increases the wealth of established dairy farmers, but increases the costs of new entrants. For tenants and part-owners, program benefits can lead to higher rents, thus transferring program benefits from renters to landowners.

Consumers

Program effects on consumers are measured by the changes in prices paid and quantities consumed that are attributable to the respective programs. Effects of the dairy price support program on consumers depend primarily upon the extent to which the program is used for producer income enhancement vs. price and income stability.

Consumers are less responsive to retail price changes of fluid milk products (beverage milk) than of processed dairy products (such as butter, nonfat dry milk, and cheese). Therefore, if the price support program boosts retail dairy prices by 10 percent, consumers reduce their fluid milk purchases about 2 percent while their fluid milk expenditures rise about 8 percent. With a 10-percent retail price increase, they reduce their manufactured products purchases about 7 percent while their expenditures rise only about 3 percent because of the much larger drop in the quantities purchased.

The price support program raises consumer prices through the Government's purchases of butter, nonfat dry milk, and cheese from processors at announced prices. The extent of dairy product price enhancement in the commercial market can be indirectly observed by the volume of dairy product purchases by the Government. As stated above, Gruebele estimated that the 1977 support price probably increased prices about 8 percent, which raised the retail price of a half-gallon of milk about 3 cents and cheese prices about 6 cents per pound. Even greater price enhancement during the 1979-83 period probably raised consumer prices two to three times this amount. But dairy price support reductions since the early 1980's have brought prices closer to market equilibrium, cut Government purchases and costs, and reduced consumer prices from levels they would have been without price support reductions.

The net effect of the price support program is that consumer prices probably average higher than they would without the program. However, dairy price supports set at market-clearing levels benefit consumers by assuring them of an adequate supply of milk and other dairy products at reasonable prices.

Taxpayers

From 1966 through 1979, USDA purchases of dairy products on a milk equivalent basis averaged 3.3 percent of total milk marketed by farmers. Purchases were less than 1 percent of marketings in 1966 but reached 6.3 percent in 1971 (app. table 7). Over the 1980-89 period, however, purchases averaged about 8 percent of marketings and reached a record level of over 12 percent in 1983.

Nominal direct costs to taxpayers of the program averaged $325 million per year from the 1952-53 through 1972-73 marketing years (app. table 8). However, since 1979-80, net program costs have exceeded $1 billion each year until the 1988-89 marketing year when they dropped to $698 million.

Net program costs reached a record $2.6 billion in the 1982-83 marketing year, about 13 percent of total cash receipts from farm marketings of milk and cream, or an average of about $13,000 per commercial dairy farmer. But since these expenditures were for processed dairy products, farmers did not receive the full benefit of these Government expenditures.

Indirect

Over much of the period since the late 1970's, Government dairy programs have resulted in excess resources being used in milk production and processing. This implies a net loss in economic efficiency to the overall economy, provided these excess resources would have been used to produce nonsurplus products.

Excess milk production increases demand for both forage and feed concentrates. Feed grain producers benefit directly from increased grain demand and indirectly from forage production on lands that otherwise would be used to produce grain. During times of feed grain surpluses, the increased demand for feed by dairy farmers absorbs excess grain and thus reduces costs to taxpayers by lowering feed grain program costs. At other times, additional costs are imposed on other feed users.

Meat animal producers initially benefit from a buildup in milk production, as fewer milk cows are slaughtered. However, the larger milk cow herd eventually results in more cull cows and calves. The most dramatic impact on meat markets occurs when actions to correct the milk surplus cause a surge in dairy cow culling such as under the recent dairy termination program.

Dairy products comprise about 13 percent of the average consumer's food budget, and the quantities purchased are relatively unresponsive to price changes. Programs which raise retail dairy prices can lower consumer expenditures for other foods, adversely affecting suppliers of those products. Producers of substitute products (margarine, for example) benefit from higher dairy prices but may be affected by domestic donations of accumulated CCC stocks.

Since price support for milk is achieved only by purchases of storable milk products, price support policy significantly affects the manufactured dairy products industry. In 1983, Government purchases peaked and represented nearly one-third of total butter production, 70 percent of nonfat dry milk production, and over one-fourth of the American cheese production. Many manufacturing plants were probably operating beyond their optimal (low cost) capacity point in the flush milk production months of 1983. Some areas of the industry, which struggled to find plant capacity to process the large milk

supplies in the early 1980's, had excess capacity under the closer overall supply-demand balance in the late 1980's.

During the 1990's, there will continue to be dairy manufacturing capacity and structure adjustment problems because of milk production shifting to the Southwest and West out of the traditional milk production areas of the Upper Midwest, the central part of the country, and the Northeast. In addition, population is moving from the "frostbelt" to the "sunbelt." New manufactured dairy product plants and expanded capacity is coming on line in Texas and California at the same time that there is excess plant capacity in traditional dairy areas. This has generated pressures for higher over-order charges in Grade A supply plants for fluid milk markets as processing costs rise when manufacturing plants are underutilized.

In theory, fresh fluid milk products are generally considered to have first call on Grade A milk, the excess being available to produce manufactured dairy products. While fluid milk demand is relatively stable from year-to-year, it varies seasonally within the year just opposite of milk production. That is, fluid milk demand is lowest in the spring and summer when production is highest, and highest in the fall and winter when production is lowest. Thus, there is a need for substantial excess dairy product manufacturing capacity to meet the seasonal and annual fluctuations. These problems are compounded in the American cheese, butter, and nonfat dry milk industries since they must convert excess raw milk supplies into storable form. The regional shifts in milk supplies to the West and Southwest, along with the associated new manufacturing capacity in those areas, could compound excess capacity problems in other areas.

Federal dairy programs establish the overall price level for milk mostly through price supports but Federal orders can be used to raise prices further. Federal orders provide more equal treatment for producers and handlers (processors) who are similarly situated. For producers, marketwide pooling yields the same price to all producers at a given location. For handlers, classified pricing means the same price for milk in a given use at a given location.

Federal Milk Marketing Orders

About 90 percent of the total milk supply is fluid grade (Grade A) milk which meets the requirements of local and municipal health departments for use in fresh fluid milk products and is marketed primarily under Federal or State milk marketing orders. The remaining manufacturing grade (Grade B) milk can be used only in dairy products such as butter, nonfat dry milk, and cheese. About 45 percent of the fluid grade milk is sold as fresh fluid milk products and the remainder is processed into manufactured dairy products. Only Grade A milk is regulated under Federal milk marketing orders. On January 1, 1990, 41 orders regulated the handling and pricing of about 80 percent of the Grade A milk marketed domestically. Most of the remaining Grade A milk was regulated under State regulations (especially in California).

Producers

Under classified pricing, producers receive a higher price for Grade A milk used in fluid milk products (beverage milk) than for Grade A milk used to produce manufactured dairy products. To the extent that Class I prices are established above cost-justified levels, Grade A dairy farmers receive more for their milk than they probably would in the absence of marketing orders.

Consumer purchases of fresh fluid milk products are less responsive to price changes than purchases of manufactured dairy products. Therefore, producer revenue can be increased by charging a higher price for milk used in fresh fluid milk products than for the same milk used to produce manufactured dairy products. There is special interest, then, in the justification (cost-related or otherwise) of the price differentials under milk orders between milk used for fluid purposes (Class I) and for milk used in manufactured dairy products (Classes II and III).

Price enhancement diminished from 1968 to 1981 as the minimum Class I differential remained constant while the manufacturing grade milk price tripled. The average minimum Federal order Class I differential in all markets declined from 33.4 percent of the average Federal order minimum Class I price in 1968 to 14.6 percent of the Class I price in 1983 when the Class I price peaked (table 8). The percentage began to increase in 1984 as Class I prices declined and received another boost in May 1986 when the 1985 Food Security Act legislated higher minimum Class I differentials in 35 of 44 Federal milk orders that were operating in May 1986. However, with strong international dairy product markets, the M-W price rose substantially in 1989 which again resulted in a reduction in the relationship between the Class I differential and the Class I price.

Price enhancement has been reduced even further over the years since costs of transporting milk and servicing the fluid milk market have increased, primarily due to energy costs and inflation. The transportation cost allowance for intermarket shipments built into the minimum Federal order price structure is substantially less than the actual cost of shipping raw milk.

In general, lowering or eliminating minimum Class I differentials would increase the M-W price and would have only a minor effect on the average U.S. milk price received by dairy farmers. However, the regional price effects would be substantial. Manufacturing grade milk producers and Grade A dairy farmers in regions such as the Lake States, Corn Belt, and Plains, with a high proportion of milk used in manufactured dairy products, would receive a higher price than under a continuation of current policy. Conversely, farmers in the Northeast, South, and Southwest would receive somewhat lower prices. The trend of pooling under marketing orders and moving toward one grade of milk (Grade A) would likely be slowed or possibly reversed.

Table 8--Federal order Class I differential as percentage of Federal order Class I price

Year	All markets	Chicago regional	Southeastern Florida
		Percent	
1966	30.5	---	46.2
1967	31.6	---	44.7
1968	33.4	22.7	43.2
1969	32.5	21.4	41.3
1970	31.0	21.5	41.2
1971	30.4	20.8	39.6
1972	29.6	20.1	38.6
1973	26.2	17.5	34.8
1974	22.4	14.8	30.2
1975	22.4	14.8	30.3
1976	19.6	12.8	26.8
1977	19.8	12.9	27.1
1978	18.4	11.9	25.3
1979	16.3	10.5	22.6
1980	15.3	9.7	21.3
1981	14.4	9.1	20.0
1982	14.7	9.2	20.2
1983	14.6	9.1	20.1
1984	15.1	9.3	20.4
1985	15.6	9.7	21.2
1986	17.8	10.8	25.6
1987	18.4	11.0	27.0
1988	19.1	11.4	27.7
1989 1/	17.7	10.5	25.9

--- = No Federal order.
1/ Preliminary.

Consumers

When the manufacturing grade milk price is above the support level, increasing Class I differentials beyond the cost-justified level increases fluid milk product prices and decreases fluid use. The drop in fluid milk sales, combined with increased Grade A milk production because of the higher price received by farmers, increases supplies of milk for manufacturing, lowering the manufacturing grade milk price. This lowers prices of manufactured dairy products and increases both manufactured dairy product and total milk sales. However, when the manufacturing milk price is at or below the support level, increasing Class I differentials increases fluid milk product prices and decreases consumption. The manufacturing milk price and manufactured product consumption remain unchanged, and total milk consumption

decreases. The opposite would be true in the above examples for decreased Class I differentials.

Selected groups of U.S. households which are large (small) consumers of fluid milk relative to the U.S. average tend to be large (small) consumers of manufactured dairy products. Thus, a decrease in fluid milk prices relative to manufactured dairy product prices would not give a greater advantage to one group relative to another group within the U.S. population.

Milk order pricing and allocation provisions reduce or eliminate the economic incentives for reconstituting nonfat dry milk and butterfat into fluid milk or blended fluid milk products. There is little evidence to show how closely reconstituted milk products from traditional forms of concentration would substitute for fresh fluid milk products. However, studies do indicate that substantial savings in fluid milk costs could be achieved in some markets, especially in high-cost areas. Some say that changes in market order pricing and allocation provisions could be made to better accommodate adoption of available and emerging technologies conducive to lower fluid milk product ingredient, transportation, and market-balancing costs.

Emerging technology includes membrane filtration (reverse osmosis and ultrafiltration) which can reduce the water content of milk and produce a 50-percent concentrate. Since fluid milk is approximately 87 percent water, concentrating milk can reduce transportation, storage, and handling costs. Historically, the dairy industry has had to rely on the more traditional forms of concentration such as nonfat dry milk, evaporated milk, and butter. These high-heat concentrating processes tend to yield a reconstituted fluid milk product with a "cooked" flavor. Membrane technology does not subject milk to high-heat treatment and should significantly improve consumer acceptance of reconstituted milk. Reverse osmosis is the most likely membrane technology to be used because it reduces only the water content and does not remove other milk components as is the case with ultrafiltration.

Taxpayers

Direct Government (taxpayer) costs of the Federal milk order program are small compared with those of the price support program. Expenses of market administrators totaled $34.4 million in 1988 and are estimated at $35.9 million for 1989. These expenses are recovered by assessments on processors regulated by the orders and are only indirectly reflected in retail prices of fluid milk products. Headquarters expenses (about $2.8 million in FY 1988) in operating the program are paid from Section 32 funds which are receipts from duties collected under the customs laws. Section 32 was established in 1935 by amending the Agricultural Adjustment Act of 1933. It set aside 30 percent of the customs receipts for promoting exportation and domestic consumption, encouraging the use of surplus commodities by diverting them to industrial or other use, and financing adjustments in the production of agricultural commodities.

Excess milk supplies under market orders increase supplies available for manufactured dairy products. If the manufacturing grade milk price is at or below the price support level, excess milk supplies under the market order program result in increased dairy product purchases by the CCC and therefore costs under the price support program increase.

Indirect

Federal milk marketing orders generally provide a favorable environment for cooperative marketing and bargaining. Cooperatives, assuming more of the fluid milk market balancing functions, fine-tune Federal order minimum Class I prices through negotiations with fluid milk processors for over-order charges. The participation of cooperatives reduces the need for even further Government involvement in pricing. Several studies indicate that, except for a few markets, over-order charges are primarily cost-related and generally do not represent pure price premiums extracted through exertion of market power.

The major effects of changes in the level and structure of Class I differentials and pooling provisions to more closely reflect competitive market conditions would be on changes in regional farm income, the location of milk production, and the location of manufactured dairy product processing plants. Producer revenue and overall milk production would likely fall the most in the Northeast and Mid-Atlantic regions. The manufactured dairy products industry in the Northeast would face the most severe structural adjustment with the decline of milk available for manufacturing.

Reducing Class I differentials when market prices are above support levels would tend to increase the manufacturing grade milk price, and increase the price of manufactured dairy products relative to fluid milk product prices.

Overview of Price Support Program and Federal Milk Marketing Order Effects

A recent analysis attempted to quantify the social welfare gains and losses from deregulating the dairy industry (McDowell and Fallert). The analysis assumes the elimination of the price support program and Federal and State marketing orders, while holding constant import and commercial stock levels for the calendar years 1984 through 1987.

The total welfare gains from deregulation increase from $1.9 billion in 1984, to a maximum of $3.0 billion in 1985, and decline to $1.3 billion in 1987 (table 9). Consistent with the overall welfare changes, deregulation causes the maximum change in all prices and quantities in 1985. This is because 1985 production levels were the least affected by the dairy diversion and dairy termination programs. Thus, 1985 price levels required the greatest reductions to achieve market clearance.

Table 9--Welfare changes resulting from dairy deregulation 1/

Year	Consumption		Production		CCC saving	Total
	Fluid	Manufacturing	Grade A	Grade B		
			Million dollars			
1984	1,511.0	332.9	-1,271.1	-55.7	1,391.0	1,908.1
1985	1,901.8	645.0	-1,755.4	-98.4	2,293.0	2,986.0
1986	1,701.4	382.4	-1,444.4	-62.9	2,107.0	2,683.5
1987	1,586.8	-90.9	-1,090.6	14.4	888.5	1,319.8
Avg.	1,675.3	317.4	-1,390.4	-50.7	1,669.9	2,224.4

1/ Welfare measures are consumer and producer surplus, and net CCC expenditures. Net annual CCC expenditures are adjusted from fiscal year expenditures.
Source: McDowell and Fallert.

The major beneficiaries of deregulation are fluid milk consumers with an average gain of $1.675 billion, and taxpayers with a saving of $1.670 billion in CCC net expenditures. Grade A milk producers' losses average $1.390 billion under deregulation. Manufacturing milk consumer gains averaged just over $315 million, less than 20 percent of fluid consumer gains, but applicable to about 60 percent of total consumption. Grade B milk producer losses averaged $50 million. The magnitudes of change associated with consumers of manufacturing milk and Grade B producers relative to those for Grade A producers and fluid milk consumers provide some insight into the magnitudes of distortion associated with the price support program as compared with Federal orders. Results of the analysis clearly indicate the effects of programs in transferring income from consumers to producers.

Consumers of fluid milk subsidize Grade A dairy farmers if the regulated prices under Federal and State milk marketing orders are higher than cost-generated levels. The resulting greater Grade A milk production levels place downward pressure on commercial manufacturing milk prices, benefiting manufacturing milk consumers at the expense of Grade B milk producers and the Treasury. It also provides incentives for Grade B producers to convert to Grade A even though there may already be sufficient Grade A milk in the system to adequately supply fluid milk markets plus an adequate Grade A milk reserve.

One qualification of the above results is that under deregulation the CCC would make no purchases of dairy products. Therefore, there would be no surplus dairy commodities to distribute in domestic and foreign food aid programs. In the above welfare calculations, the value of dairy products distributed in food aid programs is not considered. These expenditures on donations averaged $1,750.6 million per year over 1984 through 1987. If the donations were valued to society at their cost, then there

would be a like reduction in the overall costs of dairy programs. If donations are valued to society at 50 percent of CCC expenditures on these commodities, the donation welfare loss would average $875 million. This would be an offset to the $2,224 million average welfare gain from dairy industry regulation shown in table 9.

Another complicating factor is that the structure of the dairy industry would probably change under deregulation. For example, the costs faced by dairy farmers might change under deregulation because of greater milk price variability and increased risk. If this is true, dairy farmers would require a somewhat higher price to produce a given quantity of milk under deregulation than under more stable regulated markets. Thraen and Hammond found that from 1950 through 1978 the price support program resulted in increased production and blend prices 4-8 percent lower than would have been generated without price support. The Federal milk marketing order system also reduces producers' risk. Risks are also reduced for dairy processors, manufacturers, and marketing firms. Thus, it may be possible that the deregulated prices simulated in the McDowell and Fallert study are lower than would be the case under a deregulated and more market-oriented system. This also implies that benefits to consumers, losses to producers, and gains for taxpayers might be less from deregulation than shown by simulated results.

Effects of Voluntary Supply Management Programs

The Dairy and Tobacco Adjustment Act of 1983 was a major departure from traditional dairy policy in that it authorized substantial direct payments to producers who would voluntarily reduce marketings from a historical base. This payment program and the refundable second 50-cent per cwt deduction of the preceding 1982 legislation represented the first attempts to add voluntary supply management provisions to the dairy price support program.

One of the objectives of the milk diversion program which was included in 1983 legislation was to encourage adjusting milk production to levels consistent with the demand for dairy products. Under the terms of the program, milk producers could enter into contracts with the CCC to reduce milk marketings during a 15-month period beginning January 1, 1984, and ending March 31, 1985. The reduction could have been from 5 to 30 percent of milk marketings during a base period selected by the producer. Contracting producers received a fixed payment of $10.00 per cwt of reduction in their milk marketings.

Approximately 38,000 producers signed contracts to reduce marketings under the terms of the milk diversion program. The participation rate was less than expected, possibly due to the short time given farmers to study the program regulations and make their decision. The contracting producers represented about 12 percent of all operations with milk cows or about 20 percent of commercial dairy farmers with typical herds and output levels. The contracted reduction in milk marketings for the 15 months of

the program was about 9.4 billion pounds (from a base of 41 billion pounds).

It was expected that reductions in milk marketings would translate into decreased milk production. As a group, those participants in the milk diversion program had begun reducing marketings on their own prior to contracting reductions under the program. The program may also have accelerated exits from dairying by providing monetary incentives large enough to convince some producers to retire from farming.

Data suggest that there was no long-term effect on cow numbers or milk production. In December 1983, the U.S. dairy herd numbered 11.1 million head. In March 1985, the herd numbered just over 10.8 million and by the end of 1985 had increased to 11.1 million. Total milk production on farms in 1983 was approximately 139.6 billion pounds. In the first quarter of 1985, production was reported as 33.6 billion pounds, about 2 percent below the first quarter production in 1983. Second, third, and fourth quarter production levels in 1985 were all above 1983 levels, by 2, 5, and 5 percent, respectively. The recovery of production in the second half of 1985 resulted in total milk production for the year being more than 2 percent above 1983 production.

Milk production decisions of producers not participating in the milk diversion program heavily influenced overall milk supply adjustments. These adjustments of the nonparticipants were probably influenced more by lower milk prices, changes in feed and other input costs, and other farm and off-farm opportunities than by the diversion program.

The Food Security Act of 1985 included legislation enacting a voluntary dairy termination program, also known as the whole-herd buyout, as a method to slow the expansion of U.S. milk production. Milk producers could submit competitive bids to remove production, based on 1985 marketings, for at least 5 years. Participating farmers had to sell all of their cattle for slaughter or export, not to other milk producers. In addition, a participant's physical plant could not be used for milk production or dairy cattle. A long-term objective of the program was reduction of U.S. milk production capacity by removal of resources from the dairy industry.

Bids ranging from $3.40 to over $1,000 per cwt of base production were submitted by about 39,500 producers. All bids up to $22.50 per cwt (averaging $14.88 per cwt) were accepted, a total of 13,988. Total cost of the program was $1.8 billion of which 38 percent was paid by the industry. Participants had marketed just over 12 billion pounds of milk in 1985 and held, at the time of bidding, slightly more than 1.55 million head of dairy animals. Herds removed under the program were generally average or above in terms of size and output per cow.

Three herd liquidation periods were established: April-August 1986, September 1986-February 1987, and March-August 1987. About

two-thirds of the participants in the program chose the first period. Concerns raised by beef industry interests regarding the effects on the beef market of slaughtering a large number of dairy cattle led the U.S. Department of Agriculture (USDA) to permit shifts by first-period participants to later periods.

The dairy termination program likely accelerated the normal exit patterns from dairying. There can be little doubt that there was removal of resources from the dairy industry; the removal of over 1.55 million dairy animals and about 14,000 farmers with their accumulated human capital are visible examples. The longer term effect of the program on the physical plant is less certain. Some of these resources are likely to come back into the industry at the end of the 5-year legislated period. 2/ The compression of exit decisions into a nearer term resulted in rather large initial program effects on production; these effects diminished over time. The overall production effects were conditioned by the extent to which tighter milk supplies generated a price that induced expansion of output by nonparticipants.

Prior to the initiation of the dairy termination program in 1986, milk production had been rising, on average, about 2 percent per year from 1980 to 1985. The expansion from 1984 to 1985 was almost 6 percent. The average increase in production from 1985 to 1988 was just less than six-tenths of 1 percent. However, the annual increase from 1987 to 1988 was just over 2 percent, comparable to the pre-program average rate. Not all of the credit for the lower cow numbers and slower average growth of milk production can be given to the program; reductions in the dairy support price from $13.10 per cwt in November 1983 to $10.60 on January 1, 1988, also played an important role.

There were pronounced regional differences in participation in the milk diversion program. Contract diversions ranged from 2 percent of 1983 production in Pennsylvania to 15 percent in Florida. Diversions were heaviest in most of the South, the Plains States, the western Corn Belt, and some of the Mountain States. Participation was relatively limited in the Northeast and low in the Lake States and Pacific regions, the major milk producing regions. The diversion rate in the five major dairy States--Wisconsin, California, New York, Minnesota, and Pennsylvania--was 3.8 percent of production, little more than half the rate of the other 43 States. The program excluded Alaska and Hawaii.

As in the milk diversion program, State and regional participation and effects on processors varied widely. The share of 1985 marketings covered by accepted contracts under the dairy termination program ranged from 4.7 percent in the Northeast to 17.2 percent in the Southeast. Participation was generally low

2/ The ending dates of the 5-year period legislated under the program in which participating producers can reenter the dairy industry are Sept. 1, 1991, Mar. 1, 1992, and Sept. 1, 1992, depending upon their termination period.

in northern regions and relatively high in southern and western regions. The Lake States, Corn Belt, and Northeast had relatively low levels of accepted contracts.

Import Restrictions

The international dairy market is generally restricted to manufactured products since fresh fluid milk products are highly perishable, and transportation costs are high relative to the value of the final product. International trade in dairy products is also constrained by extensive import restrictions by most developed countries.

Only New Zealand and Australia would probably have a clear absolute advantage over U.S. producers for providing manufactured dairy products to the U.S. market. Import restrictions are imposed by the United States to avoid supporting world prices through the U.S. price support program. On balance, U.S. imports have averaged less than 2 percent of U.S. milk marketings or about 3 percent of U.S. manufactured dairy products consumption (app. table 11). The effectiveness of domestic dairy programs, as currently structured, depends critically upon foreign trade policies and programs. Without the import controls provided by Section 22 of the Agricultural Adjustment Act of 1937, as amended, price supports through a purchase program would be unworkable because the United States would be supporting world dairy product prices.

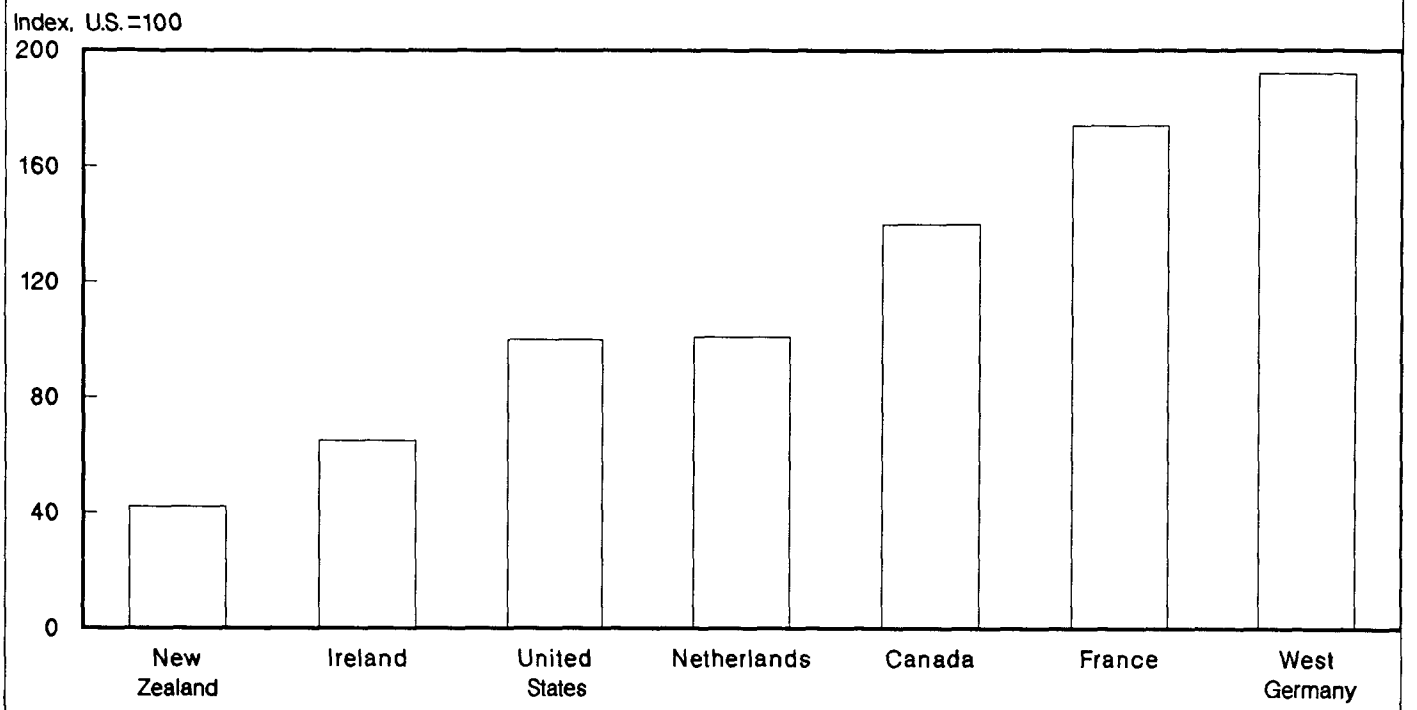
International dairy markets--especially for nonfat dry milk--changed dramatically in 1988. The primary reasons for this change in which prices of skim milk powder, casein, and cheese rose substantially were EC and U.S. efforts to reduce dairy surpluses and stocks.

International Competitive Position

The U.S. competitive position in international dairy markets is a dynamic and dramatically changing milk marketing phenomenon. For years, world dairy markets were heavily influenced by the subsidized exports of many countries, especially the European Community. But since the quota system was established in the EC in 1984 to reduce dairy surpluses and stocks, and the United States reduced price supports and initiated the milk diversion and dairy termination programs in 1984 through 1987, the "butter and milk powder mountains" have declined dramatically and nonfat dry milk prices have risen sharply. Even so, conditions in international markets remain dominated by large, subsidized EC exports.

Under liberalized agricultural trade, the relative costs of milk production and the principles of comparative advantage should influence world dairy product prices and trade flows. Research indicates that in the absence of subsidized milk production and exports, the United States can compete in world dairy markets (fig. 8).

Figure 8
Indexes of cost estimates for milk production, seven major milk producing countries, 1986



Source: Baker, Hallberg, Tanjuakio, Elterich, Beck, and Liebrand. "Estimates of the Cost of Producing Milk in Seven Major Milk Producing Countries, 1986," U.S. Dept. Agr., forthcoming.

Among the major milk producing countries in the world, milk production costs--disregarding subsidies less taxes--appear to be lowest in New Zealand and Ireland. They are highest in France and West Germany. Milk production costs in Canada are substantially higher than in the United States while costs in the Netherlands are about the same as in the United States. Overall, milk production costs in the United States appear to be in the middle-range of cost estimates in major milk producing countries.

The lowest cost milk producing countries are pasture-based systems like New Zealand's. However, New Zealand's total milk production about equals the amount produced in California and additional pasture resources for dairying are limited. Furthermore, countries like New Zealand with low-cost pasture-based systems and relatively low milk prices are not likely to benefit as much from emerging bovine somatotropin (bST) technology as could the United States or the European Community where farmers receive higher prices and supplement forage rations with grain and concentrates. Use of bST as a management tool will also be substantially different--and probably less advantageous--for the EC and Canada, if adopted there, than in the United States because of the quota restrictions on individual farm output.

Costs of EC milk production have risen relative to U.S. costs since initiation of the EC quota in 1984, for several reasons. First, when a milk production quota system is locked into place, the industry is not permitted to shift production to areas of

competitive advantage. Second, individual farm output was cut back about 15 percent from 1983 levels and fixed overhead is spread over fewer units of milk production. Finally, the relatively high milk prices are being capitalized into quota values. The Canadian experience with the effects of milk quotas on costs of milk production would also indicate that the United States can be competitive in world dairy markets.

Issues

Provisions of the Food Security Act of 1985 expire on December 31, 1990. Dairy policy issues likely to be of concern and debated during deliberations on the 1990 farm bill will likely concentrate most heavily on the dairy price support program. The dairy price support adjustment mechanism and the need to prevent the recurrence of heavy dairy product surpluses and high government costs will likely be under scrutiny. The flexible price support program, the trigger mechanism, the trigger level, and the method of calculating dairy removals will also likely be considered. An issue with dairy policy is the amount of discretion given the Secretary of Agriculture in setting the level of price supports. Other topics may include whether there will be a continuation of authority to establish another milk diversion or dairy termination program.

Due to actual or perceived regional distortions in prices under Federal milk marketing orders, an issue might arise as to whether Federal milk marketing order provisions should be addressed by the Congress or through the normal USDA hearing process. In the 1985 farm act, the Congress set a precedent by legislating higher minimum Class I differentials (prices) in 35 of 44 Federal milk orders that were operating in May 1986. Most of these increases were in milk-deficit southern markets. Some dairy interest groups feel these legislated price changes further distorted regional prices while other groups contend the price changes were needed to assure better industry performance. Emerging processing technology such as reverse osmosis, which removes water from milk and lowers transportation, storage, and handling costs for servicing the fluid milk and soft dairy products markets, may also raise interest in changes in Federal order provisions to accommodate this technology. Historically, most Federal order issues have been addressed by USDA through the Federal order hearing process.

Proposals for reducing trade-distorting agricultural policies are a focus of current GATT multilateral trade negotiations, which include 105 participating nations. Liberalization of agricultural trade has been discussed extensively by both policymakers and policy analysts in recent years. Thus, the level of dairy import restrictions under Section 22 of the Agricultural Adjustment Act of 1937, as amended, may come under scrutiny. Section 22 authorizes the President to restrict imports by imposing quotas or fees if the imports interfere with Federal price support programs or substantially reduce U.S. production of products processed from farm commodities.

The dairy export incentive program, due to be terminated September 30, 1990, may surface as an issue. Discussion of direct sales of surplus dairy products as well as donations of dairy products through food assistance programs to the needy overseas under PL 480 and Section 416 might also arise.

The high concentration of dairy cattle in some areas of the country gives rise to groundwater pollution through dairy manure. Thus, environmental considerations could directly affect the dairy industry in the 1990's.

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Glossary

Agricultural Marketing Service (AMS) -- A USDA agency responsible for administering the marketing of several agricultural products, including providing marketing news and stock reports. AMS oversees the operation of the Federal milk marketing order system.

Agricultural Stabilization and Conservation Service (ASCS) -- A USDA agency responsible for administering farm price support and income support programs and some conservation and forestry cost-sharing programs.

Allocation procedure -- The Federal order procedure in which imported milk, regardless of use, is allocated to a manufacturing class when local milk for fluid use is available. This procedure reserves as much of the Class I allocation as possible for producers within the order, increases the order blend price, and reduces unnecessary transportation.

Balancing -- The market service of moving milk between various uses and among processors to meet fluctuating needs from varying supplies.

Blend price -- A weighted average price based on the proportion of Grade A milk in a pool allocated to each of the use classes. Producers participating in a pool receive its blend price with adjustments for butterfat content and farm location.

Census of Agriculture -- A survey taken by the Bureau of the Census every 5 years to determine the number of farms, land in farms, crop acreage and production, farm spending, and so forth.

Class I differential -- The amount added to the M-W price to obtain a given order's Class I price. Two components make up the effective or total Class I differential: a minimum Federal order differential and an over-order payment.

Class I use -- Grade A milk used in Class I milk products as defined under a milk marketing order. Class I products generally include all beverage milks and may include other fluid products.

Class II use -- Grade A milk used in fluid cream products or perishable manufactured products (ice cream, cottage cheese, and yogurt) under Federal marketing orders with three classes. The designation also refers to Grade A milk used to produce any manufactured product under a Federal marketing order with only two classes.

Class III use -- Grade A milk used to produce storable manufactured products (cheese, butter, canned milk, and dry milk) under a Federal marketing order with three classes.

Classified pricing -- The Federal order pricing system under which regulated processors pay into the pool for Grade A milk according to the class in which it is used.

Commodity Credit Corporation (CCC) -- A federally owned and operated corporation within the U.S. Department of Agriculture created to stabilize, support, and protect farm income and prices through loans, purchases, payments, and other operations.

Compensatory payment -- An assessment paid on milk or components for reconstitution shipped into a Federal order from another order or market. The assessment is equal to the difference between the order's Class I price and its Class III price in some situations and between the order's Class I price and its blend price in other situations.

Cooperative -- A firm that is owned by its farmer-members, is operated for their benefit, and distributes earning on the basis of patronage (volume of milk).

Cost of production -- An amount, measured in dollars, of all purchased inputs, allowances for management, and rent, that is necessary to produce farm products.

Economies of size -- Increasing returns as use of factors is expanded in least-cost combinations. Once the size of an operation reaches a certain size, the marginal cost of producing additional output begins to decline.

European Community -- Also known as the European Economic Community and the Common Market, an attempt originating under the Treaty of Rome in 1957 to unify and integrate member economies by establishing a customs union and common economic policies, including the Common Agricultural Policy. The EC currently has 12 members.

Farm act -- The omnibus agricultural legislation that expires every 4 or 5 years. The act's titles include program commodities, trade, conservation, credit, agricultural research, food stamps, and marketing.

Federal milk marketing order -- A regulation issued by the Secretary of Agriculture specifying minimum prices and conditions under which milk can be bought and sold within a specified area.

Fluid utilization -- The proportion of Grade A milk pooled in a market and used to produce fluid (Class I) products.

Fluid product -- Packaged dairy products traditionally including beverage milks, milk and cream mixtures, cream, eggnog, and yogurt.

Food Security Act of 1985 (PL 99-198) -- The omnibus food and agricultural legislation signed into law on December 23, 1985, that provides a 5-year framework for the Secretary of Agriculture to administer various agriculture and food programs.

General Agreement on Tariffs and Trade (GATT) -- An agreement originally negotiated in 1947 by 23 countries, including the United States, to increase international trade by reducing

tariffs and other trade barriers. The agreement provides a code of conduct and a framework for periodic multilateral trade negotiations on trade issues.

Give-up charge -- The price needed to attract milk away from profitable manufacturing operations because lower volume increases costs of manufacturing. This charge is included in over-order payments.

Grade A milk -- Milk produced under sanitary conditions that qualify it for fluid consumption. Only Grade A milk is regulated under Federal marketing orders.

Grade B milk -- Milk not meeting Grade A standards; less stringent standards generally apply.

Handlers -- Generally refers to fluid milk processors and includes manufacturing plants that also supply fluid markets.

Interregional marketing costs -- The average cost of marketing milk interregionally is equal to the actual average cost of transporting milk times the proportion of milk marketed that is actually transported.

Make allowance -- The margin between the Government support price and the CCC announced price for butter, nonfat dry milk, and cheese. This margin is administratively set to attain the desired level of prices for milk in manufacturing uses.

Manufacturing milk -- Grade B milk or Grade A milk assigned to Class II and Class III or otherwise used in the production of a manufactured product.

Manufacturers -- Generally refers to the manufacturers of cheese, butter, nonfat dry milk, or other storable dairy products.

Minnesota-Wisconsin (M-W) price -- The average price per cwt paid to farmers for Grade B milk in Minnesota and Wisconsin as estimated by USDA.

Over-order payment -- A payment negotiated between buyers and sellers to cover the cost of providing market services or attracting milk away from manufacturing plants. Over-order payments could also result from market power.

Parity price -- Originally defined as the price which gives a unit of a commodity the same purchasing power today as it had in a base period, traditionally 1910-14. In 1948, the base prices used for calculating parity were made dependent on the most recent 10-year average prices for commodities. Except for wool, mohair, and certain minor tobaccos, parity is not currently used to set price-support levels for dairy or any program commodities.

Perishable manufactured dairy products -- Manufactured dairy products with limited storage life, including ice cream, cottage cheese, yogurt, and sour cream.

Processors -- Generally refers to firms that process raw Grade A milk into fluid dairy products.

Public Law 480 (PL 480) -- Common name for the Agricultural Trade Development and Assistance Act of 1954 which seeks to expand foreign markets for U.S. agricultural products, combat hunger, and encourage economic development in developing countries.

Reconstituted milk -- Fluid milk recombined from ingredients (nonfat dry milk, condensed milk, and butterfat) or concentrated milk.

Revenue pool -- With a classified pricing system such as that used in Federal and State orders, processors pay for milk at different prices for each use category. Producers are paid a weighted average, or "blend," price for all uses of milk in a particular order or market. Processors pay into the pool on the basis of their uses of milk; these are the pool revenues. Producers participating in the pool receive identical uniform blend prices, with adjustments for butterfat content and location of the farm.

Reverse osmosis filtration -- A membrane separation technique used to remove water from fluid milk, yielding a concentrate for shipping and recombining at the final destination. The process can yield a concentrate of about 50 percent without altering the milk's key taste and nutrient characteristics.

Section 22 -- A section of the Agricultural Adjustment Act of 1933 (PL 73-10) that authorizes the President to restrict imports by imposing quotas or fees if the imports interfere with Federal price support programs or substantially reduce U.S. production of products processed from farm commodities.

Storable manufactured dairy products -- Storable manufactured dairy products, including butter, nonfat dry milk, and cheese.

Appendix table 1--Dairy herd size distribution on farms with milk cows, by region, 1987

Region 1/	Herd size (number of cows)								Average herd size	
	1-4	5-19	20-49	50-99	100-199	200-499	500+	All sizes	All farms	Farms with 5 or more cows
	Number of farms								Number of cows	
New England	1,051	450	1,756	1,983	685	152	8	6,085	55	66
Middle Atlantic	7,148	5,158	15,754	12,888	3,796	679	51	45,474	48	56
Corn Belt	8,278	5,906	12,805	8,892	2,296	281	11	38,469	38	48
Lake States	1,556	5,724	28,780	15,977	2,466	267	9	54,779	45	46
Plains	3,862	1,853	4,156	2,625	634	77	4	13,211	33	46
Southeast	2,608	543	447	710	797	352	124	5,581	76	141
South Central	9,078	2,547	2,526	3,204	2,164	694	107	20,320	44	79
Mountain	4,565	431	435	603	466	237	66	6,803	39	115
Southwest	1,253	201	122	236	504	999	792	4,107	282	405
Northwest	2,912	554	841	1,192	1,025	504	88	7,116	67	112
United States 2/	42,311	23,367	67,622	48,310	14,833	4,542	1,260	201,945	50	63
	Percent of farms									
New England	17.3	7.4	28.9	32.6	11.3	2.5	.1	100	---	---
Middle Atlantic	15.7	11.3	34.6	28.3	8.3	1.5	.1	100	---	---
Corn Belt	21.5	15.4	33.3	23.1	6.0	.7	*	100	---	---
Lake States	2.8	10.4	52.5	29.2	4.5	.5	*	100	---	---
Plains	29.2	14.0	31.5	19.9	4.8	.6	*	100	---	---
Southeast	46.7	9.7	8.0	12.7	14.3	6.3	2.2	100	---	---
South Central	44.7	12.5	12.4	15.8	10.6	3.4	0.5	100	---	---
Mountain	67.1	6.3	6.4	8.9	6.8	3.5	1.0	100	---	---
Southwest	30.5	4.9	3.0	5.7	12.3	24.3	19.3	100	---	---
Northwest	40.9	7.8	11.8	16.8	14.4	7.1	1.2	100	---	---
United States 2/	21.0	11.6	33.5	23.9	7.3	2.1	.6	100	---	---
	Percent of milk cows									
New England	.6	1.5	18.7	39.7	26.0	12.1	1.7	100	---	---
Middle Atlantic	.6	2.9	25.2	39.2	22.4	8.1	1.7	100	---	---
Corn Belt	.9	4.8	29.1	40.1	19.6	4.9	.5	100	---	---
Lake States	.1	3.1	40.3	41.3	12.3	2.7	.2	100	---	---
Plains	1.5	5.0	31.2	39.4	17.9	4.5	.5	100	---	---
Southeast	1.0	1.2	3.5	12.1	25.3	23.0	33.9	100	---	---
South Central	1.7	2.8	9.2	24.8	31.4	20.5	9.7	100	---	---
Mountain	2.7	1.4	5.4	15.8	23.1	25.8	25.8	100	---	---
Southwest	.2	.2	.3	1.5	6.4	27.4	64.0	100	---	---
Northwest	1.0	1.2	6.0	17.7	28.9	30.2	15.2	100	---	---
United States 2/	.7	2.8	22.9	31.5	18.9	11.8	11.6	100	---	---

	Herd size (number of cows)							
	1-4	5-19	20-49	50-99	100-199	200-499	500+	Total
	Number of milk cows							
New England	1,931	4,896	62,681	132,343	87,339	40,656	5,625	335,471
Middle Atlantic	12,301	62,884	547,517	851,083	485,709	175,212	36,145	2,170,851
Corn Belt	13,477	70,206	423,476	584,145	285,367	71,727	7,584	1,455,982
Lake States	3,009	76,519	987,860	1,012,767	300,566	66,497	6,041	2,453,259
Plains	6,339	21,678	135,704	171,520	78,028	19,610	2,350	435,229
Southeast	4,395	5,094	14,870	51,311	107,604	97,554	144,168	424,996
South Central	14,981	24,888	82,901	222,773	282,329	184,223	87,467	899,562
Mountain	7,171	3,645	14,390	42,020	61,190	68,485	68,412	265,313
Southwest	2,003	1,745	3,940	16,846	74,023	317,477	740,612	1,156,646
Northwest	4,540	5,645	28,229	83,876	136,760	142,882	71,907	473,839
United States 2/	70,147	277,200	2,301,568	3,168,684	1,898,915	1,184,323	1,170,311	10,071,148

* = Less than 0.05 percent.

--- = Not applicable.

1/ New England: CT, ME, MA, NH, RI, VT; Middle Atlantic: DE, MD, NJ, NY, OH, PA, VA, WV; Corn Belt: IL, IN, IA, KY, MI, MO; Lake States: MN, WI; Plains: KS, NE, ND, SD; Southeast: FL, GA, NC, SC; South Central: AL, AR, LA, MS, OK, TN, TX; Mountain: CO, MT, NV, NM, UT, WY; Southwest: AZ, CA; Northwest: ID, OR, WA.

2/ Excluding Alaska and Hawaii.

Source: 1987 Census of Agriculture, Vol. 1, Parts 1-51, Table 30.

Appendix table 2--Dairy herd size distribution on farms with milk cows, by region, 1978

Region 1/	Herd size (number of cows)								Average herd size	
	1-4	5-19	20-49	50-99	100-199	200-499	500+	All sizes	All farms	Farms with 5 or more cows
	Number of farms								Number of cows	
New England	2,764	847	2,917	2,279	647	117	5	9,576	40	55
Middle Atlantic	19,986	8,648	22,777	13,410	2,968	441	20	68,250	33	47
Corn Belt	25,255	11,208	20,267	8,914	1,676	169	11	67,500	24	39
Lake States	4,390	13,154	40,939	12,598	1,316	117	3	72,517	34	36
Plains	9,650	3,952	6,484	2,438	451	63	2	23,040	21	35
Southeast	9,188	1,088	819	1,183	846	363	147	13,634	36	107
South Central	28,900	5,281	4,284	4,385	2,142	535	52	45,579	22	57
Mountain	9,771	888	820	870	473	165	29	13,016	19	71
Southwest	3,182	301	228	396	713	1,034	528	6,382	143	283
Northwest	8,134	1,253	1,660	1,665	919	320	40	13,991	31	71
United States 2/	121,220	46,620	101,195	48,138	12,151	3,324	837	333,485	31	48
	Percent of farms									
New England	28.9	8.8	30.4	23.8	6.8	1.2	.1	100	---	---
Middle Atlantic	29.3	12.7	33.4	19.6	4.4	.6	*	100	---	---
Corn Belt	37.4	16.6	30.0	13.2	2.5	.3	*	100	---	---
Lake States	6.1	18.1	56.4	17.4	1.8	.2	*	100	---	---
Plains	41.9	17.1	28.1	10.6	2.0	.3	*	100	---	---
Southeast	67.4	8.0	6.0	8.7	6.2	2.6	1.1	100	---	---
South Central	63.4	11.6	9.4	9.6	4.7	1.2	.1	100	---	---
Mountain	75.1	6.8	6.3	6.7	3.6	1.3	.2	100	---	---
Southwest	49.8	4.7	3.6	6.2	11.2	16.2	8.3	100	---	---
Northwest	58.1	9.0	11.9	11.9	6.5	2.3	.3	100	---	---
United States 2/	36.4	14.0	30.3	14.4	3.6	1.0	.3	100	---	---
	Percent of milk cows									
New England	1.2	2.5	26.3	39.4	21.6	8.2	.8	100	---	---
Middle Atlantic	1.5	4.3	33.8	38.4	16.4	5.0	.6	100	---	---
Corn Belt	2.3	8.0	39.2	34.9	12.5	2.6	.5	100	---	---
Lake States	.3	6.9	53.6	31.5	6.4	1.2	.1	100	---	---
Plains	3.1	9.4	41.2	31.7	11.1	3.3	.2	100	---	---
Southeast	2.9	2.0	5.4	16.9	22.6	20.7	29.5	100	---	---
South Central	4.6	5.1	14.1	30.3	27.3	14.3	4.3	100	---	---
Mountain	6.2	3.3	10.8	24.2	24.8	18.6	12.1	100	---	---
Southwest	.6	.3	.8	3.1	11.3	35.8	48.1	100	---	---
Northwest	2.9	2.9	12.6	26.6	27.8	20.2	7.0	100	---	---
United States 2/	1.9	5.2	31.9	30.2	14.9	9.0	6.9	100	---	---

* = Less than 0.05 percent.

--- = Not applicable.

1/ New England: CT, ME, MA, NH, RI, VT; Middle Atlantic: DE, MD, NJ, NY, OH, PA, VA, WV; Corn Belt: IL, IN, IA, KY, MI, MO; Lake States: MN, WI; Plains: KS, NE, ND, SD; Southeast: FL, GA, NC, SC; South Central: AL, AR, LA, MS, OK, TN, TX; Mountain: CO, MT, NV, NM, UT, WY; Southwest: AZ, CA; Northwest: ID, OR, WA. 2/ Excluding Alaska and Hawaii.

Source: 1978 Census of Agriculture, Vol. 1, Parts 1-51, Chap. 1, Table 20.

Appendix table 3--Milk production costs, United States, per cwt, 1972-89

Item	1972	1973	1974	1975	1976	1977	1978	1979 1/	1980	1981	1982	1983	1984	1985 2/	1986	1987	1988	1989 3/
								Dollars per cwt										
Gross value:																		
Milk	6.07	7.13	8.33	8.58	9.57	9.62	10.49	11.93	12.95	13.69	13.52	13.50	13.38	12.70	12.47	12.51	12.24	13.27
Cull cows	.79	1.03	.79	.65	.75	.74	1.06	1.49	1.38	1.25	1.14	1.09	1.07	1.07	1.02	1.18	1.24	1.26
Total, cash receipts	6.86	8.16	9.12	9.23	10.32	10.36	11.55	13.42	14.33	14.94	14.66	14.59	14.45	13.76	13.49	13.69	13.48	14.53
Cash expenses:																		
Concentrates	1.51	2.17	2.72	2.71	2.71	2.66	2.68	3.02	3.35	3.45	3.28	3.43	3.47	3.35	3.19	3.06	3.42	3.70
Byproducts 4/	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	.21	.20	.18	.22	.23
Hay	.44	.57	.70	.73	.79	.69	.64	.74	.86	.80	.86	.85	.82	1.10	1.04	.99	1.35	1.60
Silage & haylage	.31	.40	.49	.51	.56	.48	.44	.52	.61	.56	.54	.56	.58	.58	.57	.53	.83	.94
Pasture & other	.02	.03	.04	.04	.04	.03	.03	.04	.04	.04	.04	.04	.04	.06	.06	.06	.07	.08
Total, feed cash expenses	2.28	3.17	3.95	3.99	4.10	3.86	3.79	4.32	4.86	4.85	4.72	4.88	4.91	5.30	5.06	4.82	5.89	6.55
Milk hauling & marketing	.31	.32	.33	.31	.31	.32	.33	.38	.43	.45	.45	.44	.45	.58	.55	.61	.61	.61
Artificial insemination	.05	.05	.06	.07	.08	.08	.08	.09	.10	.11	.12	.12	.12	.12	.12	.12	.12	.13
Veterinary & medicine	.12	.13	.14	.16	.17	.17	.17	.18	.19	.20	.20	.21	.22	.20	.20	.20	.20	.21
Livestock hauling	.01	.01	.02	.01	.01	.01	.01	.02	.02	.02	.02	.02	.02	.03	.03	.03	.03	.03
Fuel, lube, electricity	.12	.13	.17	.19	.19	.20	.21	.27	.38	.40	.40	.37	.33	.32	.22	.23	.22	.25
Machinery, building repairs	.20	.22	.26	.30	.28	.27	.28	.30	.33	.35	.37	.37	.37	.41	.39	.38	.37	.38
Hired labor	.45	.50	.56	.60	.62	.65	.69	.74	.77	.83	.87	.85	.91	.92	.94	.94	.97	1.05
DHIA fees	.02	.02	.03	.03	.03	.04	.04	.04	.04	.05	.05	.05	.05	.06	.06	.06	.06	.06
Dairy supplies	.09	.10	.12	.14	.14	.14	.15	.17	.18	.19	.19	.19	.19	.21	.19	.19	.20	.20
Dairy assessment	0	0	0	0	0	0	0	0	0	0	0	.48	.50	.13	.36	.19	.03	0
Total, variable expenses	3.65	4.65	5.64	5.80	5.93	5.74	5.75	6.51	7.30	7.45	7.39	7.98	8.07	8.28	8.12	7.77	8.72	9.47
General farm overhead	.09	.12	.16	.19	.23	.24	.29	.38	.46	.54	.60	.50	.60	.53	.59	.70	.81	.87
Taxes and insurance	.10	.12	.15	.14	.16	.18	.21	.29	.34	.37	.35	.36	.34	.37	.35	.35	.39	.40
Interest	.41	.52	.65	.68	.76	.74	.83	1.08	1.29	1.52	1.56	1.55	1.63	1.41	1.23	1.03	1.02	1.10
Total, fixed expenses	.60	.76	.96	1.01	1.15	1.16	1.33	1.75	2.09	2.43	2.51	2.41	2.57	2.31	2.17	2.08	2.22	2.37
Total, cash expenses	4.25	5.41	6.60	6.81	7.08	6.90	7.08	8.26	9.39	9.88	9.90	10.39	10.64	10.59	10.29	9.85	10.92	11.84
Value of prod less cash expenses	2.61	2.75	2.52	2.42	3.24	3.46	4.47	5.16	4.94	5.06	4.76	4.20	3.81	3.17	3.20	3.84	2.56	2.69
Capital replacement	.73	.86	.98	.87	.92	.96	1.14	1.47	1.61	1.64	1.57	1.58	1.56	1.70	1.64	1.59	1.69	1.71
Value of prod less cash expenses & capital replacement	1.88	1.89	1.54	1.55	2.32	2.50	3.33	3.69	3.33	3.42	3.19	2.62	2.25	1.47	1.56	2.25	.87	.98
Economic costs:																		
Variable expenses	3.65	4.65	5.64	5.80	5.93	5.74	5.75	6.51	7.30	7.45	7.39	7.98	8.07	8.28	8.12	7.77	8.70	9.47
General farm overhead	.09	.12	.16	.19	.23	.24	.29	.38	.46	.54	.60	.50	.60	.53	.59	.70	.81	.87
Taxes and insurance	.10	.12	.15	.14	.16	.18	.21	.29	.34	.37	.35	.36	.34	.37	.35	.35	.39	.40
Capital replacement	.73	.86	.98	.87	.92	.96	1.14	1.47	1.61	1.64	1.57	1.58	1.56	1.70	1.64	1.59	1.69	1.71
Allocated returns to owned inputs:																		
Operating capital	.06	.10	.11	.08	.06	.06	.09	.12	.13	.15	.12	.12	.12	.05	.06	.06	.08	.09
Other nonland capital	.33	.40	.51	.48	.51	.51	.58	.75	.80	.77	.71	.64	.49	.55	.55	.63	.72	.72
Land	.22	.23	.25	.17	.18	.20	.21	.23	.26	.26	.25	.24	.19	.18	.14	.14	.19	.19
Unpaid labor	.80	.88	.99	1.06	1.10	1.15	1.22	1.32	1.37	1.46	1.51	1.49	1.58	.55	.55	.54	.56	.58
Total, economic costs	5.98	7.36	8.79	8.79	9.09	9.04	9.49	11.07	12.27	12.64	12.50	12.91	12.95	12.24	11.99	11.78	13.14	14.03
Residual return to managment and risk	.88	.80	.33	.44	1.23	1.32	2.06	2.35	2.06	2.30	2.16	1.68	1.50	1.52	1.50	1.91	.34	.50

NA = Not available.
1/ Estimates for 1972-84 are based on technical information from the 1979 Milk Production Survey, U.S. Dept. Agr.
2/ Estimates for 1985-89 based on technical information from the 1985 Farm Costs and Returns Survey, U.S. Dept. Agr.
3/ Forecast.
4/ Not included prior to 1985.

Source: Economic Indicators of the Farm Sector: Costs of Production--Livestock and Dairy, 1988. ECIFS 8-3. U.S. Dept. Agr., Econ. Res. Serv. Mar. 1990 and prior issues.

Appendix table 4--Milk production costs, by region, per cwt, 1986-88 1/

Item	Appalachia			Corn Belt			Northeast			Pacific			Southeast			Southern Plains			Upper Midwest		
	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988
									Dollars												
Gross value of production:																					
Milk	13.07	13.47	13.21	12.28	12.41	12.09	12.77	12.93	12.65	11.81	11.56	11.13	15.33	15.10	14.87	13.60	13.70	13.20	12.10	12.10	11.92
Cull cows	.65	.77	.82	1.30	1.45	1.52	.94	1.09	1.17	.88	1.04	1.09	.98	1.17	1.27	1.10	1.28	1.28	1.13	1.30	1.35
Total	13.72	14.24	14.03	13.58	13.86	13.61	13.71	14.02	13.82	12.69	12.60	12.22	16.31	16.27	16.14	14.70	14.98	14.48	13.23	13.40	13.27
Cash expenses:																					
Feed	5.38	5.21	5.97	5.16	4.83	5.81	4.36	4.25	4.91	6.07	5.58	6.30	7.07	6.27	7.39	6.45	5.92	6.90	4.72	4.58	6.14
Other	2.90	2.77	2.67	3.21	3.09	2.93	3.32	3.19	3.10	3.13	2.93	2.77	4.13	4.06	3.91	3.57	3.36	3.10	2.67	2.61	2.43
Total, variable cash exp.	8.28	7.98	8.64	8.37	7.92	8.74	7.68	7.44	8.01	9.20	8.51	9.07	11.20	10.33	11.30	10.02	9.28	10.00	7.39	7.19	8.57
Total, fixed cash exp.	1.83	2.15	1.89	2.57	2.23	2.69	1.94	2.14	2.22	1.27	1.04	1.37	1.89	1.53	1.71	1.63	1.54	1.87	2.75	2.53	2.62
Total, cash expenses	10.11	10.13	10.53	10.94	10.15	11.43	9.62	9.58	10.23	10.47	9.55	10.44	13.09	11.86	13.01	11.65	10.82	11.87	10.14	9.72	11.19
Capital replacement	1.49	1.45	1.49	1.84	1.82	1.96	1.78	1.73	1.79	.69	.67	.69	.87	.84	.87	.96	.94	.97	2.05	1.98	2.19
Net cash returns 2/	2.12	2.66	2.01	.80	1.89	.22	2.31	2.71	1.80	1.53	2.38	1.09	2.35	3.57	2.26	2.09	3.22	1.64	1.04	1.70	-.11
Economic (full ownership) costs:																					
Cash expenses (less interest)	9.15	9.03	9.80	9.25	8.88	9.76	7.68	7.44	8.01	9.61	9.08	9.75	11.92	11.18	12.49	10.80	10.20	11.21	8.57	8.37	10.00
Capital replacement	1.49	1.45	1.49	1.84	1.82	1.96	1.78	1.73	1.79	.69	.67	.69	.87	.84	.87	.96	.94	.97	2.05	1.98	2.19
Allocated returns to owned inputs 3/	1.19	1.26	1.41	1.73	1.82	2.07	1.46	1.58	1.82	.62	.66	.73	.67	.68	.79	1.22	1.25	1.33	1.40	1.48	1.70
Total, economic costs	11.83	11.74	12.70	12.82	12.52	13.79	11.95	11.98	12.92	10.92	10.41	11.17	13.46	12.70	14.15	12.98	12.39	13.51	12.02	11.83	13.89
Residual returns to managment and risk	1.89	2.50	1.33	.76	1.34	-.18	1.76	2.04	.90	1.77	2.19	1.05	2.85	3.57	1.99	1.72	2.59	.97	1.21	1.57	-.62

1/ Severe drought in 1988 affected feed costs and, accordingly, net and residual returns, especially in the Corn Belt, Southeast, and the Upper Midwest regions.
2/ Gross value of production less cash expenses and capital replacement.
3/ Variable expense items mutiplied by part of year used; 6-month U.S. Treasury bill rate and value of machinery and equipment multiplied by longrun real rate of return to production assets in farm sector; value of land multiplied by longrun real rate of return to production assets in farm sector; and unpaid labor.

Source: Economic Indicators of the Farm Sector: Costs of Production--Livestock and Dairy, 1988. ECIFS 8-3. U.S. Dept. Agr., Econ. Res. Serv. Mar. 1990.

Appendix table 5--Per capita and indexes of per capita consumption of selected dairy products, 1970-88 1/

Item	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
									Pounds										
Whole milk 2/	219.1	214.9	207.5	197.7	186.8	181.3	175.2	167.3	161.0	154.8	146.4	139.9	133.2	130.0	126.5	122.9	116.0	111.4	106.1
Lowfat milk products 3/	50.8	55.6	60.9	66.1	68.4	74.8	79.6	84.8	87.5	90.3	93.6	96.0	96.2	99.2	103.8	110.0	116.1	118.6	122.5
Cream products 4/	5.2	5.1	5.2	5.2	5.2	5.3	5.4	5.4	5.4	5.5	5.6	5.7	5.8	6.2	6.7	7.2	7.5	7.6	7.6
Total fluid items 2/	275.1	275.6	273.6	269.0	260.4	261.4	260.2	257.5	253.9	250.6	245.5	241.5	235.3	235.4	237.0	240.1	239.6	237.5	236.2
Butter	5.4	5.2	5.0	4.8	4.5	4.7	4.3	4.3	4.4	4.5	4.5	4.2	4.3	4.9	4.9	4.9	4.6	4.6	4.5
Nonfat dry milk 5/	5.3	5.2	4.6	5.3	4.1	3.3	3.5	3.3	3.1	3.3	3.0	2.1	2.1	2.2	2.5	2.3	2.5	2.5	2.6
American cheese	7.0	7.4	7.7	7.9	8.5	8.2	8.9	9.2	9.5	9.6	9.6	10.2	11.3	11.6	11.8	12.1	12.1	12.3	11.4
Other cheese 6/	4.4	4.7	5.3	5.6	5.9	6.1	6.6	6.8	7.3	7.5	7.9	8.0	8.6	8.9	9.6	10.3	11.0	11.6	12.1
All dairy products 7/	563.9	558.4	560.1	551.0	538.3	539.4	539.7	541.1	544.5	548.0	543.4	540.9	555.5	572.4	581.3	592.7	590.5	597.8	582.2
									Index (1970 = 100) 8/										
Whole milk 2/	100.0	98.1	94.7	90.2	85.2	82.7	79.9	76.3	73.5	70.6	66.8	63.8	60.8	59.3	57.7	56.1	52.9	50.8	48.4
Lowfat milk products 3/	100.0	109.4	120.0	130.1	134.7	147.3	156.8	167.1	172.3	177.8	184.2	188.9	189.5	195.4	204.4	216.7	228.6	233.5	241.2
Cream products 4/	100.0	98.3	99.0	100.6	100.4	102.3	103.6	103.9	103.7	105.9	107.3	109.7	112.3	119.3	129.3	137.5	145.1	146.3	147.0
Total fluid items 2/	100.0	100.2	99.4	97.8	94.6	95.0	94.6	93.6	92.3	91.1	89.2	87.8	85.5	85.6	86.1	87.3	87.1	86.3	85.9
Butter	100.0	95.7	91.9	88.2	83.7	87.6	80.0	79.6	80.7	83.3	82.8	78.5	80.5	90.8	90.9	90.2	85.5	85.7	82.7
Nonfat dry milk 5/	100.0	98.9	86.4	99.3	78.1	61.5	66.2	62.5	58.5	62.1	56.8	40.4	40.0	42.2	47.5	42.6	46.7	47.4	48.4
American cheese	100.0	104.8	109.9	112.0	120.9	116.5	126.9	131.5	136.0	137.0	137.5	144.8	161.3	165.3	168.4	173.1	171.9	175.9	162.8
Other cheese 6/	100.0	107.5	121.6	129.5	136.2	140.3	151.9	155.4	167.6	173.4	181.2	183.8	196.7	205.1	220.7	237.3	251.7	267.5	279.2
All dairy products 7/	100.0	99.0	99.3	97.7	95.5	95.7	95.7	96.0	96.6	97.2	96.4	95.9	98.5	101.5	103.1	105.1	104.7	106.0	103.2

1/ Data represent domestic disappearance divided by total population including military overseas, except for fluid milk and cream that are based on resident population. All items are on a product-weight basis except for "all dairy products" which is on a milk-equivalent, milkfat basis.

2/ Commercial sales and onfarm consumption.

3/ Includes lowfat and skim milk, buttermilk, and yogurt.

4/ Includes heavy cream, light cream, half and half, sour cream and dip, and eggnog.

5/ Excludes that used in other dairy products.

6/ Excludes cottage cheese.

7/ Includes all dairy products (including some manufactured products not shown separately) on a milk-equivalent, milkfat basis.

8/ Index calculation made from unrounded numbers.

Appendix table 6--Number of cooperatives and their share of U.S. market at the farm milk supply and processing levels, selected products

Marketing level and item	Number of cooperatives				Cooperative share of U.S. market											
					All cooperatives			4 largest			8 largest			20 largest		
	1964	1973	1980	1987	1973	1980	1987	1973	1980	1987	1973	1980	1987	1973	1980	1987
	-Number-				-Percent-											
Farm milk supply:																
Grade A	NA	1/370	1/322	1/264	81	79	76	31	26	25	41	36	35	54	52	56
Nongrade A	NA	1/328	1/228	1/144	55	57	57	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	NA	2/563	2/420	2/289	75	76	74	NA	NA	NA	NA	NA	NA	NA	NA	NA
Milk processed or manufactured at cooperative plants	856	291	192	121	28	35	37	10	19	15	12	27	23	17	40	34
Selected products--																
Powder	212	62	48	31	85	87	91	46	36	46	57	50	66	72	74	86
Butter	740	207	148	82	66	64	83	34	26	45	41	36	60	51	53	78
Cheese	294	187	157	94	35	47	45	13	19	25	18	26	31	25	36	40
Cottage cheese	126	64	44	23	13	22	13	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluid products	215	85	59	34	12	16	14	4	6	8	6	9	10	9	14	13
Ice cream and ice milk	143	60	38	21	5	10	8	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA = Not available.

1/ Number of cooperatives receiving milk from farmers or bargaining directly for farmers, but does not include federations of cooperatives.

2/ Total numbers do not add since some cooperatives received both Grade A and non-Grade A milk.

Source: K. Charles Ling and James B. Roof. Marketing Operations of Dairy Cooperatives. ACS Res. Rpt. 88. U.S. Dept. Agr., Agricultural Cooperative Service, Nov. 1989.

Appendix table 7--Milk marketing and USDA net removals, 1960-89

Year	Milk marketings 1/	Net removals 2/	
	Million pounds		Pct. of mktgs.
1960	113,951	3,115	2.7
1961	119,325	8,022	6.8
1962	118,587	10,748	9.1
1963	118,144	7,772	6.6
1964	120,478	7,677	6.4
1965	118,206	5,665	4.8
1966	114,440	645	.6
1967	113,568	7,427	6.5
1968	112,563	5,150	4.6
1969	111,793	4,479	4.0
1970	112,999	5,774	5.1
1971	114,814	7,268	6.3
1972	116,487	5,345	4.6
1973	112,141	2,185	1.9
1974	112,385	1,346	1.2
1975	112,337	2,036	1.8
1976	117,221	1,236	1.1
1977	119,830	6,080	5.1
1978	118,796	2,743	2.3
1979	120,867	2,119	1.8
1980	126,068	8,800	7.0
1981	130,466	12,861	9.9
1982	133,144	14,282	10.7
1983	137,228	16,814	12.3
1984	132,421	8,637	6.5
1985	140,544	13,174	9.4
1986	140,735	10,628	7.6
1987	140,450	6,706	4.8
1988	143,292	8,856	6.2
1989	3/ 142,733	8,968	6.3

1/ Milk production less amount fed to calves and consumed on farms.
2/ Milk equivalent basis.
3/ Estimated.

Appendix table 8--Net Government expenditures on dairy support and related programs, fiscal years, 1950-89

Year beginning July 1	Net producer payments 1/	Net support purchases 2/	Military milk 3/	Section 32 4/	Section 709 5/	Section 4(a) 5/	Export assis-tance 6/	Total (excluding special milk)	Special milk program 7/
					Million dollars				
1949-50		170.5	---	17.6	---	---	---	188.1	---
1950-51		8/-49.1	---	9/-.9	---	---	---	8/ -50.1	---
1951-52		1.6	---	7.5	---	---	---	9.1	---
1952-53		274.9	---	25.1	---	---	---	300.0	---
1953-54		400.4	---	74.0	---	---	---	474.4	---
1954-55		228.7	4.3	24.4	---	---	---	257.4	22.2
1955-56		237.9	7.3	39.0	---	---	---	284.2	48.2
1956-57		239.1	16.4	75.6	---	---	---	331.1	61.0
1957-58		205.9	30.4	123.7	---	---	---	360.0	66.7
1958-59		102.1	23.0	106.2	---	---	---	231.2	74.7
1959-60		159.5	23.6	35.1	---	---	---	218.2	81.2
1960-61		173.9	25.3	82.1	---	---	---	281.3	87.0
1961-62		539.0	25.9	47.1	---	---	---	612.0	91.7
1962-63		454.0	24.8	---	---	---	6.7	485.5	93.7
1963-64		311.7	26.5	4.4	---	---	36.5	379.1	97.1
1964-65		157.2	26.2	105.6	---	---	44.7	333.7	86.5
1965-66		26.1	---	38.7	---	---	3.8	68.6	97.0
1966-67		283.9	---	.9	14.2	---	18.4	317.4	96.1
1967-68		357.1	---	---	---	---	7.1	364.2	103.1
1968-69		268.8	---	45.4	---	---	13.1	327.3	101.9
1969-70		168.6	---	107.1	7.8	---	7.4	290.9	102.9
1970-71		315.4	---	91.6	3.2	---	11.6	421.8	91.8
1971-72		267.0	---	63.9	---	---	7.3	338.2	93.6
1972-73		135.8	---	15.4	.1	---	1.5	152.8	90.8
1973-74		31.4	---	10.8	13.7	15.0	---	70.9	50.2
1974-75		485.8	---	6.5	---	3.8	---	496.1	122.9
1975-76		69.6	---	4.1	---	2.8	---	76.5	144.0
Transition quarter 10/		43.5	---	1.0	---	---	---	44.5	25.5
1976-77		709.8	---	---	---	4.5	---	714.3	109.7
1977-78		446.4	---	---	---	5.0	---	451.4	137.8
1978-79		244.3	---	---	---	6.3	---	250.6	134.1
1979-80		1,274.0	---	---	---	5.8	---	1,279.8	159.3
1980-81		1,967.2	---	---	---	7.5	---	1,974.7	104.4
1981-82		2,231.3	---	---	---	7.9	---	2,239.2	22.9
1982-83	(253.8)	2,592.0	---	---	---	8.4	---	2,600.4	14.9
1983-84	(481.0)	1,588.1	---	---	---	9.4	---	1,597.5	16.0
1984-85	255.8	2,168.8	---	---	---	16.2	---	2,185.0	15.5
1985-86	202.1	2,401.9	---	---	---	14.6	---	2,416.5	16.5
1986-87	156.5	1,221.7	---	---	---	15.8	---	1,237.5	17.5
1987-88	185.2	1,317.7	---	---	---	11.5	---	1,329.2	19.9
1988-89 11/	155.0	679.2	---	---	---	18.6	---	697.8	22.1

--- = Not applicable.

1/ Milk diversion and/or termination payments less producer deductions and/or reductions. 2/ CCC support purchases and related costs (for processing, packaging, transporting, and storing) of dairy products, plus net payments to producers and net expenditures for certain red meat purchases, less proceeds from sales to commercial buyers for domestic use and for export, U.S. military agencies, foreign government and private welfare agencies, and Section 32 programs. 3/ CCC reimbursements to U.S. military agencies, Veterans' Administration and other participants. 4/ Expenditures of Section 32 funds to buy dairy products in the market and from CCC for school lunch and welfare uses. 5/ Purchases of dairy products at market prices under Section 709 of the Food and Agriculture Act of 1965, and Section 4(a) of the Agriculture and Consumer Protection Act of 1973, for domestic school lunch and welfare uses. 6/ Value of payment-in-kind certificates issued by CCC on exports of nonfat dry milk, butter, and other high-milkfat products, and CCC cost of exports under Title I, PL 480 of dairy products not originating in CCC stocks. 7/ Expenditures under the program to increase milk consumption by children in schools, child-care centers, and similar institutions. 8/ Net receipt due to sales exceeding purchases. 9/ Receipt due to adjustment. 10/ Start of fiscal year moved from July 1 to October 1 in 1976. 11/ Preliminary.

Source: U.S. Dept. Agr., Agricultural Stabilization and Conservation Service.

Appendix table 9--Milk: Production by States and regions, selected years

State and region	1965	1970	1975	1980	1985	1989 1/
			Million pounds			
Maine	660	619	629	665	673	609
New Hampshire	394	356	336	347	364	293
Vermont	2,055	1,970	2,009	2,289	2,410	2,331
Massachusetts	790	658	601	570	596	446
Rhode Island	103	75	63	47	44	34
Connecticut	713	661	608	612	620	524
New York	11,033	10,341	9,964	10,974	11,732	11,142
New Jersey	1,034	730	528	494	487	364
Pennsylvania	7,206	7,124	7,140	8,496	9,983	9,998
Delaware	156	130	127	125	147	128
Maryland	1,559	1,560	1,550	1,520	1,625	1,377
Northeast	25,703	24,224	23,555	26,139	28,681	27,246
Michigan	5,528	4,602	4,411	4,970	5,568	5,152
Wisconsin	18,848	18,435	18,900	22,380	24,700	24,000
Minnesota	10,731	9,636	8,946	9,535	10,835	10,108
Lake States	35,107	32,673	32,257	36,885	41,103	39,260
Ohio	5,200	4,420	4,259	4,310	4,870	4,555
Indiana	2,954	2,382	2,210	2,210	2,358	2,231
Illinois	3,844	2,850	2,446	2,540	2,721	2,743
Iowa	5,945	4,670	3,893	3,994	4,058	4,202
Missouri	3,243	3,012	2,840	2,826	2,870	2,975
Corn Belt	21,186	17,334	15,648	15,880	16,877	16,706
North Dakota	1,467	1,065	917	939	1,120	1,030
South Dakota	1,580	1,578	1,556	1,669	1,744	1,724
Nebraska	1,821	1,566	1,431	1,315	1,340	1,360
Kansas	1,749	1,740	1,392	1,330	1,285	1,251
Northern Plains	6,617	5,949	5,296	5,253	5,489	5,365
Virginia	1,829	1,749	1,755	1,974	2,102	1,991
West Virginia	500	374	350	350	382	279
North Carolina	1,502	1,485	1,498	1,631	1,748	1,533
Kentucky	2,568	2,471	2,319	2,219	2,222	2,265
Tennessee	2,171	2,123	2,031	2,241	2,235	2,192
Appalachian	8,570	8,202	7,953	8,415	8,689	8,260
South Carolina	518	512	512	541	576	463
Georgia	991	1,182	1,221	1,367	1,300	1,303
Florida	1,390	1,641	1,956	2,028	2,038	2,447
Alabama	838	816	686	610	547	523
Southeast	3,737	4,151	4,375	4,546	4,461	4,736

Continued--

Appendix table 9--Milk: Production by States and regions, selected years--Continued

State and region	1965	1970	1975	1980	1985	1989 1/
			Million pounds			
Mississippi	1,136	1,049	876	817	876	767
Arkansas	722	685	707	740	848	794
Louisiana	1,002	1,089	1,054	1,012	911	950
Delta States	2,860	2,823	2,637	2,569	2,635	2,511
Oklahoma	1,314	1,250	1,060	1,110	1,183	1,232
Texas	2,973	3,065	3,206	3,625	3,968	5,170
Southern Plains	4,287	4,315	4,268	4,735	5,151	6,402
Montana	378	326	278	314	349	332
Idaho	1,475	1,490	1,555	1,947	2,421	2,669
Wyoming	175	140	110	132	134	124
Colorado	832	856	845	858	1,105	1,277
New Mexico	292	304	366	602	1,078	1,243
Arizona	529	585	840	1,031	1,348	1,523
Utah	736	819	919	1,028	1,135	1,170
Nevada	134	142	168	219	242	292
Mountain	4,551	4,662	5,081	6,131	7,812	8,630
Washington	1,932	2,091	2,322	2,942	3,750	4,097
Oregon	980	970	990	1,169	1,438	1,509
California	8,480	9,457	10,853	13,577	16,762	19,353
Alaska	21	19	17	13	22	23
Hawaii	149	137	146	152	142	154
Pacific	11,562	12,674	14,328	17,853	22,114	25,136
United States	124,180	117,007	115,398	128,406	143,012	144,252

1/ Preliminary.

Appendix table 10--Regional shares of U.S. milk production, selected years

Region 1/	1965	1970	1975	1980	1985	1989
			Percent of U.S. total			
Northeast	20.7	20.7	20.4	20.4	20.1	18.9
Lake States	28.3	27.9	28.0	28.7	28.7	27.2
Corn Belt	17.0	14.8	13.6	12.4	11.8	11.6
Northern Plains	5.3	5.1	4.6	4.1	3.8	3.7
Appalachian	6.9	7.0	6.9	6.6	6.1	5.7
Southeast	3.0	3.6	3.8	3.5	3.1	3.3
Delta	2.3	2.4	2.3	2.0	1.8	1.8
Southern Plains	3.5	3.7	3.7	3.7	3.6	4.4
Mountain	3.7	4.0	4.4	4.8	5.5	6.0
Pacific	9.3	10.8	12.3	13.8	15.5	17.4

1/ See appendix table 9 for States included in the respective regions.

Appendix table 11--Milk: Supply and utilization of all dairy products, 1965-88 1/

Year	Supply				Utilization					
								Domestic disappearance		
	Production	Imports	Beginning stocks 2/	Total	Total use	Exports 3/	Shipments	Fed to calves	Human	Ending stocks 2/
	Million pounds									
1965	124,180	923	5,290	130,393	125,937	1,836	522	2,061	121,518	4,456
1966	119,912	2,791	4,456	127,159	122,300	778	430	1,980	119,112	4,859
1967	118,732	2,908	4,859	126,499	118,247	363	461	1,891	115,532	8,252
1968	117,225	1,780	8,252	127,257	120,550	1,185	586	1,821	116,958	6,707
1969	116,108	1,621	6,707	124,436	119,092	921	498	1,745	115,928	5,344
1970	117,007	1,874	5,245	124,126	118,323	438	522	1,702	115,631	5,803
1971	118,566	1,346	5,803	125,715	120,611	2,458	568	1,635	115,950	5,104
1972	120,025	1,694	5,104	126,823	121,325	1,470	677	1,624	117,554	5,498
1973	115,491	3,860	5,498	124,849	119,641	654	638	1,584	116,765	5,208
1974	115,586	2,923	5,208	123,717	117,831	582	576	1,558	115,115	5,886
1975	115,398	1,669	5,886	122,953	119,110	550	496	1,566	116,498	3,843
1976	120,180	1,943	3,843	125,966	120,257	507	520	1,567	117,663	5,709
1977	122,654	1,968	5,709	130,331	121,705	465	527	1,541	119,172	8,626
1978	121,461	2,310	8,626	132,397	123,668	376	602	1,497	121,193	8,729
1979	123,350	2,305	8,729	134,384	125,785	400	620	1,442	123,323	8,599
1980	128,406	2,109	8,599	139,114	126,155	426	562	1,395	123,772	12,959
1981	132,770	2,329	12,959	148,058	129,680	3,197	586	1,418	124,479	18,378
1982	135,505	2,477	18,378	156,360	136,306	5,095	516	1,521	129,174	20,054
1983	139,588	2,616	20,054	162,258	139,612	3,188	577	1,520	134,327	22,646
1984	135,351	2,741	22,646	160,738	144,034	3,600	634	2,129	137,671	16,704
1985	143,012	2,776	16,704	162,492	148,797	4,805	566	1,745	141,681	13,695
1986	143,124	2,732	13,695	159,551	146,685	1,970	546	1,715	142,454	12,866
1987	142,709	2,490	12,866	158,065	150,625	2,434	602	1,599	145,990	7,440
1988 4/	145,152	2,394	7,440	154,986	146,797	1,533	615	1,615	143,034	8,189

1/ Milk equivalent, milkfat basis.
2/ Excludes cream and bulk condensed starting 1970.
3/ Government and commercial.
4/ Preliminary.

Appendix table 12--Dairy products: Per capita consumption, United States, 1977-88 1/

Year	Fluid milk and cream 2/	Butter	Cheese			Evaporated and condensed			Frozen products					Dry milk products			
			Whole and part skim milk 3/		Cottage	Canned whole milk	Bulk, whole milk	Bulk and canned, skim milk	Ice cream	Ice milk	Sherbert	Other frozen dairy products	Mello-rine	Dry whole milk	Non-fat dry milk	Dry butter milk	Dry whey 4/
			American	Other													
								Pounds									
1977	258	4.3	9.2	6.8	4.7	3.2	1.1	3.9	17.7	7.7	1.5	0.3	0.4	0.2	3.3	0.3	2.4
1978	254	4.4	9.6	7.3	4.7	3.0	1.0	3.5	17.6	7.7	1.4	.4	.4	.3	3.1	.2	2.4
1979	251	4.5	9.6	7.5	4.5	3.0	1.1	3.3	17.3	7.3	1.3	.3	.3	.3	3.3	.2	2.7
1980	246	4.5	9.6	7.9	4.5	2.8	1.0	3.3	17.5	7.1	1.3	.3	.3	.3	3.0	.2	2.7
1981	242	4.2	10.2	8.0	4.3	2.9	1.2	3.2	17.4	7.0	1.3	.6	.2	.4	2.1	.2	2.7
1982	235	4.3	11.3	8.6	4.2	2.7	1.3	3.0	17.6	6.6	1.3	.6	.2	.4	2.1	.2	2.9
1983	235	4.9	11.6	8.9	4.1	2.7	1.1	3.2	18.0	6.9	1.3	.6	.2	.4	2.2	.2	3.1
1984	237	4.9	11.8	9.6	4.1	2.4	1.3	3.7	18.1	7.0	1.3	.6	.2	.4	2.5	.2	3.2
1985	240	4.9	12.1	10.3	4.1	2.2	1.4	3.8	18.1	6.9	1.3	1.3	.2	.4	2.3	.2	3.5
1986	240	4.6	12.1	11.0	4.1	2.2	1.4	4.3	18.4	7.2	1.3	.9	.2	.5	2.5	.2	3.7
1987	237	4.6	12.3	11.6	3.9	2.2	1.5	4.2	18.3	7.4	1.2	1.0	.2	.5	2.5	.2	3.6
1988 5/	236	4.5	11.4	12.1	3.9	2.1	1.4	4.2	17.2	7.9	1.3	1.0	.2	.6	2.6	.2	3.5

1/ ERS no longer separately estimates civilian and military use. Data represent domestic disappearance divided by total population including military overseas, except for fluid milk and cream that are based on resident population.

2/ Product pounds of commercial sales and onfarm consumption. Commercial sales include whole milk, lowfat milk, skim milk, buttermilk, flavored milk and drinks, cream, milk-cream mixtures, sour cream and dips, eggnog, and yogurt.

3/ Excludes cottage cheese.

4/ Includes modified dry whey products.

5/ Preliminary or estimated.

Appendix table 13--Per capita consumption of selected cheese varieties, 1971-88 1/

Year	Natural equivalent of cheese and cheese products												
	American			Italian							Miscellaneous		
	Cheddar	Other 2/	Total	Provolone	Romano	Parmesan	Mozzarella	Ricotta	Other	Total	Swiss 3/	Brick	Munster
	Pounds												
1971	5.94	1.42	7.35	0.22	0.14	0.20	1.38	0.28	0.07	2.30	0.94	0.11	0.19
1972	6.04	1.67	7.71	.24	.17	.23	1.58	.31	.08	2.61	1.07	.10	.22
1973	6.10	1.76	7.86	.27	.15	.18	1.77	.34	.09	2.81	1.07	.11	.22
1974	6.32	2.16	8.48	.27	.15	.25	1.86	.33	.09	2.96	1.20	.11	.23
1975	6.04	2.13	8.17	.28	.22	.17	2.12	.38	.07	3.24	1.10	.09	.24
1976	6.45	2.46	8.91	.31	.17	.27	2.32	.41	.08	3.56	1.25	.09	.25
1977	6.80	2.43	9.23	.35	.16	.26	2.47	.41	.09	3.73	1.21	.07	.25
1978	6.94	2.61	9.55	.36	.19	.28	2.69	.44	.11	4.07	1.34	.08	.27
1979	6.93	2.69	9.62	.40	.16	.32	2.81	.46	.08	4.24	1.36	.06	.28
1980	6.89	2.76	9.65	.42	.15	.28	3.02	.47	.10	4.44	1.33	.07	.31
1981	7.03	3.14	10.17	.45	.14	.30	2.98	.49	.09	4.45	1.27	.06	.29
1982	8.71	2.61	11.32	.46	.17	.32	3.28	.47	.11	4.83	1.30	.06	.31
1983	9.09	2.51	11.60	.50	.16	.32	3.67	.54	.09	5.27	1.25	.06	.30
1984	9.50	2.31	11.82	.54	.17	.35	4.02	.57	.09	5.76	1.24	.07	.32
1985	9.73	2.42	12.14	.56	.21	.37	4.61	.60	.08	6.43	1.29	.08	.34
1986	9.73	2.35	12.07	.57	.16	.33	5.17	.63	.10	6.96	1.29	.08	.37
1987	10.58	1.79	12.38	.61	.23	.42	5.59	.67	.08	7.60	1.23	.12	.38
1988 4/	9.45	1.97	11.42	.61	.19	.48	5.98	.72	.11	8.08	1.28	.10	.34

Year	Natural equivalent--continued						Product-weight form				
	Miscellaneous--continued					Total	Processed				
	Cream and Neufchatel	Blue 5/	Edam and Gouda	Other	Total		Cheese	Foods and spreads	Total	Natural	Total 6/
	Pounds										
1971	0.63	0.15	0.10	0.26	2.38	12.03	3.5	2.3	5.9	7.3	13.2
1972	.63	.17	.11	.38	2.68	13.00	3.4	2.6	6.0	8.2	14.2
1973	.66	.18	.12	.48	2.83	13.49	3.3	2.7	6.0	8.8	14.8
1974	.70	.16	.11	.46	2.97	14.41	3.4	2.9	6.3	9.4	15.8
1975	.74	.16	.11	.42	2.86	14.27	3.3	3.3	6.7	9.1	15.8
1976	.77	.18	.11	.39	3.05	15.52	3.9	2.6	6.5	10.3	16.8
1977	.80	.18	.11	.40	3.03	15.99	3.9	3.2	7.1	10.4	17.5
1978	.89	.19	.12	.31	3.19	16.81	3.8	3.2	7.1	11.3	18.3
1979	.94	.18	.13	.35	3.30	17.16	3.8	3.1	6.9	11.7	18.6

--Continued

Appendix table 13--Per capita consumption of selected cheese varieties, 1971-88 1/--Continued

Year	Natural equivalent--continued						Product-weight form				
	Miscellaneous--continued					Total	Processed				
	Cream and Neufchatel	Blue 5/	Edam and Gouda	Other	Total		Cheese	Foods and spreads	Total	Natural	Total 6/
						Pounds					
1980	1.00	0.17	0.13	0.44	3.44	17.53	4.0	3.1	7.0	12.0	19.0
1981	1.05	.16	.15	.56	3.54	18.15	3.6	3.1	6.8	12.8	19.6
1982	1.13	.16	.18	.59	3.73	19.88	4.7	3.3	7.9	13.6	21.5
1983	1.15	.16	.18	.54	3.65	20.52	5.1	3.3	8.4	13.8	22.2
1984	1.17	.17	.18	.69	3.84	21.42	4.4	3.3	7.7	15.3	23.0
1985	1.23	.17	.16	.61	3.89	22.47	4.6	3.0	7.6	16.4	24.0
1986	1.33	.17	.17	.59	3.99	23.02	4.8	3.2	7.9	16.7	24.6
1987	1.40	.17	.19	.54	4.03	24.01	5.2	3.2	8.4	17.2	25.6
1988 4/	1.53	.17	.19	.46	4.06	23.57	4.6	3.7	8.3	17.0	25.3

1/ ERS no longer separates military and civilian consumption. These data are slightly different from the civilian consumption previously published.
2/ Includes Colby, washed curd, stirred curd, Monterey, and Jack.
3/ Includes imports of Gruyere and Emmenthaler.
4/ Preliminary.
5/ Includes Gorgonzola.
6/ Total product-weight is greater than natural equivalent because processed cheese and cheese food is made from natural cheese and other dairy products. Numbers may not add due to rounding.

Appendix table 14--Fluid milk sales by product, 1970-88

Year	Plain whole milk	Flavored whole milk	Plain lowfat milk	Plain skim milk	Flavored lowfat and skim milk	Buttermilk	Total-beverage milk
			Million pounds				
1970	41,363	1,144	6,082	2,368	611	1,130	52,698
1971	41,043	1,287	7,022	2,552	538	1,153	53,595
1972	40,027	1,484	8,207	2,599	533	1,131	53,981
1973	38,473	1,549	9,100	2,921	571	1,065	53,679
1974	36,765	1,440	9,763	2,959	561	988	52,476
1975	36,188	1,366	11,468	2,480	719	1,011	53,232
1976	35,241	1,475	12,431	2,524	864	1,021	53,556
1977	34,036	1,446	13,426	2,617	1,062	1,007	53,594
1978	33,235	1,359	14,250	2,543	1,097	983	53,467
1979	32,480	1,236	15,043	2,604	1,129	939	53,431
1980	31,253	1,075	15,918	2,636	1,197	927	53,006
1981	30,391	843	16,655	2,586	1,288	926	52,689
1982	29,345	710	17,031	2,451	1,283	951	51,771
1983	28,866	749	17,631	2,476	1,373	1,006	52,101
1984	28,204	907	18,525	2,726	1,409	1,020	52,791
1985	27,760	882	19,812	3,009	1,430	1,046	53,939
1986	26,439	851	21,151	3,235	1,516	1,017	54,207
1987	25,620	829	21,718	3,403	1,607	1,039	54,217
1988	24,617	843	22,343	3,981	1,625	1,017	54,426

	Half & half	Light cream	Heavy cream	Sour cream and dip	Total cream products	Eggnog	Yogurt	Total all products
				Million pounds				
1970	591	76	111	222	1,000	61	169	53,928
1971	557	67	113	246	983	74	229	54,881
1972	540	60	111	264	975	103	281	55,340
1973	554	80	120	272	1,026	80	307	55,092
1974	522	85	116	310	1,033	81	324	53,914
1975	514	87	119	350	1,070	76	442	54,820
1976	530	76	129	350	1,085	87	481	55,209
1977	536	68	126	364	1,094	94	533	55,315
1978	537	70	123	374	1,104	94	563	55,228
1979	543	66	139	395	1,143	94	565	55,233
1980	551	55	159	408	1,173	95	583	54,857
1981	565	56	165	424	1,210	100	579	54,578
1982	566	62	172	451	1,251	104	613	53,739
1983	596	67	195	484	1,342	112	760	54,315
1984	656	74	221	523	1,474	116	866	55,247
1985	714	85	243	544	1,586	121	974	56,620
1986	759	102	260	577	1,698	121	1,071	57,097
1987	754	103	271	600	1,728	124	1,094	57,163
1988	755	100	289	608	1,752	127	1,142	57,447

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