

# Megatrends Affecting the U.S. Dairy Industry

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In the last few years the dairy industry, including farmers and processors, has been buffeted by volatile prices that have resulted in large part because of declining milk price supports. While this has been a very important issue of immediate concern, numerous non-price factors have played and continue to play an equally important role in shaping the future of the American dairy industry. In this paper, I will discuss what might be called megatrends shaping milk production and consumption in the U.S.

The future is shaped by factors over which individuals and groups have little or no control as well as by the decisions and actions people take. In assessing the outlook for the dairy sector over the next 5 to 10 years, it is well to recognize that several layers of factors will be at work. At the innermost level, there are certain factors that are internal to each firm. They can shape the outcomes of the individual firm, but they are not relevant to the industry at large. At the next level are factors internal to the industry. These are factors that pertain to industry members broadly; they may be generated within the industry and generally are not factors associated with other sectors. At the outermost level are the factors that are external to the firm and the industry. These factors represent the deep undercurrents which move large sections of the economy in one direction or another.

The individual firm can make decisions to control or mitigate factors that are firm-internal. The rewards of successful decisions and the cost of failures are borne by the firm. One must be careful to avoid assuming that any negative outcome for one's own firm is always the result of factors external to the firm. The firm may have more ability to determine its own fate than it thinks. Industry members can collectively work to control or mitigate factors that are industry-internal. The benefits of successful decisions should accrue to all, but there is no guarantee that they will be in proportion to the effort made by individuals. Dairy industry members, by definition, can do little to change external factors. It is likely to be more profitable to work on strategies that accept and manage external factors than to dwell on how to change external factors.

Given this nomenclature, what are key industry-internal and external factors shaping the markets for

milk and dairy product, and processors, cooperatives, and farmers?

## Factors Shaping the Dairy Sector

The primary driving factor behind consumer choice in a free market economy is price. The concept of quality and price tradeoffs, leading to a general notion of value, is relevant; however a product or set of products must have clearly differentiated characteristics before consumers will acknowledge that a value tradeoff exist. The emphasis on price means that productivity growth in milk production and dairy processing still looms as the largest factor shaping dairy markets, especially if one takes as a given the fact that productivity grows at a greater rate than consumption. Given the sources of productivity growth, the implications of this are continuing and substantial changes in the structure of the production and processing sub-sectors—larger and fewer farms and plants.

Relative changes in productivity versus consumption have been and continue to be the two most powerful determinants of structural change in the dairy industry. In addition to these, one can identify other factors which have their own effects and which may also have implications for productivity and consumption growth. The remainder of this section is a more detailed discussion of the following eight factors shaping milk markets.

1. Technology and Productivity
2. Availability of Labor
3. Urbanization and Farmland Protection
4. Environmental Issues
5. Consumer-Driven Markets
6. Food Safety
7. Minimal Government Support and Increased Regulation
8. Global Economics

### *Technology and Productivity*

Man-made bovine growth hormone and its potential impacts throughout the dairy sector has become a symbol of milk production technology. With or without growth hormone, **the technologies that already exist today are sufficient to fuel productivity in-**

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**creases well into the future. The prospects for new technologies only increase this potential.**

Along with increased production per cow, technological change is in part also responsible for increased production per farm. Some technologies have inherent scale or size advantages. Milk parlors, for example, represent a substantial capital investment on any farm; however, a large farm can better bear such an investment because the expenditures do not increase in direct proportion to cow numbers.

Other technologies may be size neutral; for example, artificial insemination. Even in the case of size neutral technologies, the added complexities that any new technology usually implies probably leads to a built-in bias toward larger farms. Complex technologies require better educated farmers and more well-developed management skills and the time to utilize them. Good managers can and do exist on small farms, and not all large farms are well managed; nonetheless, well-managed farms are likely to grow in size, and as they do, owners can begin to hire labor, preserve more of their time for management, and afford to hire more specialized skills to assist them in the management function.

*Technological change in processing and marketing* will be just as, if not more, important. Some of these changes will be cost-reducing technologies and practices that will be fairly transparent to farmers and consumers. Examples include continuous processing, high speed fillers and packaging, energy efficient concentration technologies, lower cost handling and warehousing methods, and the like.

Other technologies will lead to new products, packaging, or processes. For example, it may well be that processing technologies will be more successful in helping to alleviate the burgeoning milkfat problem that changes on the farm. Technologies to remove cholesterol from milkfat are just now being exploited, but they will be eclipsed by the need to reduce and/or change milkfats, and the processes to do it. Some of these technologies will be costly. Their purpose will be to address consumer concerns relating to things such as a healthful diet or the environment, which are discussed further in later sections.

In the past, the emphasis of technological change probably has been primarily to achieve cost efficiencies. **Cost will continue to be a strong motivating factor, but future technological change, at least in processing, may be more motivated by quality considerations, at least as they relate to lean, clean, and green agendas.**

#### *Availability of Labor*

Despite increases in scale and dramatic reductions in labor input on dairy farms, one of the major current constraints affecting many milk producing areas is a

shortage of local skilled labor. Whereas farmers may view milking cows as a way of life which offers its own rewards, more and more potential workers may view this life as just another job. Dairy farmers are challenged to come up with creative ways to address this issue. This could limit farm expansion for the short run, but it tends to be less of a problem on very large farms than on moderate to large farms.

Dairy product processing is a much less labor intense activity today than in the past; yet labor remains a major cost category and an item of concern to processors and other types of employers. One key item is the cost of labor, particularly taking into account benefits such as health and retirement. The demands for worker safety are greater than ever. Finding labor and technicians skilled and trained in dairy plant work, and likewise finding managers that know the dairy business, is not an easy task.

#### *Urbanization and Farmland Protection*

Pressures on alternative uses of agricultural land are coming from numerous quarters and with increasing levels of intensity. In addition to concern for the loss of farm land, there is an increasing concern on the part of many remaining farmers about the effect of having ever larger numbers of non-farm neighbors. In some cases, municipal governments have responded to the concerns of non-farm neighbors by creating regulations to force changes on farming practices. These tensions are likely to continue and expand.

On the other hand, many state and local governments operate programs designed to counteract the influence of population expansion on farm operations in traditional farm communities. This involves limits on property taxes, agricultural districting, farm land conservancies, and right-to-farm laws. These programs have probably been more effective than many farmers would guess; nonetheless, the problem is hardly solved.

**Unless and until the general public strongly perceives an imminent threat to food production capacity and stable prices, there is unlikely to any major effort to seriously preserve farm land. For the foreseeable future, there will more likely be pressures to conserve land and habitats for environmental reasons.**

These trends may have some implications for location of processing facilities, but the greater industry-wide effect is likely to be through milk procurement. *Fluid processors in particular will find that they need to reach farther away to obtain milk supplies.*

#### *Environmental Issues*

Urban sprawl is an element of the growing interest in environmental related issues; there are many others. The general public used to think of farmers as benign

caretakers of the land. Concerns are now being expressed that dairy farming does not have a benign or neutral effect on the environment. Criticisms range from the legitimate to the ridiculous. In either case, the issue should not be taken lightly. Several state governments are beginning to take initiatives on environmental issues, and it is expected that federal initiatives in the environmental arena will be expanded at some point in the not-too-distant future.

Activities or practices which may pollute the environment are probably the focal point; however, conservation of natural resources is also a serious issue. The leading example is water usage in the West. Yet, the fastest growing milk-producing states are almost all in the dry areas.

Environmental lobbyists have had to rely on coalitions with stronger, commercial forces and thus have worked primarily with incentives-based environmental programs to date. The balance of power seems to be shifting to the environmentalist agenda. If so, the legislative trend will be to more regulation of milk production and processing practices. This inevitably will lead to higher costs of production. Of course, if competing food suppliers face similar requirements the competitive implications are moderate. However, it is highly doubtful that these new burdens will be felt equally 1) within the dairy sector (for example, by regions or product sub-sectors), 2) across competing food sub-sectors in the U.S., or 3) across competitors in world markets. While it is easy to say that the impacts will not be equal, it is much harder to speculate on which side of average the dairy industry will come down. To the extent that costs of production and processing are raised unequally, there are implications for domestic and international competitiveness.

**Some of these issues can be resolved or minimized by the use of new practices or technological innovations. In this case, the issue for the milk production sector is more one of cost competitiveness than survivability. In other areas, if pressed, environmental pressure could lead to shifts in the geographic location of milk production. In either case, many environmental issues or problems should be solvable, but they may well add costs to the production of dairy foods.**

Just as farmers will need to be environmentally conscious, consumers are also thinking “clean and green”. In many respects, dairy products face the same challenge in this regard as other food products, but there are some aspects of perhaps more importance to dairy.

Perhaps the chief concern that is somewhat greater for dairy than other foods is packaging, particularly for fluid milk. Another issue of concern has to do with waste water and by-product waste from dairy plants. **For the most part, society will look on new requirements**

**for environmentally friendly practices as desirable. Manufacturers will need to learn cost effective ways for meeting these goals.**

Some consumers will take their “clean and green” concerns to greater extremes. They will want more regulation or monitoring of the management practices used on farms and some will simply be opposed to animal agriculture altogether. **The implications for processors stem from potential impacts on milk production. To the extent that animal welfare activists are successful in imposing alternative production practices on farmers, processors may face higher milk costs. If these effects are predominantly on larger farms, the effects on processors in the West and Florida would be far greater than elsewhere.** While this is a growing consumer trend, it is hard to imagine that it will become a large concern for the majority of the population. In fact, it may offer some niche opportunities for “organic” dairy products and the like, although the experience with fruits and vegetables would indicate this might be a very small niche.

#### *Consumer Driven Markets*

The overall size of the dairy sector is ultimately determined by sales, and sales will be determined by the changing demands of U.S. consumers and the success U.S. processors have in cultivating foreign markets. Trends in the U.S. population profile point to declining per capita sales of dairy products. Processors have opportunities to develop products that mitigate these declines, but slow long growth is the most optimistic scenario for domestic markets.

It is often said that consumers are sovereign in a market economy. The dairy industry must in the long-run provide dairy products that people want to buy. Changes in preferences and the nation’s demographic make-up will have to be accommodated. There is a rapidly growing interest in healthful diets and the relationship between what we eat and our short-term and long-term health. Most of the effects of the consumer agenda will be felt by processors, not farmers.

The best recent example of a consumer derived factor affecting farmers, as well as processors, is the declining use and value of milkfat—the lean agenda. This concern has made itself vividly apparent in per capita consumption of dairy products. Whereas per capita consumption of all dairy products has been fairly stable since 1970, the specific product mix has not. As consumers continue to substitute low-fat and nonfat alternatives for traditional dairy foods, the dairy industry will be increasingly challenged to figure out what to do with the residual unwanted milkfat. If the alternatives consumers substitute are non-dairy foods, the problem for the dairy industry is much greater. It is not clear how much of the milkfat problem will be solved by changes in

dairy processing and product development vs. adjustments at the farm level. Some changes at the farm level are possible; economics will determine whether they become likely.

Numerous other dimensions of consumer markets are of interest to processors. In assessing consumer markets, economists are generally schooled to think of price and income as the primary factors affecting consumption. Marketing people are typically trained to think in terms of other factors. There is merit to both schools of thought.

### *Prices and Family Income*

Favorable prices for dairy products, relative to either general price inflation or the price of competing foods, has been a very positive factor for dairy product consumption in the 1980s and 1990s, and even over a longer time period. Largely due to the persistent improvement in productivity on the farm and similar efficiencies in processing and handling, dairy products have been an increasingly good buy. This is true whether dairy product prices are measured in terms of purchasing power or overall inflation. For example, between 1970 and 1991, all prices paid by consumers increased by more than three-fold (3.5 times). Over this same time period, all food prices increased by the same rate, but dairy product prices increased at a rate 20% lower (2.8 times). This means that if one adjusts for consumer price inflation, “real” food prices were relatively unchanged between 1970 and 1991, whereas “real” dairy product prices declined by 20%.

It is generally assumed by dairy product consumption is not especially sensitive to price changes. Economists refer to this as an inelastic demand, which means that when price changes by a certain percentage, consumption changes by a smaller percentage. (Note that inelasticity does not mean that demand is immune to price changes.) While the demand for milk and dairy products is probably highly inelastic in the short run, economists also believe that demand is less inelastic and may even be elastic in the longer run. Thus, a long period of favorable prices probably stimulates sales more than a shorter term change in price would imply. **This is a major factor supporting the oft stated claim that price stabilizing policies are beneficial.**

Another factor that the typical discussion of consumer demand ignores is the fact that a large amount of dairy products is used in food processing and food service establishments. For example, cheese has been the fastest growing major dairy product category, and only a little more than one-third of the cheese produced is sold at retail. The rest of the cheese is used about equally as an ingredient in other prepared foods sold in food service establishments or as a further processed food. While consumers may be relatively insensitive to changes in

retail prices, suppliers know that food processors and food service operators are much more sensitive to changes in wholesale prices. The rate of inflation in wholesale prices of dairy products is less than retail price inflation; since 1970, wholesale dairy prices have increased 2.6 times compared to 2.8 times for retail prices, an 8% slower rate of inflation.

Disposable income levels can help to explain differences in consumption levels between families at one point in time or for the entire population over time. Over the long term, per capita income growth is favorable to dairy product consumption; however it is also true that dairy products generally have a low income elasticity of demand. This means that changes in income have a less than proportional impact on dairy product sales, which would be expected for a staple food. In times of recession, this is an advantage; because it means that families will cut back on many other expenditures more than dairy.

### *Quality and Value Consciousness*

People are always interested in getting a good buy, but there is a growing sense among retailers that shoppers are paying more attention to quality and a little less attention to just price. Some marketers speak in terms of value, where value might be loosely thought of as quality divided by price. A very high quality product can have a very high value even if price is higher than average, and a low quality product can have a low value even if price is below average.

The dairy industry has generally thought all of its products have a rather uniformly high quality. Given national product identity standards and food safety requirements, this is in many respects true. Likewise, dairy processors will typically attest to the fact that their sales are very cost competitive, i.e. they must go to their customer with the “right” price. Future marketing efforts will need to further stress value concepts in dairy products, including both quality and price dimensions. **The dairy industry will need to remember that sales are based on the consumer’s perception of value, not their own.**

Current consumer concerns about nutrition and health provide a good example of value tradeoffs that consumers make. Concern about fat and cholesterol in the diet ranks as the top food related health concern in the U.S. today. Food as a public health topic has gone through an interesting history. In the early part of the century, public concern was focused on food safety issues, keeping things that don’t belong in food out. In the middle of the century, food safety controls were in place and public health concerns shifted to making sure that people got enough of the right things to eat. Now, in the late stages of the century, our priorities have shifted to telling people that they eat too much and need to avoid nutritionally undesirable things in food.

Dairy products have several very positive, nutrition attributes that made selling dairy products easier when the focus was on eating enough of the right things. The levels of overall fat, saturated fat, and cholesterol in most traditional dairy foods have become a major challenge more recently. Dairy processors have responded with many new lowfat and nonfat products; however these products can't help but taste different from the traditional versions. Hence, consumer acceptance has been somewhat mixed.

**Consumers will increasingly make food choices based on their assessment of the healthfulness of the foods they eat. Dairy products have many opportunities to rise to this challenge and are doing so already, but more will need to be done.**

At the same time that consumers are worrying about healthfulness, they have also shown a strong tendency to treat themselves with little luxuries from time to time. Sales of the foods that indulge our desire for such treats will not represent a large volume, but they will likely be profitable items. Dairy foods offer many opportunities for such indulgences. **As methods are found to make dairy foods taste extravagant, or at least good, while still avoiding undesirable components, dairy products will become doubly desirable.**

#### *The Changing Consumer*

Changes in the population profile are altering the way we think about consumers. It is well known that dairy product consumption varies according to various demographic factors. The vast majority of beverage milk is consumed by people 18 years old and younger, and in general dairy product consumption declines with age. Blacks tend to consume less dairy products than whites, whereas some Hispanic people have high levels of dairy product consumption. Women have tended to be less likely to consume dairy products, but there have been some changes as a result of the focus on calcium in the diet. Dairy product consumption tends to be higher in the northern U.S. and lower in the Southeast.

Eating habits are being transformed by the desire to reduce the time involved in food preparation or eating itself. A major motivation has been the large number of women who now work outside the home. Time for food preparation has become an increasingly scarce and valuable commodity. In addition, workers are generally spending more hours at work and families are increasingly finding that there are fewer and fewer occasions when they can all sit down together for supper. Short of quitting their jobs, people cannot create more hours in the day, but they can reduce the amount of time spent on various tasks, such as food preparation and eating.

Increasing consumption of food outside the home, fast-food restaurants, eating meals that are ready-to-eat, preparing foods that are ready-to-cook, or just snacking and grazing through the kitchen are all examples of how the desire to spend less time cooking and eating has changed the way Americans eat. Some dairy products have fit into this changing lifestyle more easily than others. Cheese, for example, has done well; beverage milk has probably suffered some. The challenge for the future is to design dairy products that meet the need for convenience. Dairy processors have made great strides in this direction already, but more will need to be done.

**Taken as a whole, many of the demographic trends point in a negative direction for dairy. The U.S. population is aging, becoming more racially and culturally diverse, growing most in areas where dairy consumption is lower than average, and has less time for traditional meals and cooking. Although this is not universally true, many of the expanding cultural groups are not associated with diets in which dairy products have been a major part. It is not as easy as it once was to target products to a clearly visualized consumer. It is highly unlikely that anything will substantially alter these population and consumer market trends; prospects in ingredient and food service markets may be better. In either case, the challenge for the dairy industry is to optimize their opportunities.**

#### *Food Safety*

A specific area that combines some of the broader social or environmental concerns with consumer issues is food safety, particularly as it relates to on-farm production practices and additives introduced in processing.

Increasing attention is focused on chemical use in food production, ranging from pesticides and herbicides in feeds and foods to animal drugs. Producers can respond to serious concerns of this type, but more likely there will be cost implications.

A related concern is food additives. Although one could rightly argue that chemicals added to foods are done so to improve quality in one sense or another, it is nonetheless true that consumers are more and more wary of any food additives. Inasmuch as most dairy products have no or few additives, this is a positive area for dairy products.

A particularly troubling aspect of the food safety issue is symbolized by the reaction to bovine growth hormone supplements. The negative reaction to bGH is multifaceted, but a large part is presented as a food safety concern. Scientists who have studied pituitary growth hormone research overwhelmingly conclude that there is no food safety or human health issue. By exten-

sion, bGH derived by recombinant DNA biotechnology is accepted as no different than pituitary hormone, and, therefore, it also is not perceived as a food safety concern by knowledgeable food scientists and medical experts. This notwithstanding, there is clearly a strong reaction by consumers to the generic use of hormone supplements in animal agriculture and latent concerns about the possibility of scientists underestimating the potential for food safety problems to develop.

**Thus, dairy farmers and milk processors must contend with what may be legitimate food safety issues and, in the age of recombinant biotechnology, with issues that appear to have little scientific merit as well. Some of the items of concern will not be legitimate safety issues, but they may affect perceptions of quality. All in all, dairy products have a better than average ability to score well on the “clean” agenda and should probably strive to preserve and emphasize this desirable status.**

#### *Minimal Government Support and Increased Regulation*

Since the 1930s, federal and state legislation has played a major role in regulating aspects of the economy of dairy markets. In the half century or more since then, there have been countless changes in the industry. Some critics now ask whether today's government programs are an anachronistic artifact of yesterday's problems. Proponents argue that federal policies still address vital needs that are not altered by changes in technology or market structure and which serve a legitimate public interest.

Traditional federal farm programs may be at a crossroads. The direction taken may lead to modified but continued commitment to a positive regulation of farm markets, or it could lead to the dismantling of programs built up over a half century or more. The worst case scenario may be keeping the bureaucratic trappings of programs but having programs that are ineffective or disruptive. On top of this uncertain commitment, the dairy industry, and agriculture more generally, is confronted with a rapidly changing market situation involving new technologies, new consumer demands, larger market dimensions, new relationships to the environment and urban areas, and so on. For the time being, no watershed changes are imminent, but over time substantial changes may occur. **One possibility is that we will take the route of much less government intervention and decide, after a few years, that it is necessary to reverse course and put some governmental controls back. I would suggest that it may take 20 years or more for this scenario to run its course. Of course, by the time any new regulation would take effect unregulated markets would have wrought many changes on the milk production**

#### **and processing sub-sectors.**

The dairy industry is also learning that other federal policies can be just as or more important than dairy-specific programs. Examples include health policies that shape consumer dietary concerns, welfare policies that affect the use of dairy foods in food assistance programs, energy and transportation policies that affect the cost of fuels and energy, environmental policies that will require changes in production practices and add to costs of production and processing, fiscal policies that determine how many federal dollars are available for federal programs, trade policies that are more concerned with the big picture than the little parts of that picture, and so on. **The dairy industry has a stake in all of these major policy areas, but it is not large enough in an of itself to have much influence on the directions taken. Developing alliances with larger groups and adopting realistic objectives could give the dairy industry at least some voice in shaping policy decisions.**

#### *Global Markets*

At the turn of the 20th century, dairy markets were generally thought of as having a small geographic scope—markets were local. At the turn of the 21st century few if any products will be thought of in this manner. If it is not obvious already, the dairy industry should assume that it is about to be thrust into the world of global food markets.

Presently, restrictive policies limit the extent to which the U.S. dairy industry participates in world markets. As alluded to above, the mentality driving global agricultural trade policy is switching from one of protectionism to one of expansionism. Although the current round of talks on the General Agreement on Tariffs and Trade have stalled, the long-run pressures are for freer trade. Moreover, bilateral and trilateral agreements with Canada and Mexico are taking place. **At some point in the not-too-distant future the U.S. dairy industry may find that it is no longer relatively insulated from the rest of the world. How it fares in the global arena is difficult to judge, but it will depend in part on what the rules of engagement will be. The transition of policy and world trading rules may be made gradually over a ten year period, but for the dairy industry this will feel like an abrupt change. It's time to start getting ready.**

As the U. S. looks toward greater world trade in the next century, personal income levels and the characteristics of dairy product demand have implications beyond those that were discussed with respect to U.S. markets. Compared to other basic foods, dairy product consumption is associated with fairly high income levels, when measured against the kinds of income levels observed

across the world. This means that high income countries tend to have higher levels of dairy product consumption. It is also generally true that higher income countries tend to be milk producing countries. (There are exceptions to both of course. For example, Japan is a high income country, but it neither produces nor consumes many dairy products. India is a low income country with a very large dairy sector.) **What this means is that other dairy producing countries will be looking to sell their products in the U.S. and U.S. exporters will likewise be faced with trying to sell in markets that have the income but don't really need the milk or in markets that need the milk but don't have a lot of income.**

The export market could be enormous, but U.S. processors face enormous challenges in expanding exports. Processors have little experience in foreign markets and have much to learn. Foreign competitors may face even greater challenges from the changes in their internal support program that are likely to accompany a liberalized world trade policy; nevertheless, Europe and other competitors can not be written off lightly. In addition, although the need for food is enormous, the ability of needy people to pay for food is extremely limited, and most developed countries are self-sufficient in dairy products. The dairy industry will benefit from U.S. foreign food-assistance programs and, ultimately, from world-wide programs to raise the incomes and standards of living in developing countries. For the intermediate term, slow aggregate sales growth is the most likely scenario.

### Implications for the Intermediate Term Outlook

Over the next five to ten years, the factors discussed above will drive sales and prices and shape the structure of the dairy production and processing sub-sectors nationally and regionally. An intermediate term outlook for the structure and sales of the dairy industry is discussed below.

#### *Structure in the Farm Sub-Sector*

After World War II, dairy farms declined rapidly in total and as a fraction of all farms. By 1959 well under 2 million farms reported milk cows, a decrease of nearly 3 million farms over the 1940-59 span. Reductions in farms with dairy livestock were even more remarkable in percentage terms during the 1960s, when dairy operations were terminated on more than 1.2 million farms, a 10-year decrease of 68 percent. This trend has persisted in the 1970s and 1980s, and in 1987 the Census reported 202,000 farms with milk cows. These farms account for about 10 percent of all U.S. farms.

Of course, much of this reduction is in farms having

very few cows, which probably should not be thought of as dairy farms in the first place. Of the 202,000 farms with cows in 1987, two-thirds, or 138,000 farms, are classified as dairy farms in the Census, by virtue of the fact that sales of dairy products on these farms account for 50 percent or more of gross receipts from farm marketings. These farms account for over 90 percent of all milk cows in the U.S..

Reductions in farms with dairy livestock have been accompanied by rapid declines in the size of the nation's dairy herd. During the 1940s and the early 1950s, milk cow numbers were in the 20-25 million range. Abrupt decreases during the next 20 years brought cow numbers to the 11 million range by the mid-1970s. Milk cow numbers have been falling since that time but at a far slower rate. In 1991, the number of milk cows dropped below 10 million, the smallest national herd in over 100 years.

Declines in milk cows are driven by the fact that farm productivity increases at a faster rate than dairy product sales. Productivity trends in the U.S. dairy sector can be observed in steady increases in milk per cow. American dairy producers have realized a three-fold increase in average milk production since 1940, from 4,600 pounds per cow to about 14,800 pounds per cow in 1991. Since 1960 the rate of gain has been about 275 pounds per year.

Perhaps the most widely discussed facet of structural adjustment in American agriculture is farm size. Larger farm size is very much in evidence for the U.S. dairy sector. Reductions in cow numbers have been far more abrupt than losses in dairy farms, resulting in steady increases in average herd size on each farm. Using Census data on farms reporting dairy cows as a reference point suggests that average herd size has increased from 5 cows in the 1940s to slightly more than 50 cows per farm in 1987. Moreover, the subset of farms which specialize in the production of dairy products and are so classified by the Census reported 68 cows per farm, on average, in the 1987 Census. As the average herd size has increased, the top end of the range of farm sizes has expanded greatly. Nonetheless, with a few notable regional exceptions, mid-sized dairy farms are still the mainstay of the U.S. dairy industry despite the notoriety often received by the nation's very large dairy farms.

USDA data for 1991 indicate that there were 9.99 million cows on 181,570 farms. Production per cow averaged 14,868 pounds and commercial disappearance of dairy products was equivalent of 142.7 billion pounds of milk (fat based equivalent). Assuming 1) no increase in imports, 2) a low level of government purchases, 3) milk production only keeps up with population growth of about 1 percent per year and 4) production per cow grows at its historical average rate of about 2 percent per year,

then cow numbers must decline over 10 percent by the year 2000. If farm size moves up from 55 to an average of 75 cows per farm, the number of farms in the U.S. would, by inference, decline about 35 percent.

In the simple example shown above, just moving the annual rate of gain in productivity from 2 to 3 percent would imply a decrease in cow numbers of almost 19 percent by 2000, other things being equal. If we assume that advances in technologies result in more larger farms and greater productivity gains to the point that the average herd size in 2000 rises to 100 cows instead of 75, then farm numbers will decline 51 percent over the next 10 years, other things being equal from the first example above. With a 3% gain in productivity plus 100 cows per farm, farm numbers decline 55% relative to 1991.

These calculations are hardly a rigorous, scientific prediction of what will be, but rather a simple example to illustrate that an immense potential for further change exists in the U.S. dairy sector. Other assumptions could be made, but these are not particularly radical ones. These rough calculations help focus attention on the future of American dairy farmers.

**By 2000, there will be some 8.5 million cows in the U.S. on about 90,000 dairy farms. These cows will produce an average of about 18,500 pounds of milk per year, for a total of about 157 billion pounds of milk. Milk production will continue to grow more rapidly in the West, with smaller pockets of growth in the Southeast. Moderate growth in Pennsylvania, Vermont and New York will offset declines elsewhere in the Northeast, but this region's share of the national total production will decline. After some readjustment struggles during the 1990s, milk production will rebound in the Upper Midwest, especially Wisconsin, although Wisconsinites will have to adjust to no longer being the largest milk producing state.**

*Structure in the Processing Sector*

Changes in the size and number of dairy processing plants have been nearly as great as the change in farms. As shown in the table below, the number of fluid processing plants in 1990 is about 11% of what it was thirty years earlier. The number of manufacturing plants is 28% of what it was in 1961. Within the manufacturing sector, cheese manufacturing plants have declined the least, and are the only product sector listed below that declined less than the average for all manufacturing plants. Of the remaining manufacturing sectors, butter plant numbers declined the most, to 10% of their 1961 level. The reduction in butter and fluid milk plant numbers is comparable to the decline in the number of farms with dairy cows.

As with the change in farm structure, economies of

size, fueled largely by new technologies, are primarily responsible for the reduction in plant numbers. Improvements in transportation have been another factor. Further reductions in plant numbers are a certainty.

**By 2000, fluid plant numbers may decline by one-third and manufacturing plants by one-sixth or one-fifth. Plant declines will likely be greatest in cheese, fluid milk, cottage cheese, and butter. Increasing cheese production kept plant numbers from going down at a greater rate. In the next ten years, declines in cheese plant numbers are likely to be more precipitous as older and smaller plants, particularly in the Upper Midwest, give way to competition from larger plants and more stringent environmental regulations. Most likely to decline the least are numbers of nonfat dry milk plants.**

Numbers of Dairy Processing Plants in the United States, 1961 to 1990

Product Sector	1990	1975	1961
Fluid*	600	1,494	5,328
Manufacturing	1,714	2,801	6,134
Ice Cream	709	1,167	3,500
Cottage Cheese	173	375	1,207
Cheese	515	839	1,410
Butter	152	366	1,516
Nonfat Dry Milk	76	153	431

\* Fluid milk plant numbers are taken from 1960, not 1961, data.

Source: USDA and Bureau of Census, U.S. Department of Commerce.

*The Outlook for Product Sales and Price*

From 1960 to 1980, total sales of dairy products (milk equivalent, fats basis) showed only small gains, as increases in cheese sales did little more than offset declines in butter and other categories. Beginning 1984, dairy product sales increased at much faster rates. Favorable prices and new promotion campaigns probably explain much of the increase; however one can also observe that sales of some previously weak products, like butter, tended to stabilize, while cheese sales skyrocketed.

Population is growing at a rate of almost 1% per year; yet the dairy industry may be challenged to keep total dairy product sales increasing at even half that rate. Although minimal government supports and continuing productivity gains should keep farm and whole-



sale price inflation nearly flat and retail dairy product price gains at much less than the general rate of inflation, favorable prices alone may not be enough to offset the powerful demographic and consumer preference trends that are unfavorable to dairy product consumption. As the population changes in the manner discussed earlier, per capita consumption will decline.

Estimated Commercial Sales of Dairy Products in the United States, 1960 to 1990.

Product	1990	1975	1960
	(million pounds)		
<u>Milk Equivalent, fats basis</u>			
Total	139,000	113,800	110,992
<u>Product Weight</u>			
Fluid	53,918	53,232	53,182
Frozen Desserts (gals.)	1,427	1,263	969
Cottage Cheese	833	991	769
Cheese	6,211	3,049	1,478
Butter	915	951	1,247
Nonfat Dry Milk	695	697	973

Source: USDA

**Total commercial disappearance may plateau at around 140 billion pounds of milk equivalent for a few years in the early to mid-1990s and**

**gradually edge upward for the rest of the decade at a rate of 0.5% per year. A primary reason will be a tapering off of cheese sales. One absolutely vital question for the U.S. dairy industry will be to what extent can it augment sluggish domestic sales with new export sales; or will it lose share of the domestic market to imports?**

### Desired Outcomes and Industry Strategies

Some of the factors discussed above, like increasing productivity, have been very major factors influencing dairy markets in the past and will likely be major factors for the foreseeable future. Other factors, like consumers' concerns about healthful foods, are of more recent vintage, but they have been around for long enough that the dairy industry is already responding. Yet other factors, like environmental concerns, are new enough that we are not really sure what all their implications and impacts will be. No doubt there will be as yet unidentified new factors that will emerge in the next five to ten years. Some of these factors and trends will lead to changes and require responses that will be difficult or costly for the dairy industry, at either the producer or processor level, or both. In some cases, dairy products have advantages that can be exploited in a positive way.

**Dairy industry leaders will want to first ask whether the intermediate outlook presented herein seems reasonable. Given this or any other outlook, the next step is to ask whether those outcomes are satisfactory and what can be done to lead to more desirable outcomes.**