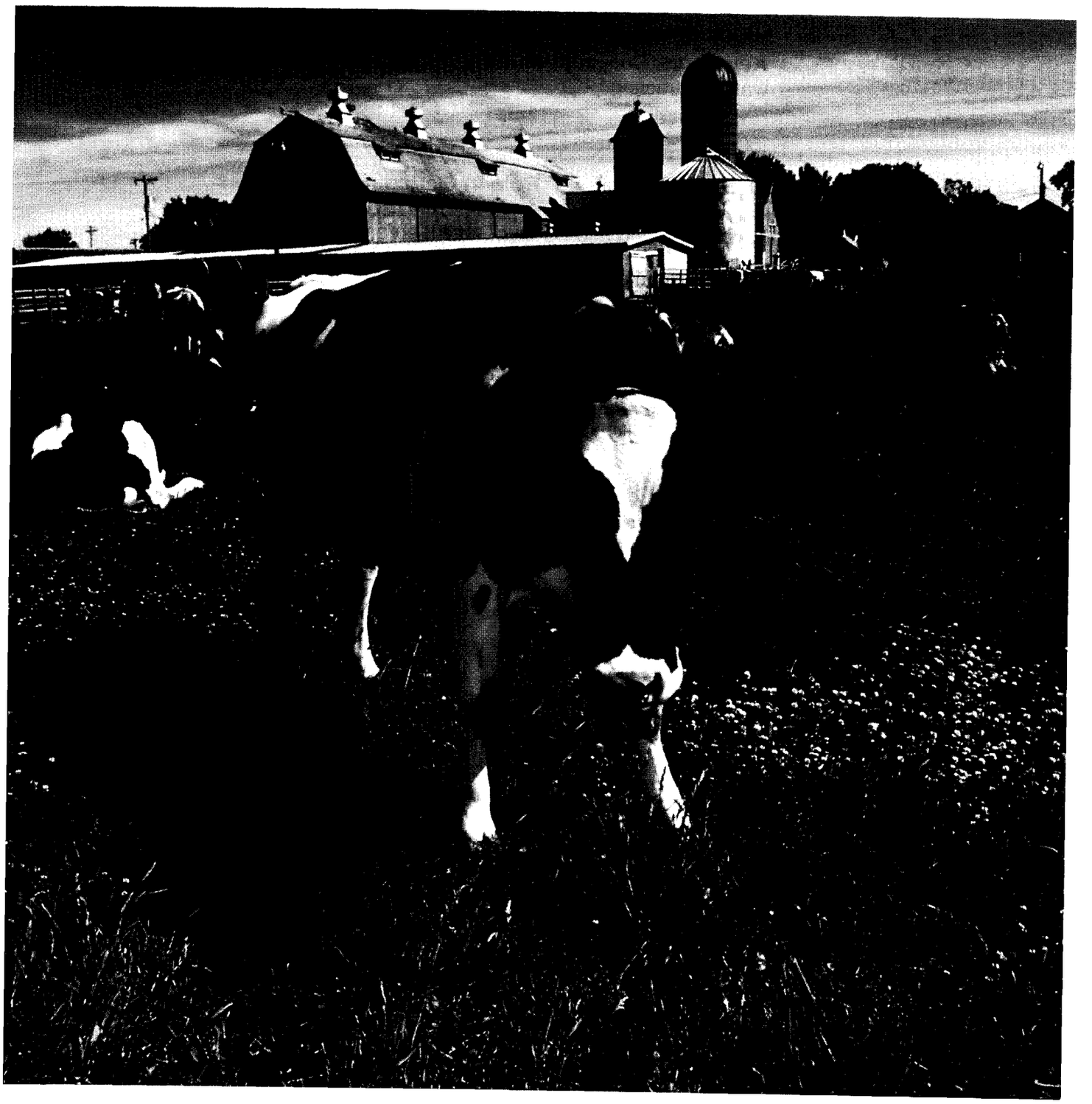
United States
Department of
Agriculture

Rural Business–
Cooperative
Service

RBS Research
Report 152

Dairy Cooperatives' Role in Managing Price Risks



Abstract

Prices for milk and dairy products have become increasingly unstable as the Government support safety net has been lowered. Dairy cooperatives' traditional pricing system is delineated and their role in the new market environment is discussed. Some of the risks involved in using emerging hedging mechanisms such as futures, options, and forward contracting for managing price risks are assessed. The traditional pricing system in regard to managing price risks is evaluated. Guidelines for developing a cooperative's hedging strategy are suggested.

Key words: Cooperatives, dairy, pricing, hedging, futures, options, forward contracting

---

Dairy Cooperatives' Role in Managing Price Risks

K. Charles Ling and Carolyn Betts Liebrand

Rural Business-Cooperative Service

RBS Research Report 152

September 1996

Price: $5 domestic; $5.50 foreign

Preface

The efforts by the Federal Government to reduce milk-producing capacity by lowering the price support safety net since the mid-1980s resulted in wide and uncharacteristic milk price fluctuations beginning in 1988. The drastic price changes since 1989-90 have served as a wakeup call to the dairy industry that price volatility has become a fact of life as the industry moves toward a market-oriented dairy economy.

Dairy cooperatives have adapted to the situation and hedged the price risks by diversifying into multi-product and multi-plant operations, expediting inventory turnover, integrating and diversifying into consumer-product and niche markets, forming marketing agencies in common to share market information or coordinate dairy product marketing, and entering joint ventures with other firms to shift away some of the risks.

New dairy price hedging mechanisms have been introduced by commodity exchanges. The Coffee, Sugar and Cocoa Exchange, New York, began trading Cheddar cheese and nonfat dry milk futures contracts in June 1993, and in December 1995, also started trading milk futures contracts. The Chicago Mercantile Exchange launched trading of milk futures contracts in January 1996. There has also been some experimenting with forward contracting, based on these futures contracts.

Futures, options, and forward contracting have been used extensively for price hedging by some other commodities, but the dairy industry is just beginning to learn to use them. This report attempts to add some knowledge to the learning process for dairy farmers and their dairy cooperatives. It is neither a trading guide nor an exhaustive exploration of the subject matter.

This report focuses on dairy cooperatives' role in managing price risks for the benefit of member-producers who are also their owners and patrons. This relationship is fundamentally different from the one between proprietary milk handlers and their milk shippers. Therefore, discussions in this report that are relevant to dairy cooperatives' role in managing price risks may not be applicable to proprietary handlers' risk management activities.

Contents

Highlights

A fundamental role of dairy cooperatives is guaranteeing members a market for their milk. Dairy producers sign membership (marketing) agreements with their cooperatives, making them their exclusive marketing agent. Members then ship all the milk they produce to the cooperative which finds a market for that volume. Pay prices for most milk are based on the pool blend price of Federal milk market orders. Cooperatives may add operating earnings to and subtract operating expenses from pool payment and pay producers a reblended price. A “13th check” at the end of the fiscal year distributes part or all of the cooperative’s net savings from operations to its members. Such is the essence of a dairy cooperative’s role in the traditional pricing system of milk.

This system has brought a degree of stability to the milk market. The Government price support program provides a floor price for milk. Government programs, marketwide pooling, and cooperative reblends have created pricing uniformity among producers over a wide region and dampen the fluctuation of milk prices they receive.

Prior to 1981, the milk support price level was mandated at between 75 and 90 percent of parity. In the mid-1970s, support prices were frequently adjusted upward because of rapid inflation. High prices brought on expanded milk production and milk prices hovered around the support price level. This served as a floor under milk prices and with the surplus, in effect, a ceiling. To reduce the surplus, the price support level was tied to the size of the Commodity Credit Corporation (CCC) purchases in the 1981 legislation. Legislation in 1982 froze the support price level for 2 years and producers were assessed to help pay for the program. Support prices were lowered in the 1983 and in the subsequent legislation. The whole-herd-buy-out program that ended in 1987 helped create a relative balance of supply and demand. With a lower floor price, milk prices were more responsive to market forces and started to experience wide fluctuation beginning in 1988.

Dairy cooperatives have managed price risks by taking advantage of the flexibility in the business system, by changing their business practices, or by forming business alliances with other firms to shift the risk. In many cases, cooperatives with multi-product, multi-plant operations have the flexibility to shift production among products that would return the highest margins. Other examples include faster inventory turnover to avoid inventory writedowns, integrating into the consumer and niche markets to avoid the volatilities in the commodity markets, forming marketing agencies in common to gain better market intelligence or coordinate product marketing, and forming joint ventures with other firms to shift some risks to partners.

Hedging mechanisms are emerging for managing price risks. Commodity exchanges saw the opportunities in the price volatility in the dairy markets and offered futures and options for hedging price risks.

Highlights

The Coffee, Sugar and Cocoa Exchange began trading Cheddar cheese and nonfat dry milk futures contracts in 1993 and started trading milk futures contracts in 1995. The Chicago Mercantile Exchange began trading milk futures contracts early in 1996. Some cooperatives have experimented with forward contracting for milk production, selling futures contracts to offset fixed price agreements with members.

Milk and dairy products have some unique characteristics that may affect the use of the emerging hedging mechanisms. Milk production is a bovine biological process. It is produced day in and day out. Therefore, milk is a flow product. By extension, dairy products such as commodity cheese, butter, and nonfat dry milk are also flow products. Under the pressure of accumulating products, inventory management is usually for regulating dairy product flow to the market rather than for storing for later sales at anticipated higher prices.

Milk production is limited by the number of cows in individual herds. Cow numbers increase only gradually, so it is unlikely to have unforeseen drastic increases in milk production. This limitation on milk production undergirds the floor price of milk, although the price floor may not be visible or rigid. On the other hand, consumption of milk and dairy products also changes gradually. Given a stable milk production level and a stable consumption trend, shocks to the milk market usually translate into upswings in milk prices.

Hedging by definition is a break-even proposition. By shifting away undesirable price risks, a hedger actually takes on some new risks. (The risk of basis changes inherent in all futures contracts is not discussed in this report.)

For dairy cooperatives using the futures market to hedge price risks, possibilities exist that actual milk volume delivered by members may be lower than the short position taken by the cooperative on the futures market. (Short position refers to the volume represented by the futures contracts sold.) Part of the hedge may become speculation. For this reason, dairy cooperatives may have to limit the volume hedged to a certain fraction of member production. Another possibility is that the futures-implied cash price may be lower than the cash market milk price prevalent when the futures contracts expire, and the cooperative may be outpaid by competitors. This would create a potential problem for producer relations. Still another possibility is that the futures market may not be liquid enough for the cooperative to liquidate its futures position by the settlement date. There may be some other possible unforeseen risks.

(Dairy farmers who use the futures market to hedge may encounter similar risks. In addition, they may need to hedge input costs to make sure that the futures-implied milk price will yield profitable earnings.

Furthermore, in the unlikely case of actual delivery on futures contract, some complicating side effects may arise.)

There are many variations of forward contracts. In dairy, the marketing agreement between producers and their cooperatives might be interpreted as one form of a forward contract that promises future deliveries without specifying volumes or prices. The so-called new-generation dairy cooperative would issue delivery rights to members based on their equity subscription. The plan is similar to a conventional marketing agreement, except that the delivery volume is specified.

Forward contracting usually refers to contracts that promise future delivery of a commodity of a fixed volume and at a fixed price. In essence, they shift price risks from the contracting producers to the cooperative. Because the cooperative is owned by the producers, shifting the risks from the producers to the cooperative does not diminish producers' collective risks. Contracted volume should constitute a separate pricing pool so that producers who are not under forward contracts will not have to share the contract risks and expenses. Studies of other commodities show that forward contracting on average returns a price lower than cash market price because producers have to bear the costs of this service-an analogy in the purchase of insurance.

Under the traditional pricing system, wide-area pooling of milk prices and reblending by dairy cooperative are similar to mutual insurance of milk prices by producers. Marketing agencies in common of dairy cooperatives that pool earnings and costs of marketing dairy products are also akin to institutions of mutual insurance. Marketing agencies in common may be particularly useful for dairy cooperatives in the export markets where price fluctuation is potentially more volatile than in the domestic market.

Because milk is produced continuously and priced regularly, theoretically the traditional pricing system is expected to pay producers an average price in the long run that is even with the average milk price yielded by "automatic hedging" (hedging all production all the time with futures contracts), without having to incur futures transaction costs.

Adapting to price instability by shifting or offsetting existing risks by changing business practices may create new risks. A multi-product, multi-plant cooperative may encounter chronic excess plant capacity. Faster inventory turnover may result in foregoing profitable sale opportunities because the cooperative is short of inventory. Integrating into the consumer-product or niche markets requires a new set of business ingredients that the cooperative might be lacking. Joint ventures run the risk that the joint venture partner may not perform its side of the contract. The cooperative may also find the contract restricts its own operational flexibility.

Highlights

Risk management should not be an isolated business function, but rather an integral part of the cooperative's corporate strategy. The cooperative should assess the overall risks of its operations and determine how the risks may impact on producer pay prices through the traditional pricing system. If some of the risks are deemed to be best managed by using the emerging hedging mechanisms, the board of directors should spell out the policy and prepare guidelines for using them. The prerequisite for a sound hedging strategy is understanding what each hedge mechanism is, how it works, what it is used for, and the risks involved in using it.

Dairy Cooperatives' Role in Managing Price Risks

Dairy cooperatives play a prominent role in marketing milk. Based on farmers' 1994 cash receipts, an estimated 86 percent of milk at the first handler level was marketed by the Nation's 247 dairy cooperatives. Working in tandem with Government programs, dairy cooperatives have promoted stability and orderliness in the marketplace.

The Federal Government has historically played a significant role in milk marketing. For more than one-half a century, the Government has provided a dairy price support program and the Federal milk market order program. The support program reduces dairy farmers' and their cooperatives' price risks by ensuring that they would receive at least the support price for their milk. The market order system provides for orderly marketing of milk by ensuring equal raw product costs to handlers and equal blend pay prices to producers. However, in the mid-1980s the Government began successively lowering the level of price supports for milk to reduce surplus production. The Federal Agriculture Improvement and Reform Act of 1996 (the 1996 farm bill) provides for further reductions in the milk support price through 1999 and complete elimination of the support program in 2000. Beginning January 1, 2000, a recourse loan program for Cheddar cheese, butter, and powder will become effective. (The dairy price support program as authorized by the Agricultural Act of 1949 will be effective on January 1, 2003, if no new legislation is enacted prior to that date.)

The changes in the Government dairy price support program since the 1980s have resulted in increased fluctuation in milk prices. Changes outlined in the 1996 farm bill are expected to continue or increase price volatility in a dairy sector that relies on market forces. Because of this volatility, price risks have become a growing concern of dairy farmers and their cooperatives. This report examines the traditional roles of dairy cooperatives in milk pricing and how they address price risks, and assesses the implications of the emerging mechanisms for managing price volatility for dairy farmers and cooperatives.

Traditional Pricing Roles

As the dairy industry developed in the early years of this country, producers faced marketing risks due to undependable market outlets for milk, erratic and chaotic milk pricing by dealers, seasonally fluctuating milk supplies, and the distance between farms and cities (centers of consumption). In response, dairy producers formed cooperatives that extended their farm businesses beyond the farmgate. Through collective action, farmers were able to more effectively bargain for milk prices, balance supply and demand, and transport milk more economically, among other things.

Assured Markets

A fundamental role of dairy cooperatives is to guarantee members a market for their milk. In fact, surveys of dairy farmers have shown that the assurance of a market and guarantee of payment for their milk are the primary reasons they belong to a cooperative. By negotiating terms of trade collectively, dairy farmers reduce their exposure to loss of market or unreasonable terms of trade.

Dairy producers sign membership (marketing) agreements with their cooperative, making it their

exclusive marketing agent. Members then ship all their milk to the cooperative which finds a market for the milk. Cooperatives typically exert little or no influence over the volume of milk produced by members.

Bargaining cooperatives carry out the obligation to market their members' milk solely by negotiating milk prices with customers and rarely take title to the milk. These cooperatives do not own manufacturing or processing facilities. Other cooperatives negotiate milk prices with customers and also own manufacturing and /or processing facilities. These manufacturing/processing cooperatives either use their facilities to handle milk not needed by their customers or add value to members' milk by making higher value products, or both.

The ability of manufacturing/processing cooperatives to handle surplus milk by manufacturing it into storable products, to a certain extent, reduces their exposure to milk price risks. When milk supplies increase, they can move surplus milk into manufacturing plants, thus, solidifying their bargaining position. When supplies tighten they may be able to shift milk from manufacturing to fulfill their customers' needs without having to purchase milk from spot markets at elevated prices. However, operating their plants below capacity increases operating costs.

For bargaining-only cooperatives, when supplies are plentiful they may have to sell surplus milk at distressed prices, not having a means to handle the excess volume. However, when milk supplies are tighter or in balance with demand, they benefit from higher prices without the burden of maintaining under-used manufacturing facilities.

Cooperatives and Federal Milk Market Orders

Cooperatives helped usher in the Federal milk market order system to smooth fluctuations in individual producer prices and to reduce disruptive competition between producers. Market orders provide a system of Government-administered, producer-requested regulation and rule-making that establishes minimum prices for milk according to its end use, and pools the price obligations of individual buyers across entire marketing areas. Class I milk is used for fluid or beverage purposes; Class II milk is manufactured into soft products like yogurt and ice cream; Class III milk is used to produce "hard" products such as cheese; Class IIIa milk is dried into powder. Buyers pay minimum class prices according to how they use the milk, while producers get paid a weighted average (by volume) of the four class prices.

Classified pricing was intended to eliminate the possibility that fluid processors would use distant milk supplies to unduly lower nearby milk prices. It also reduced the incentive for processors to add producers when milk supplies were short and cut them off when supplies were abundant. Likewise, pooling creates pricing uniformity among producers and minimizes the incentive of one farmer to undercut another to gain access to higher value (fluid) markets.

Cooperatives principally have balanced the day-to-day milk needs of processors with the supply of milk in a given market as facilitated by the market order system. Cooperatives attempt to recover the costs associated with market balancing by negotiating "over-order" premiums (over and above the established market order minimum class prices) with milk processor-customers. These premiums may reflect additional transportation costs not covered by the market order price; the cost of providing fluid milk of specified quality and/or butterfat content at specified times and places; and/or the premium paid by fluid milk processors to attract milk away from manufacturing operations ("give-up charges"). The amount of over-order payments that cooperatives can demand differ from actual costs incurred, depending upon the relative market power of the cooperative and the processor. The ability of cooperatives to recoup these expenses from handlers in the market insulates members from shouldering the costs arising from market balancing tasks.

Reblend

Cooperatives with members in more than one Federal order market, or with some members not delivering to a market order, are permitted to provide for uniform distribution of milk payments to all members. Cooperatives may average ("reblend") the net proceeds of all their operations over all members, and are exempt from paying the blend price effective in any particular market.

Patronage Refunds

Cooperatives that add value to members' milk through manufacturing and/or marketing return the net savings to members through patronage refunds. These are distributions of net income to members (patrons) in proportion to the volume of milk they marketed. Sometimes known as the "13th check," net savings from cooperative operations can provide income for producers over and above the marketplace raw milk price.

The Traditional Milk Pricing System

The traditional methods of pricing milk have brought a degree of stability to the milk market. Government programs, market-wide pooling, and cooperative reblending have dampened the fluctuation of milk prices received by farmers.

Government Programs

The dairy price support program undergirds the farm milk price through Federal Government purchases of all butter, American cheese, and nonfat dry milk that cannot be sold commercially at or above announced prices. Federal purchase prices then become a floor for wholesale product prices due to competition among manufacturers across the Nation. Through competition for milk supplies by these manufacturers, hopefully, U.S. dairy farmers will receive a farm milk price that is at least the targeted support price.

The Federal market order system works in concert with the dairy price support program so that farmers who sell to handlers of nonsupported products will receive at least the prices that manufacturers of supported products pay. Since the 1960s, every Federal market order has used the Minnesota-Wisconsin (M-W) price as a starting point for setting minimum class prices. The M-W price is USDA's estimate of prices manufacturers in Wisconsin and Minnesota paid for grade B (manufacturing) milk in a given month.

On June 1, 1995, the M-W price was replaced by the basic formula price as the base price for the Federal market order system. This price also represents the market price for manufacturing milk in Minnesota and Wisconsin, but with adjustments reflecting month-to-month changes in dairy product prices. Thus, the dairy price support program effectively sets the minimum price paid for manufacturing milk. This price is reflected in the basic formula price used to establish grade A class prices in market orders, which currently price 74 percent of the Nation's grade A milk.

Thus, the Federal dairy price support program and the milk market order program have provided a measure of long-term stability for the dairy industry.

Pooling

The pooling provisions in market orders and reblend by cooperatives encourage stability in both spatial and temporal price relationships. Marketwide pooling under the orders and cooperative reblends smooth out producer pay price variation throughout the milkshed.

Cows produce milk day in and day out and that volume hits the market nearly every day throughout the year. The daily delivered volume varies, depending on the fluctuation of individual cows' production, weather, road conditions, and other uncontrollable factors. Daily demand varies according to day of the week in even greater magnitude due to factors such as consumer buying habits. Pooling over time with monthly pool prices minimizes the impact of the possible day-to-day fluctuation in milk prices in the spot market.

In aggregate, milk production generally peaks in the spring and bottoms out in the fall due to weather-related factors. Demand, on the other hand, peaks in the fall when schools open and the ensuing holiday season keeps demand strong. As a result, milk prices tend to be higher in the fall and lower in spring. Nevertheless, producers' cash flow may be more even than seasonal price fluctuations may indicate Because producers market milk year-round, their volume sold tends to be lower during the season when milk prices are higher, while the reverse may be true in the flush period. It evens out their month-to-month cash flow.

Wide-area Market Coordination

Many dairy cooperatives have members in a wide geographical area and operate a complete procurement system, including assembling and managing fluid milk supplies, routing raw milk to handlers as needed, and managing the surplus. Many handlers have entered into full supply arrangements with cooperatives to reduce the high cost of procuring and coordinating a fluctuating supply to meet a variable demand. These handlers recognize that cooperatives serving an entire market can better route milk to needed uses much more efficiently than if each handler managed its own milk supplies independently. Furthermore, marketwide coordination reduces reserve storage requirements of milk, yielding significant savings for both farmers and plants. Consequently, cooperatives' ability to manage milk supplies over a wide area to a variety of handlers reduces the need for individual handlers to use price to attract the right amount of milk. This encourages price stability.

Co-op Responses to Increasing Price Instability

Increasing Price Instability

Prior to 1981, the milk support price level was legislatively mandated between 75 and 90 percent of parity. Commonly set at 80 percent of parity, this price level evidently provided ample incentive for farmers to produce abundant milk supplies. In the mid-1970s, support prices were frequently increased because of rapid inflation. This brought on expanded milk production. Large surpluses built up in the form of Government purchases and holdings of butter, powder and cheese. Market prices hovered around the support price, which kept prices from falling further to market-clearing levels (figure 1). Therefore, the support price served as a floor under milk prices and, with the surpluses, in effect, a ceiling. Price volatility was minimized.

The M-W Price, which reflects the market price for raw milk, rises and falls according to market conditions. Sharp rises occur either when the basic supply-demand balance is very tight, or when the market tightens unexpectedly. The M-W Price normally rises in the short-supply season (typically October-November) when milk production reaches a seasonal low point and fluid product demand is seasonally high. Conversely, the M-W Price is seasonally low in the flush season (normally May-June) when milk production tends to peak and fluid milk product sales decline. The very heavy surplus of the first half of the 1980s obscured the seasonal deficit period, thus dampening the seasonal rise and fall of the M-W Price. Even the relatively large seasonal rise in **1984 was small compared to what was to come (refer again to figure 1).**

The growing volume of butter, powder, and cheese purchased by the Government through the CCC required ever larger Government outlays to finance the dairy price support program. As a result, legislation passed in 1981 took steps to bring supplies back into line with consumption by tying 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. In 1982, the support price level was frozen legislatively for 2 years and a $1 per cwt assessment on producers was instituted. The money collected was used to partially offset rising Government costs.

Subsequently, the 1983 Dairy and Tobacco Adjustment Act lowered the minimum price support level and enacted a milk diversion program, the first of two **attempts at voluntary supply control. The** second supply control program, the whole herd buy-out, was authorized by the Food Security Act of 1985. It called for removing whole herds from dairy production for 5 years beginning between April 1986 and September 1987. In addition, the support price was ratcheted downward in the following years. These actions contributed to a large decrease in the volume of product (in the form of butter, powder, and cheese) removed from the market by the CCC (figure 2).

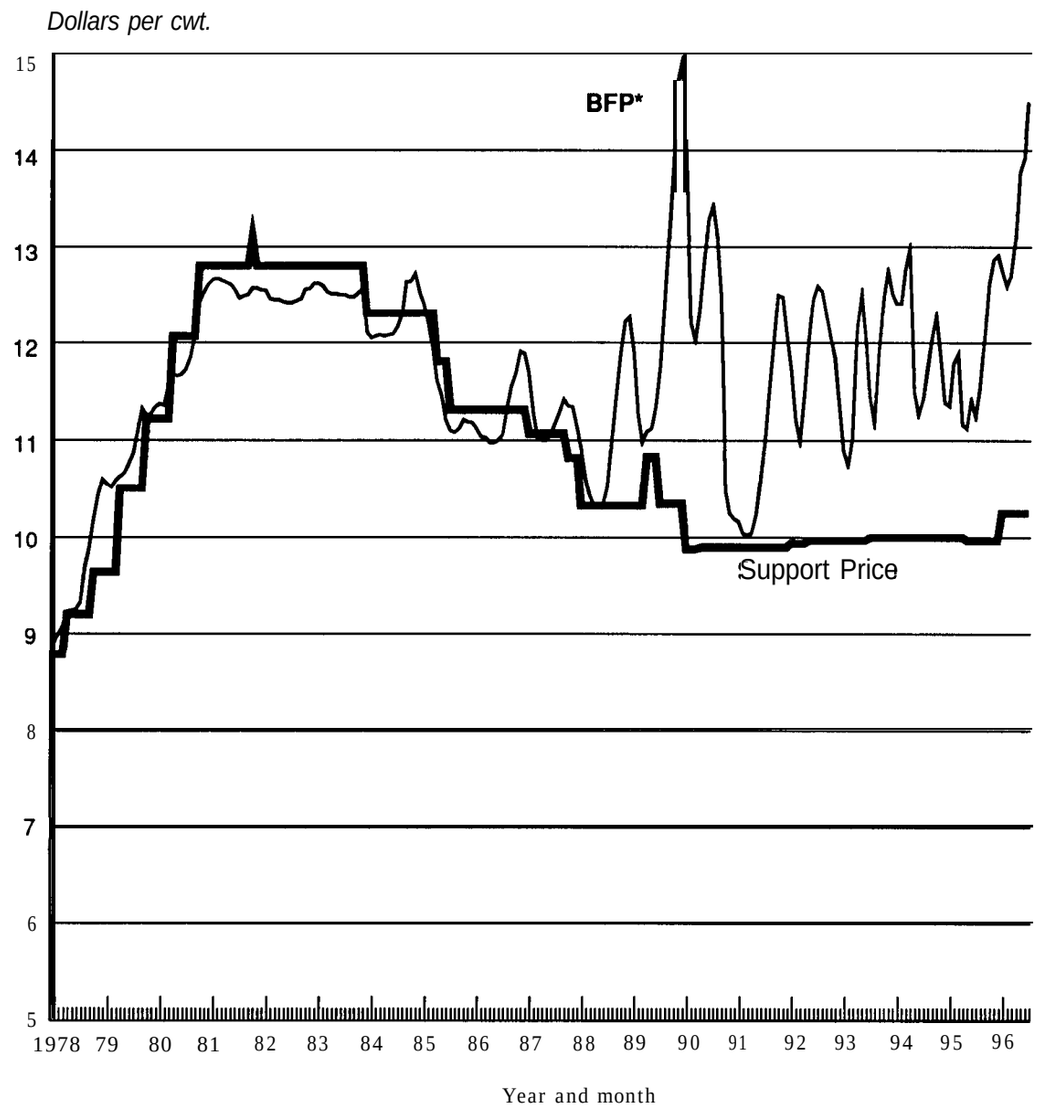
Commercial stocks of commodity products also play a crucial role in the dairy industry. American cheese stocks were especially influential from the late 1980s on because cheese production was absorbing an increasing share of the milk supply. Stocks help maintain smooth flows to consumers, stabilize seasonal price swings, and offer a buffer against unexpected developments. During 1982-87, commercial American cheese stocks declined fairly steadily, reflecting the profitability of minimizing stocks when a surplus is constant. Under these conditions, the role of stocks can be handled more efficiently by varying the flow of cheese sold to the Government. However, the low level of stocks in the late 1980s contributed to wide price swings.

While changes in Federal dairy policy set the stage, an ensuing combination of market factors led to dramatically atypical fluctuations in milk prices in 1988 that continued well into the 1990s. On the demand side, an unprecedented growth in foreign demand and higher world prices for nonfat dry milk allowed the United States to become a major player in international dairy markets during 1988 and 1989. Domestic use of skim milk products also accelerated in 1988 due to relatively large cuts in the support purchase price for nonfat dry milk. Commercial use of all dairy products reached a record volume.

On the supply side, **U.S.** milk production reached a record high in 1988 while the number of milk cows fell to a 20th-century low. The record output occurred at the same time that the price support was lowered by 50 cents, a summer drought substantially increased feed costs, and milk-feed price relationships were the lowest in more than 20 years. For the first time since 1982, the M-W Price peaked in December instead of November, reflecting a change in seasonal price patterns.

Falling milk output in 1989 accompanied by large export commitments for nonfat dry milk, strong domestic demand, and low commercial stocks of cheese and nonfat dry milk led to uncharacteristically sharp increases in wholesale, farm, and retail dairy prices. Even though milk production was expanding **by** early 1990, strong cheese sales tightened markets

Figure 1— Support Price and Bask Formula Price,* by Month at 3.5 Percent Butterfat

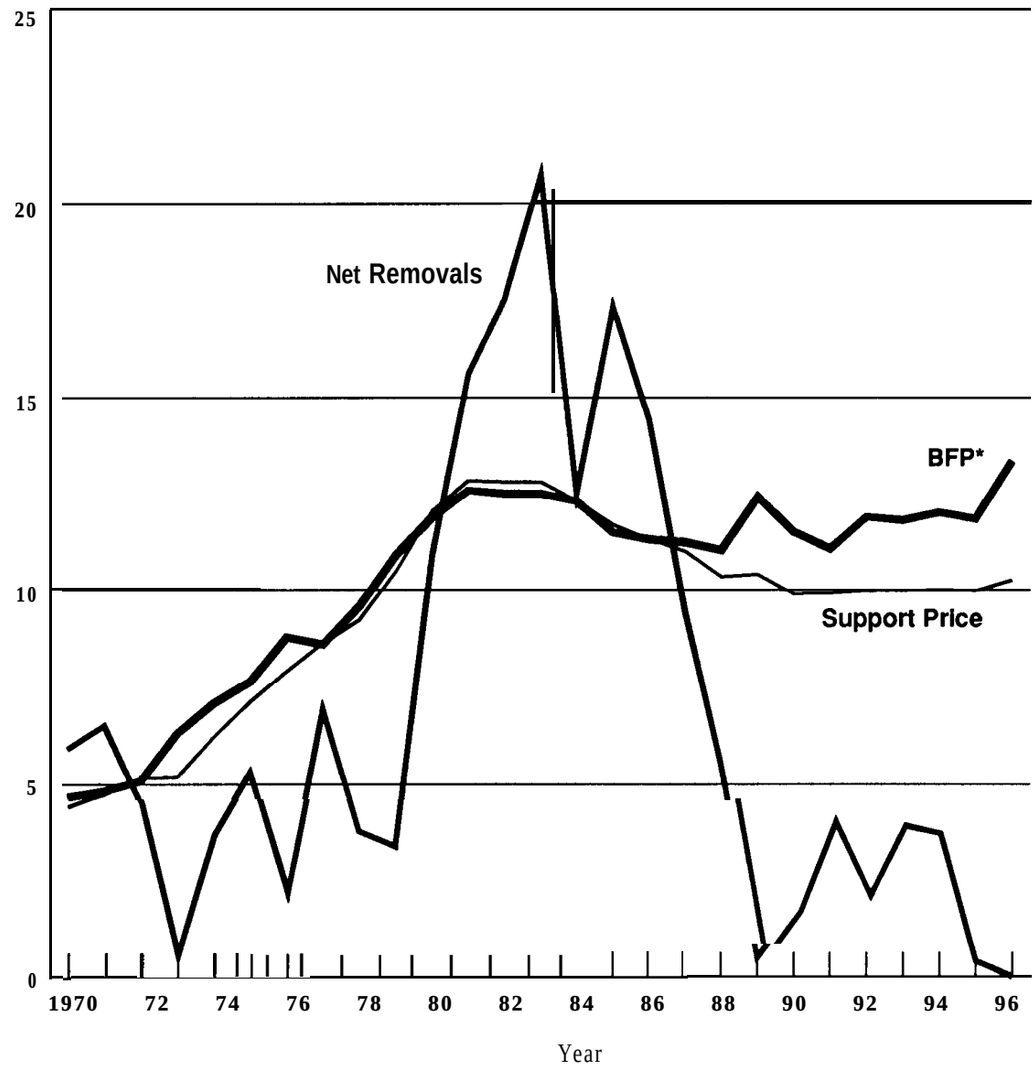


'M-W price prior to June 1, 1995.

Sources: *Dairy Yearbook.* U.S. Department of Agriculture, Economic Research Service, Statistical Bulletin Number 924, December 1995.
Dairy *Market News.* U.S. Department of Agriculture, Agricultural Marketing Service, 1996, various issues.

Figure 2— Net Removals, Support Price and BFP*

Billion pounds; dollars per cwt @ 3.5% butterfat



'M-W price prior to June 1, 1995.

Sources: *Dairy* Yearbook. U.S. Department of Agriculture, Economic Research Service, Statistical Bulletin Number 924, December 1995.
Dairy Market News. U.S. Department of Agriculture, Agricultural Marketing Service, 1996, various issues.

slightly more than expected and caused buyer concerns. Consequently, panicky stock building by buyers, who feared a recurrence of late-1989 conditions, triggered counter-seasonal price rises even though milk supplies for manufacturing were more readily available. In addition, commercial exports were negligible because international prices for dairy products had fallen dramatically. In 1990, milk prices reached near-record highs before declining precipitously. This excluded the United States as a major trader. Thus, milk prices plummeted as the collapse of supply concerns easily outweighed normal seasonal tightening. Buyers very quickly shifted from attempting to increase pipeline stocks to meeting current use partially from accumulated stocks. By late 1990, wholesale prices of major dairy products settled near support purchase prices following the mid-1990 collapse. Notably, the annual average farm milk price in 1990 was the highest for the period 1981 through 1995, despite the wide price swings.

The level of support for milk price for the remainder of the 1990s appears to be below market-clearing levels, such that market forces are relatively free to influence milk prices as evidenced by the continued variability seen in figure 1.

Cooperatives' Responses

Dairy cooperatives have adapted to the increased price instability by using several strategies. Many cooperatives claim to have stepped up their efforts to turn over inventories and avoid being caught in a market downturn that would force them to write down the inventory. This strategy may have worked to a certain degree for nonfat dry milk, butter, and commodity cheese. However, the strategy will not work for those cooperatives that age cheese, because by the nature of the aging process, they can not sell aged cheese before its time. Furthermore, the aged cheese business requires careful inventory management because both shortage and surplus in supplying the consumer market can bc costly.

Some cooperatives have diversified into processing value-added dairy products and integrated closer to the consumer market. In such efforts, they hope to capture a larger share of the consumer dollar. Other cooperatives look toward nontraditional markets such as fractionalizing milk components for industrial uses or differentiating their products to fill market niches. The operations in the consumer market and the nontraditional markets rely less on the commodity dairy product markets where prices tend to be more volatile.

Another strategy is to form marketing agencies in common that are permitted under the Capper-Volstead Act of 1922. Dairy cooperatives have formed these common agencies to share market information, especially regarding inventory levels and product movements of nonfat dry milk and whey powder. This valuable information enables the cooperatives to make informed decisions on inventory management and marketing operations. Examples of marketing agencies in common that have been formed in recent years are Dairy Marketing Cooperative Federation, Dairy Marketing Information Association, and Western Cooperative Marketing Association.

In 1995, three dairy cooperatives in California joined forces to create DairyAmerica, Inc., a marketing agency in common to market the powdered milk they manufactured. Besides taking advantage of scale economies in sales operations, the common agency can better coordinate marketing of the product and spread market risks over a very large volume.

Joint ventures have long been used by some dairy cooperatives to shift the risks of manufacturing operations and inventory management to joint venture partners. The cooperative leases its manufacturing plant(s) to the joint venture partner, which commits to purchasing milk from the cooperative, operating the plant(s), and marketing the end products. In this setup, the cooperative secures a market outlet for its members' milk without assuming the risks of further processing, product marketing, and inventory management.

These responses by dairy cooperatives to reduce exposures to price instability in the commodity market falls in the broad definition of hedging. However, hedging is usually narrowly defined to mean the use of futures and options to manage price risks. Dairy futures and options trading has been instituted in the past 3 years. Another much discussed method for managing price risks is forward contracting.

Emerging Hedging Mechanisms for Managing Price Risks

Futures, options, and forward contracts, though new to the dairy industry, have been used extensively in some other commodities. There is a rich reservoir of literature on the what's and how's of these pricing mechanisms. This report summarizes only the very basics of futures, options, and forward contracts as applied to the dairy industry, mainly to set the stage for delineating some of the risks associated with their uses by dairy farmers and their cooperatives. It is not

intended as a trading guide. These risks are specific to milk and dairy products and are in need of careful assessment and examination. Not discussed in this report is the risk of basis changes, which is inherent in all futures contracts. (Basis is the difference between the cash price at a specific location and the futures price for a particular delivery period.)

Milk and dairy products have some unique characteristics, unlike other commodities. These unique characteristics may affect the use of the emerging hedging mechanisms:

• Milk is a flow product (much like water coming out of a spring). Cows produce milk every day. Because of its perishability, once milk is produced, it must be used and processed. On any given day, the volume of milk supply going into the market is fixed and reflects underlying cow numbers. It is difficult to instantaneously change the volume of milk production in response to changes in current market milk price. This is very different from other storable commodities such as grains, corn, soybeans, or cotton. At any point in time, the volume of any one of these commodities actually offered to the market is directly related to the commodity price. Therefore, the market dynamics are very different between milk and these commodities.

. Milk is processed into fluid and soft products for current consumption or manufactured into "hard" products, namely, cheese, butter, and nonfat dry milk. Although these hard products are relatively storable, they are also flow products because they are derived from a flow product. Inventories of these hard products are usually kept for the purpose of regulating product flow to meet market demand. Storing them for price speculation is not the usual practice of the industry.

• The capacity to produce milk is limited by the underlying number of cows. Because of the biological nature of the bovine animals, if there is an increase in aggregate cow numbers, it tends to increase only gradually. Therefore, it is unlikely to have unforeseen drastic increases in milk production. This production capacity as limited by the cow numbers undergirds the floor price of milk, although the floor may be neither visible nor rigid. On the other hand, milk production could drop instantaneously because cow numbers could be reduced suddenly by diseases, natural disaster, or other factors, or some cow herds could be liquidated in a short period. Poor quality feeds or forage also could reduce milk production drastically. Furthermore, in terms of its components and usage, milk does not have close substitutes and therefore overall demand for milk does not change much. The exception would be a drastic decrease in demand due to food safety scare on some rare occasions. Given a stable consumption trend, shocks to the milk market usually translate into upswings in milk prices. Subsequent price declines should not drop below the price floor which is undergirded by the production capacity limit (or by the support price for milk if and when the support is effective). Therefore, price volatility in the milk market may be lopsided; price hikes do not have a upper limit while there is a tacit floor on the down side. This lopsided phenomenon also applies to dairy product markets. In contrast, prospective and actual crop production can change drastically in either direction because of favorable or adverse natural conditions such as weather or pest infestation, and price swings are usually uninhibited in either direction, up or down.

I. Futures Markets

The major reason for the existence of futures markets is to provide a means for shifting the risk of price changes in the cash market for the commodities involved. A futures contract is a commitment to either accept or make delivery of a specified quantity and quality of a commodity at a specified time, and usually at a specified place of delivery. Commitments are enforced by requiring actual delivery and acceptance of delivery of the underlying physical commodity, if a contract is allowed to mature (come due). However, no actual commodity changes hands unless and until the contract matures. Most contracts are offset or "covered," by making a transaction in the futures market opposite to a previously taken position before they come due. In fact, futures contracts are viewed as financial instruments and the commodity is rarely expected to physically change hands. For many of the commodities traded, less than 2 percent of all futures contracts result in actual delivery.

Buyers and sellers meet to trade futures contracts at exchanges. The increase of price volatility in dairy markets led the Coffee, Sugar and Cocoa Exchange (CSCE), New York, to begin trading futures contracts for milk and dairy products. In June 1993, the CSCE introduced Cheddar cheese and nonfat dry milk futures contracts. Next, the CSCE launched a milk futures contract in December 1995. A second exchange also developed dairy futures. The Chicago Mercantile Exchange (CME) began trading milk futures in January 1996 and is planning to begin trading butter futures later in 1996.

Those who use the futures market to shift price risks are called hedgers. Hedging involves making simultaneous and opposite transactions in the cash and futures market, hoping that any loss in one market

will be offset by a gain in the other. Speculators assume the price risks that hedgers are attempting to avoid. Speculators aim to make a profit as a result of buying and selling (trading) futures contracts. They trade only futures contracts and do not deal in the underlying commodity cash markets. Thus, they cannot offset losses in the futures market with gains in the cash market. Speculators provide the futures market with liquidity which increases the ease with which hedgers are able to buy or sell contracts when they want to offset their contracts, also known as settling or lifting their hedges. Orders to buy and sell futures contracts go through brokers who charge commissions for making the trades for hedgers and speculators.

A hedger buys or sells a commodity futures contract to lock in a desirable price and eliminate risk exposure to price fluctuations during the time leading to actual buying or selling of the cash commodity. The hedger should evaluate whether the futures-implied cash price is attractive relative to the forecasted future cash price. A hedge should only be maintained if the futures-implied cash price is deemed desirable; otherwise the hedge should be lifted. Hedging all production all the time (called automatic hedging) would only exchange the futures-implied cash price for the subsequent actual cash price. Over the long run, automatic hedging may not gain any advantage over relying on current cash transactions and may even be a disadvantage because of the transaction costs incurred in trading futures. (See Jack D. Schwager book for discussion on hedging, pp. 9-11.)

Milk Futures

The milk futures contract offered by the CSCE calls for f.o.b. delivery of one tanker load (50,000 pounds) of Grade A raw milk with 3.5 percent butterfat to Interstate Milk Shippers (IMS) certified plants, receiving stations, or transfer stations in the Madison, WI, district. The buyer picks up the milk from the seller's plant. Delivery months are February, April, June, August, October, and December. Starting on July 1, 1996, CSCE calls these 6 months the "regular delivery months." The other 6 months of the year are called "additional delivery months." (Trading in an additional delivery month is limited. It is initiated at the opening of trading on the first CSCE business day of the second calendar month preceding such additional delivery month.)

The milk futures contract traded on the CME is similar. It also calls for 50,000 pounds of Grade A cow's milk delivered to approved facilities in Minnesota, Wisconsin, and portions of surrounding States within designated Federal milk market order areas. The contract months are February, April, June, July, September, and November.

A Cooperative's Risks in Using Milk Futures

Hedging by trading futures may help shift price risks. However, trading futures also creates other risks for dairy cooperatives and dairy farmers. Some generally observable risks are discussed here. However, both dairy cooperatives and individual producers may have specific risks due to particular situations in addition to what are addressed in this report.

Dairy cooperatives do not produce milk. Under their marketing agreements with members, dairy cooperatives receive whatever milk volume is produced by members' farms, but cooperatives have no control over the actual volume. When hedging on futures, there is a risk that actual milk volume may be lower than the short position taken by the cooperative. (Short position refers to the volume represented by futures contracts sold.) A part of the hedge may become speculation; but the degree depends on the extent of the production shortfall. Then, possible losses in the futures market could not be offset by gains in the cash market for the volume of milk the cooperative hedged, but did not receive deliveries from members. For this reason, dairy cooperatives may have to limit the volume hedged to a fraction of member production.

Cooperatives that hedge in the milk futures market have the ability to pay their members the futures-implied cash price. However, if the eventual cash market milk price turns out to be higher than the futures-implied cash price, the cooperatives may be out-paid by competitors-a potential problem for producer relations. In this situation, the cooperative cannot pay the going cash price because it must cover its losses in the futures market through paying its producers the hedged price rather than the current cash market price.

Cooperatives typically handle large volumes of milk. If a large proportion of their milk is hedged in the futures market, there is a risk that the futures market may not have enough liquidity for the cooperative to lift its hedges in time. In that situation the cooperative would likely pay a high price to liquidate its position, or would have to deliver to fulfill the futures contracts.

A Dairy Farmer's Risks in Hedging

Under normal market conditions, when feed cost rises, the milk/feed price ratio falls. That leads farmers to feed less concentrate rations to dairy cows, resulting in lower milk production. Higher milk price would

likely ensue and help offset at least some of the impacts of the rising production cost. Thus, if a producer hedges milk price in the futures market, the producer would also need to hedge farm supply costs, especially feed. Otherwise, the producer's profit margin may be squeezed by the unexpectedly high feed cost and a hedged milk price that is fixed. A loss could result depending on how high feed cost rises.

Milk production is a bovine biological process. Many variables can affect a cow's performance. Factors such as diseases, adverse weather conditions, and high feed cost can cut the milk volume produced by the cow. If there is a shortfall in milk production, part of the producer's hedge in the futures market may become speculative, increasing instead of minimizing exposures to possible loss. Therefore, it is important to determine what proportion of a producer's milk is to be hedged. Hedging a high proportion may cause some portion of the hedge to be speculative, while hedging too small a volume would not provide adequate protection from price risks.

Producers receive cash market prices for their milk on a monthly basis. Milk prices in the futures market are also quoted on a monthly basis. However, as stated earlier, milk is a flow product that is produced day in and day out all year round. Choosing the right time period to hedge milk production is an important consideration. Automatic hedging (hedging all production all the time) would only substitute the futures-implied cash price for cash milk price as the producer's pay price for milk. Over the long run, such substitution may just be a break-even exercise or even a losing proposition because of the futures' transaction costs.

Producers who hedge selectively to lock in a price need to have market insight. They run the risk of foregoing higher prices if the market does not act as predicted.

As mentioned earlier, volatility in the milk market may be lopsided; price hikes do not have an upper limit while falling prices may be mitigated by a tacit floor (or an explicit floor when the Government support price is effective). In other words, price protection by hedging is rather limited on the down side, but hedging prevents the producer from benefitting from rising cash market prices, which have no limits. In this connection, the worst case scenario for the producer who locks in a fixed milk price through hedging is when the rising cash market milk price is due to reduced milk production caused by unexpectedly high feed cost.

Another risk in hedging is that the producer may be squeezed if there is low liquidity in the futures market and the producer is not able to lift the hedge at the right moment or would have to pay a high price to buy settlement contracts. The alternative is to make delivery on the futures contracts, the logistics of which may be troublesome for an individual dairy farmer. Also, making delivery to a buyer other than the producer's own cooperative may constitute a breach of the membership agreement.

Futures Market for Nonfat Dry Milk and Cheese

The CSCE nonfat dry milk futures contract calls for delivery of 11,000 pounds of USDA Extra Grade or better nonfat dry milk in 25 kg bags FOB Western region. Delivery unit is 4 contracts (44,000 pounds) and delivery months are the same as in milk futures. The nonfat dry milk must be certified Kosher, have moisture content of 4 percent or less, have been manufactured using low heat, and be less than 180 days old on date of delivery. The seller is responsible for shipping the nonfat dry milk from its manufacturing plant or storage center according to the buyer's shipping instructions to any location within the continental United States. Nonfat dry milk delivered from points outside the Western Region are subject to a .5 cent/pound location differential for the Central Region, and a 1.5 cents/pound for the Eastern Region. If the final settlement price is below the CCC support price, differentials will be reduced by an equivalent amount.

The CSCE Cheddar cheese futures contract calls for FOB delivery of 10,500 pounds of USDA Grade A or better Cheddar cheese in 40-pound blocks at any point within the continental United States (640-pound blocks are deliverable at a discount of 300 points). The delivery unit is 4 contracts (42,000 pounds), and the delivery months are the same as in milk futures. The cheese will be manufactured from pasteurized milk, colored, have a moisture basis of 36.5 percent to 39 percent, and must be less than 30 days old on the first Exchange business day following the first Thursday of the delivery month. On the day cheese is actually delivered it must be more than 4 days old. The seller will ship the cheese from its manufacturing plant or storage center according to the buyers' shipping instructions. Cheese may be delivered at any point within the continental United States.

A Cooperative's Risks in Using Dairy Product Futures

Dairy cooperatives manufacture members' milk into storable products such as cheese, butter, and nonfat dry milk either as their main lines of business or as

last-resort processing. Conventional wisdom would have it that dairy cooperatives are in the position to use nonfat dry milk and cheese futures for hedging to protect inventory values. As with the case of milk futures, while hedging helps cooperatives manage price risks, it also creates some new risks. These risks should be considered when contemplating hedging.

Nonfat dry milk and cheese are products derived from members' milk. Dairy cooperatives generally do not have control over milk production . They take whatever actual volume members produce and manufacture some or all of it into various products. A cooperative that hedges on nonfat dry milk and/or cheese futures markets may encounter the risk that actual milk volume it receives may not be enough to cover the short position it takes selling futures contracts. Part of the hedge will become speculative transaction; how speculative depends on the size of the production shortfall. For this reason, dairy cooperatives may have to limit the volume hedged to a fraction of production.

Milk is a flow product as are hard products derived from it. Flow products must be moved to the market as soon as possible before excessive inventories accumulate. Unlike other commodities, nonfat dry milk and commodity cheese as flow products may not be suitably stored for later price increases. (Aged cheese is different, as explained later.) Our estimate is that dairy cooperatives on average keep manufactured products inventory for no more than a month. In 1994, the year the most recent data is available, the Nation's top 27 dairy cooperatives with processing/manufacturing operations had an inventory turnover rate (sales to inventory ratio) of 41.4. Assuming 60 percent of their sales was for raw milk and the rest was processed/manufactured products (the actual volume processed/manufactured by cooperatives was 38 percent of member milk deliveries in 1992), and assuming all of their inventories were processed/manufactured products, the inventory turnover rate for these products was 16.5. Allowing for some estimation error, the actual inventory turnover rate may be higher than this number, but in all likelihood will be less than 30—the inventory level on average was less than a month's supply.

Aged cheese may be the exception because it is sold to the consumer market. Price movements in the consumer market are very different from price changes in the commodity market. Consumer psychology is such that retail marketers and their suppliers usually do not like to change prices frequently. They change prices only when they are certain that the changes will be for a prolonged period of time, or permanent, and the price adjustments are usually made in a racheting fashion. In other words, prices in the consumer market are usually quite stable and do not experience the same kind of volatility as in the commodity cheese market.

The futures-implied cash price is the one a cooperative that hedges in the futures market can afford to pay its members for milk. If, by the contract expiration date, the cash market price turns out to be higher than the futures-implied cash price, the cooperatives may not be able to pay its producers a price as high as its competitors. This could potentially create a producer relations problem for the cooperative.

II. Options

There are two type of options: calls and puts. A call option confers to the buyer the right, but not the obligation, to purchase a designated futures contract at a specified price, known as the strike price or exercise price, at any time prior to the expiration of the futures contract. On the other hand, a put option confers to the buyer the right, but not the obligation, to sell a designated futures contract at the strike price, at any time prior to the expiration of the futures contract. As the futures market moves, options for additional strike prices on each futures contract may be available for trading. Therefore, the total number of different options may far exceed the number

of futures contracts. The cost of an option (i.e., the price the buyer of an option pays) is called the premium.

A put option protects a milk seller against falling prices. During the effective time period of the put option, if the current price of the underlying futures contract is lower than the strike price by at least the premium, the option holder would come out ahead (provided that the transaction cost is covered). On the other hand, if the futures price is not lower than the strike price by at least the amount of the premium by the time the underlying futures contract expires, the option holder would incur a loss. The maximum amount the holder could lose is limited to the premium (and the transaction cost). While the loss is limited, the protection the put option provides is potentially large. The tradeoff is that the probability of the potentially small loss may be high, while the probability of the potentially large gain may be low.

A holder of the call option profits from rising prices or is protected against rising milk prices if the holder is a milk buyer. A call option is profitable when the current price of the underlying futures contract is higher than the strike price by at least the premium (provided that the transaction cost is covered). The

holder of the option could buy the futures contract and settle it for a profit. However, if the current price of the futures contract is not higher than the strike price by at least the premium by the time the underlying futures contract expires, the call option holder would incur a loss. The maximum amount the holder could lose is the premium (and the transaction cost). While the potential loss to the option holder is limited, the potential gain is unlimited. Again, the tradeoff is that the probability of the potentially large gain may be low, while the probability of the limited loss may be high.

The observation by Schwager provides a good summary of options trading:

Roughly speaking, the option buyer accepts a large probability of a small loss in return for a small probability of a large gain, whereas the option seller accepts a small probability of a large loss in exchange for a large probability of a small gain. In an efficient market, neither the consistent option buyer nor the consistent option seller should have any advantage over the long run.

An option allows the hedger to sell or buy a futures contract at a time closer to the contract expiration date than outright futures trading. Presumably by the time the option is executed, more market information would be available to make hedging less risky. However, for dairy producers or cooperatives, using options requires more investment in information gathering to determine if the price protection is worth the premium, and how likely a large price increase may be. Using options is a more costly method of hedging when price movements are relatively small.

III. Forward Contracts

There are many variations of forward contracts that have been used by commodities other than dairy. In dairy, current market transactions are most prevalent. Forward contracts are rarely used, although the marketing agreements between dairy farmers and their cooperatives might be interpreted as one form of forward contracts that promise future deliveries without specifying volumes or prices. Some cooperatives, however, provide price guarantees to some new or highly leveraged farmers to enable them to obtain bank financing.

There have been recent discussions about "new-generation" dairy cooperatives that would issue delivery rights to members based on their equity subscription. The plan is similar to a conventional marketing agreement, except in this case, the delivery volume is specified. Only the milk volume that is within the delivery rights is entitled to receive a favorable price and to share in the earnings of the cooperative and enjoy certain other privileges. The delivery rights may be transferrable at the discretion of the cooperative's board of directors. This plan is workable if the cooperative consistently generates positive earnings to make purchasing the delivery rights worthwhile. For a milk producer whose production surpasses the delivery-right contract volume, the excess milk is likely to be priced lower. Overall, whether the producer would be better off under the new-generation delivery rights arrangement depends on the relative proportion of contract versus non-contract volumes and on the price difference between the two types of delivery.

Another form of forward contract being discussed is a fixed-volume, fixed-price contract. (This is the common form used by other commodities, but rarely used by dairy cooperatives.) Producers would forward contract with the cooperative. The contract would specify a predetermined fixed price for a given volume of milk delivery for a given time period (most likely for a particular month).

In essence, this type of forward contracts shift price risks from the contracting producers to the cooperative. The shift in risks reveals some interesting aspects of forward contracts:

- A cooperative is owned by its member-producers. Shifting the risks from the producers to the cooperative does not diminish producers' risks. Rather, the risks remain the same, except that they are collectively assumed by the cooperative. Shifting the risks assumes that the cooperative could manage the risks better than the individual producers could do themselves.
- Some member-producers probably would not use the forward contracts. Therefore, they probably would not cover all milk volume produced by member-producers. Because of the costs of managing the risks, shifting price risks to the cooperative through forward contracts would disadvantage those producers whose production is not under forward contracts or the milk volume that is not covered by forward contracts. A separate pricing pool may have to be maintained by the cooperative to pool the proceeds and share expenses from forward contracting.
- Fixed-price forward contracts would compel the cooperative to hedge the contracted volume to protect the cooperative from price risks. The cooperative may make advanced sales of, say, cheese to buyers at a certain price, to be delivered later when the contracted milk volume is available. Thus, price risks arc shifted to the cheese buyers. Alternatively, the cooperative may hedge the contracted volume in the futures market. Over the long run, forward contracts may not

return more than current market milk prices to producers. As a matter of fact, forward contracts can be expected to return lower milk prices because of the costs of transacting forward contracts and trading futures.

- The cooperative should be aware of the risks associated with futures trading, if it decides to hedge the contract volume on the futures market.

There have been many empirical studies of forward contracts in commodities other than dairy. Brorsen, et al., in their analysis of the data of Texas Gulf forward basis bids for Hard Red Winter wheat from 1975 to 1991, concluded that a farmer would average about $0.02 to $0.04 per bushel less forward contracting on April 15 (before harvest begins) each year than by selling during the last half of June (when harvest is near completion). They concluded that farmers were paying a premium for the service of forward contracting, which was consistent with earlier studies on live cattle, grain, and soybeans.

In a recent extensive study of the red meat packing industry organized by USDA Grain Inspection, Packers and Stockyards Administration, a team of researchers found that cattle purchased by packers under forward contracts brought $1.74 per cwt. (live-weight) less than delivered prices for similar cattle obtained on the spot market, while marketing agreement cattle brought prices about 54 cents above spot market prices. (In livestock procurement, a forward contract is a contract between a packer and a seller to purchase a specific lot of cattle at a future date, with the contract established at any time from placement of cattle on feed up to 2 weeks prior to kill date; a marketing agreement is a long-term arrangement between a packer and a seller in which the packer agrees to purchase a specified number of cattle per specified time period such as a week, month, or year.) Using a different data-set, another team of researchers for the same study found that prices paid for cattle delivered under forward contracts on any given day were about $3.00 per cwt. lower (dressed-weight basis) than prices for similar cattle on the cash market, while prices for cattle obtained through marketing agreements were about 10 cents per cwt. higher than prices for cash-market cattle.

These studies show that forward contracting is certainly not free. Producers pay a price for shifting market risks to other parties. As a result, forward contracting prices tend to be lower than spot market prices. It is also interesting to note that cattle sales under marketing agreements received higher prices than the spot market.

Dairy cooperatives have only limited experience with fixed-volume and fixed-price forward contracts. Alto Dairy Cooperative at Waupun, WI, is believed to be the first one to pioneer such contracts for dairy. In 1994, the cooperative conducted a pilot program for members to forward-contract a portion of their milk production. The pilot project used cheese futures contracts because 90 percent of the change in the basic formula price can be explained by changes in Cheddar cheese prices. In addition, the milk futures contracts had not been developed at the time of the project which was conducted between August 1, 1994 and August 31, 1995. (Alto's pilot program was evaluated in a report by Cropp.)

Seventy-eight producers signed up for the project, where 43 actually executed one or more cash forward price contracts during the 13-month trial period. Alto Dairy would bid to buy milk delivered into the future. The bid price was based on the previous business day's prices for Cheddar cheese futures contracts on CSCE. Producers could phone Alto Dairy each morning and get the offered bid prices. Quoted bid prices were base prices; producers who contracted received all premiums and price adjustments otherwise paid by Alto Dairy on all member milk delivered to the cooperative. If a bid price was acceptable, the producer could contract a specified quantity of future milk production at that price. Producers had the option of forward contracting 5,000 pounds or more of a given month's milk production, up to a maximum of 50 percent of their monthly milk production. The producer could contract various milk volumes at more than one price per month as long as the total quantity contracted for the month was less than 50 percent of monthly milk production. Some producers accepted more than one contract price for a given month. If the bid prices were unacceptable, producers were not obligated to contract future milk production.

Alto Dairy was able to guarantee producers the contract price by selling Cheddar cheese futures to hedge the producer contracted volume and then buying offsetting Cheddar cheese futures when the milk was delivered. If the price of cheese declined in the time between the two transactions, Alto Dairy would make a profit on the futures market and add this profit to the now lower cash price to pay the contract price for milk. If the price of cheese increased, Alto Dairy would experience a loss on the futures market but pay producers the contract price, which was lower than the cash price. Thus, the net effect to Alto Dairy was to come out the same (except for the transaction cost) as if paying producers the going cash price, while pro-

ducers receive a guaranteed price for future milk production, regardless of cash market price changes.

Alto Dairy assumed some risks in offering the forward contracts to members and viewed the associated costs as the cost of providing the member service. One of the risks is basis change. (Basis is the relationship between the cash and futures market prices.) If the basis changes between the time of setting and lifting of a hedge, the price objective will not be met. By assuming this risk, Alto Dairy would gain or lose by the amount and direction of basis change. Furthermore, Alto Dairy's bids were offered based on the previous business day's settling price for Cheddar cheese futures. Alto Dairy may not always have been able to set a hedge at the exact bid price. This difference between contract price and hedged price is known as slippage.

At the end of the 13 months, Alto Dairy showed a net gain from all forward contracts combined, even after paying brokerage commission. Alto's objective is to adjust the basis used in forward contract price quotations so that the gain/loss is near zero.

Although 256 total individual forward price contracts were made by producers, Alto Dairy made only 201 short hedges to cover them. Alternatively, the unhedged cash forward contracts were protected with corresponding cash cheese sales.

By the end of the pilot project (August 31,1995), 136 contracts resulted in the producer getting a $.03 to $.73 per cwt higher price than Alto Dairy's actual producer pay price, 119 received a $.01 to $.76 per cwt lower price as a result of their forward contract(s), and one contract was equal in price. On average, the cash forward contract price was $.003 per cwt higher than Alto Dairy's actual pay price for milk.

Evaluating the Traditional Pricing System in Terms of Managing Price Risks

In light of the assessment of the emerging mechanisms for hedging price risks, it is also useful to evaluate the traditional milk pricing system in regard to price risk management.

Most dairy cooperatives coordinate milk marketing over a wide geographical area, and pool and reblend their proceeds monthly to pay producers. These practices ensure that pay price for producers in the same pool is equalized regardless of location and regardless of milk price movements during the month. Individual member-producers share price risks together-much like mutual insurance.

Marketing agencies in common of dairy cooperatives that pool earnings and costs of marketing dairy products are also akin to institutions of mutual insurance. Marketing agencies in common may be particularly useful for dairy cooperatives in the export markets where price fluctuation is potentially more volatile than in the domestic market.

There is a pronounced seasonality of milk production, and price movements tend to run counter to the seasonal production pattern. Therefore, producer cash flow may be more even than seasonal movements in price or production alone would suggest. Also, because milk is a flow product, in the long run the average cash market milk price, in theory, can be expected to be even with the average futures-implied cash price received by a producer who hedges all production all the time on the futures market-what is called automatic hedging.

Dairy cooperatives concerned with product price fluctuation usually have the ability to manage risks through changes in business practices without having to follow an explicit hedging plan. Because they usually have multi-product, multi-plant operations, they have the flexibility to shift production to products that would return the highest margins. Other examples include faster inventory turnover to avoid inventory write-downs, integrating into the consumer and niche markets to avoid the volatilitics in the commodity markets, forming marketing agencies in common to gain better market intelligence or coordinate product marketing, and joint ventures with other firms to shift some risks to partners.

But, by shifting or offsetting existing risks, these cooperatives arc certain to take on new ones. A multi-product, multi-plant cooperative may encounter chronic excess plant capacity. Faster inventory turnover may result in not having enough inventory to take advantage of rising prices or sales opportunities. Integrating into the consumer-product or niche markets requires a new set of business ingredients such as ample capital, a forward-looking board of directors and capable management, among many other things. Having all the right ingredients does not guarantee success, but lacking any one can doom the business enterprise. For a cooperative that is in a joint venture with another firm, the risk is that the joint venture partner may not successfully perform its side of the contract. The cooperative may also find its own operational flexibility being restricted by the joint venture contract.

Conclusion

The traditional pricing system has served dairy cooperatives and their members well. In the gradually deregulated dairy market environment where the awareness of price instability is heightened, the challenge for the board of directors and management is to assess the overall risks of the cooperative's operations and determine how the risks may impact on producer pay prices through their traditional pricing system, and if and how the risks should be managed. They may want to manage the risks by taking advantages of the flexibility in the business system, by changing their business practices, or by forming alliance with other firms to shift the risks.

If they decide that some of the risks should be managed by using the emerging hedging mechanisms, it is imperative that they should understand what each hedging mechanism is, how it works, what it is used for, and the risks involved in using it. (This and the next paragraphs benefitted from the insights presented in The Economist.)

Because the opportunities for using the hedging mechanisms and the risks involved in using them tend not to be fully comprehended, they are susceptible to misuses. What is intended as hedging sometime turns out unexpectedly to be speculating and wreaks havoc on the cooperative. This has been the experience in some commodities other than dairy. Therefore, careful management and prudent precautions are required in using them. If the board of directors decides some of the risks should be managed with the emerging hedging mechanisms, it should determine a hedging strategy for the cooperative that should at least include the following:

- Treat risk management as an integral part of the cooperative's overall corporate business strategy, not as an isolated business function.
- Adopt an explicit policy for the use of the hedging mechanisms and spell it out to the membership.
- Set up a process to monitor the cooperative's uses of the hedging mechanisms.
- Have safeguard to ensure that controls are in place to protect against misuse and fraud.
- Require that risk exposures by using the hedging mechanisms be properly accounted for in the financial statements to inform members, creditors, and other interested parties.

References

Brorsen, B. Wade, J. Cooms, and K. Anderson. The Cost of Forward Contracting Wheat. Agribusiness, Vol. 11, No. 4, 349-354 (1995).

Coffee, Sugar & Cocoa Exchange, Inc. Trading Milk Futures and Options. Coffee, Sugar & Cocoa Exchange, Inc., New York. 1995.

Cropp, Robert A. Forward Milk Contracting Pilot Program, Alto Dairy Cooperative: Summary September 1994-August 1995. University of Wisconsin Center for Cooperatives, Madison, WI. February 1996.

Cropp, Robert A. and M. Stephenson. Introduction to Cheese and Nonfat Dry Milk Futures. Dairy Markets and Policy Issues and Options, Cornell University, M-12, February 1995.

The Economist. Too Hot to Handle? A Survey of Corporate Risk Management. The Economist. February 10th, 1996.

Fortenberry, Randall T., R. Cropp, and H. Zapata. Analysis of Expected Price Dynamics Between the Proposed Fluid Milk Futures Contract and Cash Prices for Fluid Milk. A report to the Coffee, Sugar, and Cocoa Exchange, Inc. September 1995.

Liebrand, Carolyn B. Security, Price or Service? Farmer Cooperatives. U. S. Department of Agriculture, Rural Development Administration, Cooperative Services Programs. Washington, DC. September 1994.

Ling, K. Charles and Carolyn Betts Liebrand. Marketing Operations of Dairy Cooperatives. U. S. Department of Agriculture, Agricultural Cooperative Services. ACS Research Report 133. Washington, DC. April 1994.

Ling, K. Charles and Carolyn Betts Liebrand. Vertical Integration Patterns of Dairy Co-ops Reflect Changing Market. Farmer Cooperatives. U. S. Department of Agriculture, Rural Business and Cooperative Development Service, Cooperative Services Programs, Washington, DC. September 1995.

Manchester, Alden C. The Public Role in the Dairy Economy-Why and How Government Intervene in the Milk Business. Westview Press, Boulder, co. 1983.

Schwager, Jack D. A Complete Guide to the Futures Markets: Fundamental Analysis, Technical Analysis, Trading, Spreads, and Options. John Wiley & Sons, Inc., New York. 1984.

U. S. Department of Agriculture. Concentration in the Red Meat Packing Industry. U. S. Department of Agriculture, Grain Inspection, Packers and Stockyards Administration, Washington, DC. February 1996.

U. S. Department of Agriculture. Farmer Cooperative Statistics, 1994. U. S. Department of Agriculture, Rural Business-Cooperative Service, RBS Service Report 49. November 1995.

The information about Coffee, Sugar & Cocoa Exchange, Inc. and Chicago Mercantile Exchange is based on the postings by the two exchanges on the World Wide Web as of June 25, 1996.

U.S. Department of Agriculture
Rural Business/Cooperative Service
Stop 3250
Washington, D.C. 20250-3250

Rural Business/Cooperative Service (RBS) provides research, management, and educational assistance to cooperatives to strengthen the economic position of farmers and other rural residents. It works directly with cooperative leaders and Federal and State agencies to improve organization, leadership, and operation of cooperatives and to give guidance to further development.

The cooperative segment of RBS (1) helps farmers and other rural residents develop cooperatives to obtain supplies and services at lower cost and to get better prices for products they sell; (2) advises rural residents on developing existing resources through cooperative action to enhance rural living; (3) helps cooperatives improve services and operating efficiency; (4) informs members, directors, employees, and the public on how cooperatives work and benefit their members and their communities; and (5) encourages international cooperative programs. RBS also publishes research and educational materials and issues *Rural Cooperatives* magazine.