Wisconsin Center for Dairy Research

DAIRY PIPELINE

A Technical Resource for Dairy Manufacturers

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Using Dairy Based Futures Contracts, Part 3

Managing Milk Price Risk with Options Contracts

Dr. Brian W. Gould, Senior Scientist, CDR
Wisconsin Center For Dairy Research

Dr. Robert Cropp, Professor, Department of Agricultural and Applied Economics,
University of Wisconsin-Madison

As illustrated in the Spring 1998 issue of the **UW Dairy Pipeline**, a cheese plant can use a hedging strategy to lock in an operating margin and protect against milk price increases. However, a hedging program has a disadvantage— it doesn't allow you to capture the benefits of falling milk prices. As an alternative, cheese plant managers can use a *call option* to establish a milk price ceiling, which also allows them to take advantage of lower milk costs.

A futures option is a contract providing the owner the right, but not the obligation, to do something. A *call option* gives the owner the right to buy a particular futures contract (take a long futures position) at a predefined *strike price* (e.g., the price at which an option owner can purchase the futures contract). A *put option* gives the owner the right to sell a particular futures contract (take a short futures position) at a predefined strike price. The price for purchasing a particular option is referred to as the *premium*. The options premium is determined by a number of factors, including: time until expiration of the futures contract, recent cash market price volatility and associated futures contract *settle price*.

The difference between the strike price and the associated futures contracts current settle price is the option's *intrinsic value*. A higher intrinsic value translates into a higher premium. For a put option, the higher the futures price in relation to a strike price, the lower the intrinsic value. This implies a lower premium. In contrast, shown in the example below, a call option's intrinsic value increases as market price increases relative to a predetermined strike price. In general, the longer the time until an option expires, the higher the premium. This reflects the fact that the option owner has more flexibility in exercising the option compared to one which is closer to expiration. There is a greater probability of the option being *in-the-money* some time in the future. The more volatile the cash market, the more valuable the associated option and higher the premium. Volatility measures price movements. If a market is more prone to sudden sharp price changes, it also has a greater chance of coming in-the-money than if prices are not volatile. The option's premium is equal to its intrinsic value plus any time (volatility) value.

To use a futures option in a price risk management program, the option buyer needs to decide first between a call and a put option (the right to have a buying hedge or a selling hedge), and then the specific strike price desired. A put option can be used to establish a minimum output price. For example, dairy farm operators can use BFP put options to set a floor on their mailbox price. In contrast, cheese plant managers can use a call option to establish a ceiling on its milk costs. A simple example will illustrate this.

Using a Call Option to Set Milk Cost Ceiling

Since June of this year, the dairy industry has seen continually increasing BFP. If a cheese plant had adopted a hedging strategy at the beginning of this trend, cheese plants could have locked in an operating margin (assuming an acceptable margin at the time of hedging strategy adoption). In contrast to the trend over

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What's Inside:

the last six months, lower BFP's are forecast in early 1999. Therefore the plant may prefer not to hedge. To provide some price protection in case price forecasts are incorrect and milk prices actually increase, buying a call option is a strategy that helps eliminate the upside risk while allowing plant management the capability of capturing lower milk prices.

Suppose it is February 1, 1999 and you are a manager of procurement at XYZ Cheese, Inc. While your price forecasts are for lower BFP's during March and April, you would like to protect your firm against any price increases in case the forecasts are incorrect. On this date you would like to set the maximum price for your March milk. You use one of the firm's computers and access the Chicago Merchantile Exchange's web site to obtain a listing of alternative call option strike prices and premiums for March 1999 BFP (Table 1). Note that there is a positive premium ($0.10/cwt) for the $12.75 call option. That is, even though there is zero intrinsic value to the option, the market places some positive time value to the option.

Combining your best guess of the price you are going to receive for your October cheese, you determine you would like to pay no more than $13.85 for your milk to maintain profitability. You also know that over recent months the difference between your pay price and the BFP has averaged about $.90/cwt (e.g., the XYZ Cheese Plant/BFP basis). Given that you are in charge of procurement and familiar with the operations of futures markets, you know that there are commodity broker commssions (fees) for purchasing options contracts in addition to any premium associated with such a purchase. The broker you use charges $70/call option ($0.035/cwt x 2000cst), which includes the commission associated with purchasing and exercising an option.

Table 1. Alternative Strike Prices and Premiums for March,1999 BFP CME Call Option on Feb. 1, 1999 with March BFP Future's Settle Price of $12.75

Strike Price ($/cwt)	Premium	
	$/cwt	$/contract
11.75	1.10	2,200
12.00	0.85	1,700
12.25	0.65	1,300
12.50	0.40	800
12.75	0.10	200
13.00	0.09	180
13.25	0.08	160
13.50	0.06	120
13.75	0.03	60

Note: A BFP contract is for 200,000 lbs. of milk

Identifying the call option

You use the above information to identify the call option to purchase. If you choose to purchase 4 BFP call options at a strike price of $13.00 and pay a premium of $180/contract ($0.09/cwt x 2000 cwt) to cover the 800,000 lbs of milk you anticipate needing during October you would be able to establish the following maximum milk price for March (assuming the XYZ Cheese Plant/BFP basis remains constant at $0.90/cwt):

Strike Price	$13.00
+ Local Basis	$ 0.90
+ Broker Commission	$ 0.035
+ Option Premium	$ 0.09
= Max. Milk Price	$14.025

In this example we are trading on the CME where a BFP futures (and options) contract is for 200,000 lbs. of milk. At the CME there is also a mini-BFP options contract that trades for 50,000 lbs. of milk. Remember that the premium paid depends on the current futures contract settle price for the futures contract associated with the option being purchased.

On April 5th it turns out that your forecasts were a little off, the actual BFP is $13.50. By doing nothing, the call option previously purchased cash settles at the March BFP price of $13.50 announced on April 5th. With the futures transaction, the following profit is obtained:

Cash settle against March BFP	$13.50
- Purchase March futures contract	$13.00
= Net Futures Gain	$ 0.50
- Broker commission	$ 0.035
- Premium	$ 0.09
= Net Gain	$ 0.375
Plant Milk Cos t= ($13.50 + $0.90)	$14.40
- Net Gain	$ 0.375
= Net Milk Cost	$14.025

This is close to the target milk cost you desire. Without the use of the call option, the plant's milk costs would have been $14.40/cwt. ($13.50 + $0.90) compared to the net cost of $14.025, a net saving of $0.375/cwt.

When purchasing a BFP call option, the purchaser has the choice of doing nothing and if the announced BFP is above the strike price, the call option will be automatically exercised. You do not need to call your broker to request that the option be exercised. Alternatively, if the announced price is less than strike price, doing nothing results in the option contract expiring worthless, the purchaser loses the option premium and any commission costs. Finally, before the BFP is announced, if it looks like the actual BFP will be less than the strike price, the purchaser may try to sell the contract to recoup acquisition costs. Using this option is risky if, in fact, the announced BFP actual increases above the strike price.

Remember that the payment of the premium and brokerage fee occurs regardless of price movements. For example, if the BFP had actually **decreased** from $12.75 to $12.50 instead of increasing, you could elect let it expire worthless. Under this situation, net milk costs would be:

March BFP	$12.50
+ Local Basis	$ 0.90
+ Broker Commission	$ 0.035
+ Option Premium	$ 0.09
= Max. Milk Price	$13.525

instead of $13.40 that you would have had to pay for milk without the purchase of BFP call contracts. The uncertainty of having lower milk prices in the future and therefore losing the broker commission and option premium versus the potential for establishing a desirable price floor is known as the *risk-return tradeoff*. It is up to you as a plant manager to determine the degree of risk versus return you are willing accept.

It is very important to recognize that we have assumed perfect knowledge of the XYZ Cheese Plant/BFP Basis and that it does not change between the time of purchasing the BFP call and the cash settling of the March BFP futures contract. If this basis changes, then the "locked in" milk price could be higher or lower, depending on the change. As noted in an earlier issue of the **Dairy Pipeline**, the cash-futures basis tends to be less volatile than the actual price series, i.e., you face less risk when considering changes in the base versus the cash price. What would happen to the above locked in price if the actual basis payed in March was $1.20/cwt versus the expected $0.90? What would happen if it was $0.75? If you had known this basis ahead of time, would you chosen the same options contract?

And There is More

In the last three issues of the Dairy Pipeline we have attempted to show how you can use dairy-based future and options manage price risk. In forthcoming issues we will continue to explore how different types of dairy processing firms can use dairy futures to manage price risk. We will also review how to develop procedures for generating plant specific basis forecasts to use for marketing strategies.

Note:

To Hedge or Not to Hedge, is that the Question?

In the Spring, 1998 issue of the pipeline we reviewed how cheese plants can use the futures markets, via the adoption of a hedging strategy, to offer forward pricing contracts to their patrons. In Table 2, we reviewed how these contracts work under under BFP increase and decrease scenarios. The implicit assumption under the price increase (Case II) scenario was that the plant was either a cooperative or was a de-pooled plant.

Glossary

BFP (Basic Formula Price): Price used to set base milk in the Federal Milk Marketing Order System. Based on milk prices paid for milk by Grade B milk plants in Wisconsin and Minnesota and updated with a product formula using historical Cheddar cheese, non-fat dry milk and butter prices.

Broker Costs: Fees or commissions charged by a commodities broker for purchasing futures and options. These costs will vary by broker, but they are normally in the range of $0.05 to $0.07/cwt. Do ask your broker if the brokerage fee is for the initial purchase of the option only, or does it cover a round trip—that is, does it include the right to exercise the option? Many brokers charge an initial brokerage fee to purchase the option, and then another fee to exercise the option.

CME (Chicago Mercantile Exchange): One of the two markets that trade dairy-based futures and options. The other market is the New York Board of Trade, formerly the Coffee, Sugar and Cocoa Exchange.

Settle Price: The daily price established by a futures exchange associated with a particular futures contract (e.g., May BFP). The exchange's clearing house uses it to determine net gains and losses, margin requirements and the next day's price limits. On any particular day, the settle price represents the market's best guess regarding the future price of the commodity.

Strike Price: Also known as the exercise price, it is the price at which a person may purchase or sell the underlying futures contract upon exercising a commodity option.

In-the-Money, At-the-Money, Out-of-the-Money: An option is said to be *in-the-money* when it has a positive intrinsic value. For call options, this happens when the strike price is less than the market price for the underlying futures contract. For put options it occurs when the strike price is greater than the market price of the underlying futures contract. An option is referred to being *out-of-the-money* when it has no intrinsic value. For calls, this happens when the strike price is more than the market price for the underlying futures contact. For puts, the opposite would have to be true. When the option's strike price equals the current futures price it is an *at-the-money* option.

Resources:

Try these web sites:
CME **:www.cme.com**
New York Board of Trade : **www.csce.com**
CDR Dairy Futures: **www.aae.wisc.edu**

Final Draft of Chloride Rule Sent to DNR Board

By Bill Wendorff
Dept. of Food Science

How should the Wisconsin DNR regulate the discharge of chloride to surface waters? Three years of discussion between industrial and municipal representatives of the Chloride Policy Advisory Committee and regulatory officials of the Wisconsin Department of Natural Resources (DNR) have produced a final draft of the regulations. The subchapter to NR 106, "Effluent Limitations for Chloride Discharges," covers discharges of chlorides to surface waters and is on the way to the DNR Board. We expect approval for public hearings in February 1999 and the final regulation to be in place by October 1999.

During the discussion, the Chloride Policy Advisory Committee, including dairy industry representatives David Myers of Foremost Farms USA and Bill Wendorff of the University of Wisconsin Food Science Department, requested that the DNR consider a chloride control regulation based on source reduction. The other option was limiting chloride in effluent based on NR 105 (Surface Water Quality Criteria and Secondary Values for Toxic Substances). The final draft of the regulation combines both approaches, allowing voluntary source reduction activities on an interim basis, with target limitations, in lieu of immediate compliance with water quality limits under NR 105.

What to expect

With new WPDES permits, each plant will be required to monitor chloride concentrations in their discharges. The chloride limit for each plant will depend on the flow of the receiving stream. For example, if the plant discharge represents the major portion of the flow of that stream, the limit will be close to the chloride chronic limit of 395 mg/L. However, if the receiving stream has a heavier flow, e.g., the Wisconsin River, the limit will be slighter higher due to the greater mixing zone in the stream. And, if the chloride concentrations of the discharge are higher than the limit, each plant will need to choose how they want to address the new chloride limits. The plant may choose to accept the water quality limits based on NR 105 and NR 106 and apply for a variance under the extensive variance procedure.

Another choice is to work with the DNR under the new proposed source reduction program. Under this proposed program, DNR would recommend a "target limitation." This is a limit that DNR thinks the plant could reasonably meet, following recommended source reduction activities, by the end of the permit. Each successive WPDES permit would have an additional tier of source reduction activities until the plant was in compliance with the water quality limits established under NR 105 and NR 106. The 3 tiers of source reduction activities proposed for dairy plants are listed below.

Tier 1

Train plant personnel to be more aware of salt conservation, emphasizing simple, cost-effective housekeeping measures. For example, spilled salt can be cleaned up as a solid waste rather than flushed down the floor drain.

Tier 2

Improve handling salt brines and handling cheese into and out of brine systems. Consider capital improvements such as automating the brine system, properly designed drip pans and splash guards.

Optimize softener operation to ensure you are using appropriate regeneration intervals and salt dosage.

If the regeneration is manual or timer-initiated, switch to a demand-initiated regeneration controller.

Evaluate the feasibility of softener brine reclamation.

Determine which subprocesses can tolerate unsoftened water, and make appropriate changes.

Determine whether once-through cooling systems can be close-looped, and make appropriate changes.

For plants that condense whey, consider using condensate of whey (COW) water for the first rinse for clean-in-place (CIP) systems and for boiler makeup water.

Tier 3

For plants that make brine-salted cheeses, evaluate the feasibility of membrane filtration to recondition the brine, then reuse.

For plants that make brine-salted cheeses, evaluate the feasibility of using a no-brine make procedure, adding salt directly to the curd during the manufacturing procedure. This reduces salt discharges from spent brines.

Based on the 3-tiered source reduction program, a cheese plant having difficulty meeting the water quality limit for their outfall may **experience up** to three permit periods before they would be required to apply for a variance. From our initial plant surveys, I would expect most plants to be in compliance with the water quality limits by the end of the second permit period.

Summary

Traditional end-of-pipe treatment technologies for chlorides are both impractical and prohibitively expensive. The DNR has been working with the industry advisory committee to develop a program through that implements voluntary source reduction measures to meet water quality standards. Since some source reduction measures in the proposed strategy involve long-term efforts, the rule revisions provide for extended timelines to meet the water quality limits established under NR 105 and NR 106. Not only will these source reduction procedures address environmental concerns in the surface waters of our state, but they will also improve recovery of lost ingredients and improve efficiencies in the cheesemaking processes.

If you have concerns about chlorides in your plant discharges or questions about chloride limits in your discharge permits, please contact me at 608/ 263-2015 or e-mail me at wlwendor@facstaff.wisc.edu

News from CDR

Judging by the attendance at a recent CDR Codex Conference, people in the dairy industry are interested in Codex Alimentarius. If you missed this discussion of Codex Cheese Standards and how they might influence cheese and cheesemaking, you can view the presentations at the CDR website: http://www.cdr.wisc.edu/codex/

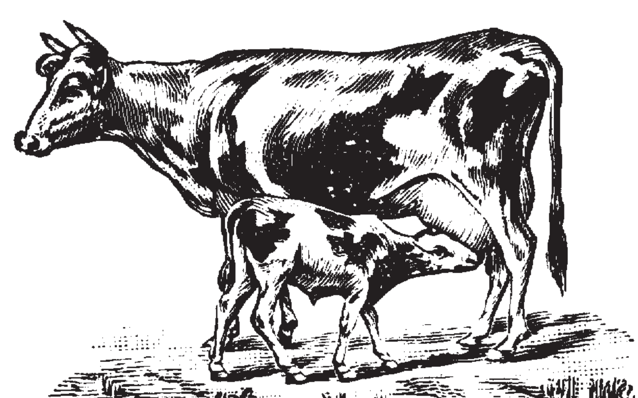
Marianne Smukowski, dairy foods safety/quality program coordinator at the Wisconsin Center for Dairy Research, was the lead judge for the butter portion of the 77th Collegiate Dairy Products Evaluation Contest held Oct. 6 in Toronto, Canada. She has been a judge for this contest for the last nine years and lead judge for the last four years.

Elmer H. Marth, emeritus professor of food science, bacteriology, and food microbiology and toxicology at the University of Wisconsin-Madison, recently was named a Fellow of the American Dairy Science Association and a charter Fellow of the International Association of Milk, Food and Environmental Sanitarians. Marth was honored for his research, teaching, and public service work at UW-Madison and for his contributions to the programs of both associations.

New Milk Quality Specialist

As of September 1, the Department of Dairy Science has a new Extension Milk Quality Specialist, Dr. Pamela L. Ruegg, DVM, MPVM. Dr. Ruegg is a native of the Upper Peninsula of Michigan and received both a Bachelors of Science and Doctor of Veterinary Medicine from Michigan State University. After private practice in Kiel, Wisconsin, she received clinical training at the University of California at Davis, and earned a Masters of Preventive Veterinary Medicine from that institution. Dr. Ruegg has held faculty positions at Atlantic Veterinary College in Prince Edward Island and at Michigan State University. Prior to joining the Dairy Science Department at the University of Wisconsin, she was a technical service veterinarian for the Monsanto Company. She is currently the Extension Milk Quality Specialist in the Dairy Science Dept. at UW-Madison. Dr. Ruegg is board certified by both the American College of Preventive Veterinary Medicine and the American Board of Veterinary Practitioners-dairy practice.

For milk quality concerns, you may contact DR. Pamela Ruegg at the following address: Dept. of Dairy Science, 1675 Observatory Dr., Madison, WI 53705. Phone: (608) 263-3495, Fax: (608) 263-9412, e-mail plruegg@facstaff.wisc.edu



Curd Clinic

Q: I own a medium sized cheese plant and I am currently land applying whey. I've heard that I might actually be able to make money on my sweet whey, what are the options?

A: You are right—it is possible to generate revenue from whey. You will need to do some research to select a process that works for you because there is a range of factors that can influence the ability of a cheese plant to take advantage of these opportunities. Some of the things you should consider include: the equipment required, capital available, shipping costs, availability of whey processors in the area, labor required, and technical expertise needed to operate the equipment and monitor the process. Of course, meeting the specifications of the customer buying your processed whey will be a major factor for you. In fact, exploring the market for processed whey in your area and locating a buyer may determine the direction you will take.

In general, the greater the revenue received for the whey product, the more complicated and expensive the process that produces the product. The following is a brief summary of some options. They are listed in order of least expensive/least revenue generated to most expensive/greatest revenue received for the final product.

Unprocessed Whey

Equipment required: heating/cooling, storage
Advantages: This option requires very limited equipment and little if any additional labor or technical expertise to produce or monitor the product.
Disadvantages: Shipping costs will be high since the majority of the product is water. This cost restricts the distance that you can ship the product, so the buyer must be nearby. Also, the whey will have a very limited shelf life, so it must be used or processed quickly. Unprocessed whey generates the least revenue of the options given.

Condensed Whey

Equipment required: heating/cooling, evaporator or, possibly, a reverse osmosis (RO) system
Advantages: The higher total solids of this form of whey mean a lower total shipping cost. Thus, you can ship condensed whey to more distant locations.
Disadvantages: The cost of buying, operating and maintaining the evaporator or RO system are the biggest disadvantages to this approach. Operators and laboratory personnel will need training to run the evaporator and monitor the final product. Condensed whey does not really have added value or a significantly increased shelf life, instead you save on shipping costs.

Dry Whey

Equipment required: heating/cooling, possibly an evaporator or a reverse osmosis system, dryer, bagging/tote filling equipment
Advantages: Shipping costs will be the lowest of all of the aforementioned products. Long term storage of this product also is possible, although the product generally should be used within 6 to 12 months.
Disadvantages: The disadvantages noted for condensed whey also apply to dry whey. The cost of purchasing, operating and maintaining the equipment are additional disadvantages. Dry storage space may be required.

Demineralized Whey

Equipment required: some type of separation system (membrane filtration, ion exchange, electrodialysis)
Advantages: The advantages depend on the system selected; however, in all cases you produce product with a higher value.
Disadvantages: Again, the specific disadvantages depend on the system. In general, these processes require trained operators and are relatively expensive to operate. Evaporation/drying of the final product may be required to gain advantages in shipping and shelf life. The process also produces waste stream containing minerals.

Whey Protein Concentrate (WPC) and Related Products

Equipment required: heating and cooling, ultrafiltration (UF) system, evaporator/dryer/bagging if dry product desired
Advantages: The product has increased value—the higher the protein level the higher the value of the product. Long term storage is possible if the product is dried. Shipping costs will be lower for the WPC portion.
Disadvantages: You need to consider the initial cost of the UF equipment and the ongoing cost for membrane replacement. These systems also require trained operators. A laboratory for product testing is very beneficial, if not a necessity, for WPC production. UF produces two product streams and only one of these is used in WPC production.

The other stream (permeate) is high in lactose and minerals and requires either additional processing or disposal. One option you could consider is producing lactose from this material. However, it is a capital intensive process that requires crystallizers, decanters, refiners, evaporators and dryers. This process will produce a smaller waste stream but it still requires handling—it has a high BOD and ash content which makes it difficult to use. Currently, land application and supplementing animal feed are two options. It is very important to consider how you will handle the permeate stream before investing in the production of WPC.

Curd Clinic Doctor for this issue is Karen Smith, CDR Researcher, Whey Processing

Questions for the Curd Clinic?
Write to:
CDR, *UW Dairy Pipeline*
1605 Linden Dr.
Madison, WI 53706
FAX: 608/262-1578
e-mail: Paulus@cdr.wisc.edu

Special Separations

Equipment required: depends on the separation (individual proteins, phospholipids)
Advantages: These products have the highest potential value
Disadvantages: The dairy industry often has very little experience in these types of processes. The equipment you need can be expensive and extensive product testing may be necessary. Operators probably will need a great deal of training to properly operate and monitor the process. In general, these types of separations require the processing of large amounts of whey and yield relatively small amounts of final product.

Fermentation

Equipment required: fermentation vessels, some type of separations equipment, evaporator/dryer perhaps
Advantages: These products often have higher value.
Disadvantages: Currently, these processes can't compete with the traditional production methods. For example, we can produce ethanol from whey products, but not profitably.

If you are interested in learning more about this spread sheet, contact Mark Johnson at (608) 262-0275, or by e-mail : jumbo@cdr.wisc.edu

Try this Tool—Standardization Spread Sheet

Candelaria Barcenas, a Food Science graduate student, has adapted a popular spread sheet to sort and calculate optimal factors to consider when standardizing cheese manufacture. To use this spread sheet (which Candy is still developing), you will need to customize some of the data input to meet your own specifications. One factor the program allows you to track all the components in your milk. If you are standardizing with ultra-filtered milk or powder, this program might confirm that you can increase your profit by capturing whey solids.

Table 1 lists the raw materials and the lbs. of ingredients you will add. You need to enter your own data into this initial screen, our table is a hypothetical example of one manufacturer's process. The second part lists desired characteristics of your cheese, including fat recovery (FR), casein recovery (CR), solids recovery (SR), and fat in the dry matter (FDM).

You can use Tables 2 and 3 to calculate revenue. To calculate profit, you will need to subtract production and material costs. Table 3 calculates your revenue (again, before subtracting production costs) when you process your whey into dried whey, or lactose and whey protein concentrates, or a mix of both. You can compare this to not processing whey. When customized for individual use, this spread sheet allows you to enter your own whey processing costs, your own standardizing method, and then figure the most economical way to add protein and recover protein.

Table 1

Data
Composition of Raw Material

	WM	CSM	WC	UF	Powder
% Fat	3.56	0.23	40.00	11.69	1.00
% Casein	2.40	8.50	0.00	9.32	28.08
% Other solids	0.85	20.00	5.00		
% Protein	3.07			11.66	36.00
% Lactose	4.75			5.50	52.30
% Total solids	12.23	30.00	45.00	29.50	77.00
Lbs. to Process	100	0	0.05	12.99	0.0
Cost per pound	0.155	0.35	1.11	0.50	1.10

Desired in Cheese

FR	0.93
CR	0.96
SR	1.09
FDM	0.53
Moisture	38.0%
Dry Matter	62%
C/F	0.708

Table 2

	Selling Price	% to Process
Cheese	$1.75	
Whey Cream	$3.56	100%
Butter B	$3.66	0%
Sep. Whey	$0.00	0%
Dried Whey	$0.28	100%
WPC	$0.62	0%
Lactose	$0.20	0%

Revenue ($)/100 lbs of raw milk standardized

Table 3

		Cheese	Whey (whey plus whey cream)	Total
1	Dried	$25.60	$2.87	$28.47
2	Lac. & WPC	$25.60	$2.76	$28.36
3	1&2(50%each)	$25.60	$2.65	$28.25
4	No processing	$25.60	0	$25.60

Calendar

Jan. 4-8 Ice Cream Makers Short Course. Madison, WI. Call Bob Bradley at (608) 263-2007 for information, or the CALS Conference Office (608) 263-1672 to register.

Jan. 19-22 Milk Pasteurization and Process Control School. Madison, WI. Call Bob Bradley at (608) 263-2007 for information, or the CALS Conference Office (608) 263-1672 to register.

Feb. 4-5 Wisconsin Dairy Field Reps Conference. Madison, WI. Call Bill Wendorff at (608) 263-2015.

Feb. 23-24 Wisconsin Process Cheese Short Course. Madison, WI. Call Jim Path at (608) 262-2253 or Bill Wendorff at (608) 263-2015 for more details.

Mar. 9 Wisconsin CIP Workshop, Madison, WI This one day hands-on workshop will cover the basics of clean-in-place (CIP) systems and methods of monitoring cleaning efficiency. Program Coordinator: Dr. Bill Wendorff (608) 263-2015.

Mar. 10 Dairy HACCP Workshop, Madison, WI This one day work-shop will cover designing and implementing HACCP plans in dairy plants. Program coordinator: Marianne Smukowski, (608) 265-6346.

(NOTE: The CIP Workshop and Dairy HACCP Workshop together fulfill the requirements for the Master Cheesemaker Safety Short Course.)

Mar. 22-26 Wisconsin Cheese Technology Short Course. Madison, WI Program Coordinator: Dr. Bill Wendorff, (608) 263-2015.

CDR

Dairy Pipeline

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The Dairy Pipeline
Center for Dairy Research
1605 Linden Dr.
Madison, WI 53706
phone: 608/262-5970
fax: 608/262-1578

Karen Paulus, Editor
e-mail: Paulus@cdr.wisc.edu
phone: 608/262-8015

Technical Reviewers:
Mark Johnson, CDR
Norman Olson, Dept. of Food Science
Jim Path, CDR
Marianne Smukowski, CDR
Tom Szalkucki, CDR
Bill Wendorff, Dept. of Food Science

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CDR
Wisconsin **Center for Dairy Research**
University of Wisconsin-Madison
1605 Linden Drive
Madison, Wisconsin 53706-1565

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