USDA United States Department Of Agriculture

Agricultural Marketing Service
Dairy Programs

FEDERAL MILK ORDER No. 1
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August 5, 2013

TO: Pool Handlers on the Northeast Order

FROM: Erik Rasmussen, Market Administrator, Boston, Massachusetts

SUBJECT: Request to Revise Fall-Month's Shipping Percentages Granted

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On June 14, 2013, pool handler, Queensboro Farm Products, Inc. (Queensboro), an operator of a supply plant under the provisions of the Northeast Marketing Area (Northeast Order), submitted a request that the shipping percentage specified in Section 1001.7 (c) (2) for the months of September, October, and November be lowered from 20 percent to 15 percent for pool supply plants regulated under the Northeast Order.

Section 1001.7 (g) of the Northeast Order states that the shipping percentages under the above provision may be increased or decreased by the market administrator if after conducting an investigation and soliciting comments the market administrator determines that such adjustment is necessary to encourage needed shipments or to prevent uneconomic shipments.

Petition

In their petition Queensboro cited declining Class I sales, a decline in the number of Class I customers seeking to purchase milk for Class I usage, their observation that Class I customers have not called upon Queensboro to sell them milk, and a comment that they, as a long-standing participant of the northeast dairy industry, were unaware of any instances where Class I needs have not been covered. Queensboro also stated that a provision of the Order that allows for handlers who operate two or more supply plants to form a "system of plants" and thereby attain the applicable shipping percentage requirements jointly in the same manner as a single plant puts stand alone supply plants at a disadvantage. The petitioner stated that being an independent single plant operation, their existing business structure does not allow them this opportunity, which the Northeast Order provides other operators of multiple supply plants. In addition, as one of two independent supply plants remaining on the Order, this seems to discourage entrepreneurship and penalize small businesses. Queensboro states that to fulfill the 20 percent shipping requirement, they would have to make uneconomical and unnecessary movements of milk that would result in higher hauling costs to their producers. Any additional cost to either producers or to a small company, the petitioners state, could jeopardize both of their viabilities.

Summarized Handler Comments

Alouette Cheese USA (Alouette), operator of a pool supply plant on the Order (aka Fleur De Lait), submitted comments in support of the reduction. Alouette cited factors including fewer distributing plants, a decline in the pounds of milk needed for Class I, and a discussion citing their perception that independent supply plants face a greater burden to comply with the Order's shipping requirements than do a group of plants operated by the same handler and organized as a system of plants. Alouette stated that reducing the diversion requirement would be a reasonable step to correct a developing inequity and this adjustment would make it easier for an independent plant to qualify without added costs.

The Greater Northeast Milk Marketing Agency (GNEMMA) submitted comments stating that they did not oppose the reduction in the shipping percentage for the period September through November 2013. GNEMMA's member cooperatives are: Agri-Mark, Inc.; Dairylea Cooperative, Inc.; Dairy Farmers of America, Inc.; Land O'Lakes, Inc.; Maryland and Virginia Milk Producers Cooperative Association, Inc.; St. Albans Cooperative Creamery, Inc.; Upstate Niagara Cooperative, Inc.; and Dairy Marketing Services, LLC. All of these organizations are cooperative association handlers regulated under the provisions of the Order who must comply with the shipping provisions under Section 1001.7 (c) (1) and (2).

GNEMMA cited declines in Class I sales at a time when producer milk on the Order has increased, noting that at this point it appears such trends are likely to continue into this autumn. GNEMMA also noted the recent closure of a pool distributing plant in Maine, the announced closure of a distributing plant in the southern portion of the marketing area to occur within the next 60 days, and changes by large retail chains in the Northeast in terms of their fluid milk supplies as factors. GNEMMA also noted that the northeast marketplace is undergoing significant changes relative to expansion and construction of significant size dairy manufacturing plants that could escalate the demand for producer milk and potentially lead to milk availability issues for fluid milk plants in future periods. In light of the unsettled nature surrounding the northeast marketplace, but while not opposing the lowering of the shipping percentages, GNEMMA stated that such an adjustment should only apply to the months of September, October, and November 2013, and not to other current or future time periods.

Comments in opposition to the requested change were jointly submitted on behalf of Dean Foods Company; Elmhurst Dairy, Inc.; Morningstar Foods, LLC; and Readington Farms, Inc. All four are handlers who operate pool distributing plants regulated under the Order. While acknowledging a general decline in Class I needs, the joint comments cited particular uncertainty in production and demand conditions, at this point of the year, due to weather and potential poor crop conditions impacting future milk production. Therefore, it was difficult to make a decision to reduce shipping requirements to distributing plants at a time of the year when milk production is generally shortest. This respondent also noted significant increases in Class II manufacturing plants and the potential challenges this may place on the availability of producer milk for fluid needs.

Findings

Qualification of a supply plant on the Northeast Order is driven in large part by the number of plants processing milk for Class I consumption together with the demand for Class I fluid milk products. When the Order commenced operations in 2000, there were 60 pool distributing plants physically located within the northeast milk shed and pooled on the Order. As of June 2013 the number of pool distributing plants within the milk shed and pooled on the Order has dropped to 50, with one of the 50 recently announcing that it will be closed within 60 days. This represents an 18 percent decline in the number of distributing plants physically located within the region who are seeking milk to be processed into Class I products.

Mirroring a national trend, the consumption of fluid milk products has declined in the Northeast. A 2012 review of annual sales of fluid milk products in the Northeast Marketing Area, as reported by pool handlers regulated under the Order, totaled 8.3 billion pounds - down 2.6 percent from 2011 (adjusted for leap year in

2012) and the largest year-over-year decline since the Order's inception. The 2012 results follow a decrease of 2.3 percent for 2011. As comparison, nationally U.S. sales of fluid milk products were calculated to have dropped by a smaller 1.7 percent from 2011 to 2012.

A May 2013 research study by USDA's Economic Research Service (ERS) "*Why are Americans Consuming Less Fluid Milk? A look at Generational Differences in Intake Frequency*" states the following regarding fluid milk consumption trends with possible future implications:

> Americans are drinking less fluid milk, on average. In this study, ERS researchers find that declining consumption since the 1970s reflects changes in the frequency of fluid milk intake, rather than changes in proportions. More recent generations of Americans show greater decreases in consumption frequency, holding constant other factors such as education and race. The majority of Americans born in the 1990s consume fluid milk less often than those born in the 1970s who, in turn, consume it less often than those born in the 1950s. All other factors constant, as newer generations with reduced demand gradually replace older ones, ***the population's average level of consumption of fluid milk may continue to decline*** (emphasis added).

According to July 2012 U.S. Census Bureau data, the population for the 11 Northeast states and the District of Columbia, approximating the geographic territory of the marketing area of the Order, has risen by 5.6 percent from 2000. However, despite this growth on an annual basis, the volume of milk utilized in Class I by all plants pooled on the order was 711 million pounds less than the annual volume utilized in Class I when the Order commenced in 2000, a drop of 6.8 percent despite an increase in the area's population. Unlike manufactured dairy products utilized in Classes II, III, or IV, which can be processed in the region and then shipped across the country or placed in storage after manufacture, fluid milk products are generally distributed in the local region where they are processed. As a result, the demand for milk to be processed into Class I fluid milk products are more closely aligned with the demand for fluid milk products within that region. Of the 13 complete years that the Order has been in existence, the three years with the lowest Class I utilization volumes were 2012 followed by 2011 and 2009. Through the first 6 months of 2013, the pattern appears to be continuing with Class I utilization in 5 of the 6 months registering the lowest for that respective month in the 14 years since the Order's inception. The June 2013 Class I volume of 722.9 million pounds was the lowest total Class I utilization ever for the 162 monthly pools that have been completed under the Order, some 11.4 percent below the average volume for June for the prior 13 years.

As respondents noted, there has been considerable growth in Class II manufacturing plant capacity in the Northeast Order region in recent years. However, at the same time there has been a significant increase in volume of milk pooled on the Northeast Order. The total annual volume pooled on the Northeast Order for 2012 was 24.7 billion pounds, which was the second largest volume surpassed only by 2003's total of 25.4 billion. The difference between the total volume pooled in 2012 and the first year of the Northeast Order in 2000 is 738.2 million pounds. If you combine this with the 711 million pound less milk utilized in Class I for this same period as described above, that is an additional 1.4 billion pounds of milk for the year (121 million pounds per month) that has had to find a home in plants regulated under the Northeast Order. While it may be premature to predict the fall milk production, it is noteworthy that the last three monthly pools (April, May, June) experienced the largest ever volume pooled for those respective months in 14 years.

The July 31 edition of the industry publication *Daily Dairy Report* (DDR), using figures from USDA's July 2013 Agricultural Prices report, calculated a milk-over-feed price margin for New York for July of $7.72 per hundredweight. A milk-over-feed value above $6 per hundredweight is generally considered to suggest profitable milk production that often signals an expansion in milk production. As comparison, Wisconsin's milk-over-feed value for July was calculated by DDR at $7.34 per hundredweight.

In addition, it is worth noting that milk utilized in Class IV – generally considered a balancing class with the manufacture of storable products of last resort – has remained strong for the Northeast Order. Of the 13 full years that the Northeast Order has existed, the number 1, 2, 4, and 5, in terms of top years with the largest volume of milk utilized in Class IV, have occurred in the last 5 years.

School start dates in the fall can have an impact on milk needed for Class I usage as the fluid milk pipeline is refilled. As the following table shows, there is considerable variability this year as to when schools resume in September with some earlier than last year and some later. When comparing the month to month change in the volume of milk utilized in Class I from August to September 2012, the increase was only 1.4 percent on a daily average basis although that was a below average August to September change.

Starting Dates for Selected Public School Districts

School District	2013	2012	2011
NYC	9-Sep	6-Sep	8-Sep
Philadelphia	9-Sep	7-Sep	6-Sep
Albany	9-Sep	4-Sep	6-Sep
Syracuse	5-Sep	4-Sep	n/a
Boston	4-Sep	6-Sep	8-Sep
Jersey City	4-Sep	5-Sep	n/a
Hartford	27-Aug	28-Aug	30-Aug
Baltimore	26-Aug	27-Aug	29-Aug
DC	26-Aug	27-Aug	29-Aug

Existing Provisions

The existing shipping provisions in question, under Section 1001.7(c) (2) of the Order, were adopted during Federal Order reform and became effective in 2000. For the first year of the order the percentage of milk in the pool utilized as Class I for September, October, and November equaled 49.3, 48.5, and 49.2 percent, respectively. As compared to the same months in 2012, the Class I utilization percentages were 40.7, 42.8, and 42.9 - a decline of 8.6, 5.7, and 6.3 percentage points, respectively. The fall shipping percentages were reaffirmed in a 2002 federal order hearing for the Northeast Order where year-round supply plant performance standards were considered and ultimately adopted in a 2005 referendum, extending 10 percent shipping requirements for the months of January through August and December, while retaining the higher 20 percent level for September, October, and November. At this same hearing, a proposal was offered by a pool supply plant to reduce the 20 percent level to 10 percent and the 10 percent figure to 5 percent; however, this proposal was not adopted.

Decision

After reviewing a variety of Northeast Order statistical data related to Class I utilization changes over time with particular attention to more recent years and months, fluid milk sales as reported by pool handlers for the past year, along with the comments and data submitted by parties responding to the call for comments on Queensboro's request, the macro trends supported by this analysis support a reduction in the shipping percentage under Section 1001.7 (c) (2) of the Northeast Order from 20 to 15 percent for the months of September, October, and November. The existing percentages for these months have been in place since the inception of the Northeast Order during which there has been considerable contraction in the volume of milk demanded for Class I utilization within the Northeast Order. Such a change should help alleviate the concern of uneconomic shipments of milk occurring by supply plants regulated by the terms of the Northeast Order under section Section 1001.7 (c) (2).

In light of market uncertainty noted by respondents regarding future milk supply along with future demand uncertainty and the potential impact on milk availability for Class I customers, this adjustment will be limited to 2013. As provided under the terms of the Northeast Order under Section 1001.7 (g) the Market Administrator may review the need for any further adjustment on his own initiative or at the request of interested parties.

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June 24, 2013

TO: Pool Handlers

FROM: Erik F. Rasmussen, Market Administrator

SUBJECT: Shipping Requirements Investigation – Solicitation of Comments

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This office has received a request from a pool supply plant, regulated under the provisions of the Northeast Marketing Order, to lower the shipping percentage specified in Section 1001.7 (c)(2) for the months of September, October, and November 2013 from 20 percent to 15 percent. Section 1001.7 (c)(2) states that in each of the months of September through November such shipments and transfers, by supply plants or qualified cooperative association handlers, to distributing plants must equal not less than 20 percent of the total quantity of milk that is received at the plant or diverted from it during the month.

Under Section 1001.7(g) of the Order the applicable shipping percentages may be increased or decreased by the Market Administrator if it is determined that such adjustment is necessary to encourage needed shipments or to prevent uneconomic shipments. After reviewing milk utilization data for the Northeast Order this office is commencing a formal assessment of milk supplies and market conditions relative to the demand for milk utilized as Class I, and in particular for the upcoming months of September, October, and November. The Market Administrator invites the submission of comments, data, or views on this request to lower the shipping percentages from 20 percent to 15 percent during those months.

A copy of the request can be found on the Northeast Order website: www.fmmone.com

Please submit any comments by July 24, 2013, to the address or email below.

Peter Fredericks
Northeast Marketing Area
302A Washington Avenue Extension
Albany, NY 122203

Fax: 518-464-6468
pfredericks@fedmilk1.com

Queensboro Farm Products, Inc.

156-02 Liberty Avenue • Jamaica, N.Y. 11433 • Telephone (718) 658-5000 • Fax (718) 658-0408

June 14, 2013

Market Administrator
Northeast Marketing Area
Attn: Erik Rasmussen
89 South Street
Suite 301
Boston, MA 02111-2671

Mr. Rasmussen,

Queensboro Farm Products, Inc. is requesting that the shipping percentage, under Section 1001.7(c)(2) of the Order, be decreased for the months of September, October, and November from 20 percent to 15 percent for the Pool Supply Plants in Federal Order One. As a handler operating as a family business for 104 years and one of the two Pool Supply Plants remaining in Order One, we have not had a call for Class I milk in years and we feel that the 5% difference in shipping would have an insignificant effect on the producer's milk pay price.

In the context of the entire Order, the volume is not noteworthy, but it has a big impact on our company. In order to fulfill the 20% shipping requirement, we would have to make uneconomical and unnecessary movements of milk which would result in higher hauling charges to our producers. In the current economic climate, any additional cost to either the producers or to a small company, such as Queensboro, could jeopardize both our viabilities.

In June 2005, when the Federal Order was amended to have year round supply plant shipping standards, handlers with multiple supply plants set up their own supply plant systems. This allowed them to meet the standards by, in effect, treating the supply plant system as one plant. They could have one plant in the system that has a high Class I shipping percentage and that could provide enough Class I sales to cover the entire plant system. Queensboro, being an independent small business and a one plant operation, does not have that luxury. As stated above we would need to move milk in an uneconomical manner to meet the shipping standards. This seems to discourage entrepreneurship and penalizes small business.

Historically there has been a dramatic drop in the number of pool supply plants. In January 2000 there were 20 pool supply plants and in January 2012 there were only 11 "plant systems" and 2 independent supply plants. Queensboro is one of those two.

Class I sales are decreasing every year and the number of viable Class I dealers is decreasing as well. In the past several years Queensboro has had to seek out Class I customers in order to reach the 20% shipping requirement. No Class I customers have called upon us to sell to them nor have we heard of any other instances where Class I needs have not been covered.

Class I sales declined from 2010 to 2011 by 3.0 percent and from 2011 to 2012 by an additional 2.7 percent. This decline is continuing in 2013 with Class I volumes setting new lows in the first 3 months of the year. Even with the population increasing by 3.2 percent in the Northeast, these declines continue. Since the inception of Order I, almost 20% of the pool distributing plants have closed. Another difficulty Queensboro has encountered is the fact that many of the remaining pool distributing plants in the Northeast Order have established full supply arrangements with cooperatives. This certainly reduces our options and increases the cost of the movement of the milk.

For all of the above stated reasons, we hope you will act upon our request.

Very truly yours,

Mark Heumann

Mark Heumann

alouette cheese USA

July 24, 2013

Market Administrator
Northeast Marketing Area
Attn Erik Rasmussen
89 South Street
Suite 301
Boston, MA

Mr. Rasmussen,

Thank you for the opportunity to comment on a possible change to our marketing order regulations.

Queensboro Farm Products has requested that the shipping percentage under Section 1001.7(c) (2) of the Order be decreased for the months of September, October, and November from 20 percent to 15 percent for the Pool Supply Plants in Federal Order 1 (FO1). Alouette Cheese USA supports this change.

Alouette Cheese USA (AC-USA) operates a plant in New Holland, PA (aka Fleur de Lait-East) that manufactures cream cheese, Neufchatel, and specialty spreadable cheeses. We are the other independent supply plant mentioned in Queensboro's letter of June 14, 2013. Each month we ship 10% (or more) of our milk supply to Class I plants in order to meet requirements for association with the FMMO pool. We do not have an issue fulfilling this obligation to the order in exchange for the benefit of participating in the pool. However, we agree with the conditions detailed by Queensboro regarding the increasing difficulty in accessing the Class I market as an independent supply plant in FO1. For reasons that are proprietary, we are not facing the exact same issue as Queensboro at this time; however, we are well aware that our situation could change and we, too, could be placed in a situation where the available market is smaller than our diversion requirement, and uneconomical movements of farm milk would become necessary.

The modification to the existing rules of FO1 to remove this disorderly marketing condition for independent supply plants would have no overall effect on producer pay prices. As the orderly supply of farm milk to meet Class I needs are the aim of the order, we feel the change requested by Queensboro is reasonable and should be adopted.

The Federal Order system provides a mechanism by which all farm milk produced for a market is able to share equally in the pooled benefits (price) for that market. The Class I needs within that market are the top priority, and plants that do not bottle Class I participate by offering their supply in reserve to meet possible Class I needs that arise. Further, they maintain that relationship by delivering a portion of their milk each month to Class I plants.

The amount delivered, or diverted, to Class I plants varies from 10-20% through the year. The increased diversion requirement- which is 20% for September, October, and November presumably accounts for two issues. The first is the increased need for milk as the school 'pipeline' is refilled in the Fall- (shouldn't this be accomplished by the end of September?) and to counter the seasonal decline in milk production.

Federal Order 1 has evolved since its inception on January 1, 2000. Among the many statistical changes there are fewer plants- both distributing and supply; there is more milk; there is a greater percentage supplied by cooperatives; and both the volume and percentage of producer milk utilized in Class I has declined. Also, in June 2005 restrictions were instituted on depooling that resulted in formation of supply systems. Curiously, as supply systems were formed, the share of cooperative milk in the order began a distinct trend upward.

Growth of the milk supply is an important factor in this decision. The current diversion requirements were written back in the 1990's when Federal Order consolidation brought FO1 into existence. But the milk supply has changed since then. The volume of producer milk in the order increases annually while the pounds needed for Class I have been flat or declining. This has had the obvious effect of decreasing the Class I utilization rate. This also means the 20% diversion rate is requiring that even more producer milk be sent to a smaller number of Class I plants.

A supply system is a collection of plants which includes at least one Class I plant. The volume of producer milk used in Class I qualifies the rest of the milk in the supply system, even if the producer milk supply to one of those plants is never physically diverted to a Class I plant. The supply system, and each of its member plants, more easily meets the varying shipping requirements.

Conversely, an independent supply plant has only itself. Nearby Class I plants must be willing to take milk from the independent plant or that independent plant will not be qualified. When those Class I plants are not willing, for reasons outside the control of the independent or its producers [meaning we are not referring to instances where a Class I plant is not interested in the milk due to quality (PI counts) or management practices (rbST-free or organic)], then the independent supply plant must incur greater costs to ship milk greater distances in order to be qualified. Ultimately the producers shipping to the independent are disadvantaged. If the milk is to be qualified, there are greater transportation costs borne by those producers. If the supply plant they ship to cannot be qualified, those producers cannot receive a pool draw and therefore do not receive a competitive price. These producers either accept a reduced price or stop shipping to the independent.

The significance here is that the producers are treated differently by the Order depending on the status of the plant they ship to. The independent plant is forced to find even more space for its diverted milk in neighboring Class I plants for it to remain qualified. If a supply system has tied up the needs for a certain Class I plant, the independent incurs greater cost to remain qualified. Not only is more of the independent plant's milk required, but its costs are increased.

In short, the increased diversion requirement in the fall months adds more burden on the independent supply plant than on plants which are part of a supply system. As fewer Class I plants are available- each on average with a larger volume of Class I volume- access to these plants becomes an asset to the supply system, rather than an outlet to be shared by the entire order. The order is creating winners and losers among producers by maintaining the same higher qualifications for pool participation as were deemed necessary in 2000 before the implementation of supply system regulations and when producer volume pooled on the order was less and Class I use was greater. Reducing the diversion requirement from 20% to 15% would be a reasonable step to correcting this developing inequity. This would make it easier for independent plant to qualify without added costs.

For these reasons we hope you will grant the Queensboro request, preferably in time to apply for the fall of 2013.

Sincerely,

John Rutherford

John Rutherford
Director, Dairy- Procurement
Alouette Cheese USA

Davis Wright Tremaine LLP

Suite 800
1919 Pennsylvania Avenue N.W.
Washington, D.C. 20006-3401

Charles M. English
202-973-4272 tel
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ChipEnglish@dwt.com

July 24, 2013

VIA E-Mail – pfredericks@fedmilk1.com

Mr. Peter Fredericks
Northeast Marketing Area
302A Washington Avenue Extension
Albany, NY 12203-7303

Re: Shipping Requirements Investigation

Dear Mr. Fredericks:

This letter is in opposition to the request to decrease the applicable shipping percentages under § 1001.7(g) of Order 1 and is submitted on behalf of Elmhurst Dairy and Dean Foods Company, Inc.[1] These companies operate multiple pool distributing plants regulated on Order 1. In summary, production and demand conditions are at best too uncertain for a decision to be made in July to reduce supply plant shipping percentages for milk supplied to fluid milk plants in the shortest months of the year – September through November; moreover, as described below, at least one fluid milk facility has offered to purchase milk for Class I use from the requestor.

Any discussion of raising or decreasing the applicable shipping percentages under the Order must start with the principle that pooling of milk under the Order by non-Class I facilities is voluntary and creates a financial benefit to the handler pooling the milk. Class I plants in contrast are always pooled and must pay the highest minimum regulated class price for their milk receipts. Supply plants obtain the privilege of pooling milk by making a small percentage of their milk available for fluid use. In the months in which traditionally milk supplies are lower, but demand is highest, supply plants under the Order are required to supply only 20 percent of their milk to fluid plants in return for receiving the benefit of pool blend on 100 percent of their milk. It is not a small request to decrease the applicable shipping percentage by 5 points, or 25%.

While milk production in the Northeast has been strong in the early part of 2013, producers traditionally are still working off of last year's feed stocks. As we get to late August and September, dairy farmers are going to use 2013 feed supplies. Unfortunately, as is known throughout the Northeast and reported by Dairy Market News: "[i]t has been very difficult the

[1] On the afternoon of July 24, 2013, as these comments were being finalized, I received written authorization from representatives of Morningstar Foods, LLC and Readington Farms to inform you that they also oppose the request.

past couple of weeks for farms to make dry hay from all the wet weather." DMN, Vol. 80, Rpt. 28, p. 4 (July 12, 2013). In contrast with reports from identical weeks last year in which 82% of pastures were rated good or excellent even after Tropical Storm Sandy (DMN, Vol. 79, Rpt. 28, p. 4 (July 13, 2012), only 62 % of the pasture is rated good or excellent in 2013 – and 50 of that 62% is only good) (DMN, Vol. 80, Rpt. 28, p. 4).

Both quantity and quality of feed crops have been adversely affected by the long, wet spring. There are plenty of news reports that the wet spring that has lasted into July, delayed or destroyed crops or has resulted in crops with lower nutritional values. *See, e.g., Maine hay farmers struggling to stay afloat* – Portland Press Herald, July 23, 2013 (wet weather continues, little hay harvested, and "the preharvest nutrient level of the grasses begins dropping in June"); *Delays in planting, lost crops follow a wet spring* – The Observer-Dispatch, Utica, N.Y., June 24, 2013; *Rain Creates Many Problems for Farmers* – Vermont Public Radio, July 5, 2013; and *Rain delay: Weather has frustrated local farmers* – Eagle Tribune, June 19, 2013 (All attached as Attachment A).

The crop problems are now compounded by a record long heat wave that also saw record high low temperatures at night. *See, e.g.,* Andrew Freedman, *'Drunken' weather pattern producing deadly heat wave* – Climate Central, July 17, 2013 (Attached as Attachment B). Heat stress on cows is compounded both by high humidity (in abundance last week) and when the animals cannot cool off overnight. J. W. West, "Effects of Heat-Stress on Production in Dairy Cattle," J. Dairy Sci. 86:2131-2144 (2003), p. 1. (Attached as Attachment C). There is thus good reason to believe that supplies of milk will be adversely affected as September approaches. Indeed, on Friday, July 19, 2013, Elmhurst placed an order for an extra load of specialty milk and that order has not yet been fulfilled. Lowering the shipping percentages for September through November based upon a request in mid-July is at best premature.

Although, as is acknowledged, Class I needs have been declining in this market, indeed nationwide, the Northeast is experiencing a great increase in Class II use, especially to supply Greek style yogurt manufacturers. A new PepsiCo and Theo Muller Group yogurt manufacturing facility started production in early June, 2013. It is reported to be gearing up production for the second half of 2013. (Attachment D). The needs for all the new yogurt facilities is so significant earlier this year, at the request of producer cooperatives, a Northeast dairy meeting was convened to discuss the coming shortages of milk for Order 1 needs. Finally, it is our understanding that the entity making the request to lower Class I shipping requirements has entered into a supply contract to supply the fluid milk needs of one of these newer yogurt manufacturing plants. Of course, the requester is perfectly entitled to do so, but it should not be then rewarded by lowering the applicable shipping percentages so that it can more easily ship milk for Class II use that does not return the highest value to the pool.

Class I handlers facing great stress in this low margin business, should not both pay the highest applicable minimum federal order price and then simultaneously be told that due to other milk use demands, the applicable shipping percentages will be reduced, making it easier for non-Class I handlers to receive milk at the expense of the Class handlers who foot the bill for the pool.

Perhaps most importantly, Elmhurst Dairy has as recently as July offered to purchase milk at competitive prices from the entity requesting lowering the applicable shipping percentages if the supplier provided rBST free certifications under both New York and EU law. As of this date, the supplier has not accepted Elmhurst's offer. For this reason alone, the request should be denied.

The Market Administrator should not at this time under all of these circumstances decrease the applicable shipping percentages for September through November.

Respectfully submitted,

Chip English

Attachments

ATTACHMENT A

Portland Press Herald

PRINT THIS

Posted:Today
Updated: 12:10 AM

Maine hay farmers struggling to stay afloat

One of the wettest Junes on record in central Maine puts hay farmers way behind schedule.

By PAUL KOENIG Kennebec Journal

Andy Baker said he should have more than 7,000 bales of hay harvested by now.

click image to enlarge

Maynard Whitten checks the dryness of hay with a pitchfork that his son, Dwight, teds with a tractor Monday, July 22, 2013 at their Manchester, Maine farm. The Whitten's have only cut 10 of the 60 acres of fields at the farm for hay this season because of heavy, consistent rainfall.

Staff photo by Andy Molloy

Instead, because of an unusually wet June, he has harvested only around 1,300 bales.

"Usually I'm all done first cut by the first week in July, and I haven't hardly got started," Baker, of Monmouth, said Monday.

He and other farmers have reported that the heavy, consistent rainfall in June and the beginning of July prevented them from harvesting and lowered the hay's quality.

Farmers who also grow hay for a second cutting are hoping for more favorable conditions – warm and dry – in the coming weeks, but Tuesday's forecast calls for rain again.

This past June has been one of the wettest in central Maine history.

In Augusta, only three years have had more rainfall in June than the 7.76 inches that fell this year, according to the National Oceanic and Atmospheric Administration's National Climatic Data Center, which has been measuring rainfall at the Augusta State Airport since 1948.

Of the five wettest Junes, four came in the past decade.

There was never a stretch of more than three days last month without rain. Some farmers who were unable to bring machinery on their wet fields all month said that it has been one of the worst seasons they can remember.

While farmers wait for the hay to dry enough to cut and bale, the quality declines.

The preharvest nutrient level of the grasses begins dropping in June, according to Rick Kersbergen of the University of Maine Cooperative Extension.

Kersbergen said nutrients move from the stalks and leaves to the seeds when the plants mature.

"Once the hay crop quality goes down, the only thing that's going to help is the second crop being of good quality," he said.

The effect of the lower nutrient level may be felt by farmers raising livestock. Farmers will have to supplement their hay with more grain, most of which is imported from out of state, Kersbergen said.

Jeremiah Smith, owner of Clemedow Farm in Monmouth, said the growing season from the middle of May to the middle of July has been the wettest he can remember in his 57 years on the farm.

He grows hay for his 100 dairy cows, 60 replacement cows and nine beef cows. Smith, who sells milk to Oakhurst Dairy, said the poorer quality will hurt.

"It will mean less milk when we feed it in the winter or it will mean a higher grain bill because we'll have to feed a higher protein grain to make up for the poor quality of forage," he said.

Smith said he might have to spend $3,000 to $5,000 more on grain from fall to spring.

Charlie Kent, a farmer in Benton, drove his tractor as workers stacked bales Monday, trying to get the crop in before the expected rain over the next two days.

Kent said his crop is behind as well.

"Too much rain in the spring and not enough time to dry cut hay this summer," he said.

Maynard Whitten, who owns a farm in Manchester, said rain has prevented him from baling his farm's first, and only, hay harvest.

"Rain, rain, rain. There's just no way of getting it in," Whitten said. "I don't know anyone that's had luck getting much in."

Logan Johnston of Oaklands Farm in Gardiner said his hay harvest had been going well until constant rain showers in the middle of June.

Johnston, who raises beef cattle, said he usually harvests a little more than 10,000 bales a year for his cattle and to sell.

He said he usually has finished his first cutting by July 4, but he still hasn't and he might not bother, waiting instead for the second harvest.

"Most likely, everybody's yields are going to be down this summer, and the quality won't be quite what we're used to," he said.

"The bottom line is it's been really tough," Johnston added.

Morning Sentinel photographer David Leaming contributed to this report.

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Delays in planting, lost crops follow a wet spring

By AMANDA FRIES
Observer-Dispatch
Posted Jun 25, 2013 @ 05:00 AM

The strawberries now are ripe and plump for picking, but they are about two weeks late.

"Usually the (season has) about 30 days," said Ron Acee, owner of Tassleberry Farms in Westmoreland. "This year, it'll be a little bit shorter because we started late."

Acee said he's fortunate to have a good drainage system made of gravel for his strawberries. Even so, he said, too much rain can be a hindrance.

"If plants don't get a chance to dry out, strawberries will begin to mold," he said.

Jeff Miller, an educator at Cornell Cooperative Extension of Oneida County, said because of cooler temperatures in the spring and uneven distribution of rainfall throughout the Mohawk Valley, crops have been delayed.

"Some (farmers) have just had to stop," he said. "There are acres that will not get planted this year because conditions didn't allow the farmers to do it."

The variation in crop status is mainly due to the fact that the recent storms have hit isolated areas, dumping inches of rain in one town and only a few drops in others. Miller said that individual farms throughout Oneida County measured a range from 2.85 inches of rain in Verona the week of June 16 to 4.8 inches in Chadwicks during the same timeframe.

Dawn Richardson, co-owner of Richardson's Farms in Vernon Center, said they've probably lost about 30 percent of their 2,000 acres of field crops — corn, hay, wheat and soybeans — because of the recent heavy rains.

"Once we got those rains, we couldn't get on the fields," she said. "Some got flooded. Some got washed out. Some did okay. Some farms are a total loss."

From May 21 to June 20, the area saw 6.58 inches of rain, WUTR Chief Meteorologist Jeff Matthews said. For this month, the area is slightly below the 4.2 inch average.

He pointed out, however, that the rainfall is measured in Rome, so it doesn't account for other areas. Matthews said he expects more average conditions in the future.

In Sauquoit, snap beans and grain farmer Vincent Johns of Long Acre Agriculture said more rain and cooler temperatures slowed the growth of crops, which also were delayed in planting by a week.

"We won't be able to get that back," he said.

Not only is part of the growing season lost, but Richardson said it's a financial loss as well.

"I think every farmer, they've had some sort of economic loss," she said.

Other farms have weathered the storms a bit better.

North Star Orchard owner George Joseph said that while last year the Westmoreland apple orchard didn't have many apples, this year they "are way ahead of what they usually are."

Blueberries also are right on schedule, he said. But Joseph added that they're always at the mercy of the weather.

"The turbulence with the storms, we're still at peril," he said. "Hail is a concern at this point."

BY THE NUMBERS

Average June rainfall: 4.2 inches

Total rainfall for June: 3.44 inches

Recent heaviest rainfall: From May 21 to June 20 measured 6.58 inches.

Numbers are collected in Rome.

Specific rainfall totals for week of June 16:

> Verona: 2.85 inches.

> New Hartford: 3.9 inches.

> Chadwicks: 4.8 inches.

Source: Jeff Miller, educator at Cornell Cooperative Extension of Oneida County and WUTR Meteorologist Jeff Matthews

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VPR News 8:45 AM JULY 9, 2013

Rain Creates Many Problems For Farmers

By STEVE ZIND (/PEOPLE/STEVE-ZIND)

Enlarge image (http://mediad.publicbroadcasting.net/p/vpr/files/201307/klein_on_farm.jpg)

Joey Klein on his Plainfield vegetable farm

Listen 2:34

Agriculture officials say the rain has been a problem for Vermont farmers, but it's difficult to generalize about its affect. The amount of rainfall, the type of soil, the crops being grown and the farming practices used, are all factors.

But the rain is a challenge even where fields aren't inundated.

The Vermont Agency of Agriculture doesn't keep a tally of how many acres of farmland are affected by the heavy rains, but there's plenty of anecdotal information about delayed or ruined crops and hayfields too wet to harvest.

"It's rained two inches in the last day. That's a fact," says Plainfield organic vegetable farmer Joey Klein.

The conditions at Klein's farm along the Winooski River illustrate the range of problems the rain has caused for farmers.

Klein has been growing organic vegetables here for 26 years. Some of his land is a sandy loam soil that drains well. Neat rows of beets, cabbage and other crops bask in a break of sunshine between rains.

"You can see things are doing generally pretty well on this soil," says Klein. They're not drowning!"

The vegetable plants growing here look good, but so do the tiny weeds springing up around them.

In dryer weather they could be taken care of with a hoe, but with the rain, they simply reestablish themselves. Getting into the fields to cultivate with a tractor is also difficult because the soil is so soft.

Klein eyes a row of Kale. "I can see that that Kale should really be a darker green," he says.

That's because a well drained soil like this loses nutrients, which are washed away with too much rain. It's going to add to the cost of this year's crop.

"We're going to have to re-fertilize. The fertilizer that I put out this spring is generally pretty gone," Klein concludes.

Elsewhere, the rain has washed away an expensive commercial organic deer repellent Klein sprays on his plants.

"So I need to spray it again to keep the deer out," Klein says as he looks at a line of deer tracks that follow a row of peas.

Some of the peas are nearly ready to pick, but in one corner of the field part of the crop is underwater.

It's in the Klein's fields with heavier soils that the effect of the rain is most pronounced.

"Look at this," he says standing at the edge of another field where the rainwater stands in pools. "The frogs are happy. The ducks could paddle. This is supposed to be what it looks like when the snow melts."

These are conditions the Agency of Agriculture says other Vermont farmers are facing and their problems are much more pronounced than they are at Klein's farm: Standing water in the fields is either drowning crops or preventing their planting.

Klein says he feels more fortunate than many farmers who are suffering through the wet weather. He's convinced warmer, wetter seasons are inevitable because of climate change.

As for the perfect farming weather, it would probably suit most Vermonters, but it's about as rare as tomatoes in April.

"We would go for an each of rain a week, overnight, one night a week. And then the rest of the time it could be sunny."

EagleTribune.com, North Andover, MA

June 19, 2013

Rain delay: Weather has frustrated local farmers

By Alex Lippa
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---- — If he was forced to pick between a drought and a deluge, Scott Johnson of Highland Farms in Windham would pick a drought every time.

"It's a lot easier to add water, then take it out," Johnson said.

But lots of rain is what Johnson and other farmers have had to deal with this month.

Concord has seen 4.83 inches of rain fall already in June, according to meteorologist Steve Capriola of the National Weather Service. Capriola said the total is more than double the average rainfall at this time of the month. The total already makes it the 29th wettest June in the 146 years they have been keeping track.

Farmers don't expect the heavy rains to impact the crops they will produce this year, but they do expect a delay.

"The fields are so wet now that we can't get things planted," said Phil Ferdinando, co-owner of J&F Farms in Derry. "Things are going to end up being later this year."

He mentioned corn and vine crops such as cucumbers and squash as those most affected.

Ferdinando said most of the crops previously planted were doing well, but not everyone is as fortunate.

John Peters of Peters Farm in Salem said he has had to replant and refertilize because of the rain.

"We lost a few growing days for sure," Peters said. "But we did well in April and May, so it all really ends up evening out."

Dan Hicks of Sunnycrest Farms in Londonderry was hoping to open U-pick strawberries last week, but the rain delayed his opening until today.

Despite the setbacks, he is staying optimistic about this year's crop.

"I expect there will be some (negative) impact, but I've been amazed before," he said. "As farmers, we never want to be negative. But it does get to you in a year like this."

Johnson said he plants his corn about once a week. But in the last two weeks, the soil has just been too muddy.

"That's why we want to start as soon as we can, because we only plant until mid-July," he said. "I think things will end up evening out and our second half will be stronger than our first half."

For Mike Cross of Mack's Apples in Londonderry, the rain has been beneficial.

"They like the water," he said. "It's looking like a good crop this year of apples and peaches."

But his pumpkins are a little delayed.

"The rain has hindered them out in the field," Cross said. "We are about a week to 10 days behind where we usually are."

Gail McWilliam Jellie, New Hampshire director of agricultural development, said it isn't a big issue statewide just yet, but it could become one.

"If the rain continues, we could have some issues," she said. "But one of the fun things about agriculture is how it depends on the weather. We just hope everything evens out in the long run."

Cooler weather hasn't helped things either.

"The cold is just so tough," Johnson said. "It slows down the growth of the plant and makes it tough to germinate."

Things could be looking up soon though. Capriola said clear skies and temperatures in the 70s are expected today and tomorrow, with only a slight chance of showers on Friday and Saturday.

ATTACHMENT B

'Drunken' weather pattern producing deadly heat wave

By Andrew Freedman

Climate Central

Fri, 07/19/2013 - 10:18am

The heat wave that has built across the eastern U.S. — roasting cities from Memphis to Washington to Boston in a stifling blanket of heat and humidity — has had one strange characteristic that meteorologists cannot yet explain in a long-term climate context. Rather than moving west to east, as typical weather patterns do in the Northern Hemisphere, weather systems across the country have moved in the opposite direction, like a drunken driver on a dark stretch of highway, drifting from east to west during the past two weeks.

And like drunk driving, the weather pattern is having serious — even deadly — consequences, with at least one death being blamed on the heat, according to the Associated Press.

The " Bermuda high " that often pumps warm and humid air into the East Coast during July and August decamped around July 11 from Bermuda and came ashore, eventually migrating all the way to the Midwest by July 15. The summertime high pressure ridge, sometimes referred to as a "heat dome," has set air pressure records as recorded by weather balloons in Pittsburgh and Virginia, and has been responsible for sending air temperatures rocketing into the mid- to upper-90s, and even the lower triple digits, in some parts of the East.

New York's John F. Kennedy Airport, for example, broke a daily high temperature record on Thursday, with a high of 100°F. The heat index, which is a measure how the temperature feels to the humid body, has reached the dangerous range of 105 to 115°F in some spots. Heat is the No. 1 weather-related cause of death in the U.S. in an average year.

Making the heat even more dangerous is that many areas affected have not been getting overnight relief. In New York's Central Park, the overnight low on Wednesday night into Thursday morning was 79°F, tying a record for the highest such temperature for the date. Record-high low temperatures were also set in the Midwest and Mid-Atlantic. Washington, D.C. may challenge a record for the longest number of consecutive hours with air temperatures above 80°F.

The National Weather Service issued heat warnings and advisories for nearly two-dozen states on Thursday, with a smaller number to be affected on Friday in the densely populated Mid-Atlantic and Northeast.

While heat waves during July are nothing new, the weather pattern that is creating this one is rare enough for meteorologists to take note. In addition to the Bermuda leaving its more tropical locale and camping out in Michigan, an area of low pressure at the upper levels of the atmosphere has also been roaming the U.S. since July 11, drifting from east to west, traveling from the Mid-Atlantic states to Texas, where it brought some welcome rainfall.

The air flow heading in the opposite direction across the U.S. is abnormal, as is the strength of the dome of high pressure. In recent years there have been numerous instances of strong and long-duration high pressure areas that have led to extreme weather events, including the Russian heat wave of 2010. According to NOAA, scientists are scheduled to meet at Oak Ridge National Laboratory in September to explore whether such "monster ridges" of high pressure are becoming more frequent or more intense as the atmosphere warms in response to manmade greenhouse gas emissions.

Jon Gottschalck acting chief of the Operational Prediction Branch at NOAA's Climate Prediction Center, told Climate Central in an email that it's not yet clear exactly how unusual the recent weather pattern has been, or what has been driving it. "Yes, the evolution you describe of the upper-level low and high pressure ridge moving east to west is definitely unusual. But it is not easy to quantify really how unusual," he said.

"It would take considerable time to crunch through the data and utilize a methodology to accurately pick events like this that have occurred in the historical record and quantify [them]. From a climate-forcing perspective, there is no clear climate pattern right now that we can point to as a contributing factor and so we can really only attribute this evolution to natural internal variability, at least at this stage."

ATTACHMENT C

J. Dairy Sci. 86:2131–2144

Effects of Heat-Stress on Production in Dairy Cattle

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ABSTRACT

The southeastern United States is characterized as humid subtropical and is subject to extended periods of high ambient temperature and relative humidity. Because the primary nonevaporative means of cooling for the cow (radiation, conduction, convection) become less effective with rising ambient temperature, the cow becomes increasingly reliant upon evaporative cooling in the form of sweating and panting. High relative humidity compromises evaporative cooling, so that under hot, humid conditions common to the Southeast in summer the dairy cow cannot dissipate sufficient body heat to prevent a rise in body temperature. Increasing air temperature, temperature-humidity index and rising rectal temperature above critical thresholds are related to decreased dry matter intake (DMI) and milk yield and to reduced efficiency of milk yield. Modifications including shade, barns which enhance passive ventilation, and the addition of fans and sprinklers increase body heat loss, lowering body temperature and improving DMI. New technologies including tunnel ventilation are being investigated to determine if they offer cooling advantages. Genetic selection for heat tolerance may be possible, but continued selection for greater performance in the absence of consideration for heat tolerance will result in greater susceptibility to heat stress. The nutritional needs of the cow change during heat stress, and ration reformulation to account for decreased DMI, the need to increase nutrient density, changing nutrient requirements, avoiding nutrient excesses and maintenance of normal rumen function is necessary. Maintaining cow performance in hot, humid climatic conditions in the future will likely require improved cooling capability, continued advances in nutritional formulation, and the need for genetic advancement which includes selection for heat tolerance or the identification of genetic traits which enhance heat tolerance.

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(**Key words:** dairy, heat stress, environment, lactation)

INTRODUCTION

One of the greatest challenges to production facing dairy farmers in the southeastern United States is heat stress and the strain that it causes the lactating dairy cow. Climatic conditions in the Southeast are such that the warm (or hot) season is relatively long, there is intense radiant energy for an extended period of time, and there is generally the presence of high relative humidity. Thus heat stress is chronic in nature, there is often little relief from the heat during the evening hours, and intense bursts of combined heat and humidity further depress performance. Lactating dairy cows create a large quantity of metabolic heat and accumulate additional heat from radiant energy. Heat production and accumulation, coupled with compromised cooling capability because of environmental conditions, causes heat load in the cow to increase to the point that body temperature rises, intake declines and ultimately the cow's productivity declines.

Virtually the entire southern United States is subject to extended periods of hot weather. In the more southern latitudes, high ambient temperature and humidity exist for 4 to 6 mo each year. Beede and Collier (1986) identified three management strategies to minimize the effects of heat stress: 1) physical modification of the environment (shading, cooling), 2) genetic development of heat-tolerant breeds, and 3) improved nutritional management practices. Based on current knowledge, it appears that a combination of these practices may be necessary to optimize production of dairy cows in hot, humid climates. This is particularly true given the continued genetic improvement in dairy breeds and the unknowns associated with global warming. The objectives for this paper are to define the environmental conditions to which dairy cattle are exposed in the southeast, examine the effects of heat stress on cattle from a physiologic and productive standpoint, and discuss management options which are available to the producer.

THE AMBIENT ENVIRONMENT OF THE DAIRY COW IN THE SOUTHEAST

Climatic Conditions

Climate is a combination of elements that include temperature, humidity, rainfall, air movement, radiation, barometric pressure, and ionization (Johnson, 1987). Climatic zones differ around the world and are dependent on latitude, prevailing winds, evaporative conditions, availability of water, elevation, proximity to mountains and other factors. The southeastern U. S. is classified as humid subtropical (Johnson, 1987) and is characterized by high though seasonal temperatures, humidity, and rainfall. The range and duration of ambient temperature is largely dependent on latitude, with latitudes closer to the equator experiencing conditions increasingly conducive to heat stress. Hahn and Osburn (1968) projected that cows producing 32 kg milk/d and living below a line drawn approximately through mid-Missouri, diagonally through Tennessee, and northern Georgia would lose approximately 180 kg of production during a 120 d period from June 1 through September 30, increasing gradually to 270 kg as one moves south to Florida and southern Alabama. Cows producing 45 kg/d were projected to lose from 272 to 454 kg for the same regions. At a point centered in Atlanta it was projected that at the 10th and 90th percentiles (lowest and highest losses expected one year in 10) losses would be 95 and 268 kg, respectively for cows producing 32 kg/d (Hahn and Neinaber, 1976). During an extremely hot summer in 1980 the actual declines were far greater than projections in southern states (Atlanta, 425 kg; Dallas 644 kg; Memphis 568 kg), suggesting that in reality the predicted declines could be conservative.

Homeotherms have optimal temperature zones for production within which no additional energy above maintenance is expended to heat or cool the body. The range for lactating dairy cows is estimated to be from –0.5 to 20°C (Johnson, 1987), while Berman et al. (1985) indicated that the upper critical air temperature for dairy cows is 25 to 26°C. While it is hot enough to cause significant heat stress for several months of each year in the southeastern region of the U. S. there are concerns that global warming will further accentuate the problem. Klinedinst et al. (1993) used several models to predict the impact of climatic change on the performance of lactating dairy cows. Depending on the model used, global warming was predicted to reduce milk yield for cows producing 33 kg/d by from 300 to 900 kg for a May 1 through September 30 season. Despite the wide range in predicted milk yield depression the models agreed that the greatest milk yield declines would occur in the southeastern and southwestern United States. The authors suggested that the predicted declines in milk yield for these regions would occur unless adequate environmental modifications were in place. They also suggested that the probability of extreme high temperature events (heat waves) would increase as mean temperature increased, and an increasing number of heat waves could significantly increase the negative impact of global warming, especially on livestock (Klinedinst et al., 1993). Severe heat waves increase the likelihood for mortality of feedlot cattle, and several hours of THI > 84 with little or no nighttime recovery of THI = 74 can result in the death of vulnerable animals (Hahn and Mader, 1997). Global warming could create conditions that not only impair productivity of cattle but increase mortality of cattle in the absence of protective facilities.

Effect of Climatic Variables on Cow Body Temperature, DMI, Milk Yield

The term heat stress is used widely and rather loosely, and may refer to the climate, climatic effects on the cow, or productive or physiologic responses by the cow. Lee (1965) presented a definition of stress often used by physiologists, in which stress denotes the magnitude of forces external to the bodily system which tend to displace that system from its resting or ground state, and strain is the internal displacement from the resting or ground state brought about by the application of the stress. Therefore the environmental factors external to the cow would contribute to stress (in this case heat stress) while the displacement of the cow from the cow's resting state would be the response to the external stress, or heat strain.

The effects of hot, humid conditions are thought to be mediated through an effect on cow body temperature. Berman et al. (1985) suggested that the upper limit of ambient temperatures at which Holstein cattle may maintain a stable body temperature is 25 to 26°C, and that above 25°C practices should be instituted to minimize the rise in body temperature. However, in the Southeast one of the major challenges is the combined effects of high relative humidity with high ambient temperature. At a temperature of 29°C and 40% relative humidity the milk yield of Holstein, Jersey and Brown Swiss cows was 97, 93, and 98% of normal, but when relative humidity was increased to 90% yields were 69, 75, and 83% of normal (Bianca, 1965). One must understand the means of cooling used by homeotherms to grasp the reasons for the effects of high relative humidity. Cooling processes were summarized in a review (Shearer and Beede, 1990). The processes of conduction, convection and radiation are all dependent on a thermal gradient, thus as air temperature rises above a critical point the thermal gradient is reduced and heat dissipation is less effective. With increasing ambient temperature there is a marked shift from nonevaporative to evaporative cooling (Kibler and Brody, 1950). Evaporative cooling is an effective means of cooling cattle but is compromised by high relative humidity which impedes evaporation, making it difficult to cool the cow in the Southeast.

The effects of the ambient environment on cow performance have been measured by establishing critical ambient temperatures for the cow (Berman et al., 1985; Igono et al., 1992, Johnson, 1987), an equivalent temperature index incorporating temperature, humidity, and air velocity (Baeta et al., 1987), and temperature-humidity index (THI), which incorporates the combined effects of temperature and relative humidity (NOAA, 1976). In classical work, Johnson et al. (1963) reported that milk yield and DMI exhibited significant declines when maximum THI reached 77. Later research determined that the critical values for minimum, mean and maximum THI were 64, 72, and 76, respectively (Igono et al., 1992). Studies established that there is a significant negative correlation between THI and DMI for cows in the southeastern U. S. (Holter et al., 1996; Holter et al., 1997), and the effect of THI is probably mediated through the effects of increasing body temperature on cow performance. Estimated milk yield reduction was 0.32 kg per unit increase in THI (Ingraham, 1979), and milk yield and TDN intake declined by 1.8 and 1.4 kg for each 0.55°C increase in rectal temperature (Johnson et al., 1963). Umphrey et al. (2001) reported that the partial correlation between milk yield and rectal temperature for cows in Alabama was −0.135. West et al. (2002) found that changes in cow body temperature (measured as milk temperature) were most sensitive to same day climatic factors. The variable having the greatest influence on cow a.m. milk temperature was the current day minimum air temperature, while cow p.m. milk temperature was most influenced by the current day mean air temperature. Cow DMI and milk yield were most affected by climatic variables, not cow body temperature. Ravagnolo et al. (2000) reported that maximum temperature and minimum relative humidity were the most critical variables to quantify heat stress, and both variables are easily combined into a THI. Milk yield declined by 0.2 kg per unit increase in THI when THI exceeded 72. The authors concluded that THI can be used to estimate the effect of heat stress on production (Ravagnolo et al., 2000).

Many early studies used current day environmental conditions to determine effects on cow performance. However, there may be a lag of time between environmental events and the full effects on production by the cow. The most significant factors affecting milk yield during hot weather in South Carolina were the total number of hours when THI exceeded 74 during the preceding four days, and the number of hours exceeding THI of 80 on the preceding day (Linville and Pardue, 1985). In Florida the black globe temperature (a measure of temperature and radiant energy) had little effect on milk yield when measured on the same day as milk yield but black globe temperature 24 and 48 h prior were closely associated with depressed milk yield (Collier et al., 1981). West et al. (2002) reported that of the environmental variables studied during hot weather the mean THI two days earlier had the greatest effect on milk yield, while DMI was most sensitive to the mean air temperature two days earlier. Milk yield for Holsteins declined 0.88 kg per THI unit increase for the 2-d lag of mean THI, and DMI declined 0.85 kg for each degree (°C) increase in the mean air temperature. The decline in milk yield and DMI per unit of increase in the environmental measure was substantially less when evaluated on same day climatic measures in comparison with climatic measures two days earlier. Thus the full impact of climatic variables on production is delayed and may be related to altered feed intake, delay between intake and utilization of consumed nutrients, or changes in the endocrine status of the cow.

Though several combinations of temperature, relative humidity, and radiant energy impact heat load in the cow, it is apparent that given sufficient night cooling, cows can tolerate relatively high daytime air temperatures. Igono et al. (1992) reported that despite high ambient temperatures during the day a cool period of less than 21°C for 3 to 6 h will minimize the decline in milk yield. These findings suggest that it will be critical not only to minimize cow body temperature increases during the hot daylight hours, but to find ways to enhance cow cooling during the evening hours.

Metabolic Heat Production

Heat production of metabolic functions accounts for approximately 31% of intake energy by a 600 kg cow producing 40 kg of milk containing 4% fat (Coppock, 1985). Physical activity increases the amount of heat produced by skeletal muscles and body tissues. Maintenance expenditures at 35°C increase by 20% over thermoneutral conditions (NRC, 1981), thus increasing the cow's energy expenditure, often at the expense of milk yield. Body heat production associated with milk yield increases as metabolic processes, feed intake, and digestive requirements increase with yield. The heat load accumulated by the cow subjected to heat stress is the sum of heat accumulated from the environment and the failure to dissipate heat associated with metabolic processes. Obviously with similar body size and surface area, the lactating cow has significantly more heat to dissipate than a nonlactating cow and will have greater difficulty dissipating the heat during hot, humid conditions. When cows that were nonlactating, or at low (18.5 kg/d) or high (31.6 kg/d) milk yield were compared, low and high yielding cows generated 27 and 48% more heat than nonlactating cows despite having lower BW (752, 624, and 597 kg for nonlactating, low, and high producers, respectively) (Purwanto et al., 1990). Berman et al. (1985) reported that rectal temperature of cows increased by 0.02°C/kg FCM for cows producing >24 kg/d, and greater heat production can explain the increasing rate of decline in milk yield for cows as production increased from 13.6 to 18.1 to 22.7 kg of milk per day and THI increased from 72 to 81 (Johnson et al., 1962). Despite the relatively low milk yield in this work, it suggests that high production will greatly accentuate heat stress in the lactating cow. The effects of high milk yield is demonstrated in work by West et al. (1990, 1991) who reported that milk temperature was greater for cows administered bST compared with controls in a hot, humid climate; low yielding cows were more responsive to bST than high yielding cows, possibly because of the higher body temperature associated with greater milk yield. Cows administered bST exhibited significantly greater heat production in both thermoneutral and hot environments, though cows were apparently able to dissipate the greater heat produced, evidenced by greater total evaporative heat losses and cooling heat loss for the bST treated cows which enabled cows to maintain normal body temperatures (Manalu et al., 1991). Administration of bST to both lactating and nonlactating cows in a hot, humid climate (Florida) resulted in elevated body temperature and respiratory rate for both groups of cattle, suggesting that the greater heat strain was not due solely to increased milk yield (Cole and Hansen, 1993). The authors suggested that either greater heat production or interference with heat loss could explain greater strain in nonlactating cattle and that although bST use is efficacious in hot climates, its use should be coupled with procedures to reduce the magnitude of heat stress during summer months.

Physiologic Effects of Heat Stress

Numerous physiologic changes occur in the digestive system, acid-base chemistry, and blood hormones during hot weather; some in response to reduced nutrient intake, but many changes occur as a result of strain in the cow. Neurons that are temperature sensitive are located throughout the animal's body and send information to the hypothalamus, which invokes numerous physiological, anatomical or behavioral changes in the attempt to maintain heat balance (Curtis, 1983). During heat stress cows exhibit reduced feed intake, decreased activity, seek shade and wind, increase respiratory rate, and increase both peripheral blood flow and sweating. These responses have a deleterious effect on both production and physiologic status of the cow.

Cows that were fed ad libitum in a thermal comfort environment, fed ad libitum in a thermal stress environment, or fed a restricted intake in a thermal comfort environment had similar milk yields for both restricted intake and thermal stress treatments, and mammary blood flow tended to be lower compared with ad libitum fed cows in thermal comfort, suggesting blood flow was responsive to level of DMI (Lough et al., 1990). For cows exposed to similar treatments as those of Lough et al. (1990), portal plasma flow was reduced about 14% for cows in thermal comfort with restricted intake or in thermal stress when compared with thermal comfort, ad libitum fed cows (McGuire et al., 1989). The authors concluded that a portion of the negative effects of heat stress on milk production could be explained by decreased nutrient intake and decreased nutrient uptake by the portal drained viscera of the cow. Blood flow shifted to peripheral tissues for cooling purposes may alter nutrient metabolism and contribute to lower milk yield during hot weather.

Hormonal alterations occur with heat strain but it is often difficult to separate effects of lower feed DMI and direct effects of heat strain. McGuire et al. (1991) reported a tendency for plasma somatotropin to decline with heat stress but no difference due to restricted DMI, while triiodothyronine concentration declined with heat and with restricted intake. Others have shown similar declines in triiodothyronine and thyroxine when cows were exposed to high ambient temperatures (Johnson et al., 1988; Magdub et al., 1982). Cows categorized as low, medium, and high producers had higher milk temperatures with increasing production (Igono et al., 1988) and concentrations of milk somatotropin declined significantly when THI exceeded 70. The authors speculated that the decline was due to suppression of hormone production to reduce metabolic heat production. Reduced concentrations of these key metabolic hormones with heat stress is logical and probably reflects the cows attempt to reduce metabolic heat production. Scott et al. (1983) reported a negative relationship for plasma thyroxine concentration and rectal temperature but the initiation of night cooling at the time that rectal temperature was highest was most beneficial to maintaining thermoneutral plasma thyroxine concentration, suggesting that strategically cooling the heat stressed cow could enhance her metabolic potential.

Heat stressed cows generally exhibit altered blood acid-base chemistry as a result of the shift in cooling from conductive, convective, and radiation to evaporative cooling (Kibler and Brody, 1950). Panting and sweating increase as the reliance on evaporative cooling increases. Panting sharply increases the loss of CO_2 via pulmonary ventilation, reducing the blood concentration of carbonic acid and upsetting the critical balance of carbonic acid to bicarbonate necessary to maintain blood pH, resulting in a respiratory alkalosis (Benjamin, 1981). Compensation for the respiratory alkalosis involves increased urinary bicarbonate excretion (Benjamin, 1981), leading to a decline in blood bicarbonate concentration. Heat-stressed cows had elevated rectal temperature and respiratory rate which was further exacerbated in cows receiving bST (Cole and Hansen, 1993) and cows receiving bST during summer in Georgia had higher milk temperature, and significant reductions in pCO_2, blood bicarbonate and base excess (West et al., 1991). Schneider et al. (1988) reported that cows exposed to heat stress in environmental chambers exhibited a diurnal variation in blood pH and blood bicarbonate levels, closely following the cow's rectal temperature and respiratory rate. Cow acid-base chemistry exhibited wide swings from alkalosis to a compensated acidosis over a 24 h period as cows compensate for the alkalotic condition caused by hyperventilation and overcorrect, excreting bicarbonate through the urine and resulting in a metabolic acidosis during the cooler evening hours. Reduced concentrations of blood bicarbonate compromise the buffering capability associated with the bicarbonate system, which may be critical during summer when producers typically feed high grain rations. In addition, cattle lose significant quantities of potassium (K) via sweat and losses increase with sweating rate (Jenkinson and Mabon, 1973).

IMPROVING COW PERFORMANCE IN HOT, HUMID CONDITIONS

Effects of Altering the Cow's Environment

Shading. One of the first steps that should be taken to moderate the stressful effects of a hot climate is to protect the cow from direct and indirect solar radiation. It was estimated that total heat load could be reduced from 30 to 50% with a well-designed shade (Bond and Kelly, 1955), and shading is one of the more easily implemented and economical methods to minimize heat from solar radiation. Cows in a shaded versus no shade environment had lower rectal temperatures (38.9 and 39.4°C) and reduced respiratory rate (54 and 82 breaths/min), and yielded 10% more milk when shaded (Roman-Ponce et al., 1977). Cattle with no shade had reduced ruminal contractions, higher rectal temperature and reduced milk yield compared with shaded cows (Collier et al., 1981). Armstrong (1994) reviewed shade and cooling for cows and discussed the benefits and deficiencies of various types of shade. The author suggested differing shade orientations, depending on whether the application was in a dry or wet climate. In the humid Southeast cows should be allocated 4.2 to 5.6 m^2 of space beneath the shade, and a north-south orientation to allow for penetration of sunlight beneath the shade for drying the ground beneath if earthen floors are used.

Numerous types of shading are available, from trees (which are easily killed by high cow density), to metal and synthetic materials (shade cloth). Concerns exist regarding the transfer of radiant energy through metal roofs. The temperature at the underside of bare metal and insulated roofs differed by approximately 10°C during the peak heat of the day averaged over a 38 d period, and on the hottest day the temperatures were 37 and 57°C under insulated and uninsulated roofs (Buffington et al., 1983). However cost and practicality of insulated roofing has deterred extensive use of the practice. Bucklin et al. (1993) reported a reduction of 2 to 3°C when roofing with a reflective coating was used over totally enclosed poultry housing with no ventilation. However when the same coated roofing was used over well ventilated poultry and dairy housing, no benefits were noted in either temperature or animal performance. The authors indicated that although reflective coatings can reduce the temperature of galvanized roofing, the coatings add expense and effectiveness drops rapidly with time due to reduced reflectivity. The reflective coatings added little benefit to well ventilated facilities.

Much of the emphasis on environmental modification in the southeastern U. S. has focused on the use of free stall and loose housing barns with high, steeply pitched (4 in 12 pitch) roofs, often with open or capped ridge vents. These barns minimize the transfer of infrared radiation due to the high roof, encourage a venturi effect due the rising of hot air up the roof incline and exiting the ridge vent, and also encourage cross ventilation from wind movement through the barn because of the high eaves. Although shade is critical, much of the discussion in this paper will focus on cooling in the presence of shading, with the assumption that shade is a requirement in any environmental management program for dairy cattle in the southeastern U. S.

Cooling for Dairy Cows. Although shade reduces heat accumulation from solar radiation there is no effect on air temperature or relative humidity and additional cooling is necessary for lactating dairy cows in a hot, humid climate. A number of cooling options exist for lactating dairy cows based on combinations of the principles of convection, conduction, radiation, and evaporation. Air movement (fans), wetting the cow, evaporation to cool the air, and shade to minimize transfer of solar radiation are used to enhance heat dissipation. Any cooling system that is to be effective must take into consideration the intense solar radiation, high ambient temperature, and the typically high daytime relative humidity, which increases to almost saturation at night. These challenging conditions tax the ability of any cooling system to maintain a normal body temperature for the cow. However evaporative cooling was predicted to improve milk yield for cows yielding 45 kg/d by 140 kg in the Missouri to Tennessee area, 230 kg in southern Georgia, and 320 kg in Louisiana and Texas during a 122 d summer season (Hahn and Osburn, 1970).

Various cooling systems have been evaluated, and air conditioning dairy cows for 24 h/d improved 4% FCM yield by 9.6% in Florida (Thatcher, 1974). Missouri work showed that air conditioning was not an economical venture (Hahn et al., 1969). Zone cooled cows (cooled air blown over the head and neck) averaged 19% greater milk yield than controls (Roussel and Beatty, 1970), though other scientists concluded that a well designed shade structure provided greater economic returns than the additional benefits derived from zone cooling (Canton et al., 1982). The costs associated with air conditioning and facilities necessary to provide an enclosed environment or ducting for zone cooling have proven cost prohibitive and these types of systems are rare today.

Early work (Seath and Miller, 1948) established the benefits of air movement and wetting the cow to aid cooling. The cooling benefits of using fans, wetting the cow, and the combination of fans and wetting were compared. Cows tied outside in the sun from noon to 2 p.m. to induce heat stress were moved inside to the respective treatments. Although cows were only sprayed down once during treatment the scientists found that after one hour of exposure to treatments, rectal temperature declined the least for cows with no cooling, was intermediate and similar for cows receiving either sprinkling only or fans only, and the greatest cooling occurred with the combination of fans and wetting the cows. Cows cooled with ducted air and spray for 20 min on, 10 min off, yielded 2 kg/d more milk than shaded controls, maintained rectal temperature near normal (below 39°C), and maintained higher plasma growth hormone compared with shaded controls (Igono et al., 1987). They found that when all costs were considered, there was a $0.22 /cow per d profit via improved milk yield. Returns did not consider potential returns from improved maintenance of body weight or reproductive performance. Similarly, Florida workers reported an 11.6% improvement in milk yield when cows were sprayed for 1.5 min of every 15 min of operation (Strickland et al., 1988). Cooled cows had sharply reduced respiratory rate (57 versus 95 breaths/min), and efficiency of production (kg milk per kg DMI) was improved for cooled cows, probably due to lower energy expenditures for body cooling. Comparisons showed little additional benefit to cooling in the holding pen, possibly due to the short duration that cows are present. Day-long cooling in the free stall barn provides for continuous cooling, minimizing the elevation of body temperature during the day. The Florida workers (Strickland et al., 1988) reported that there was an annual return of $96 per cow for 210 days of operation, again only considering increased milk yield in the economic analysis. Internal rates of return in excess of 57% for Florida conditions (210 d annual use, 10 to 15 yr depreciation) or 26.7% for more moderate conditions (100 d annual use, 10 yr depreciation) demonstrated economical returns over a broad geographic range for this type of system. Benefits from sprinkling and fans were reported in a temperate, humid climate (Kentucky), where cows yielded 3.6 kg more milk (15.9%) while consuming 9.2% more feed per day than controls (Turner et al., 1992). Missouri and Israeli work showed milk yield increases of 0.7 kg/d in moderate temperatures (Igono et al., 1985) and 2.6 kg increase in warm, humid conditions (Her et al., 1988). Frequency of wetting and duration of cooling was critical to the effectiveness of cooling systems. Wetting cows for 10 s was less effective in cooling cows than wetting for 20 or 30 s, which were similar (Flamenbaum et al., 1986), while cooling for 15, 30, and 45 m reduced rectal temperature by 0.6, 0.7, and 1.0°C, respectively. Thus length of time for both wetting and fans had dramatic effects on the amount of cooling achieved.

Sprinkler and fan cooling systems generate a large volume of waste water which must be processed. The cooling system used by Strickland et al. (1989) used 454.2 L/cow per d, which totaled 54,504 L/cow for a 120 d cooling season. However when differing rates of water application for cooling were compared, a system using 313.4 L/h (215.9 L/cow per d) cooled cows as well as a system delivering 704.1 L/h (Means et al., 1992). Large droplets from a low-pressure sprinkler system that completely wet the cow by soaking through the hair coat to the skin were more effective than a misting system (Armstrong, 1994). A combination of misters and fans was as effective as sprinklers and fans in Alabama work, where intake and milk yield were similar for the misted cows (Lin et al., 1998). The fan/sprinkler system used about 10 fold more water than the fan/mist system. Thus attention to water delivery rate through nozzle size or the use of fans and misters has proven effective in cooling cows while using substantially less water than systems evaluated in earlier research.

Evaporative cooling systems use high pressure, fine mist and large volumes of air to evaporate moisture and cool the air surrounding the cow. Because of the evaporation there is little wastewater to process in this type of cooling system, which is beneficial when developing a water budget for the dairy farm. Evaporative cooling systems improve the environment for lactating dairy cows in arid climates (Takamitsu et al., 1987; Ryan et al., 1992), and the reduced air temperature results from the removal of heat energy required to evaporate water. Evaporative cooling can be accomplished by passing air over a water surface, passing air through a wetted pad, or by atomizing or misting water into the air stream. There are questions regarding the effectiveness of evaporative systems in climates with high relative humidity. In Florida work where evaporative cooling pads were used there was an effective reduction in air temperature of the barn but milk yield was not altered although rectal temperature and respiratory rate were reduced (Taylor et al., 1986). Similarly, cows in Mississippi that were cooled using evaporative pads had reduced respiratory rate and body temperature and slight increases in DMI with little to no effect on milk yield (Brown et al., 1974). Evaporative cooling lowered air temperature during the hottest part of the day in summer by 4.5 and 5.9°C during two consecutive years but the authors questioned whether this type of evaporative cooling would be cost effective over a period of years. Another form of evaporative cooling incorporates the use of high-pressure mist injected into the fan stream, with fans directed downward to blow cooled air on the cow. Lin et al. (1998) reported that misters and fans cooled cows as well as a low-pressure sprinkler and fan system. However positioning was important and misters were much more effective when mounted low near the cow and much less effective when mounted higher in the barn. When a high pressure mist and fan system was compared with sprinklers and fans, respiratory rates were 87 versus 72 breaths/m and rectal temperatures were 39.6 versus 39.1°C for the mist and fan system and sprinkler/fan system, respectively (Bray, personal communication).

There is renewed interest in other systems to cool cows. Tunnel ventilation using evaporative cooling, fans with injection of high pressure mist, and combinations of cooling over feed bunks and free stalls are currently being investigated. Improved systems capable of either cooling the cow directly or cooling the surrounding environment are necessary to better control the cow's body temperature and maintain production in hot, humid climates.

Cooling Dry Cows. Much of the cooling research conducted in the past has targeted the lactating cow, largely because of the amount of heat generated by the lactating cow, her greater susceptibility to heat stress, and the more easily quantified and economically beneficial measures of feed intake and milk yield. In recent years greater concern has been focused on the late gestation, dry dairy cow and the potential benefits of cooling during the dry period. Maximum degree days for 60 d prepartum had a significant negative effect on early and mid-lactation milk and fat yield for cows in Mississippi (Moore et al., 1992), suggesting that dry cows do suffer the deleterious effects of heat stress and may benefit from protection from the environment. When cows shaded during the dry period were compared with unshaded controls, the shaded cows delivered calves that were 3.1 kg heavier and yielded 13.6% more milk for a 305 d lactation, even though all cows were handled similarly following parturition (Collier et al., 1982). The shaded cows had lower rectal temperature, respiratory rate, and heart rate and altered hormone patterns during the dry period. Similarly, cows that were cooled using sprinklers and fans during the dry period maintained lower body temperatures and delivered calves that were 2.6 kg heavier and cows averaged 3.5 kg more milk daily for the first 150 d of lactation than shade only controls (Wolfenson et al., 1988). Heat stress alters blood flow, potentially altering fetal development. Heat-stressed ewes delivered lambs that were 20% smaller than controls and uterine blood flow was reduced by 20 to 30% by heat stress. Livers and brains of fetuses from heat stressed ewes were substantially smaller than controls (Drieling and Carman, 1991). Similar results have been reported in beef cattle, where fetus weights for cows that were heat-stressed from d 100 to d 174 of pregnancy were reduced by 22% and uterine and umbilical blood flows were reduced by 51 and 30% (Reynolds et al., 1985). This suggests that lambs and calves delivered to heat-stressed mothers were not only smaller at birth but are likely to be less vigorous and lacking the metabolic machinery to thrive following birth. Shading and cooling cows during late gestation will improve subsequent lactation performance and may result in stronger, more vigorous calves at birth.

Heat Stress Effects On Heifers. Heifers generate far less metabolic heat than cows, have greater surface area relative to internal body mass and would be expected to suffer less from heat stress. However research from the southern United States and Caribbean regions indicates that Holstein females raised at latitudes less than 34°N weighed 6 to 10% less at birth and average approximately 16% lower BW at maturity than those in more northern latitudes, even when sired by the same bulls (NRC, 1981). There appear to be several factors contributing to slower growth and smaller body size, including greater maintenance requirements during hot weather, poor appetite and lower quality forages which are influenced by the same environmental conditions that slow growth in cattle. The NRC (1981) publication stated that "It appears, therefore, that it could be prohibitively expensive to produce 600 kg or more Holsteins at maturity in warm climates." Although it may be more expensive to grow heifers in hot climate, the U. S. dairy industry demands relatively large cows capable of high production and which are as large as their more northern relatives.

Immunity may be compromised in newborns during hot weather, and calves born in February and March had higher serum Ig levels than those born in summer (Donovan, 1986). Other Florida work with dairy cows suggested that colostrum was of higher quality during summer than winter, and that Holsteins had the highest quality of the breeds compared (Shearer et al., 1992). This was surprising since the stressful period of summer would be expected to yield lower quality colostrum. Although 79.8% of total samples tested in the low quality range (20 mg Ig/ml), Holsteins were 1.8 times more likely than other breeds to have good quality colostrum. No physiological reason is apparent for this difference and the authors speculated that perhaps Holstein calves born to heat-stressed dams were less vigorous, less likely to nurse immediately after birth, and consequently the colostrum from the first milking was of higher quality due to little or no nursing. This is consistent with the Florida and Israeli work (Collier et al., 1982; Wolfenson et al., 1988) where smaller calves were born to heat-stressed cows, and suggestions that calves were less vigorous.

When primiparous Holsteins were in a cool (THI of 65) or hot environment (THI of 82 from 0900 to 2000 h, THI of 76 from 2100 to 0800 h) for the last 3 wk of gestation and the first 36 h post-calving, cows in the hot environment had lower concentrations of immunoglobulins in colostrum and IgG concentrations were reduced by 22.3% (Nardone et al., 1997). The heat-stressed heifers had a slower rate of decline of their own plasma immunoglobulin concentrations during the final two weeks of pregnancy, suggesting that the transfer of maternal immunoglobulins to colostrum was impaired by heat stress. Work with sows that were heat-stressed from d 100 of pregnancy to about 8 d before farrowing showed that total protein and Ig concentration in colostrum was reduced compared with controls (Machado-Neto et al., 1987). Hot conditions may also compromise the ability of the calf to absorb immunoglobulins. In Arizona, calves housed under corrugated metal shades with no side walls, or the same shade with evaporative coolers were compared with hutches of tubing and corrugated steel (Stott et al., 1976). Calves in the hutches had greater mortality and lower serum IgG at 2 and 10 d of age. Mortality reached 25% (9 of 36) for calves in hutches while 1 and 2 calves died for each of the other treatments. Hutches were hotter and resulted in significantly greater stress and death losses of calves.

During hot weather reduced feed intake is common but increased maintenance costs reduce efficiency of feed conversion. In a study from the 1950's where Holsteins, Brown Swiss, and Jersey heifers were raised from one to thirteen months of age in environmental chambers with constant temperatures of 10 or 26.7°C, Holstein heifers raised in the 26.7°C environment were lighter than heifers in the cool environment by 8.2 kg at 3 months and 30.4 kg at 11 months of age. It took Holsteins in the warm environment 1½ months longer to reach 299 kg BW (Johnson and Ragsdale, 1959). Although the temperature was constant with no diurnal variation, 26.7°C is not extremely hot. In Australia, Friesians, Brahman × Friesian F_1 crosses, and Brahmans were exposed to 17.2 and 37.8°C temperatures (Colditz and Kellaway, 1972). Comparing the hot versus the cool temperature environments, rectal temperature and respiration rates increased the most for Friesians and least for Brahmans. Intake declined about 17% for Friesians, 1.4% for F_1 crosses, and 12% for Brahmans, but initial intake was greater for Friesians and thus a greater decline would be expected. Gains for Friesians were greatest during cool temperatures, but were the least of the three groups when exposed to high temperatures.

Because heifers generate less body heat and can dissipate heat more readily than lactating cows, do heifers benefit from additional cooling? In Egypt, heifers were exposed to winter conditions (17.3°C, 54.5% RH), summer conditions (36°C, 47% RH), and summer conditions with water spraying and an oral diaphoretic (Marai et al., 1995). A diaphoretic (in this study ammonium acetate was used) is a compound fed orally to cattle to increase perspiration. Heifers were sprayed with water seven times daily during the hottest period of the day. Heifers that were cooled had lower rectal temperature and respiratory rate and gain was improved by 26.1% with cooling during summer, a sharp increase even though heifers were only sprayed during the hottest part of the day without the benefit of fans.

Genetic Selection

There are many aspects of genetics that influence the response to heat stress, and variation among breeds is large. One of the challenges associated with managing high producing cattle in a hot environment is that selection for increased performance is often in conflict with maintaining homeothermy. Strictly regulated body temperature was found to promote the greatest productivity in beef cattle and even small increases in body temperature have a negative effect on metabolic processes (Finch, 1986). The maintenance of body temperature is heritable through characteristics including sweating competence, low tissue resistance, coat structure and color, but there is evidence that within Bos taurus cattle that an increased capacity for thermoregulation is accompanied by a reduction in energy metabolism (Finch, 1986). Turner (1982) reported that there was genetic variation of rectal temperature and there was a negative correlation between rectal temperature and fertility, suggesting that selection for lower rectal temperature would improve fertility. However the authors acknowledged that such selection had the potential to favor lower metabolic rate or feed intake. Selection for heat tolerance without selection for an accompanied greater productivity would likely result in lower overall performance by the animal. Sweating response was found to be negatively correlated with metabolic rate, suggesting the difficulty in combining desirable traits of heat adaptation and metabolic potential in cattle (Finch et al., 1982).

There is genetic variation in heat loss via tissue conductance, nonevaporative heat loss, and evaporative heat loss, but more efficient heat loss occurred for Brahman and Brahman cross cattle than with Shorthorn cattle (Finch, 1985). Using Brahman, Friesian, and Brahman x Friesian F_1 cross heifers, the Brahman × Friesian crosses had superior gains at 38°C, but were similar to Friesians at 17° (Colditz and Kellaway, 1972). Brahmans gained more slowly at 38°C. Thus there appear to be benefits from hybrid vigor under heat stress conditions. However it is questionable that crosses with Zebu breeds could be sufficiently productive to meet the needs of the U. S. dairy industry. The potential for crossing Holstein cattle with other domestic dairy breeds such as Jerseys may have more potential in the U. S.

There is evidence that hair color influences the susceptibility of the cow to heat stress because coat color is related to the amount of heat absorbed from solar radiation. In Bos indicus cattle the inward flow of heat at the skin of black steers was 16% greater than for brown steers, and 58% greater than for white steers (Finch, 1986). Bos taurus cattle with dark coats exhibited greater heat transfer to the skin, higher body temperature and sharply reduced weight gains than those with white coats, with increasing woolliness of the coat accentuating the effect (Finch, 1986). When dairy cows from an Arizona herd were categorized into white (less than 40% black), mixed (40 to 60% black), or greater than 60% black, no production traits were different (perhaps because cows were cooled for the first 130 d of lactation), but white cows calving in February and March required fewer services per conception and had fewer open days than mixed and black cows (King et al., 1988). Heritability of coat color was 0.22. In a Florida study using cows characterized as greater than 70% white or greater than 70% black, white cows had slightly lower body temperatures and greater milk yield, regardless of whether they were in shade or no shade conditions (Hansen, 1990). Though coat color is heritable, it is not clear if it is useful to select for color. Perhaps the greatest benefit would be derived when cows are exposed heavily to radiant energy, such as in a grazing situation.

Because genetic variation exists for traits important to thermoregulation, the potential to select sires that can transmit important traits must be considered. However when bulls were evaluated for genotype by environment interactions using daughters in California, New York, and Wisconsin, there was no sire by region interaction for milk or fat yield (Carabano et al., 1990). If these states are considered representative of their region, daughters in one region would not perform differently from those in another region. However for a large data set of cows in Georgia, when THI was near 72 variance for heat tolerance was zero, but when THI was 86 (equivalent to 36°C and 50% humidity) the additive variance for heat tolerance was as large as the general variance (Ravagnolo and Misztal, 2000). Because the genetic correlation between production and heat tolerance was approximately −0.3, the continued selection for production ignoring heat tolerance would result in decreasing heat tolerance. However because the correlation is small, a combined selection for production and heat tolerance is possible. Further investigation into this area is necessary to determine the potential to exploit a genetic approach to heat tolerance while selecting for high milk yield potential.

Nutritional Management

There have been several extensive reviews of nutritional management for the lactating dairy cow in hot climates (Fuquay, 1981; Collier et al., 1982a; Beede and Collier, 1986; Huber et al., 1994; Sanchez et al., 1994; West, 1994; West, 1998). There are several key areas of nutritional management which should be considered during hot weather. These include reformulation to account for reduced DMI, greater nutrient requirements during hot weather, dietary heat increment, and avoiding nutrient excesses. Though the NRC (2001) did not consider the effects of heat stress on the nutritional requirements of dairy cattle there is extensive literature that demonstrates that nutrient requirements for cattle should be modified during hot weather.

Water is arguably the most important nutrient for the dairy cow. Water intake is closely related to DMI and milk yield, but minimum temperature was the second variable to enter a stepwise regression equation (after DMI), indicating the influence that ambient temperature exerts on water consumption (Murphy et al., 1983). Water intake increased by 1.2 kg/°C increase in minimum ambient temperature, but regardless of rate of increase it is obvious that abundant water must be available at all times under hot conditions. In addition, Texas work demonstrated that offering chilled drinking water enhanced milk yield for lactating cows (Milam et al., 1986) by reducing body temperature through absorbed heat energy.

Intake of DM usually declines with hot weather and nutrient density of the diet must increase. The tendency is to increase dietary protein concentration above requirements, but there is an energetic cost associated with feeding excess protein. Excess N above requirements reduces ME by 7.2 kcal/g of N (Tyrrell et al., 1970). When 19 and 23% CP diets were fed, milk yield was reduced by over 1.4 kg (Danfaer et al., 1980) and the energy cost associated with synthesizing and excreting urea accounted for the reduced milk yield (Oldham, 1984). Blood NPN content was positively correlated with rectal temperature (Hassan and Roussel, 1975), suggesting reduced energy efficiency and greater heat production with excessive dietary N.

Dietary protein degradability may be particularly critical under heat stress conditions. Diets with low (31.2% of CP) and high (39.2% of CP) RUP fed during hot weather had no effect on DMI; however, milk yield increased by 2.4 kg/d and blood urea N declined from 17.5 to 13.3 mg/100 ml for the diet containing higher RUP (Belibasakis et al., 1995). In addition, cooling the cow may affect the response of the cow to protein supplementation. When diets with a similar RUP content from high quality (blood, fish, and soybean meals) or lower quality (corn gluten meal) proteins were fed to cows housed in shade or shade plus evaporatively-cooled environments, cows fed high quality RUP yielded 3.8 and 2.4 kg more milk in the evaporatively-cooled and shaded environments, respectively, than those fed low quality proteins (Chen et al., 1993). Although the interaction of protein quality by environment was not significant the authors theorized that the greater response to high quality protein for cows in the cooled environment was because the amount of protein metabolized for energy was reduced and less energy was used in converting NH_3 to urea. In addition, cows in the cooled environment had higher milk yield and greater protein demand. Arizona work summarized by Huber et al. (1994) suggested that when cows are subject to hot weather conditions RDP should not exceed 61% of dietary CP, and total protein should not exceed NRC recommendations by greater than 100 g N/d. One hundred grams N is equivalent to about 3.1% CP in the diet, assuming 20 kg DMI/d. High dietary lysine (241 g/d, 1% of DM) increased milk yield by 3 kg over diets containing 137 g/d lysine (0.6% of DM) (Huber et al., 1994). There is much to be learned about protein nutrition for heat-stressed cows.

Metabolic heat production, though advantageous during cold weather is a liability during hot weather due to the difficulty in maintaining heat balance. Heat production for a 600 kg cow yielding 40 kg of 4% fat milk amounted to 31.1% of consumed energy, which was second to fecal energy losses of 35.3% (Coppock, 1985). While maintenance was responsible for 23.5% of the heat produced, greater milk yield also increases heat production. Cows at high (31.6 kg/d) and medium (18.5 kg/d) milk yield had 48.5 and 27.3% greater heat production than dry cows (Purwanto et al., 1990). Use of some dietary ingredients may contribute less to heat increment of the diet, thus reducing total heat production by the cow. Can these differences in energy efficiency be exploited in practical diets for animals in hot weather? Lower efficiency for use of acetate may account for the low net energy of feeds high in fiber (Moe, 1981), and supports the feeding of low fiber diets during hot weather. A high efficiency for fat use and its low heat increment suggests that fats are undervalued by current feed evaluation systems when they are fed above thermal neutrality (Coppock, 1985).

The most limiting nutrient for lactating dairy cows during summer is usually energy intake and a common approach to increase energy density is to reduce forage and increase concentrate content of the ration. The logic is that less fiber (less bulk) will encourage intake, while more concentrates increase the energy density of the diet. High fiber diets may indeed increase heat production, demonstrated by work showing that for diets containing 100, 75, or 50% of alfalfa, with the remainder being corn and soybean meal, efficiency of conversion of ME to milk was 54, 61, and 65%, respectively (Coppock et al., 1964). Heat production was 699, 647, and 620 kcal per megacalorie ME for the 100, 75, and 50% alfalfa diets, respectively. When cattle were fed pelleted diets of 75% alfalfa and 25% concentrate, or 25% alfalfa and 75% concentrate, the diet containing 75% alfalfa resulted in greater heat production and less retained energy, and the greater O_2 intake by portal drained viscera and liver accounted for 44 and 72% of heat increment for low and high alfalfa diets, respectively (Reynolds et al., 1991). While heat increment is a consideration for high fiber diets, total intake has a much greater impact on metabolic heat production by the animal. Growing heifers fed pelleted rations containing 75% alfalfa or 25% alfalfa produced 48.8 and 45.5 MJ/d of heat (Reynolds et al., 1991), but heat production for low and high intake heifers (4.2 and 7.1 kg/d DMI) was 38.2 and 56.1 MJ/d. Therefore intake has a substantial effect on heat production and must be considered in designing an effective nutritional and environmental management program. Intake normally declines for high fiber diets, and West et al. (1999) demonstrated that the DMI decline for diets with a range of NDF concentration from 27 to 35% was less severe with increasing NDF during hot weather. The total DMI was less during hot weather and suggests that the less severe decline in hot weather was due to lower intake, and not higher NDF content. Low fiber, high fermentable carbohydrate diets may lower dietary heat increment compared with higher fiber diets, but this effect must be balanced with the potential for acidosis associated with high grain diets.

During hot weather, declining DMI and high lactation demand requires increased dietary mineral concentration. However, alterations in mineral metabolism also affect the electrolyte status of the cow during hot weather. The primary cation in bovine sweat is K (Jenkinson and Mabon, 1973), and sharp increases in the secretion of K through sweat occur during hot climatic conditions (Jenkinson and Mabon, 1973, Johnson, 1967, Mallonee et al., 1985). Lactating cows subjected to hot climatic conditions and supplemented with K well above minimum NRC recommendations (NRC, 2001) responded with greater milk yield (Mallonee et al., 1985, Schneider et al., 1984, West et al., 1987). However, the cow subjected to hot climatic conditions is often subject to a respiratory alkalosis due to panting, with subsequent renal compensation by increasing urinary excretion of bicarbonate and Na and renal conservation of K (Collier et al., 1982a). Although the respiratory alkalosis indicated by elevated blood pH suggests an excess of bicarbonate, the elevated pH actually results from a carbonic acid deficit created by CO_2 expiration due to panting (Benjamin, 1981). When the cow pants, bicarbonate (HCO_3^-) is converted to carbonic acid, which is broken down to CO_2 and water for expiration and excretion.

Feeding diets that have a high dietary cation-anion difference (DCAD) improved DMI and milk yield (Tucker et al., 1988; West et al., 1991). During heat stress conditions DMI was improved as DCAD was increased from 12.0 to 46.4 meq Na + K − Cl/100 g feed DM, regardless of whether Na or K was used to increase DCAD (West et al., 1992). This suggests that the DCAD equation is more significant than the individual element concentrations (barring deficiencies). Additional research is needed to more closely define the desired DCAD for lactating dairy cows and to resolve the issue of K vs. Na supplementation. Nutritional modifications to account for changing nutrient requirements are necessary to adjust for the impact of heat stress due to reduced DMI and altered nutrient requirements.

SUMMARY

Extended periods of high ambient temperature coupled with high relative humidity compromise the ability of the lactating dairy cow to dissipate excess body heat. Cows with elevated body temperature exhibit lower DMI and milk yield and produce milk with lower efficiency, reducing profitability for dairy farms in hot, humid climates. Although adequate cooling systems exist their efficiency in humid climates is less than in arid climates and these systems often lack the ability to maintain normal body temperature. Continued genetic selection for improved DMI and milk yield results in cows that are less heat tolerant, and coupled with the unknowns associated with global warming in the future, suggest that heat stress will become worse for dairies in the future. Improved cooling systems that are more efficient and that can cool cows at night when humidity is high are needed to meet challenges in the future. There is genetic variation in cattle for cooling capability, which suggests that more heat tolerant cattle can be selected genetically, and cross-breeding may also offer opportunities. Continued advances in feeding are needed as cattle are selected for greater milk yield, but are subject to lower intake because of environmental stress. Developing nutritional strategies which support yield but which also address metabolic and physiologic disturbances induced by heat strain will help the cow to maintain a more normal metabolism which should enhance performance.

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ATTACHMENT D

PEPSICO

Americas
Europe

3. Asia, Middle East & Africa

PepsiCo and Theo Muller Group Open Muller Quaker Dairy Yogurt Manufacturing Facility

U.S. Senator Chuck Schumer Joins PepsiCo CEO Indra Nooyi to Celebrate Facility Opening

Muller Quaker Dairy Facility Will Fuel National Distribution of Muller Yogurt

Expected to Become World's Largest LEED-certified Dairy Facility

BATAVIA, N.Y., June 3, 2013 /PRNewswire/ -- Muller Quaker Dairy, a joint venture between PepsiCo, Inc. (NYSE: PEP) and Theo Muller Group, today announced the opening of its new state-of-the-art yogurt manufacturing facility in Batavia, New York. The new facility, which will employ approximately 180 people, will serve as a national production and distribution center for Muller yogurt, which launched in select regional markets in 2012.

(Photo: http://photos.prnewswire.com/prnh/20130603/NY24994)

The facility opening was celebrated by United States Senator Charles E. Schumer, PepsiCo Chairman and CEO Indra Nooyi, Theo Muller Group owner Theo Muller, and various New York state and local officials.

"PepsiCo continues to perform at an extremely high level while simultaneously transforming our portfolio for the future and strengthening our position in high-growth food and beverage categories. We have invested over many years to expand our global nutrition offerings in ways that allow us to capitalize on new growth opportunities, and the new Muller Quaker Dairy facility demonstrates continued progress against this key business priority," said PepsiCo's Nooyi. "The Theo Muller Group is a tremendous partner whose deep dairy expertise has allowed our joint venture to enter the U.S. market with a delicious product that our consumers absolutely love. Thanks to the support of Senator Schumer and other leaders at the state and local levels, Muller Quaker Dairy has found a great home here in Batavia."

"I am thrilled to be here in Batavia as PepsiCo and the Theo Muller Group open one of the country's largest yogurt production facilities. The Muller Quaker Dairy operation will massively benefit New York's dairy producers and it has helped to make New York State the nation's yogurt capital," said Senator Schumer. "I have long fought to provide communities throughout New York, like Genesee County, with the federal resources and infrastructure they need to land new jobs and attract new employers. This event speaks to what those efforts can achieve. The future is bright here at the Genesee Valley Agri-Business Park, where I know that Muller Quaker Dairy and other companies, can grow, create jobs and thrive."

"Expanding our brand from Europe to the U.S. has been a long-time goal," said Theo Muller. "We are proud to partner with PepsiCo on this important business venture and we look forward to years of success in this country."

As the fastest-growing dairy category in the U.S., yogurt is a $6.2 billion industry that continues to climb.* Muller Quaker Dairy will help satisfy increasing demand for value-added dairy products in the U.S., where per capita consumption of yogurt is generally less than half that of Europe.**

The more than 350,000 square foot facility will have three production lines initially, which can produce more than 120,000 cups of yogurt per hour. The facility can accommodate up to eight production lines with room for future expansion. The company is targeting LEED certification for the facility, which would make it the largest LEED-certified dairy manufacturing plant in the world.

The facility sits on 82-acres of land in what has become one of the most concentrated milk producing and processing regions in the country. Muller Quaker Dairy will source milk for the yogurt products locally. Products manufactured at the plant will include Muller® Corner®, Muller® Greek Corner® and Muller® FrutUp™ varieties.

Formed in 2011, the Muller Quaker Dairy joint venture brings together the complementary strengths of two successful global companies.

- PepsiCo brings scale as the largest food and beverage business in the U.S. and has leading innovation-driven research and development programs, a robust go-to-market system, and superior marketing and brand recognition across its portfolio of 22 billion-dollar brands.
- The Quaker Oats Company, a unit of PepsiCo, brings one of the most trusted brands in the world and is known for wholesome breakfast and snack foods that provide nutritional benefits throughout the day.
- Theo Muller Group has decades of category-leading innovation and dairy expertise, having grown to become Germany's largest privately held-dairy business, and one of Europe's most well-known yogurt producers.

During today's ceremony, U.S. Senator Schumer, Indra Nooyi and Theo Muller opened a giant ceremonial Muller Corner Crunchy Granola, led a collective Muller FrutUp yogurt toast and officially unveiled the Muller Quaker Dairy building sign to mark the grand opening of the new facility. They were joined by state and local government and community dignitaries, Batavia community representatives, members of local and national dairy organizations and employees.

For more information, visit www.mullerquaker.com, Facebook www.facebook.com/mullerquaker or Twitter www.twitter.com/mullerquaker.

For video of the event, visit http://youtu.be/veBt9sz2oFM.

MULLER is a registered trademark of the Muller Group and is used under license. QUAKER is a trademark of The Quaker Oats Company and is used under license.

*Source: Mintel Group Ltd. Yogurt and Yogurt Drinks, U.S. 2012
**Source: Euromonitor International's Passport data, U.S. and Western Europe, 2012

About Theo Muller Group
Theo Muller Group is a German multinational dairy company, headquartered in Luxembourg, which has been producing popular yogurt and other products for more than 100 years. Founded as a family dairy farm in 1896 by Ludwig Muller, today his grandson Theo owns the hugely successful business. www.muellergroup.com.

About The Quaker Oats Company
The Quaker Oats Company, headquartered in Chicago, is a unit of PepsiCo, Inc., one of the world's largest consumer packaged goods companies. For more than 130 years, Quaker's brands have served as symbols of quality, great taste and nutrition. Holding leadership positions in their respective categories, Quaker® Oats, Quaker® Rice Cakes and Quaker Chewy® Granola Bars are consumer favorites. For more information, please visit www.QuakerOats.com, www.Facebook.com/Quaker or follow us on Twitter @Quaker.

About PepsiCo, Inc.
PepsiCo is a global food and beverage leader with net revenues of more than $65 billion and a product portfolio that includes 22 brands that generate more than $1 billion each in annual retail sales. Our main businesses – Quaker, Tropicana, Gatorade, Frito-Lay and Pepsi-Cola – make hundreds of enjoyable foods and beverages that are loved throughout the world. PepsiCo's people are united by our unique commitment to sustainable growth by investing in a healthier future for people and our planet, which we believe also means a more successful future for PepsiCo. We call this commitment Performance with Purpose: PepsiCo's promise to provide a wide range of foods and beverages from treats to healthy eats; to find innovative ways to minimize our impact on the environment by conserving energy and water and reducing packaging volume; to provide a great workplace for our associates; and to respect, support and invest in the local communities where we operate. For more information, please visit www.pepsico.com.

<u>PepsiCo Cautionary Statement</u>
Statements in this communication that are "forward-looking statements" are based on currently available information, operating plans and projections about future events and trends. Terminology such as "believe," "expect," "intend," "estimate," "project," "anticipate," "will," "expressed confidence," "position," or similar statements or variations of such terms are intended to identify forward-looking statements, although not all forward-looking statements contain such terms. Forward-looking statements inherently involve risks and uncertainties that could cause actual results to differ materially from those predicted in such forward-looking statements. Such risks and uncertainties include, but are not limited to: changes in demand for PepsiCo's products, as a result of changes in consumer preferences and tastes or otherwise; changes in the legal and regulatory environment; PepsiCo's ability to compete effectively; PepsiCo's ability to grow its business in emerging and developing markets or unstable political conditions, civil unrest or other developments and risks in the markets where PepsiCo's products are sold; unfavorable economic conditions in the countries in which PepsiCo operates; increased costs, disruption of supply or shortages of raw materials and other supplies; failure to realize anticipated benefits from PepsiCo's productivity plan or global operating model; disruption of PepsiCo's supply chain; damage to PepsiCo's reputation; failure to successfully complete or integrate acquisitions and joint ventures into PepsiCo's existing operations or to complete or manage divestitures or refranchisings; PepsiCo's ability to hire or retain key employees or a highly skilled and diverse workforce; trade consolidation or the loss of any key customer; any downgrade or potential downgrade of PepsiCo's credit ratings; PepsiCo's ability to build and sustain proper information technology infrastructure, successfully implement its ongoing business transformation initiative or outsource certain functions effectively; fluctuations in foreign exchange rates, climate change, or legal, regulatory or market measures to address climate change; failure to successfully renew collective bargaining agreements or strikes or work stoppages; any infringement of or challenge to PepsiCo's intellectual property rights; and potential liabilities and costs from litigation or legal proceedings.

For additional information on these and other factors that could cause PepsiCo's actual results to materially differ from those set forth herein, please see PepsiCo's filings with the Securities and Exchange Commission, including its most recent annual report on Form 10-K and subsequent reports on Forms 10-Q and 8-K. Investors are cautioned not to place undue reliance on any such forward-looking statements, which speak only as of the date they are made. PepsiCo undertakes no obligation to update any forward-looking statements, whether as a result of new information, future events or otherwise.

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July 22, 2013

Via email: erasmussen@fedmilk1.com
Mr. Erik F. Rasmussen
Federal Milk Market Administrator
Northeast Marketing Area
89 South Street, Suite 301
Boston, MA 02111-2671

Re: Request to reduce shipping percentage pursuant to 7 C.F.R. Section 1001.7(c)(2)

Dear Mr. Rasmussen:

This letter is submitted on behalf of the Greater Northeast Milk Marketing Agency (GNEMMA) in response to your solicitation of comments with respect to a request to reduce the shipping percentage pursuant to 7 C.F.R. Section 1001.7(c)(2) for the months of September, October, and November 2013. The dairy cooperative members of GNEMMA are: Agrimark, Inc., Dairylea Cooperative Inc., Dairy Farmers of America, Inc., Land O'Lakes, Inc., Maryland and Virginia Milk Producers Cooperative Association, Inc., St. Albans Cooperative Creamery, Inc., Upstate Niagara Cooperative, Inc. and Dairy Marketing Services LLC. All of these organizations are qualified cooperative associations marketing producer milk on Order 1.

For the reasons which follow, GNEMMA does not oppose the reduction of the shipping percentage from 20% to 15% as provided in Section 1001.7 (c)(2) for the limited time period of September through November 2013.

Market conditions in the Order this year are somewhat unsettled. Class I sales in Federal Order 1 during the first six months of the 2013 calendar year have fallen from 4.879 billion pounds in 2012 to 4.735 billion pounds, a decline of three percent. At the same time, total producer milk in the Order has increased from 12.480 billion pounds in 2012 to 12.994 billion pounds, an increase of over four percent. This has combined to drop the cumulative Class I utilization percentage from 39.1% during this six month period in 2012 to 36.4% in that same period this year. At this point, it appears that these trends are likely to continue into this autumn.

A large handler has already closed one pool distributing plant in Maine and the closing of at least one more Order 1 pool distributing plant in the southern portion of the marketing area has been announced and will occur within the next 60 days. There have also been changes by some large retail grocery chains in the Northeast in fluid milk suppliers, which add to the unsettled nature of the fluid milk marketplace.

All these factors contribute to the uncertainty that may affect individual distributing plant demand for pool milk from pool supply plants or cooperative handlers and, thus, the relative appropriate minimum shipping percentage in the Order.

The northeast marketplace is also undergoing significant changes relative to the expansion and/or construction of several large dairy manufacturing plants. Anticipated completion within the next year or two could escalate the demand for producer milk in the Northeast and possibly create milk availability issues for pool distributing plants in the future. In addition, normal supply and demand conditions often change from year to year in the Northeast. We therefore want to underscore GNEMMA's position not to oppose the lowering of the shipping percentage applies exclusively to the months of September, October and November 2013 and to no other current or future time periods.

Thank you for considering our comments.

Very truly yours,

Marvin Beshore

MB: amb
cc: (via email only)
Peter Fredericks (pfredericks@fedmilk1.com)
GNEMMA member cooperatives