NNY Agricultural Development Program
2006-2007 Project Report

Factors Affecting Milk Component Production in NNY Dairy Herds

Project Leaders:
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Collaborators:

- C. M. Ryan – Field Research Technician – Cornell University
- J. Tauzel – CCE summer student intern - Cornell University
- Cooperative Extension Educators – Extension educators in all 6 counties participated in this project.
- Cooperating feed industry professionals – A total of 29 feed representatives from 16 feed companies were involved in this project. These individuals cooperated by providing detailed ration formulation information for participating dairy herds.
- Cooperating milk processing plants – Bulk tank milk composition data for the participating dairy herds was obtained from 10 milk processors.

Cooperating Producers:
A total of 52 cooperating dairy producers from the 6-county region were involved in this project. Farms from all 6 counties were included in this project. The participation of these herds and their willingness to share data was essential to the completion of this project.

Background:
Milk components (fat, true protein) are key determinants of the price received for each 100 lbs. of milk produced on NNY dairy farms. On the majority of these farms, milk sales are the primary source of income. The multiple component pricing (MCP) system uses prices for each component in milk to determine the total milk price. These individual component values are set monthly by the Federal Milk Marketing Order administrator based on use levels of milk for the various products such as fluid milk, butter, cheese and soft dairy products. The December 2007 component prices for the Northeast Marketing Order (Federal Milk Order No. 1) are:

- Protein = $4.7061/lb.
- Butterfat = $1.4348/lb
- Other solids = $0..2637/lb

Table 1 contains the calculated milk price for a 100-cow dairy herd selling 70 lbs. of milk per cow. This herd would be shipping 7,000 pounds of milk per day. Using the milk prices in Table 1, an increase of 0.1% in both milk fat and protein represents an increased monthly income of $1,290 for this herd. This is equal to an additional $15,480 milk income per year. Since milk component prices are adjusted monthly, these differences in prices and income with varying milk component levels could be larger or smaller than the numbers in this example. However, small changes in milk component levels do have a measureable effect on farm milk income a constant level of milk production.

Table 1. Milk price and milk income for a dairy herd with varying milk component levels

Milk fat,%	Milk True Protein, %	Milk Price, $/100 lbs.	Daily Milk Income, $	Monthly Milk Income, $
3.4	2.9	20.06	1404	42120
3.5	3.0	20.67	1447	43410
3.6	3.1	21.28	1490	44700
3.7	3.2	21.90	1533	45990

Milk fat and protein levels in a specific herd are determined by a large number of factors rather than 1 or 2 key determinants. They can be broadly divided into genetic and environmental factors. Heritability estimates indicate that genetics accounts for 50-55% of the difference between cows in terms of milk fat or protein percent. The remainder of the variation is due to environmental factors that include nutrition, age, season and stage of lactation. The nutrition program is one management area that can be controlled to change the percent fat and protein in milk. Milk fat can be altered up to 1 percentage point while milk protein can only be changed by about 0.2 – 0.4 points by nutritional management. Thus, the objective of this study was to examine nutritional and management factors that might be related to differences in milk fat and protein levels in NNY dairy herds.

Methods:

Dairy herds in NNY with varying levels of milk fat and protein were selected for this study. One method of selection was to use published DHI records to identify herds. In addition, Cooperative Extension educators and feed industry professionals were asked to assist in identifying herds for this project. The following base criteria were used in selecting potential herds:

- Holstein herds that are on DHI.
- Herds had to be feeding a total mixed ration (TMR)
- A daily milk production average of > 65 lbs. of milk/cow/day or a rolling herd average of >21,000 lbs. of milk/cow.
- Herd milk fat and protein levels. In an attempt to obtain herds across a spectrum of milk component levels, milk fat % was the main measure used to select herds.

Once a herd was selected, arrangements were made with the herd owner for a farm visit to collect samples and information. When possible, Extension educators were involved in the farm visit component of this project. The following information was obtained at the farm visit:

- Release forms, signed by the herd owner, to permit access to DHI and milk plant component records.
- A survey for housing and management practices used on the farm
- Cows in the herd were visually scored for body condition, hock scores, lameness and rumination activity.
- A bulk milk tank sample was obtained for milk fatty acid analysis.
- Samples of the current forages and TMR being fed were collected.
- Ration information and ingredient composition of the grain mix being fed.
- A water sample was taken for each herd.

Forage, TMR and water samples were sent to Dairy One for analysis. Milk samples were analyzed for fatty acids in the Department of Animal Science. Forage and TMR particle size were determined using the Penn State Particle Separator and the Z-Box developed at the Miner Institute. All rations were evaluated using the CPM-Dairy (Cornell – University of Pennsylvania – Miner Institute) ration model.

The statistical approach used in analyzing the trial results were a combination of regression analysis and analysis of variance (ANOVA). The regression technique provides a method to assess the proportion of the total variation that can be accounted for by one or more variables. The ANOVA approach provides a method to test statistical differences between means.

Results:

The herds used in this project were from herds averaging 326 cows/herd and 75.9 lbs. of milk/cow/day. There were 16 herds with < 100 cows, 19 herds with 100 to 300 cows, 7 herds with 300 to 600 cows and 10 herds with >600 cows. Seventeen herds were housed in tie-stall barns while 35 were housed in free-stalls. There were 24 herds that milked cows twice a day while 28 herds milked three times a day.

Average milk fat in these herds was 3.47 with a range of 2.7 to 4.2%. Twenty-one herds had <3.4% milk fat. Nineteen herds had milk fat of 3.5 or 3.6%. Twelve herds had >3.6% milk fat. Average milk true protein was 3% with a range of 2.8 to 3.3%. Four herds had <2.9% milk protein while 32 herds had milk protein of 2.9 or 3%. There were 16 herds with a milk protein content of >3%.

All herds in this study fed some type of haycrop silage while there were 4 herds that fed no corn silage. Thirty of the herds fed some type of dry forage. A variety of concentrate energy sources were fed with corn grain being predominant. Corn meal was fed in 36 herds while 19 herds fed high moisture corn. Some level of soybean meal was fed to all 52 herds. A rumen buffer was fed in 42 herds.

There were no significant relationships between number of cow per herd or herd average daily milk production and milk fat content in this study. There were only a few factors that had a statistically significant relationship with milk fat content. These were included corn silage particle size as determined with the Z-box, starch content of corn silage and the NDF content of the corn silage. The only significant relationships found with milk protein were the ration starch or NFC levels. A significant relationship was also detected between milk fat content and milk C18:1 t10 levels. Herds with lower milk fat levels had higher levels of the C18:1 t10 fatty acid in milk. This finding confirms that the lower milk fat in these herds was related to alterations in fatty acid metabolism in the rumen.

The lack of finding a single nutritional factor that was responsible for lower milk fat in these herds is disappointing but not surprising. Since milk fat and milk protein are the end result of many interacting factors, it is unlikely that a single factor would be defined as the cause of lower milk component levels. There are a number of feed management factors that could also be involved but it was not possible to measure them as part of this

study. The relationships listed above regarding corn silage are interesting and need additional investigation.

Conclusions/0utcomes/Impacts:

The basic conclusion from this study is that one nutritional factor could not be elucidated as the cause of lower milk component levels in the 52 herds in this study. There were some components related to corn silage that appear interesting and need some additional examination.

Outreach:

The outreach component of this project is just starting since the last data was collected in late November. Reports with individual farm data have been provided to some farms. The outreach effort will include providing an individual report to each farm with their specific information. Copies of a final report publication will be provided to each farm, Extension educators and feed industry professionals that participated in this project. A short summary and presentation will be put together and used as a basis for dairy producer meetings in the individual counties. The results of this project will also be presented to feed industry professionals at the 2008 NY Feed Dealer Seminars.

Next Steps:

1. Some additional statistical procedures need to performed with this data examining the potential of multi-factor relationships that might be related to milk component levels.
2. The individual farm reports need to be completed and provided to the cooperating dairy producers.
3. An Animal Science mimeo will be written as the final report for this project.
4. Short, executive summary type information pieces need to be written and made available.
5. Dairy producer meetings in Northern NY need to be organized in conjunction with our Extension educators.
6. A presentation needs to be placed on the agenda for the 2008 Feed Dealer seminar series in New York.
7. The information gained from this study will be used to assist in developing an approach for on-farm investigation of herds with low milk components and will be used as a guide for designing future field studies investigating this problem.

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For Additional Information:

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