Precision Feed Management – What Have We Learned?

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Why?

- 1. Improve dairy farm profitability.
- 2. Improve the efficiency of nutrient use.
- 3. Decrease nutrient excretion into the environment (soil, water, air).
- 4. Help to comply with environmental regulations.

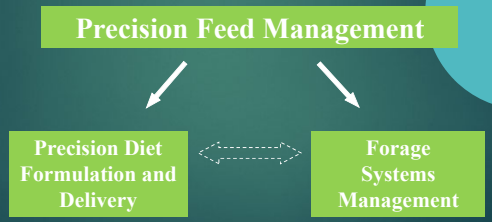
What is Precision Feed Management (PFM)?

- Definition by NY PFM Working Group
- "The continual process of providing adequate, but not excess, nutrients to the animal and deriving a majority of nutrients from homegrown feeds through the integration of feeding and forage management for the purpose of maintaining environmental and economic sustainability"

New York PFM Working Group

- Established to develop a unified approach to evaluate and quantify Precision Feed Management (PFM) on dairy farms.
- Developed 2 tools:
  - PFM benchmarks
  - Spreadsheet to calculate nutrient intake, nutrient excretion, feed cost and returns over feed cost.

The Components of Precision Feed Management



New York PFM Benchmarks

Ration P, % of required	< 110
Ration CP, %	< 16.5
MUN, mg/dl	8 – 12
F-NDF, % of BW	> 0.9
Forage DM, % of ration DM	≥ 60
Home produced feeds, % of ration DM	≥ 60
Cows dead or culled , < 60 DIM	< 8%

Nutrients Regulated

- Nitrogen -
  - Water
  - Air emissions (ammonia)
- Phosphorus -
  - Water
- Methane – The next one.

How Do Cows Partition Nutrients?

- Excrete in milk.
- Excrete in manure.
  - Store in body reserves.

What Is The Opportunity?

- 1450 lb. cow, 70 lbs. milk, 47 lbs. DMI
- Lower ration CP % by 1 unit =
  - 27.5 lbs./cow/year of N excreted in the manure
- Lower ration P by 0.05% =
  - 8.5 lbs./cow/year of P excreted in the manure

What if This Change Was Done to All Cows in New York?

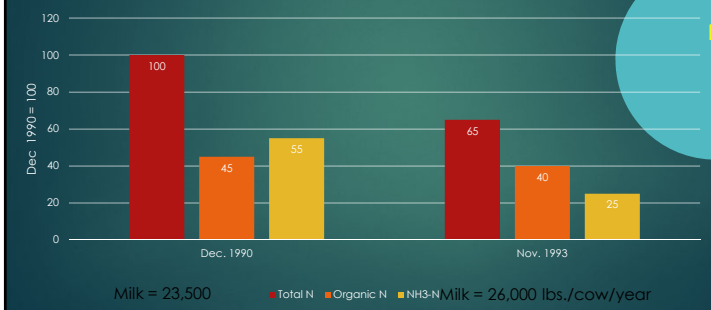
- 17.1 million less pounds of N excreted in the manure.
- 8.5 million less pounds of P excreted in the manure.

Based on 622,000 milking cows.

Dairy Farm Sustainability Project

- Whole farm project – 1990-1993.
- 2 large high producing herds in Cayuga county.
- 16 Cornell faculty from 9 departments.
- Included –
  - Rations and feeding management.
  - Crops – rotations, fertilization, harvest management.
  - Whole farm mass nutrient balance.
  - Water quality.
  - Manure management.
  - Economics.

Nitrogen Excretion – Herd A



Decreases -
Total N = 34%
Organic N = 15%
NH3-N = 45%

Milk = 23,500

Milk = 26,000 lbs./cow/year

What Else Did We Learn?

- Feed cost could be reduced and income over feed cost increased by lowering N and P in the rations with no negative effects on milk production.
- Excretion of N and P in the manure was reduced.
- Manure NH3 was dramatically reduced.
- Whole farm mass balance was improved since nutrient imports to the farm were decreased.
- Overall farm profitability improved.

Other NY PFM Efforts

- Delaware County has been doing a lot of work on farms due to the concerns of water quality in the New York City Watershed.
- The Central NY Dairy and Field Crops Team has done a number of farms.
- There has been some effort by the NW NY Regional Dairy, Livestock and Field Crops team.
- NRCS is in the process of developing a program to partially fund PFM work on dairy farms.
- We did a project with 18 farms to develop base information to assist NRCS.

Delaware County PFM Project – 2014 – 2017.

- 9 dairy herds in Delaware, Tioga and Broome counties.
- Herd size = 30 to 600 cows.
- Milk production = 28 to 87 lbs./cow/day.
- Mix of herd forage and feeding programs and housing type.
- 5 fed total mixed rations.
- One herd feeds forage only (no grain is fed).
- Used fixed milk and feed prices in the economic analysis.

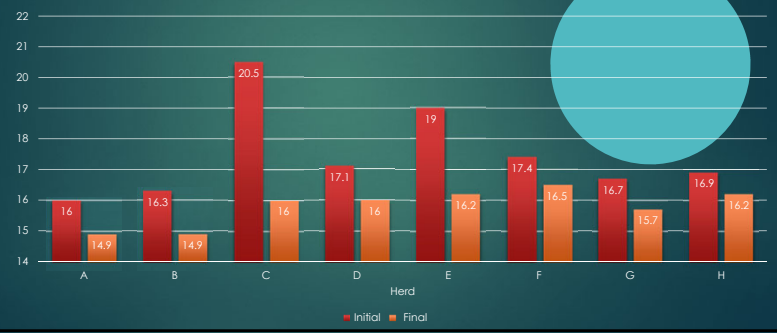
Delaware County Project - 2

- Rations were formulated by nutritionists working with the herds.
- 5 feed companies, 2 nutrition consultants.
- PFM staff visited herds to collect feed samples, cow information, milk and feed prices.
- PFM plans were written and approved by NRCS.
- Each herd had to contribute a portion of the total project cost.

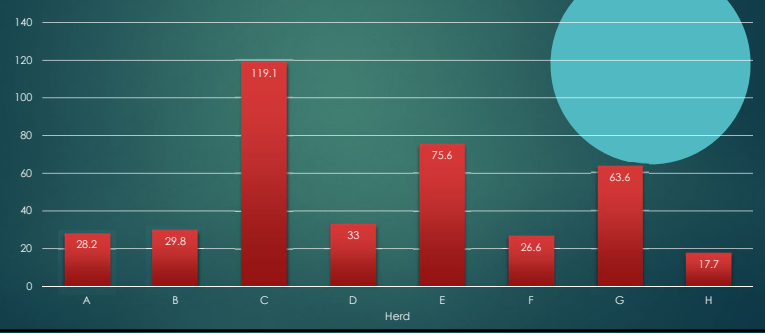
Results

- All herds were at or below the PFM benchmark for P at the beginning of the trial.
- Lowered ration CP by 1.8% (range = 0.7 to 4%).
- Decreased manure N excretion by 15% (range 5 to 29%).
- Decreased manure N excretion by 60 g/cow/day (48 lbs./cow/year).
- Increased income over purchased feed cost by 40 cents/cow/day ($146/cow/year).

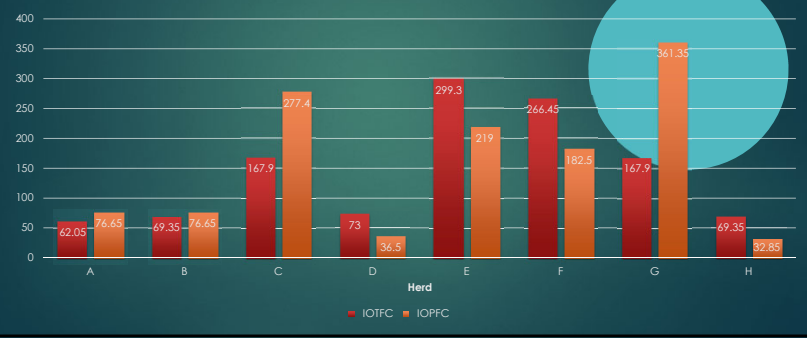
Ration CP, %



Decrease in Manure N Excretion, lbs./cow/year



Change in IOTFC and IOPFC, $/cow/year



Adding a Low Group Ration

- Herd with 576 milking cows, 85-87 lbs. milk/cow/day.
- Were feeding 2 rations (fresh, high) to the milking cows.
- Worked with the herd consultant and added a "low" cow TMR.
- No change in milk production.
- Feed cost decreased by 65 cents/cow/day.
- This is $30,842 per group per year for a 130 cow group.

EZ Acres: a 5 year research project on a 600 cow dairy

Case Farm Example - Tylutki & Fox

- 500 cow farm, 72-74 lbs. milk/cow/day
- Total animals = 922
- Milking cows = 448
- Dry cows = 100
- Replacements = 374
- Initial P balance = +67%
- Added about 100 milking cows over 5 years.

Potential for precision feed management[1]

	Purchased Feed Cost, $/day	Milk Shipped, lbs./day	Nitrogen, lb./year	Phosphorus, lb./year
Before	1813	27,622	309,043	43,435
After	1375	40,167	256,349	31,192
% change	-34.2	+45	-17.1	-28.2

[1]Tylutki PhD thesis, 2002. Results of a 5 year research project on a 600 cow dairy.

Changes in Whole Farm Mass Nutrient Farm Mass Nutrient Balance

- Cela et. sl., 2015.
- 4 NY case study herds.
- 8 – 10 years of WFMNB data.
- Improved whole farm and feed nutrient use efficiency.
- Maintained or increased milk production.
- Purchased feed nutrients was the main driver for change in WFMNB.
- Highlights importance of PFM.

Summary

- Work to date has indicated that the development and implementation of PFM plans on dairy farms is a win-win for both the farm and the environment.
- Nutrient imports to the farm and ration nutrient levels can be reduced while at least maintaining milk production.
- Nutrient excretion to the environment can be reduced.
- Whole farm nutrient balance can be improved.
- Farm profitability can be increased.

Thanks!