Lowering dietary protein in commercial herds: Case study

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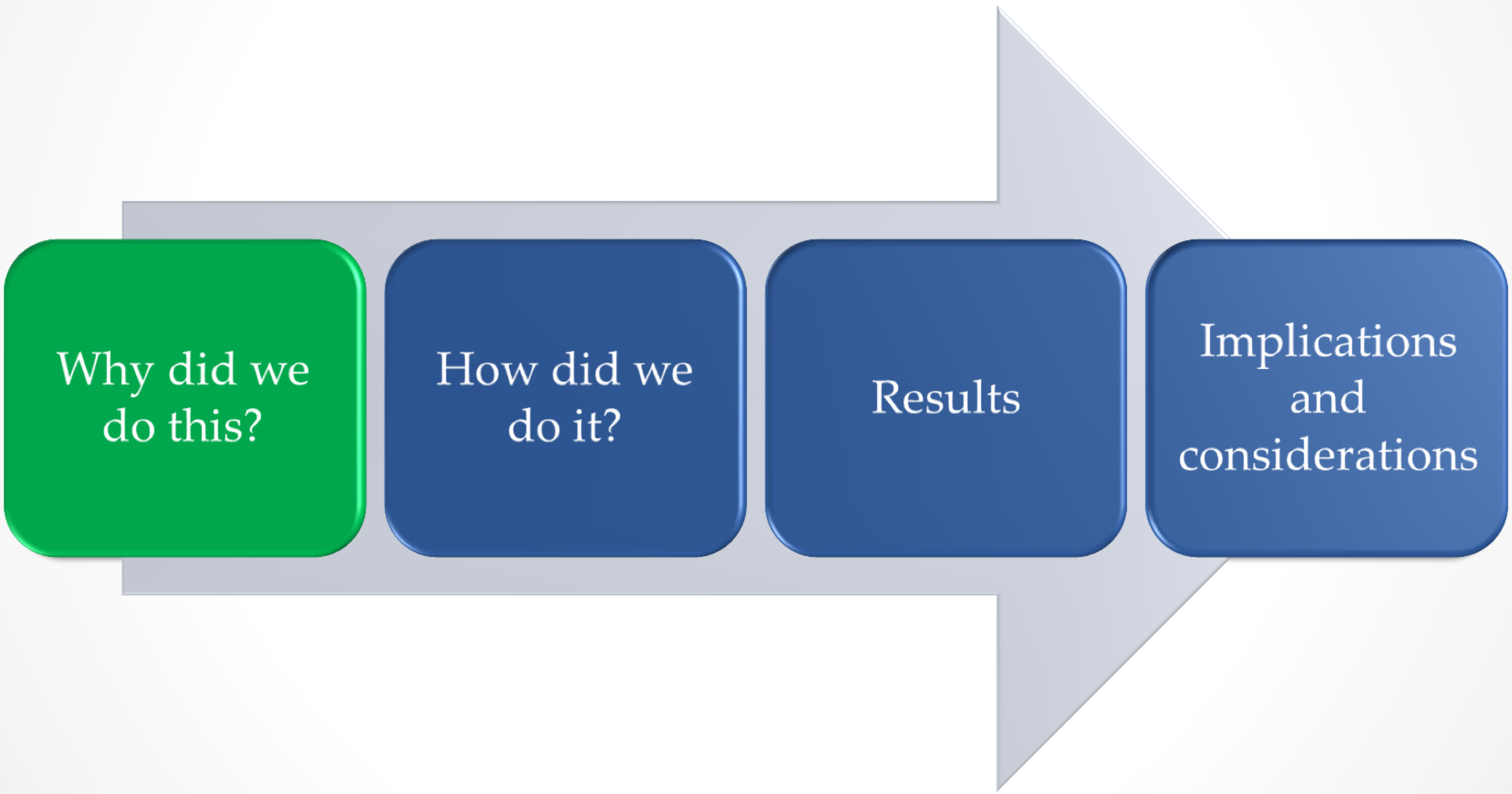
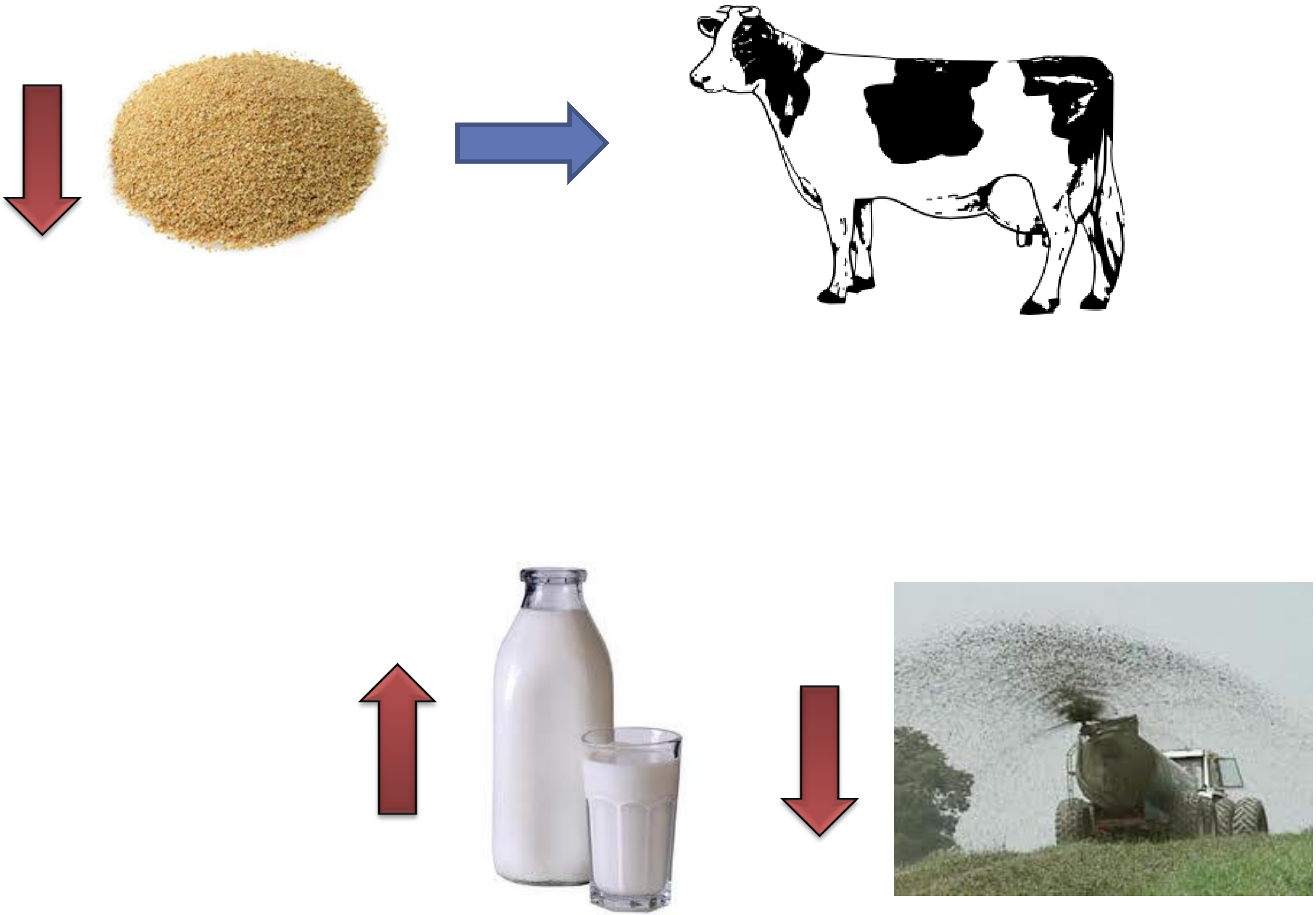

Why did we do this?
How did we do it?
Results
Implications and considerations

Study objectives

1. Improve nitrogen utilization on commercial dairy farms
2. Validate CNCPS biology in the field

Why improve N utilization?



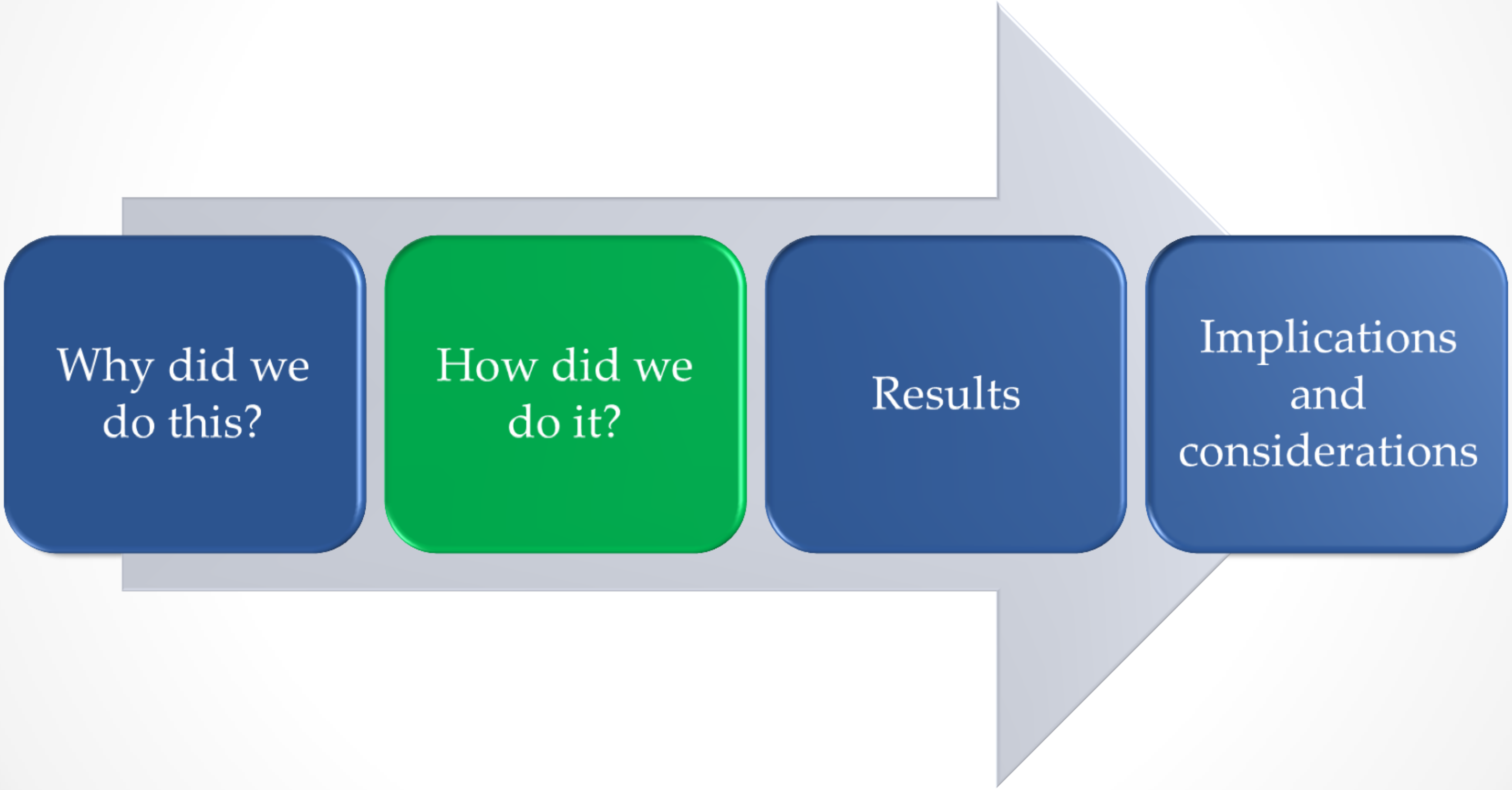
Why improve N utilization?

1. Improve profitability!!
    - Lower feed costs (in most cases)
    - Improve income over feed costs
2. Improve the efficiency of N use in the dairy cow
3. Decrease N excretion to the environment
    - Decreases crop acres needed for N application
4. Decrease ammonia release potential from manure

CNCPS validation

- Changes were made to the CNCPS to make it more sensitive to nitrogen

- Field based studies were required to validate the changes in the field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Farm selection

- Two progressive nutritionists from western NY were approached to participate in the study
- Each was asked to select a herd from their group with the following characteristics:
    1. High milk (>80 lbs/cow/d)
    2. Consistent management
    3. Opportunity to reduce protein intake

Farm descriptions

	Farm A	Farm B
Number of milking cows	400	600
Ration	TMR	TMR
Source of forages	Home grown	Home grown
bST use	Eligible cows	Eligible cows
Milking regime	2 X	2 X
Housing	Free stall	Free stall

Observation period

- Initial farm visits were used to collect the information required to model the farm in the CNCPS
  - BW, BCS, stage of lactation, days pregnant, DMI, feed analyses, milk production, milk components etc.
- Farms were monitored for 2 months prior to any dietary changes
  - This was important to get to know the farm and understand the management
  - Perspective was also gained on typical levels of variation on each farm

Experimental period

- After the observation period, rations were re-balanced with lower levels of crude protein
  - Farm visits were made once every 2 months
  - Close contact with the farms nutritionist was maintained between visits
  - Dietary changes were made to meet study objectives, but also in response to forage changes
  - Bulk tank MUN was monitored as an independent indicator of N utilization

What Did We Change?

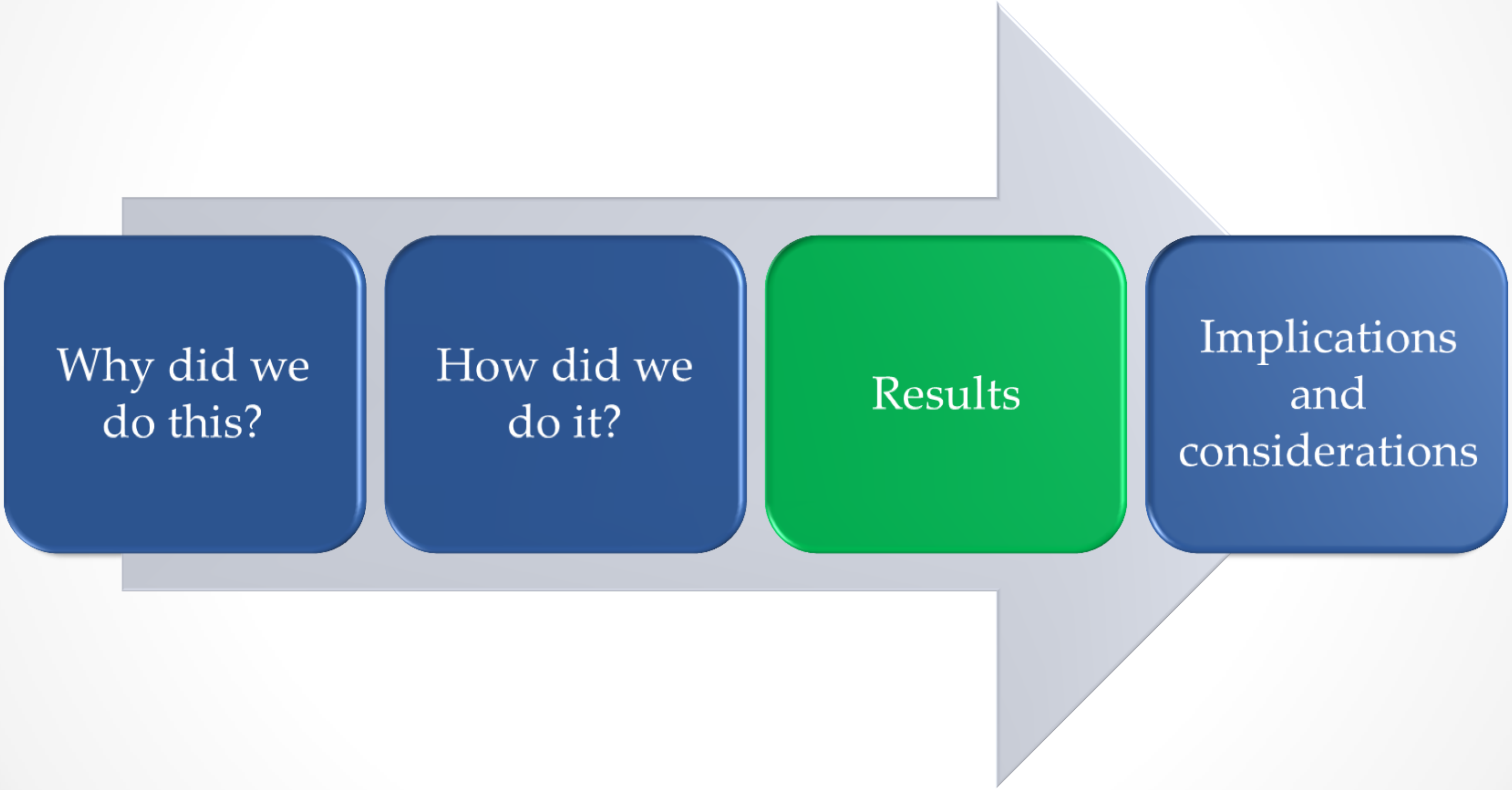
- Herd A
  - Increased corn silage, less HCS
  - Increased ration forage (54 to 57%)
  - Decreased SBM, steam flaked corn, bypass fat
  - Switched high moisture corn for corn meal
- Herd B
  - Increased corn silage
  - Added some high moisture corn, decreased corn meal
  - Increased soy hulls, lowered bypass fat

Herd A changes

Farm B	Initial	Final
Corn silage	17.5	21.3
Haylage	12.3	8.7
Corn grain, flaked	4.4	1.3
Corn grain, ground finely	3.5	0.0
Distillers	3.5	3.1
Soybean meal	3.1	1.7
Corn gluten feed, dry	1.8	1.8
Soybean hulls	1.8	1.6
Minerals and vitamins	1.6	1.6
Soy Pass	1.3	1.3
Wheat middlings	1.3	1.5
Bakery by-products	0.9	0.0
Blood meal	0.7	0.7
Corn gluten meal, 0.6	0.3	0.3
Molasses cane	0.2	0.2
Megalac	0.2	0.0
High-moisture corn	0.0	7.7
Total	**54.5**	**52.8**

Herd B changes

Item	**Initial**	**Final**
Corn silage	16.2	14.9
Haylage	12.5	9.0
Corn grain, flaked	6.4	4.4
Canola meal	4.1	3.1
Soybean meal	1.7	1.8
Dry hay	1.7	0.9
Soybean hulls	1.5	3.6
Minerals and vitamins	1.5	1.6
Molasses cane	1.3	1.2
Wheat middlings	0.9	1.3
Blood meal	0.9	0.7
Megalac	0.7	0.3
Corn gluten meal, 0.6	0.6	0.6
Corn gluten feed, dry	0.4	0.4
Soybeans, rolled roasted	0.4	0.7
Fat tallow beef	0.3	0.2
Urea	0.02	0.00
Alimet	0.02	0.02
High-moisture corn	0.0	6.8
Total	**51.0**	**51.6**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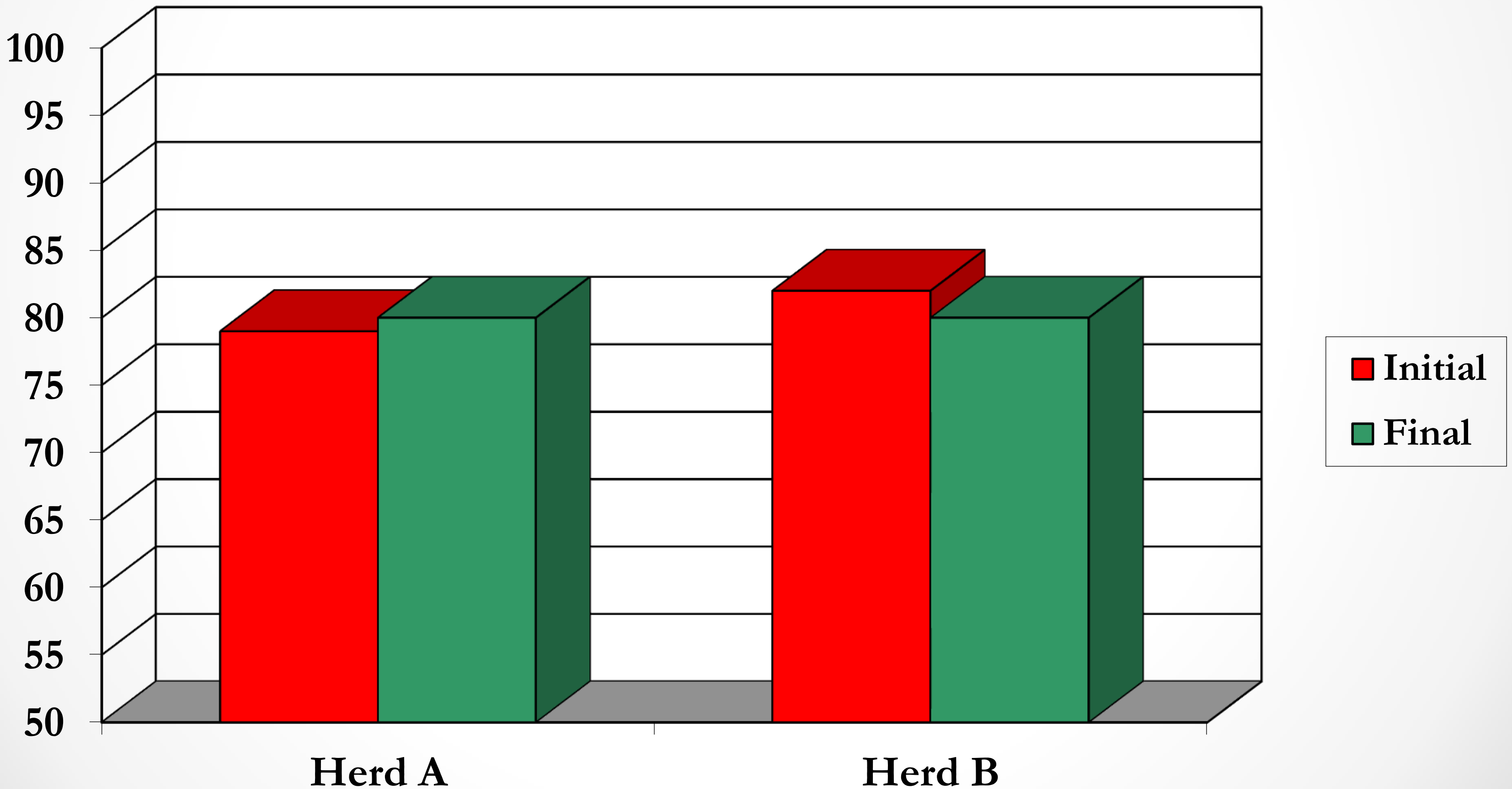
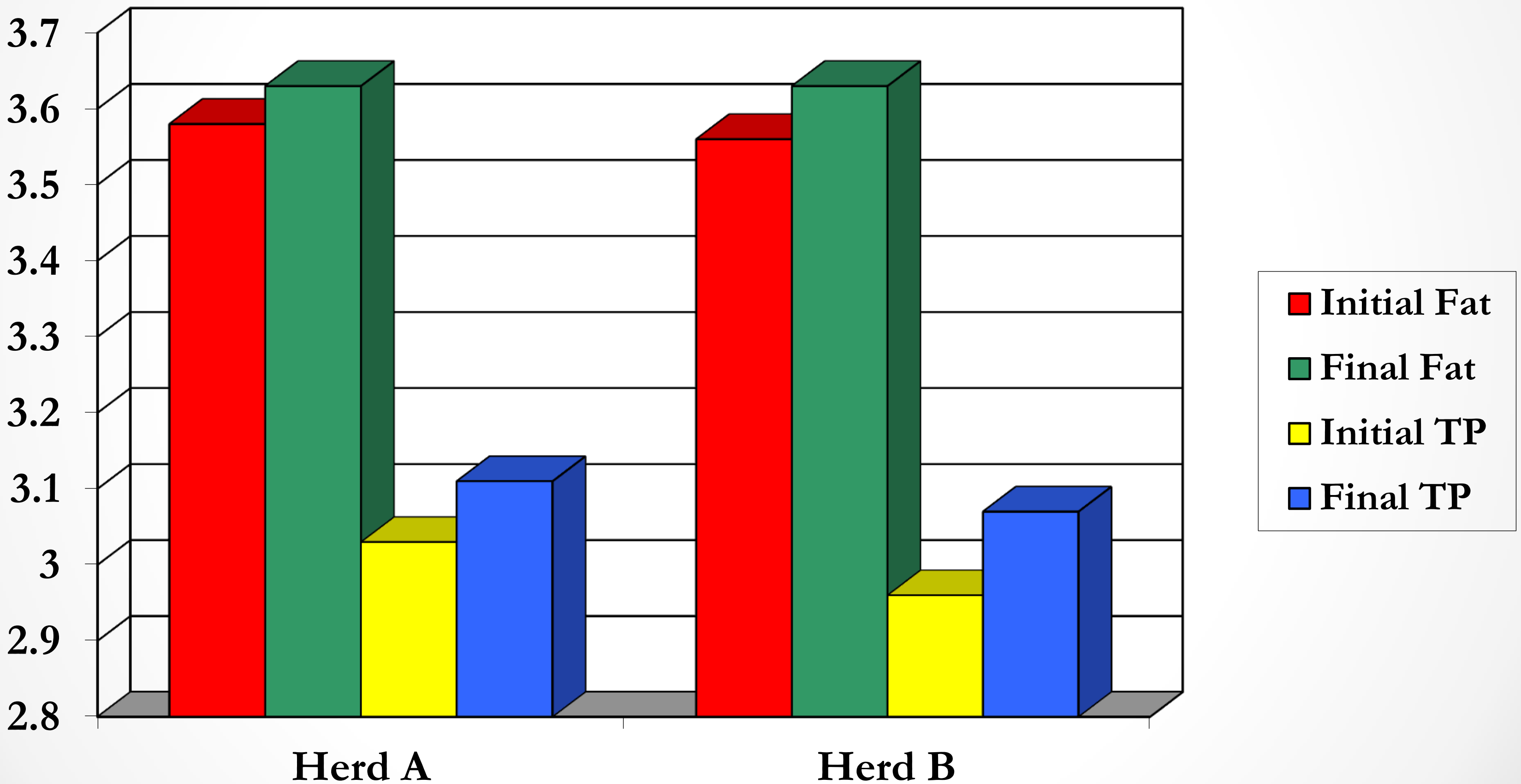
Herd Milk, lbs/cow/day

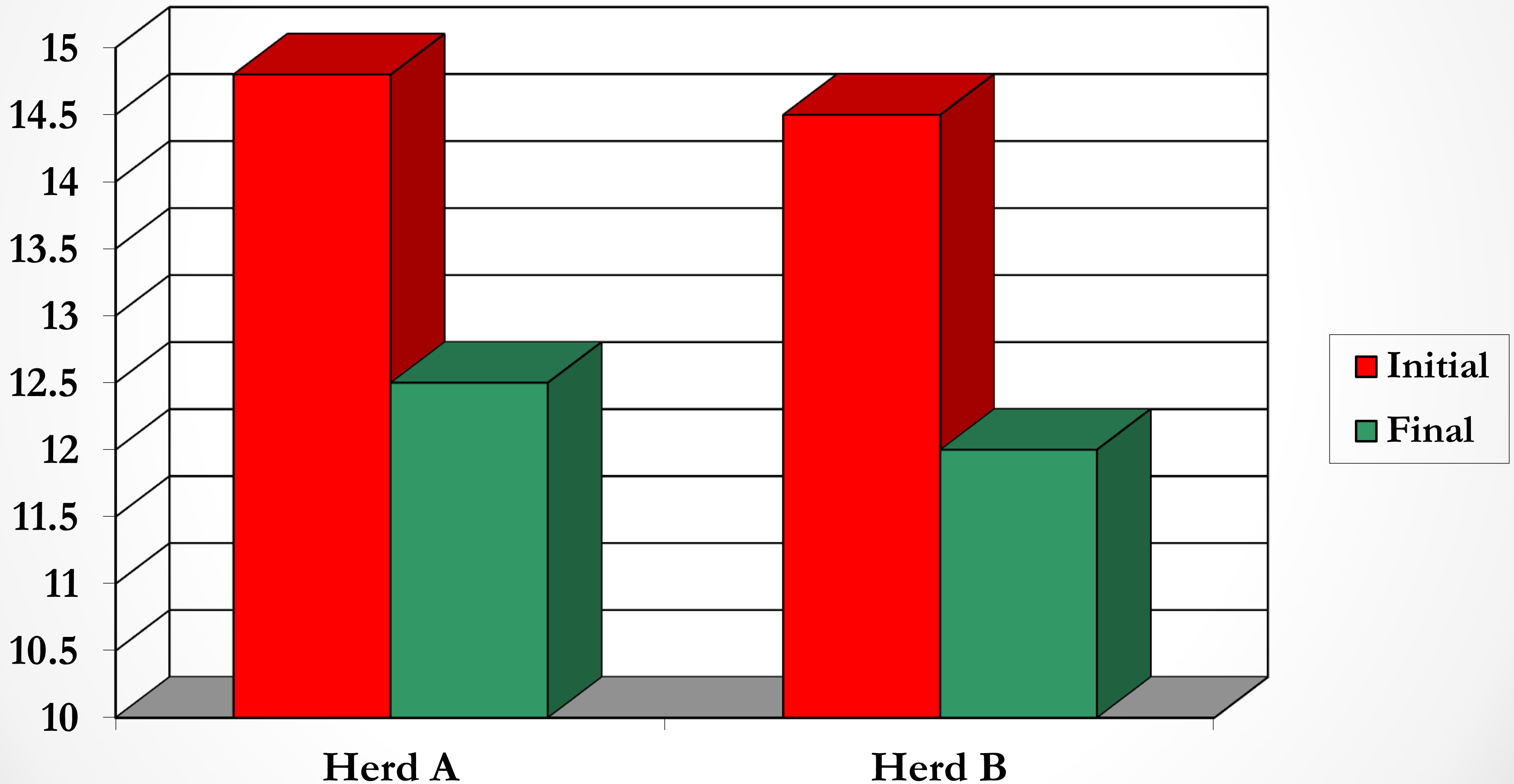


Milk Fat and Protein (%)



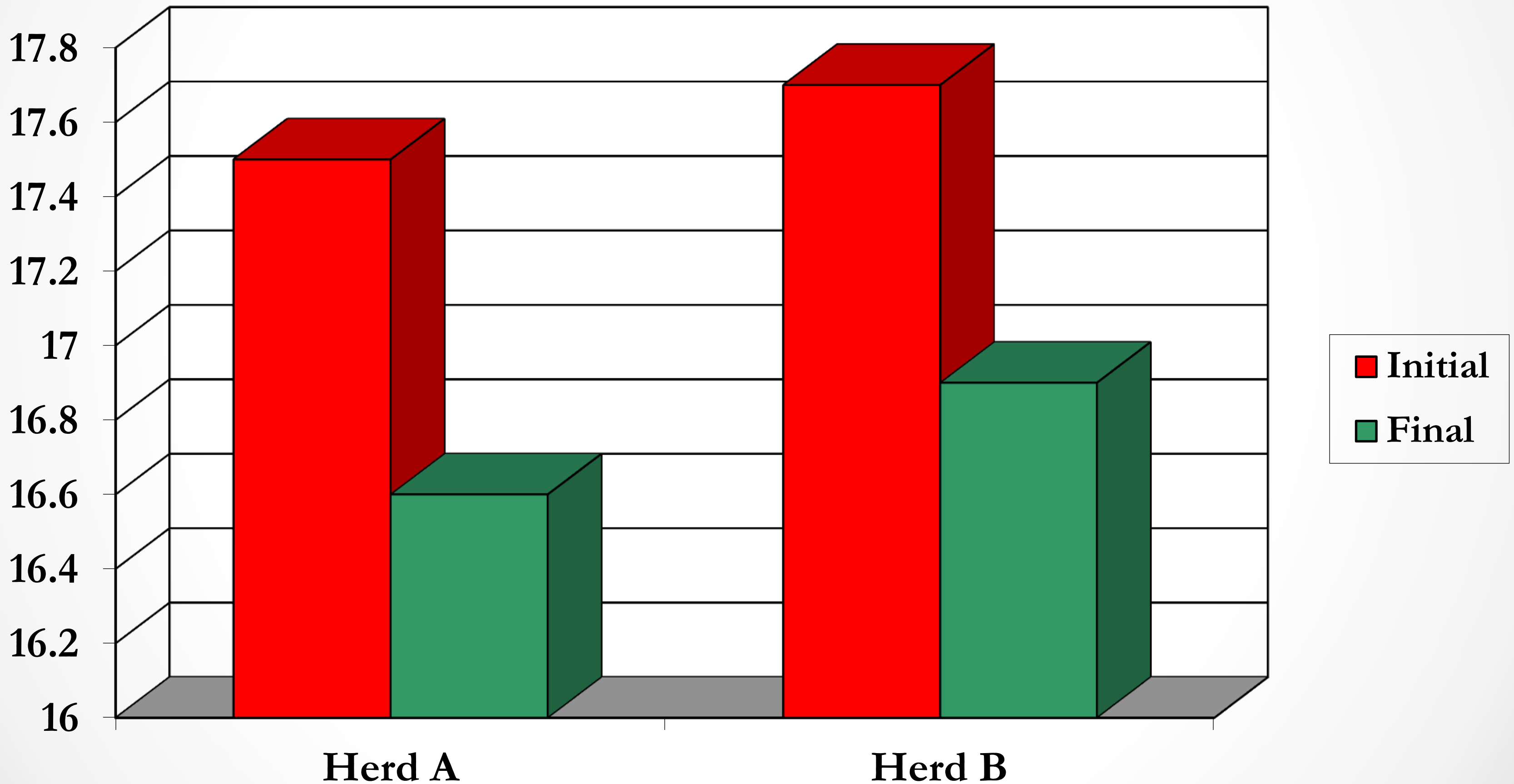
Milk true protein increased about 0.1 points

Milk Urea Nitrogen, mg/dl

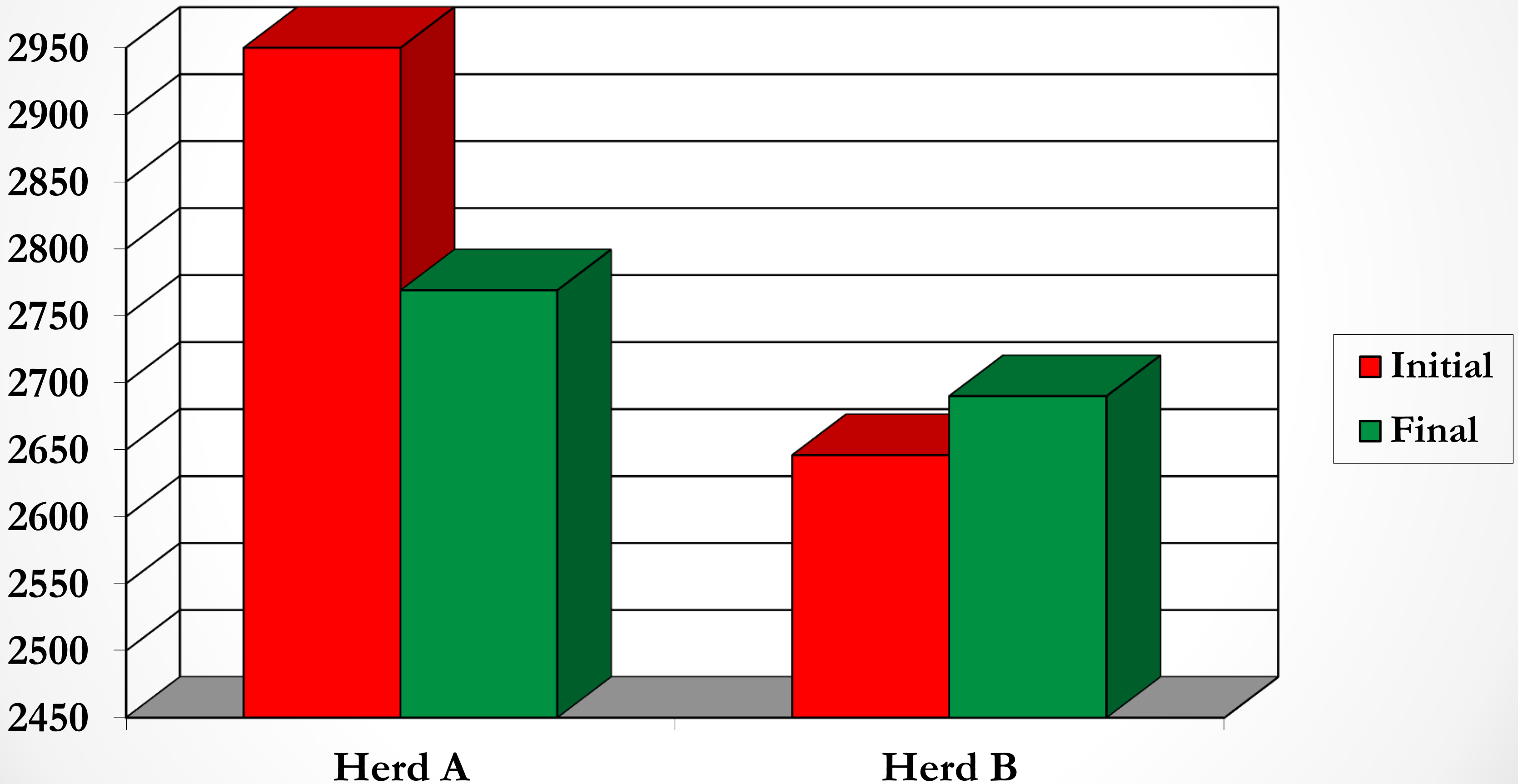


Based on daily bulk tank data

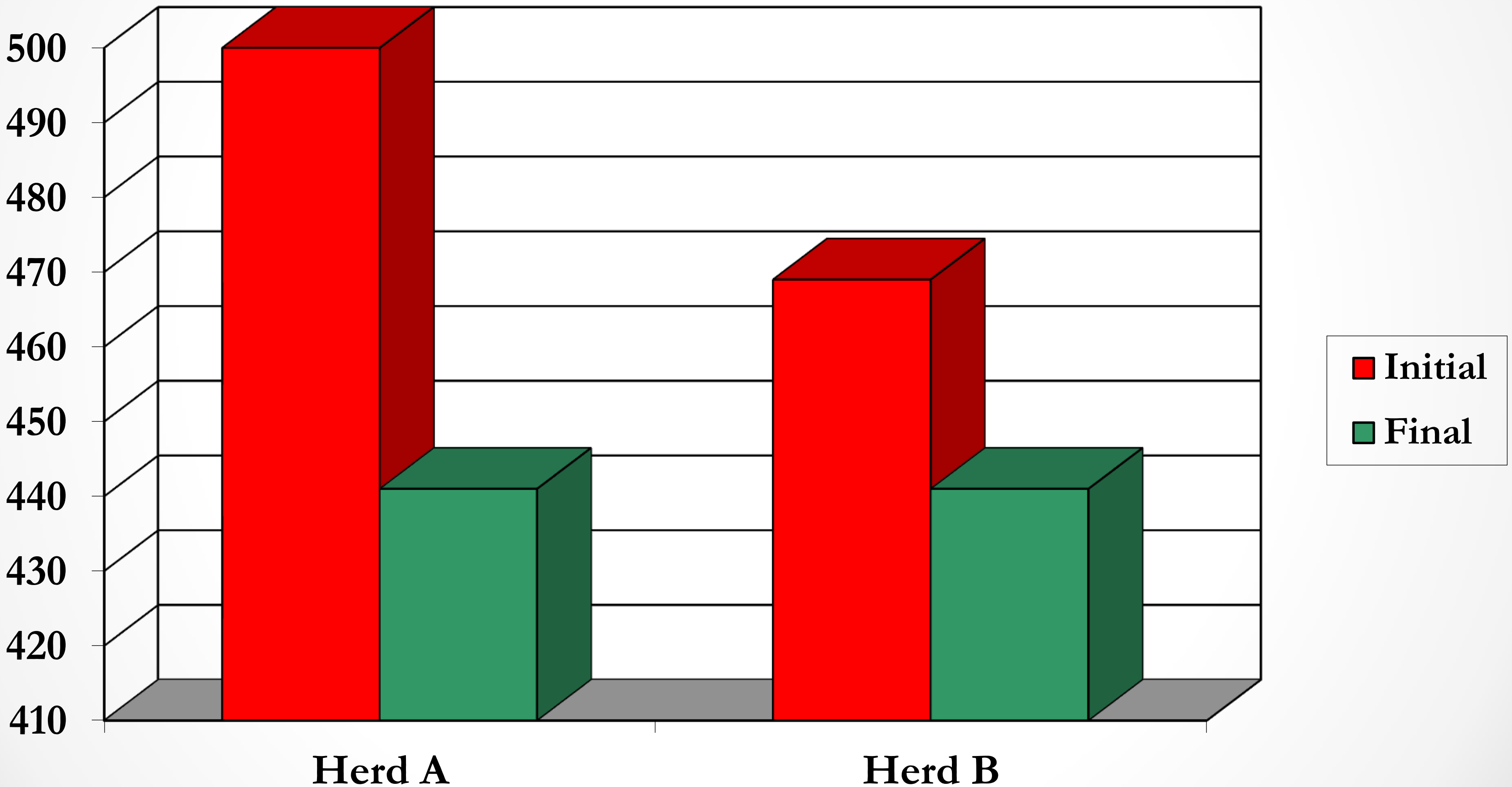
Ration CP, %


17.8
17.6
17.4
17.2
17
16.8
16.6
16.4
16.2
16
Herd A
Herd B
Initial
Final

Ration MP, g/cow/day



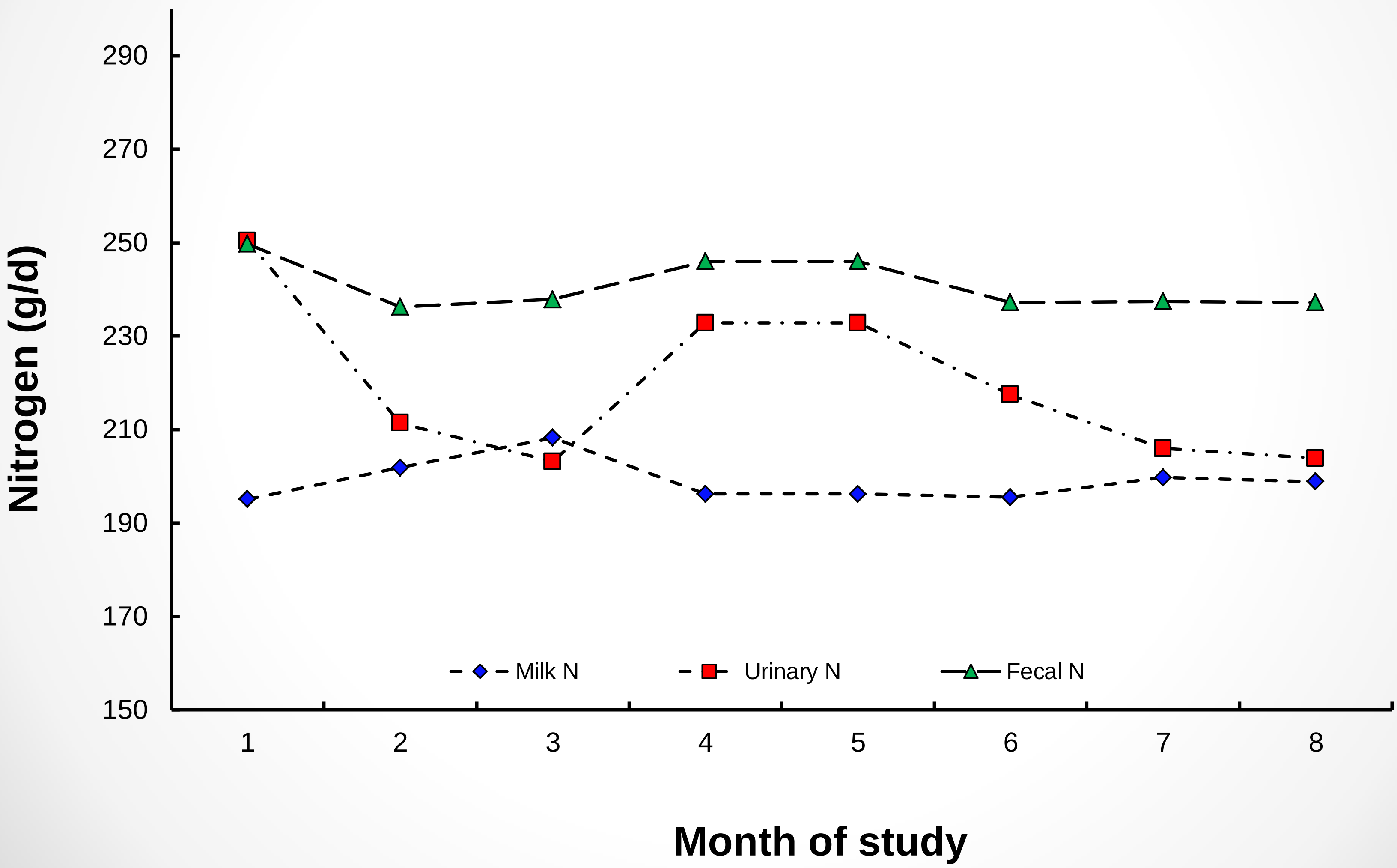
Total Manure N Excretion, g/cow/day

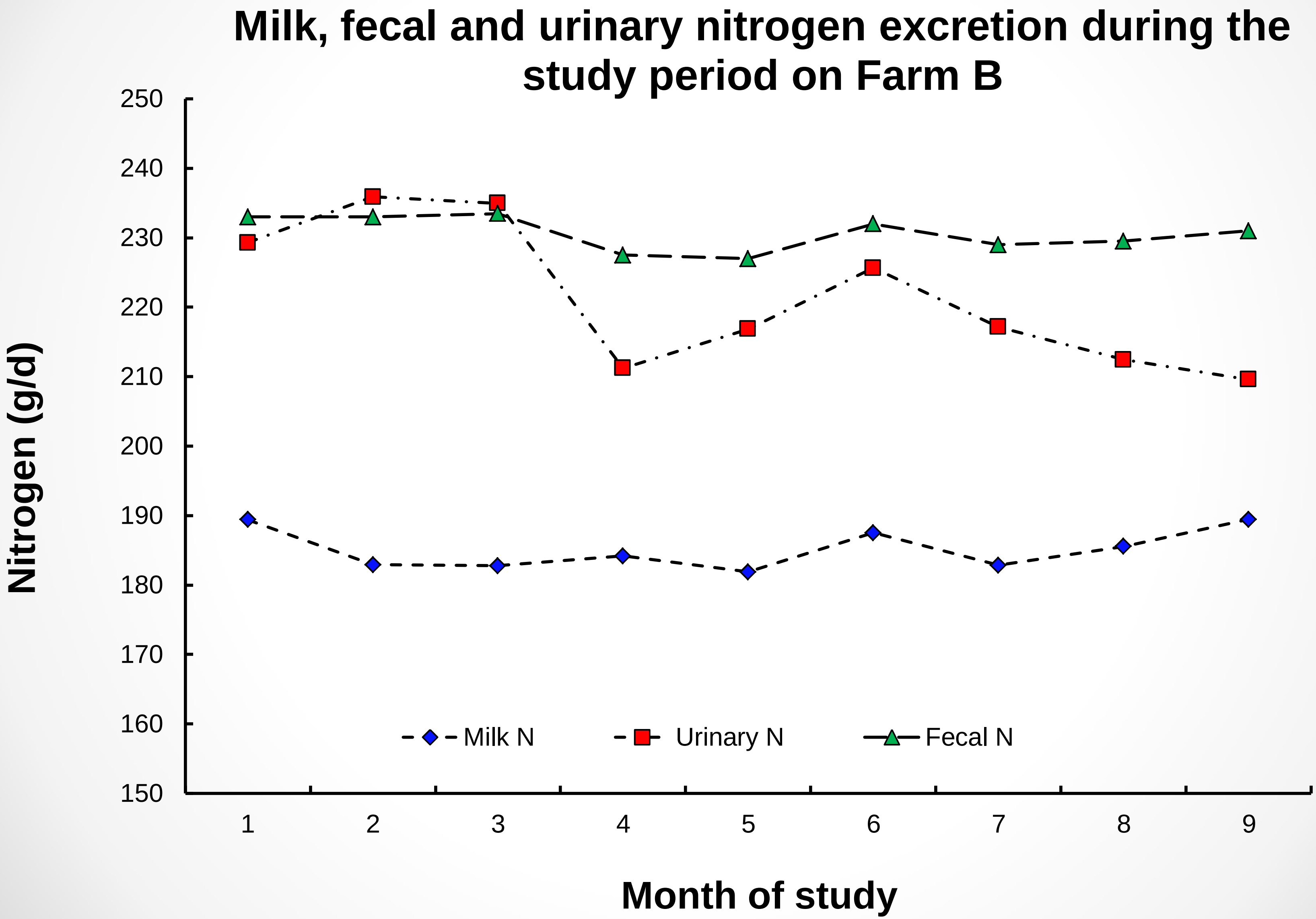


- 59 g

-28 g

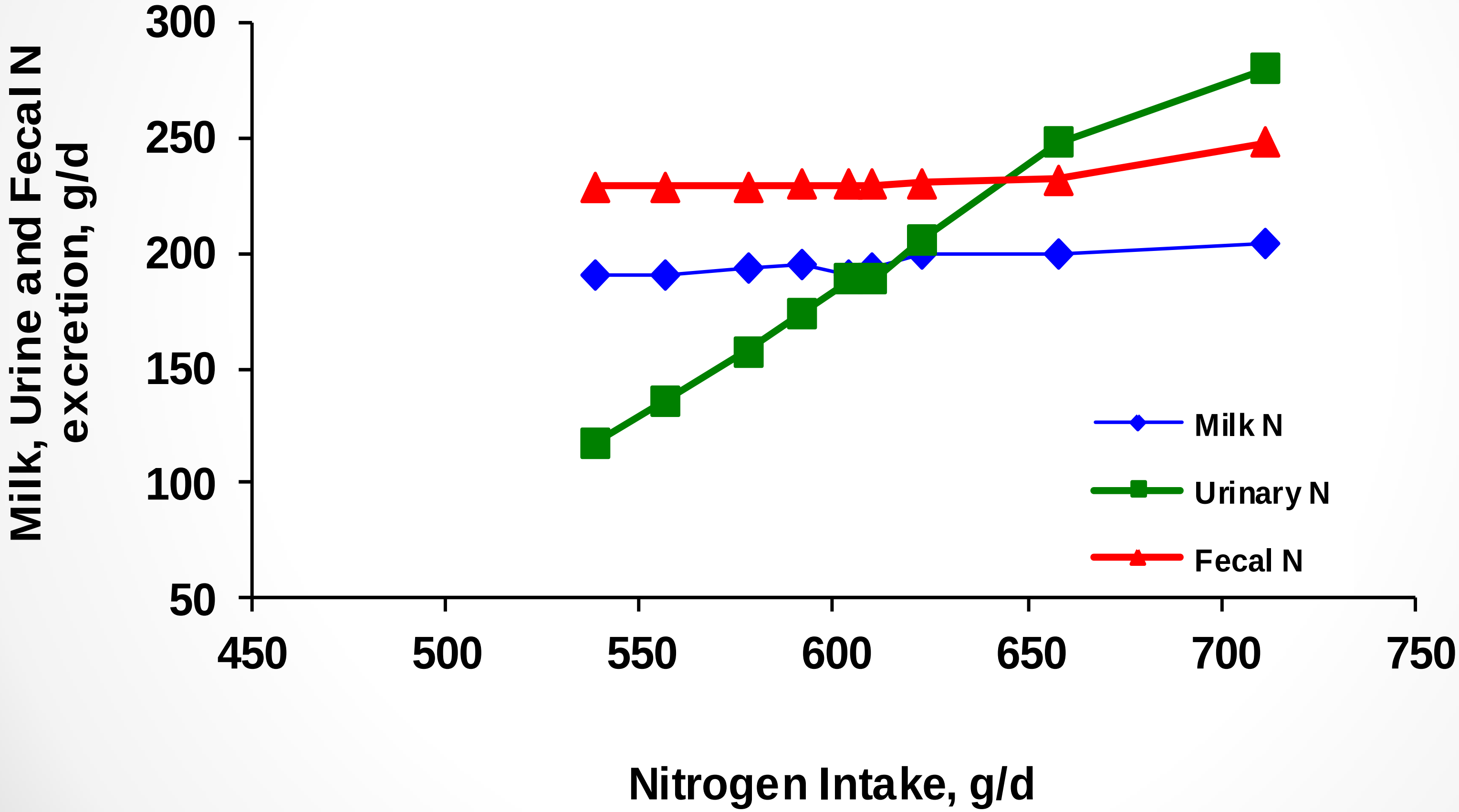
Milk, fecal and urinary nitrogen excretion during the study period on Farm A





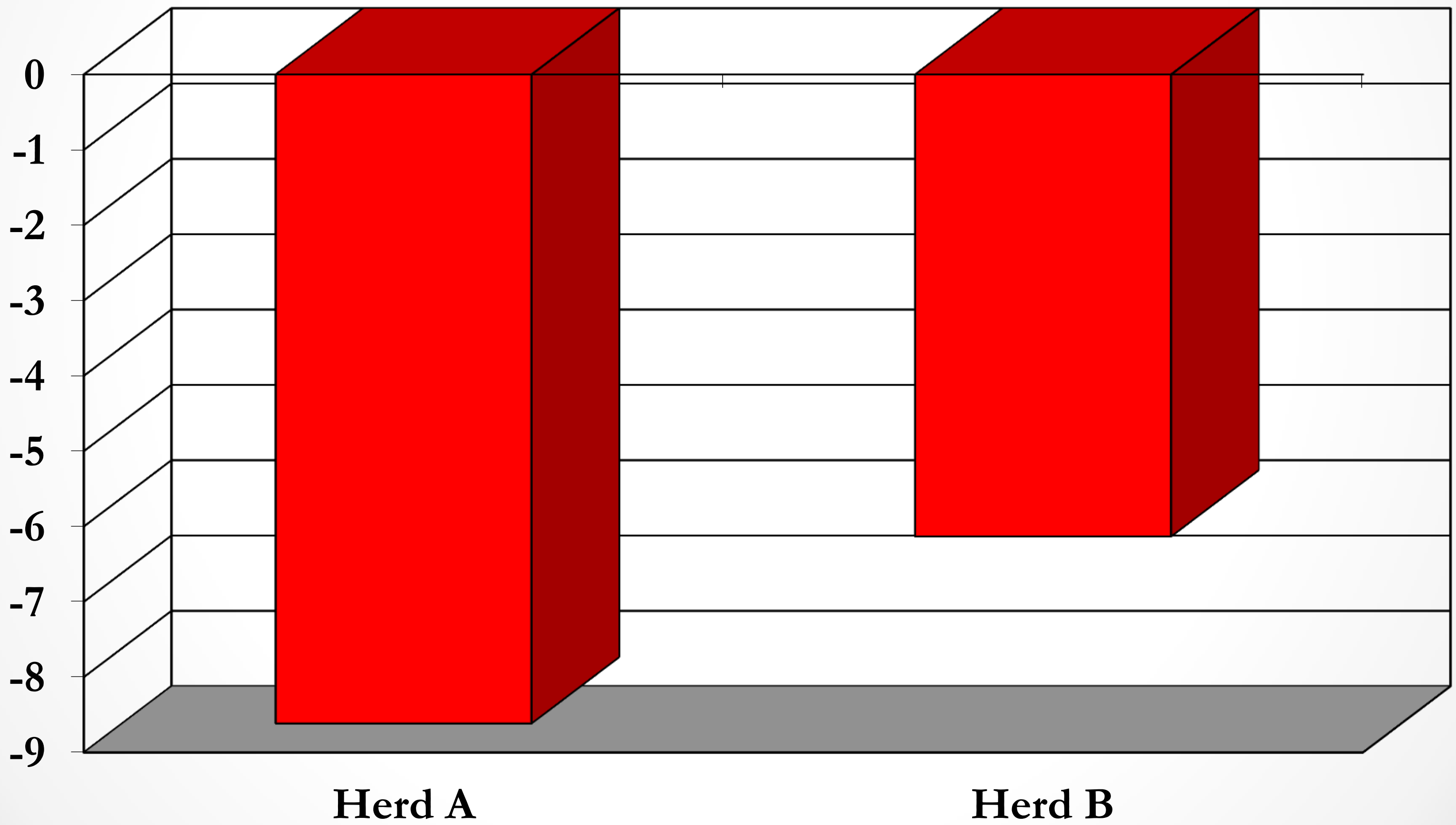
Milk, fecal and urinary nitrogen excretion during the study period on Farm B
Nitrogen (g/d)
250
240
230
220
210
200
190
180
170
160
150
1
2
3
4
5
6
7
8
9
Milk N
Urinary N
Fecal N
Month of study

Nitrogen Excretion in Milk, Feces and Urine Based on N Intake in Lactating Dairy Cattle

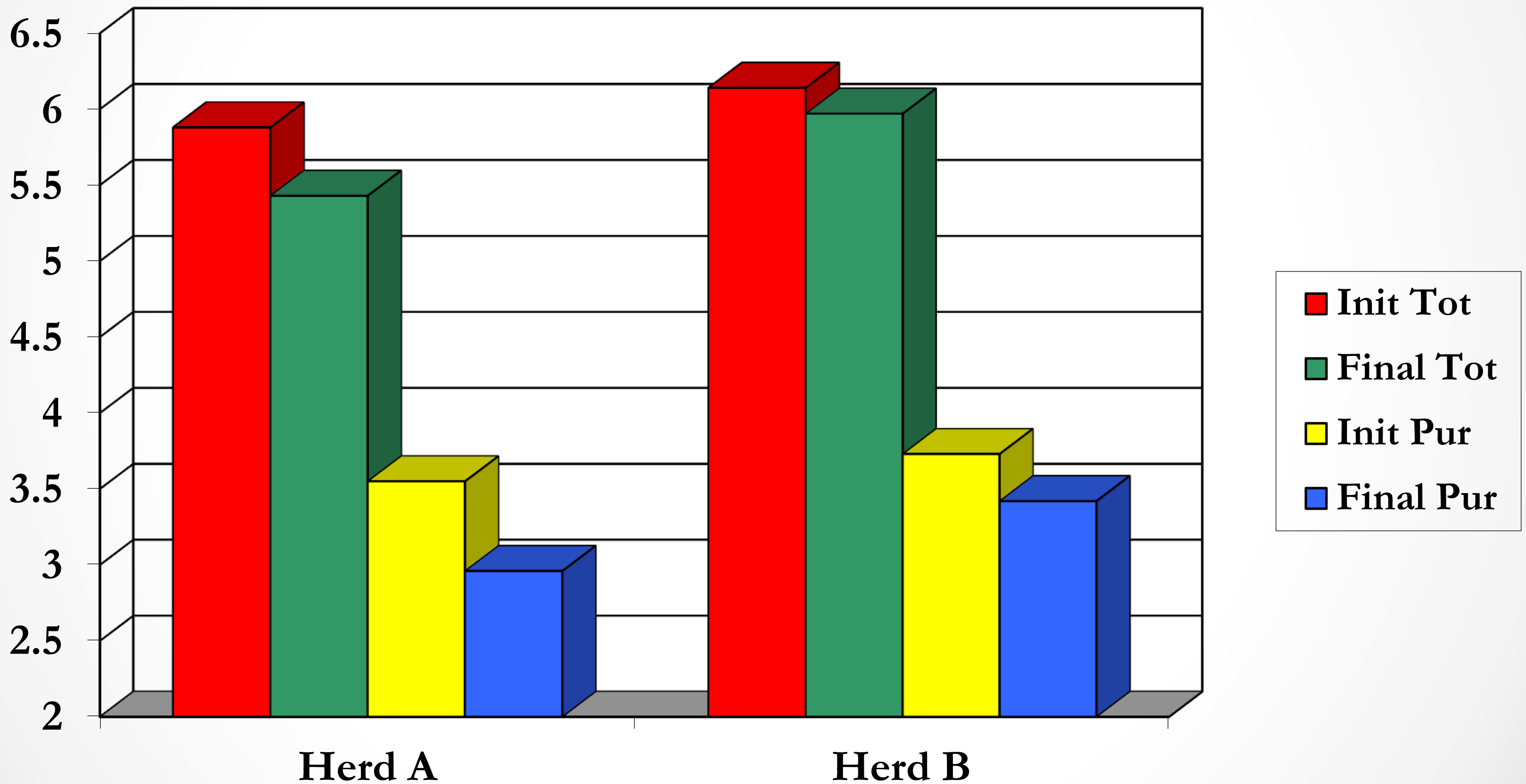


Source: Dr. Mike Van Amburgh

Change in N Excretion/Year, Tons



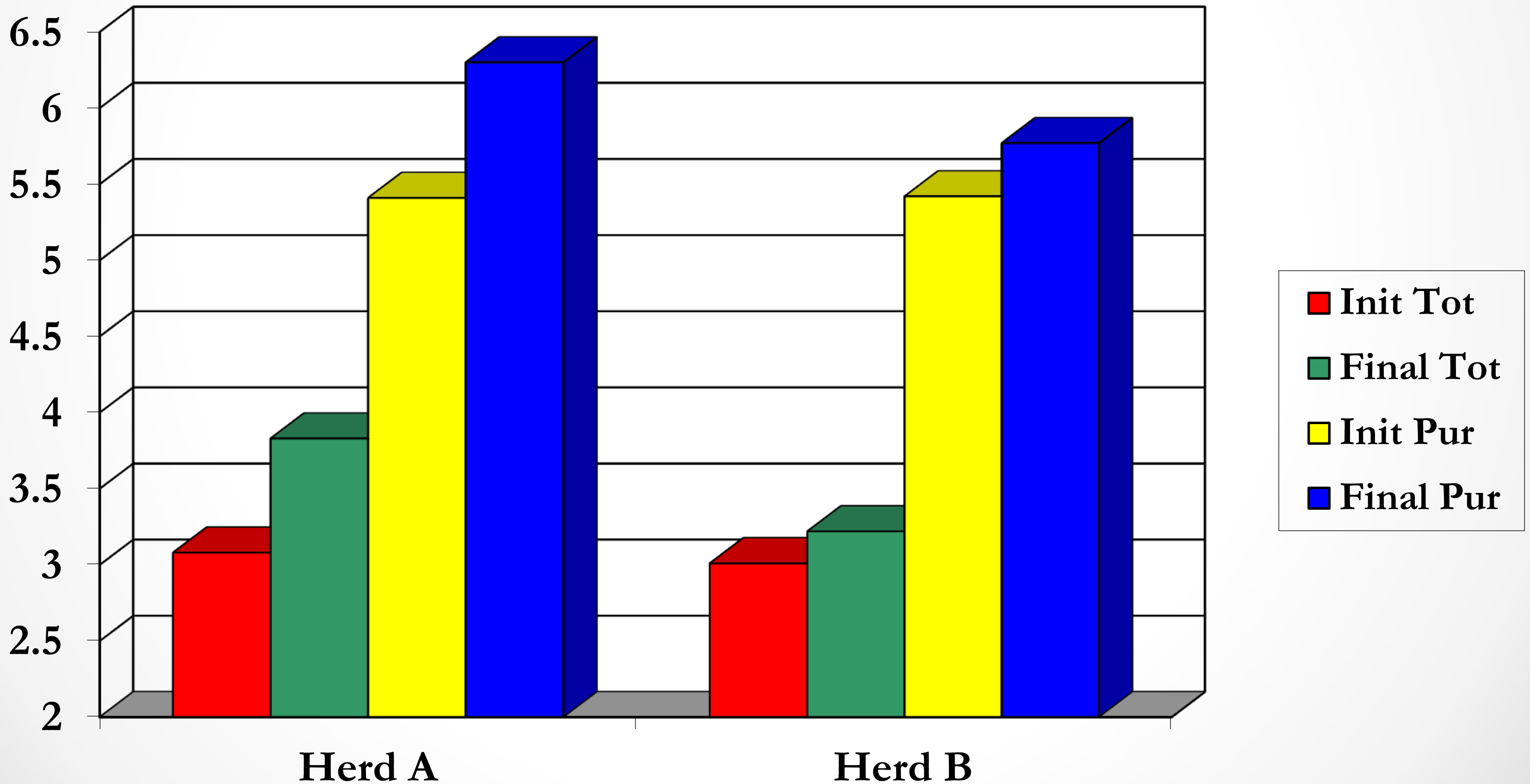
Total and Purchased Feed Cost, $/cow/day



-0.45, - 0.59

- 0.17, -0.29

Income over Total and Purchased Feed Cost, $/cow/day



+0.75, +0.89

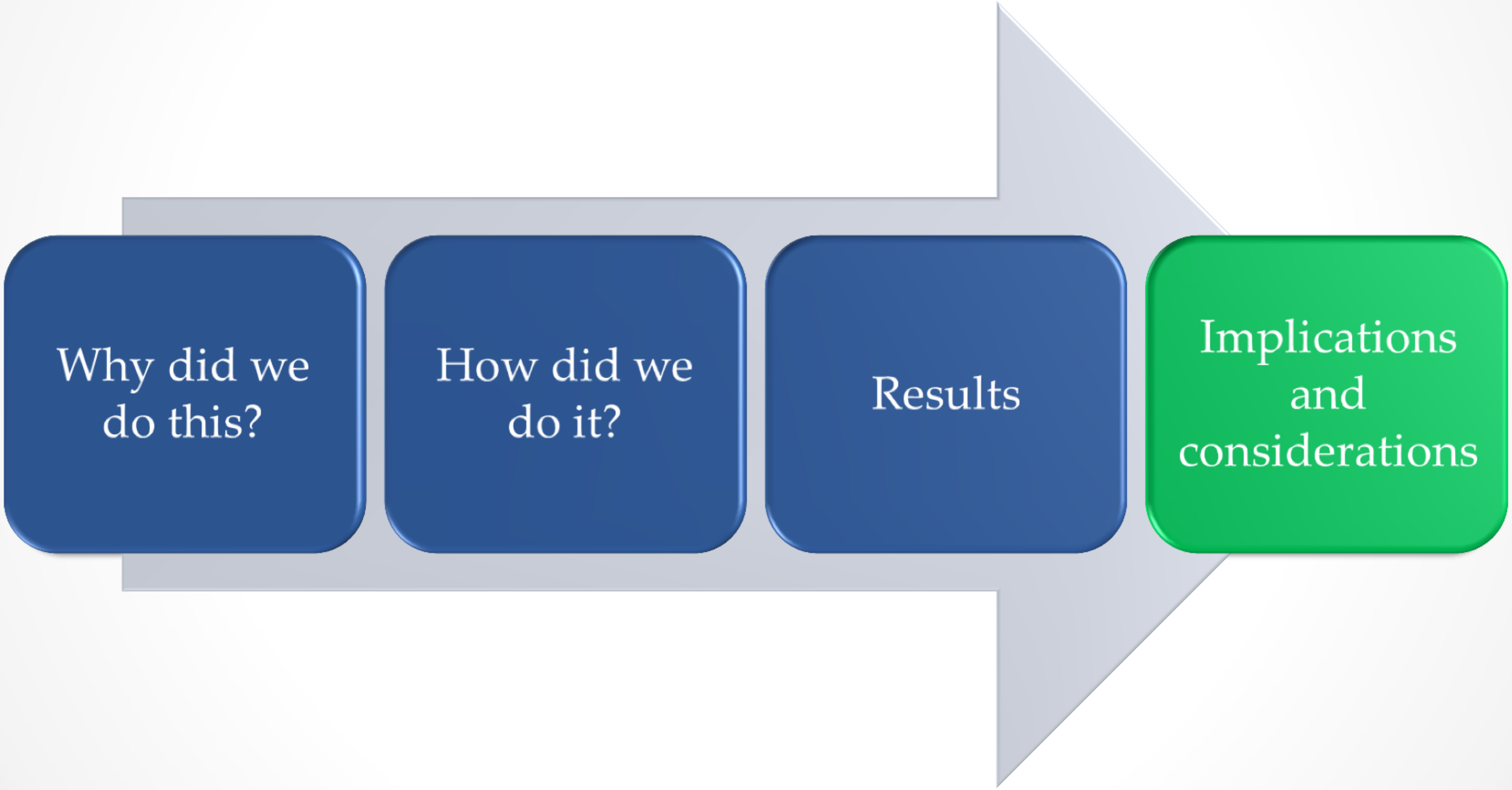
+0.21, +0.35

Bottom line

- If comparing the **initial** and **final** IOFC on a **herd level** basis over **12 months**:

- **Farm A: +$109,500**

- **Farm B: +$45,990**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Important considerations

- Low day to day variation
  - Feeds, feeding management
- Dry matter intake
  - Robust on-farm data
- Optimize the ration to produce microbial protein
- Select RUP sources with low variability
- Consider amino acids in formulation
- Monitor milk urea nitrogen

Summary

- Both research data and commercial farm data indicates an opportunity to lower ration CP in many dairy herds without decreasing milk
- In many herds, we can lower ration CP by 0.5 to 1+ units of CP
- This usually improves profits and lower N excretion to the environment

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Case Study: Application and evaluation of the Cornell Net Carbohydrate and Protein System as a tool to improve nitrogen utilization in commercial dairy herds

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Acknowledgements

Committee

- Dr. Van Amburgh (chair)
- Dr. Chase
- Dr. Boisclair
- Dr. Roche
- Dr. Schwab
- Dr. Sloan

Collaborators

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