

Using MUN Data to Determine N Status for Dairy Herds in the Chesapeake Bay Watershed

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Photo credit: Penn State Extension



PennState Extension

A Changed Dairy Industry – Improved Nitrogen Efficiency

- **MOU with ARPAS and USDA-NRCS**
 - American Registry of Professional Animal Scientists
 - Consultants Certified in Feed Management
 - **Collaboration with Extension and USDA-NRCS**
 - Joe Harrison – WSU
 - MD, VA, PA (Rick Kohn, Charles Stallings and Virginia Ishler) and NRCS (Jana Malot and Dan Ludwig) – Developed educational programming on precision feeding
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A Changed Dairy Industry – Improved Nitrogen Efficiency

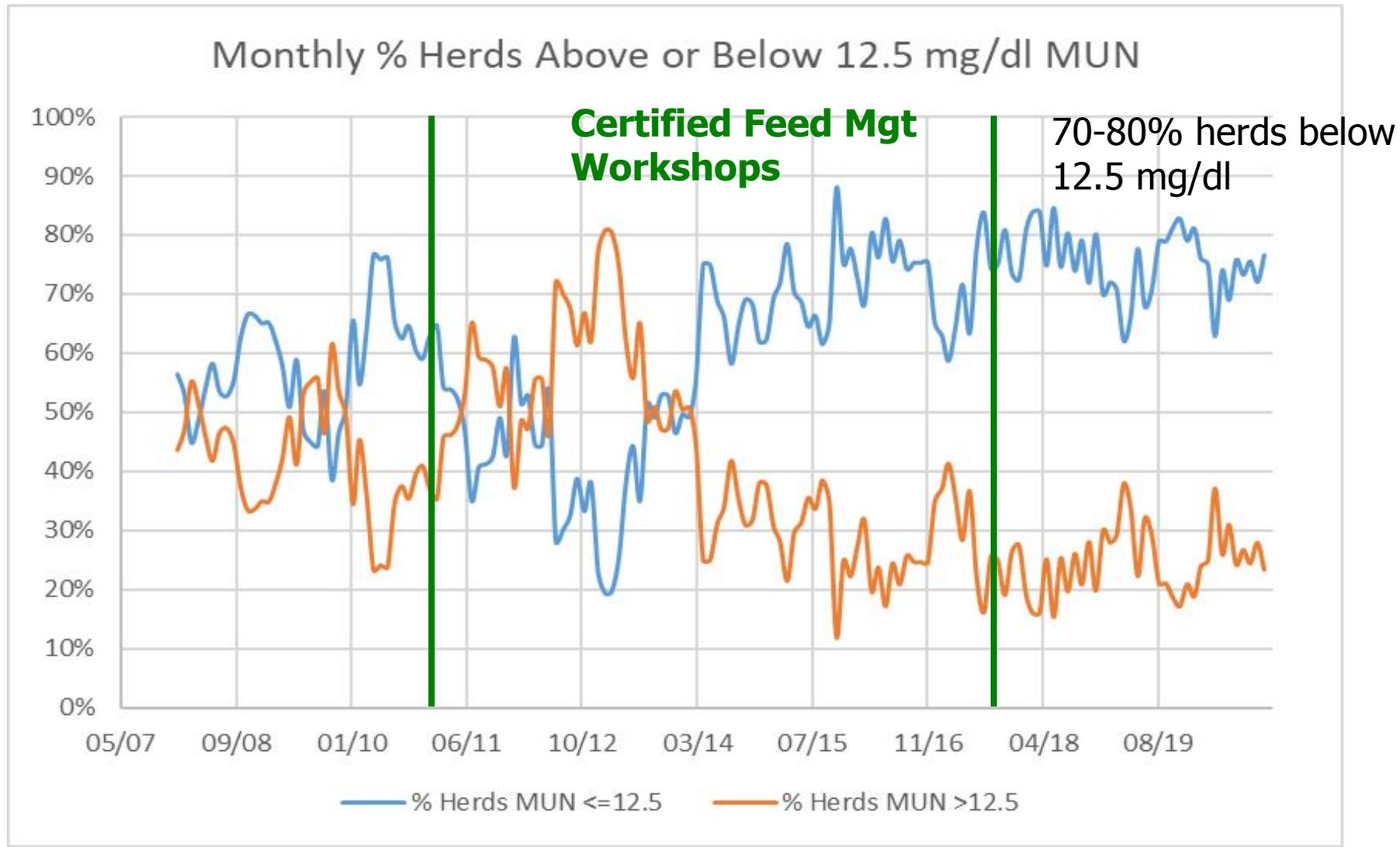
Double cropping –
utilizing the cover
crop for feed

- Heavy corn silage-based diets coupled with small grain silage
- Reduction in alfalfa being fed
- Improved protein-carbohydrate balance for cows

Penn State
research – Drs.
Heather Karsten &
Doug Beegle on
double cropping

- Environmental benefits as well as economic benefits to producers.

Percent Herds with MUN less than or greater than 12.5 mg/dl



Source: DHIA data – 580 dairy operations – Jan 2008 – Dec 2020

Predicting N Excretion

- Over 114 published papers on MUN and Urinary N excretion in the Journal of Dairy Science
 - Of the total N consumed –
 - 26% is excreted in milk
 - **33% is excreted in urine**
 - 35% is excreted in feces
 - 6% is retained for growth and reserves
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Predicting N Excretion

Summary of N data collected from 1995 to 2015.

Item	Observations Number	Min g/d	Median g/d	Mean (SD) g/d	Max g/d
Lactating cows					
Urine N	215	39.5	187.5	192.9 (70.5)	331.0
Fecal N	213	69.2	176.0	177.3 (51.3)	308.0
Total manure N	211	151.2	368.0	370.1 (98.9)	606.4

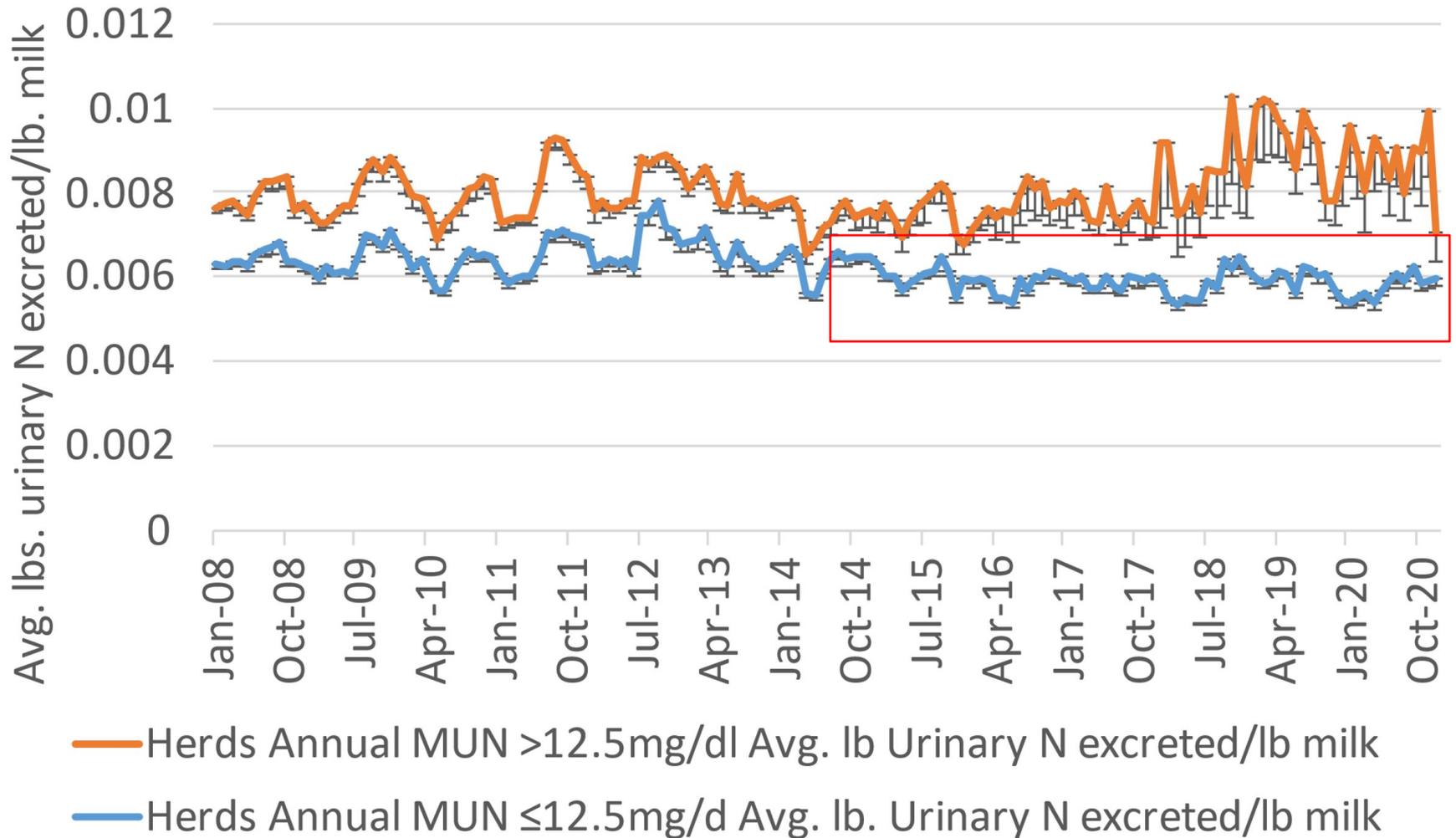
Source: Johnson et. al. Journal of Dairy Science, 2016.

Predicting Urinary N Excretion

MUN	Grams N excreted/ cow/day	Lbs. N excreted/ cow/day
8	148.6	0.33
9	163.7	0.36
10	178.8	0.39
11	193.9	0.43
12	209.0	0.46
13	224.1	0.49
14	239.2	0.53
15	254.3	0.56
16	269.4	0.59

- Kohn et. al. Journal of Dairy Science, 2002
- $(15.1 * \text{MUN}) + 27.8$
- MUN ideal range is 8 to 12 mg/dl.

Average lbs. Urinary N excreted per lb. milk by Annual Average MUN Group



Source: DHIA data – Jan 2008 – Dec 2020 – 580 herds

Predicting lbs. Urinary N Excreted

Lb. Urinary N excreted/ lb. of Milk

MUN	Grams N excreted/ cow/day	Lbs. N excreted/ cow/day	65 lbs. of milk	70 lbs. of milk	75 lbs. of milk
10	178.8	0.39	0.0061	0.0056	0.0053
11	193.9	0.43	0.0066	0.0061	0.0057
12	209.0	0.46	0.0071	0.0066	0.0061

- Kohn et. al. Journal of Dairy Science, 2002

Initial DHI Review Summaries

- Increase in % herds with avg MUN ≤ 12.5 mg/dl since 2014
 - Herds ≤ 12.5 mg/dl average less lbs. Urinary N excreted per pound of milk
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Next Steps Moving Forward

- DHIA provides a robust data set
 - Monthly data along with cow numbers and milk production
 - Limitation – limited number of herds are testing MUNs.

 - Milk cooperatives
 - **Potential** for a robust data set – MUNs tested on every pick-up
 - Data lacking – cow numbers and average milk production to determine urinary N excretion
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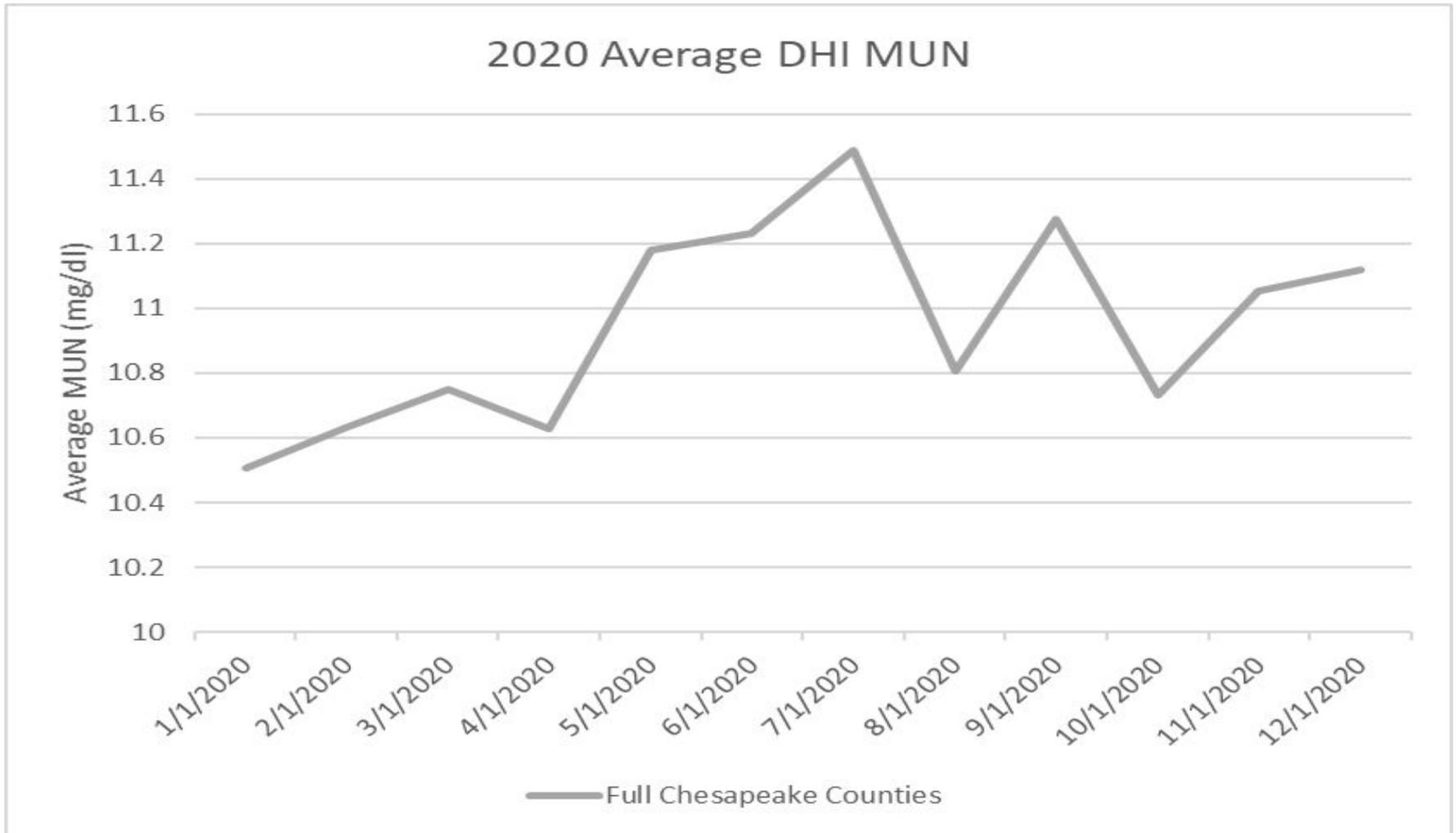
Next Steps Moving Forward

- 3 Milk Cooperatives provided data
 - 2 co-ops provided only ANNUAL numbers for 2020
 - 1 co-op provided monthly data for 2020

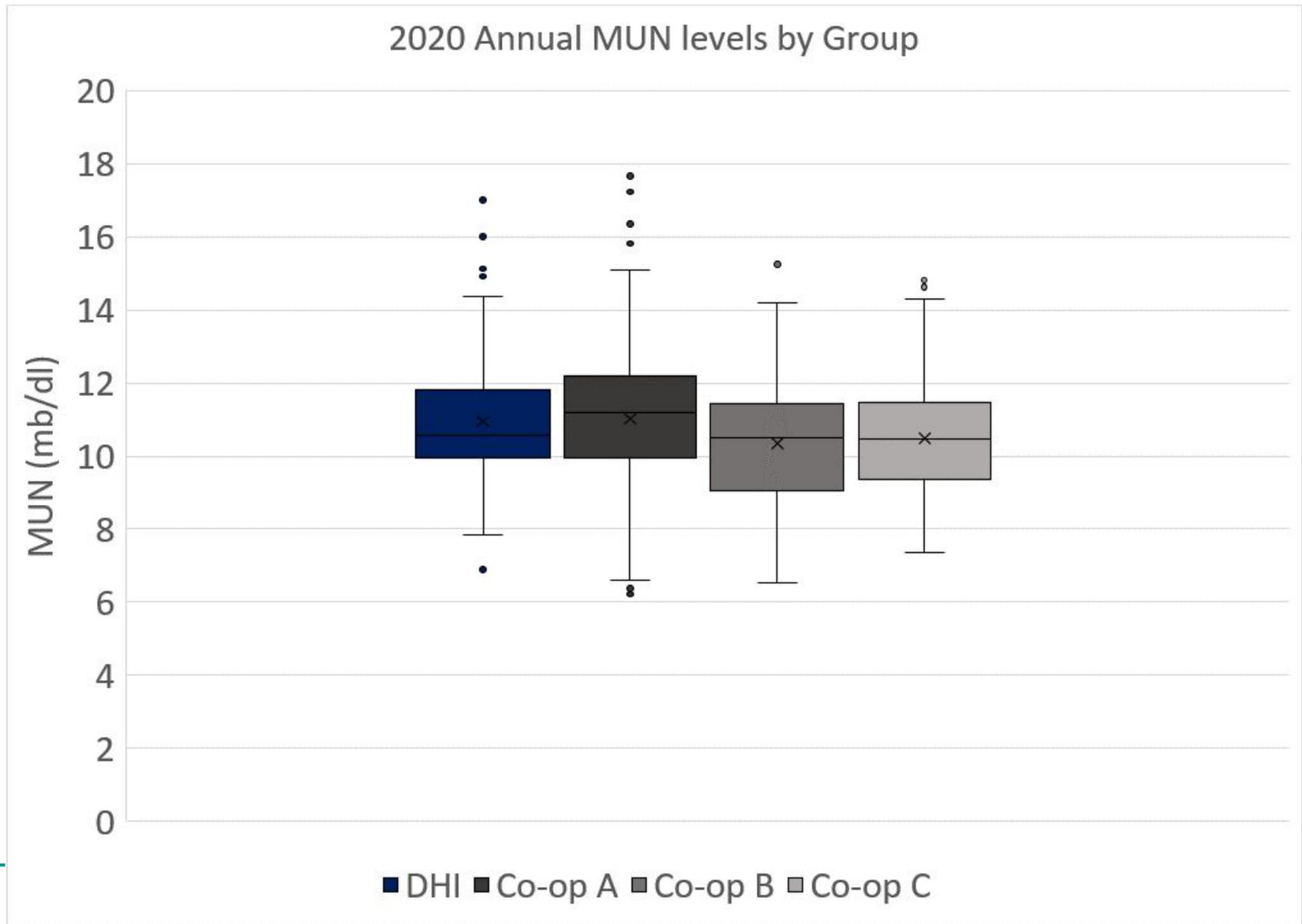
 - Missing information
 - Cow numbers
 - Average production
 - Historical information
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Monthly Results from Milk Cooperative

A - 2020



Comparison of DHIA and Co-ops using Annual Data



Comparison of DHIA and Co-ops using Annual Data

<i>MUNS Results for 2020</i>	<i>DHI-Monthly</i>	<i>Co-op A-Monthly</i>	<i>Co-op B - Annual</i>	<i>Co-op C - Annual</i>
Mean	10.95	10.54	11.02	10.34
Standard Error	0.07	0.01	0.07	0.12
Median	11.00	10.40	11.20	10.50
Standard Deviation	2.51	2.36	1.74	1.66
Minimum	6.00	6.00	6.22	6.54
Maximum	24.00	29.30	17.66	15.24

Take Away Messages

MUNs are decreasing and fall within ideal range of 8 to 12 mg/dl since 2014.

DHIA and Co-op data agree that this declining MUN trend is real.

Co-op data would provide a more robust data set to validate N reductions in the Chesapeake Bay Watershed

- Need more discussions with co-ops on collecting cow numbers, milk production and herd identifiers

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