2024

Illinois Dairy Summit

PLANNING FOR UNCERTAIN MARGINS IN THE DAIRY INDUSTRY

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ILLINOIS MILK PRODUCERS ASSOCIATION

ILLINOIS Extension
COLLEGE OF AGRICULTURAL, CONSUMER & ENVIRONMENTAL SCIENCES

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14th Annual Illinois Dairy Summit hosted by Illinois Milk Producers Association and University of Illinois Dairy Extension

2024
Illinois Dairy Summit

PLANNING FOR UNCERTAIN MARGINS IN THE DAIRY INDUSTRY

FEBRUARY 7 / 10 A.M. - 3 P.M.

AGENDA

10:00am **Registration**

10:30am **Welcome**
IMPA Updates
Tasha Bunting
Illinois Farm Bureau

10:45am **Nutritional Strategies for Improved Margins**
Phil Cardoso, *DVM, Ph.D.*
University of Illinois

11:35am **Market Chaos is the New Normal**
Ben Buckner, *Ph.D.*
AgResource

12:25pm **Lunch & Booth Visits**

1:25pm **Managing Cows and Costs to Strive for Dairy Profitability**
Derek Nolan, *Ph.D.*
University of Illinois

1:55pm **Producer Panel: Strategies for Improved Margins in Uncertain Times**
Moderator: Phil Cardoso, *DVM, Ph.D.*
University of Illinois

2:55pm **Wrap up and adjourn**

Illinois Milk Producers Association
Illinois Extension
University of Illinois Urbana-Champaign

www.illinoismilk.org/DairySummit2024

SPEAKERS
Contact Information

Phil Cardoso, DVM, Ph.D.
University of Illinois
cardoso2@illinois.edu

Phil is an associate professor at the University of Illinois at Urbana-Champaign. He received his D.V.M., and M.S. degrees from the Universidade Federal Do Rio Grande do Sul in Brazil, and his Ph.D. from the University of Illinois. Since 2012, Phil has established a unique program that seamlessly blends his teaching, extension, and research efforts. Phil and his students have published over 75 peer-reviewed manuscripts (original research and invited reviews) and 3 invited book chapters to date.

Ben Buckner, Ph.D.
AgResource
buckner@agresource.com

Grains and dairy analyst Ben Buckner has been with AgResource since 2008. Ben specializes in grains market research, and has been in commodity markets analysis since 2005. He began his career with the research department at the Iowa Grain Company in 2007. Ben hails from from Nashvile, Tennessee. He graduated from Transylvania University in Lexington, Kentucky with a degree in economics.

Derek Nolan, Ph.D.
University of Illinois
dtnolan@illinois.edu

Derek grew up on a dairy farm in Northeast Iowa. His passion for agriculture led him to Iowa State University where he earned his degree in Dairy Science. Derek completed both his Master's and Ph.D. at University of Kentucky with a research focus in milk quality and decision economics. Derek is now a Teaching Assistant Professor and Dairy Extension Specialist in the Animal Sciences Department at the University of Illinois.

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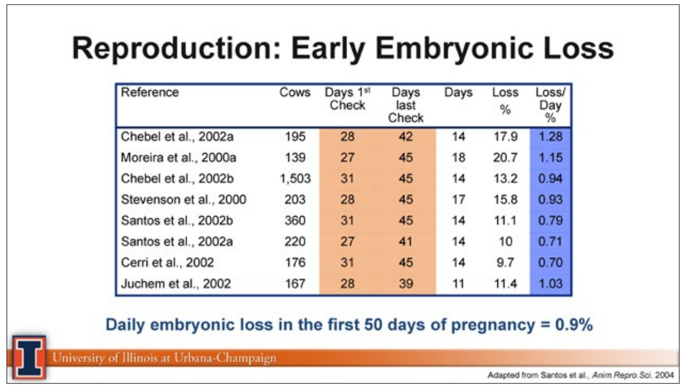
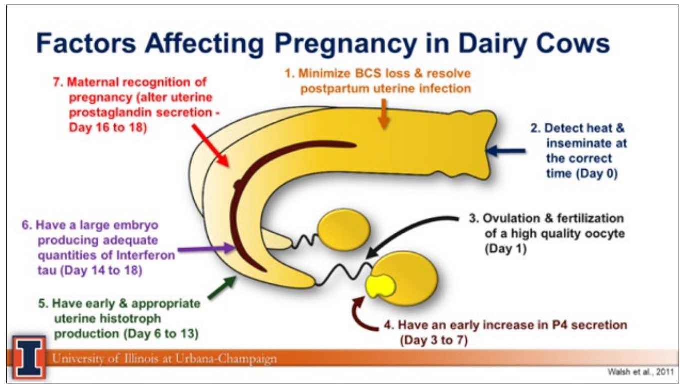
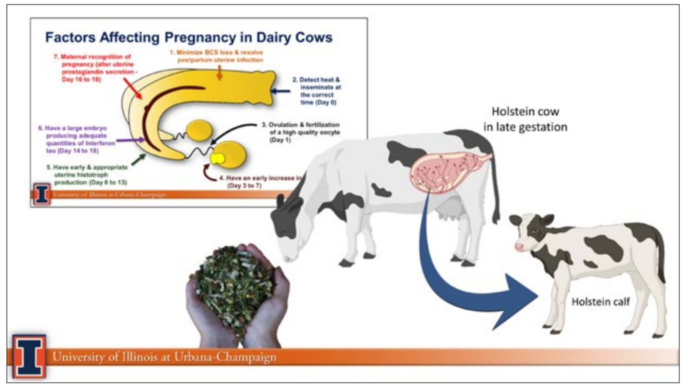
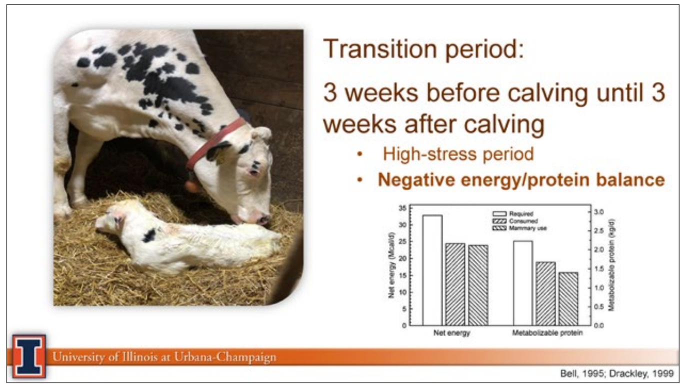
Phil Cardoso, DVM, Ph.D.
University of Illinois

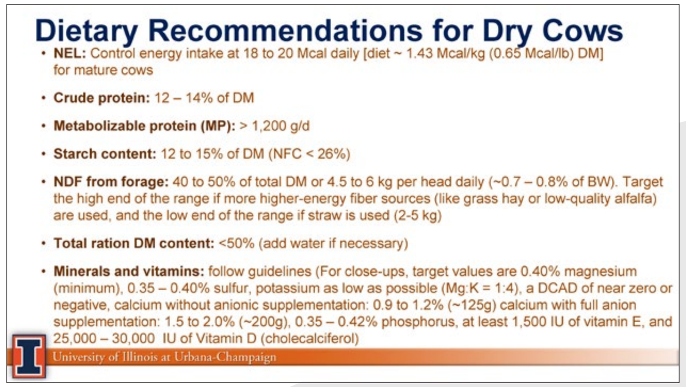
Nutritional Strategies for Improved Margins

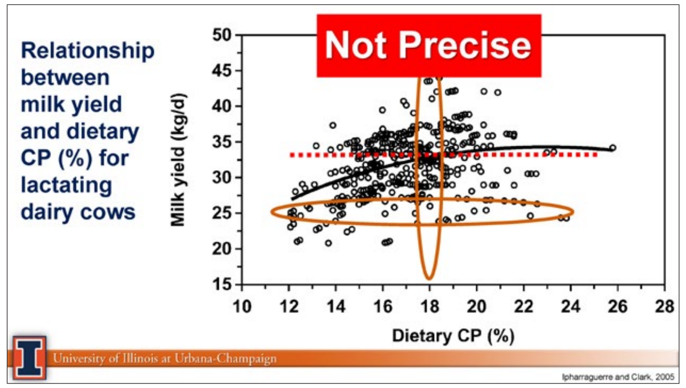


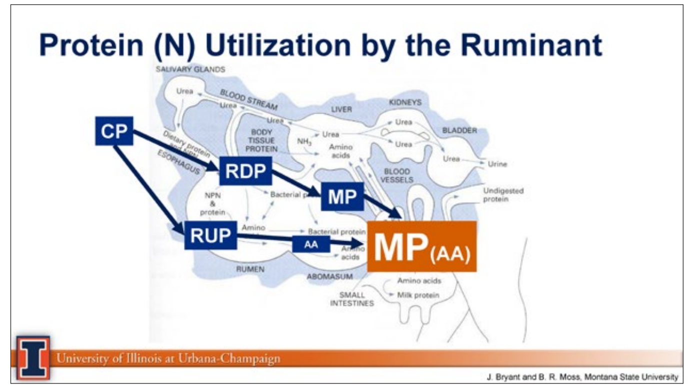


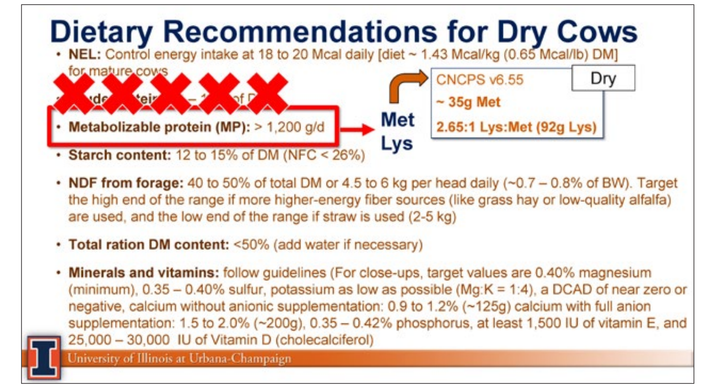


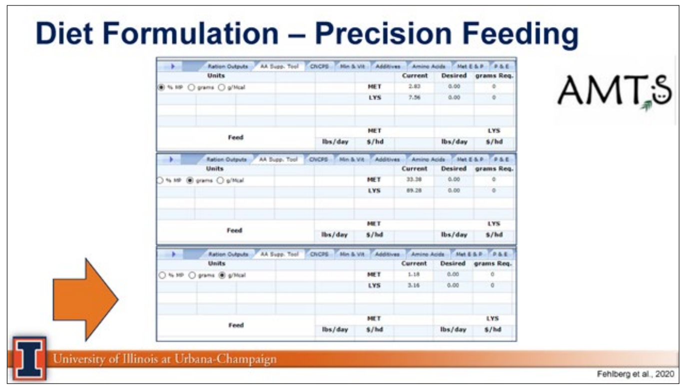


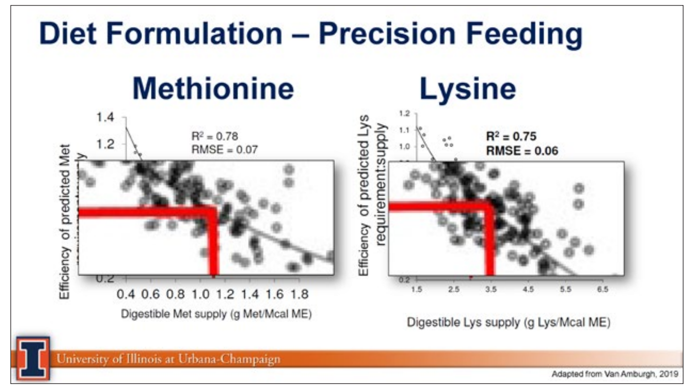


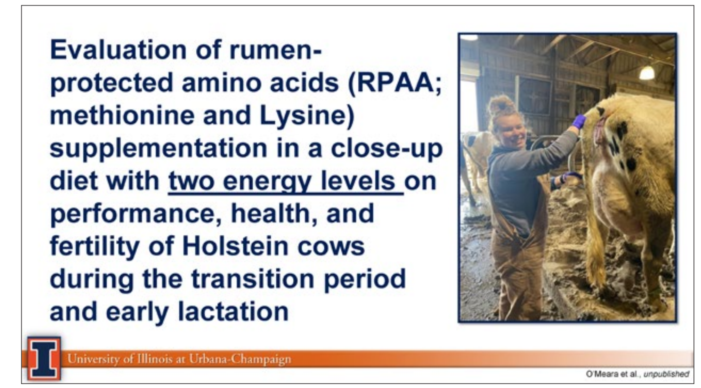

Relationship between milk yield and dietary CP (%) for lactating dairy cows
Not Precise
Milk yield (kg/d)
Dietary CP (%)
University of Illinois at Urbana-Champaign
Ipharraguerre and Clark, 2005

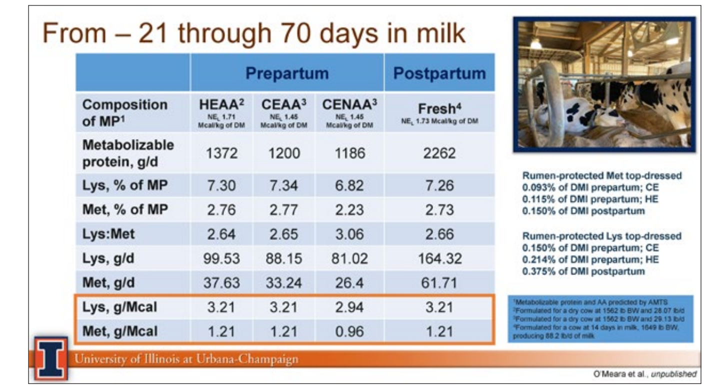

Protein (N) Utilization by the Ruminant
CP
RDP
MP
RUP
MP(AA)
University of Illinois at Urbana-Champaign
J. Bryant and B. R. Moss, Montana State University

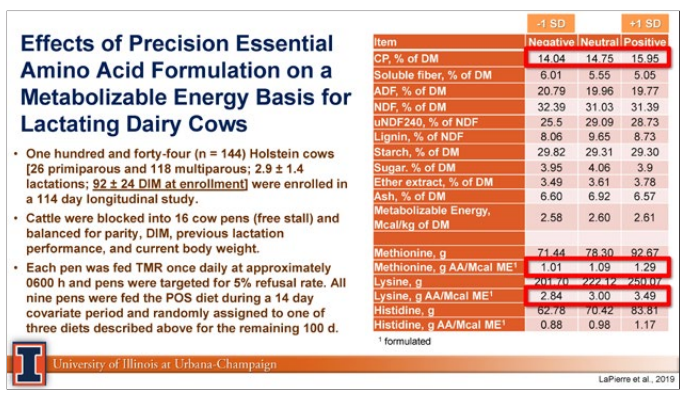

Dietary Recommendations for Dry Cows
NEL: Control energy intake at 18 to 20 Mcal daily [diet ~ 1.43 Mcal/kg (0.65 Mcal/lb) DM]
CNCPS v6.55
Dry
~ 35g Met
Met
Lys
2.65:1 Lys:Met (92g Lys)
Metabolizable protein (MP): > 1,200 g/d
Starch content: 12 to 15% of DM (NFC < 26%)
NDF from forage: 40 to 50% of total DM or 4.5 to 6 kg per head daily (~0.7 – 0.8% of BW). Target the high end of the range if more higher-energy fiber sources (like grass hay or low-quality alfalfa) are used, and the low end of the range if straw is used (2-5 kg)
Total ration DM content: <50% (add water if necessary)
Minerals and vitamins: follow guidelines (For close-ups, target values are 0.40% magnesium (minimum), 0.35 – 0.40% sulfur, potassium as low as possible (Mg:K = 1:4), a DCAD of near zero or negative, calcium without anionic supplementation: 0.9 to 1.2% (~125g) calcium with full anion supplementation: 1.5 to 2.0% (~200g), 0.35 – 0.42% phosphorus, at least 1,500 IU of vitamin E, and 25,000 – 30,000 IU of Vitamin D (cholecalciferol)
University of Illinois at Urbana-Champaign

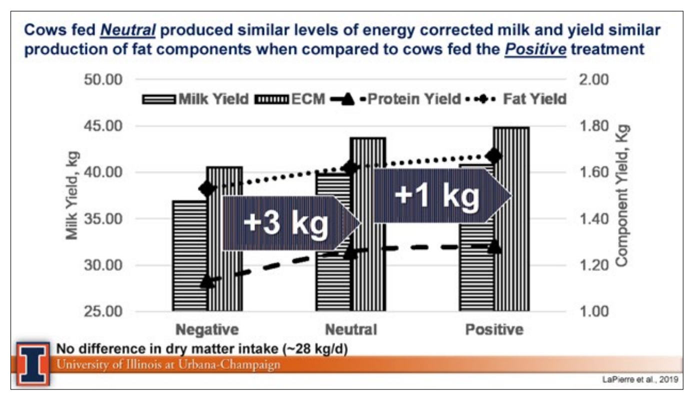

Diet Formulation – Precision Feeding
AMTS
University of Illinois at Urbana-Champaign
Fehlberg et al., 2020

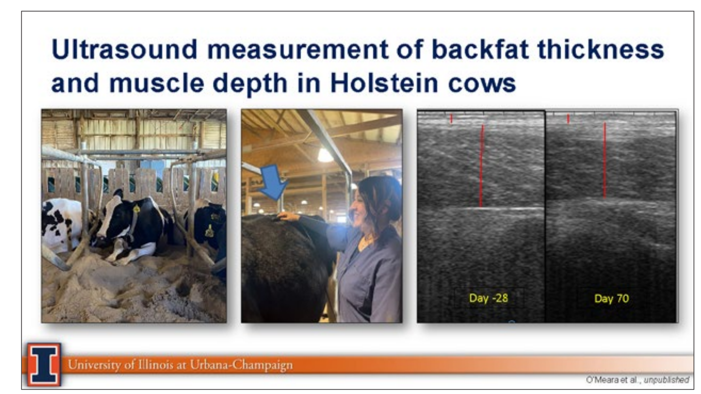

Diet Formulation – Precision Feeding
Methionine
Lysine
R² = 0.78
RMSE = 0.07
R² = 0.75
RMSE = 0.06
Efficiency of predicted Met
Efficiency of predicted Lys requirement:supply
Digestible Met supply (g Met/Mcal ME)
Digestible Lys supply (g Lys/Mcal ME)
University of Illinois at Urbana-Champaign
Adapted from Van Amburgh, 2019

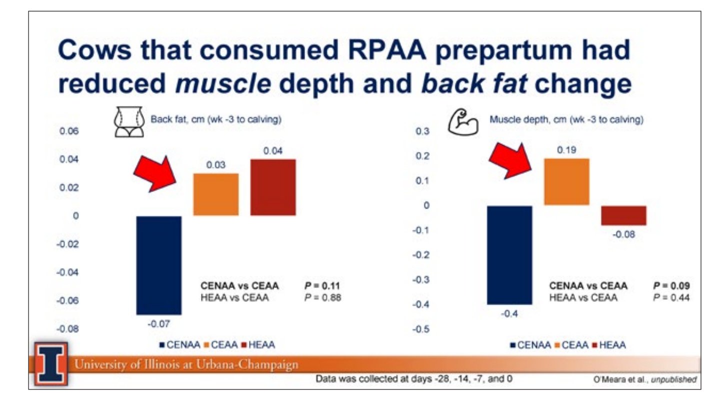

Evaluation of rumen-protected amino acids (RPAA; methionine and Lysine) supplementation in a close-up diet with two energy levels on performance, health, and fertility of Holstein cows during the transition period and early lactation
University of Illinois at Urbana-Champaign
O'Meara et al., unpublished

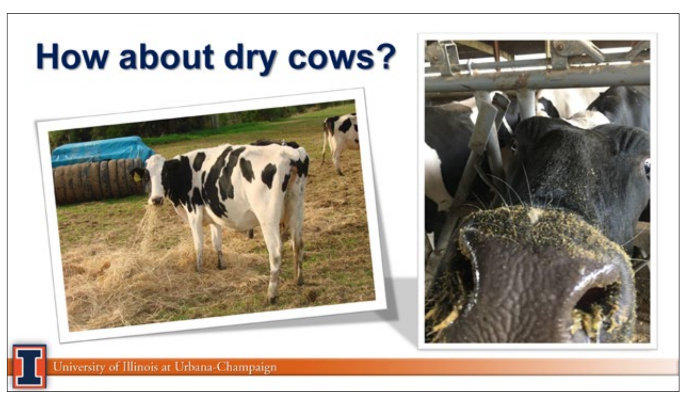

From – 21 through 70 days in milk
Prepartum
Postpartum
Composition of MP
HEAA
CEAA
CENAA
Fresh
Metabolizable protein, g/d 1372 1200 1186 2262
Lys, % of MP 7.30 7.34 6.82 7.26
Met, % of MP 2.76 2.77 2.23 2.73
Lys:Met 2.64 2.65 3.06 2.66
Lys, g/d 99.53 88.15 81.02 164.32
Met, g/d 37.63 33.24 26.4 61.71
Lys, g/Mcal 3.21 3.21 2.94 3.21
Met, g/Mcal 1.21 1.21 0.96 1.21
Rumen-protected Met top-dressed
0.093% of DMI prepartum; CE
0.115% of DMI prepartum; HE
0.150% of DMI postpartum
Rumen-protected Lys top-dressed
0.150% of DMI prepartum; CE
0.214% of DMI prepartum; HE
0.375% of DMI postpartum
University of Illinois at Urbana-Champaign
O'Meara et al., unpublished

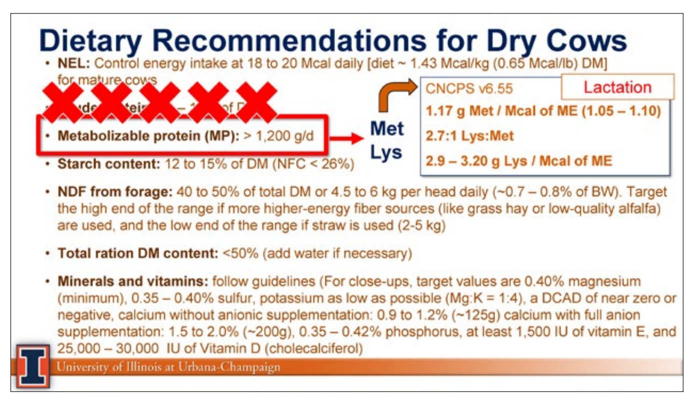

Effects of Precision Essential Amino Acid Formulation on a Metabolizable Energy Basis for Lactating Dairy Cows
One hundred and forty-four (n = 144) Holstein cows [26 primiparous and 118 multiparous; 2.9 ± 1.4 lactations; 92 ± 24 DIM at enrollment] were enrolled in a 114 day longitudinal study.
Cattle were blocked into 16 cow pens (free stall) and balanced for parity, DIM, previous lactation performance, and current body weight.
Each pen was fed TMR once daily at approximately 0600 h and pens were targeted for 5% refusal rate. All nine pens were fed the POS diet during a 14 day covariate period and randomly assigned to one of three diets described above for the remaining 100 d.
-1 SD
+1 SD
Item
Negative
Neutral
Positive
CP, % of DM 14.04 14.75 15.95
Soluble fiber, % of DM 6.01 5.55 5.05
ADF, % of DM 20.79 19.96 19.77
NDF, % of DM 32.39 31.03 31.39
uNDF240, % of NDF 25.5 29.09 28.73
Lignin, % of NDF 8.06 9.65 8.73
Starch, % of DM 29.82 29.31 29.30
Sugar, % of DM 3.95 4.06 3.9
Ether extract, % of DM 3.49 3.61 3.78
Ash, % of DM 6.60 6.92 6.57
Metabolizable Energy, Mcal/kg of DM 2.58 2.60 2.61
Methionine, g 71.44 78.30 92.67
Methionine, g AA/Mcal ME 1.01 1.09 1.29
Lysine, g AA/Mcal ME 2.84 3.00 3.49
Histidine, g 62.78 70.42 83.81
Histidine, g AA/Mcal ME 0.88 0.98 1.17
formulated
University of Illinois at Urbana-Champaign
LaPierre et al., 2019

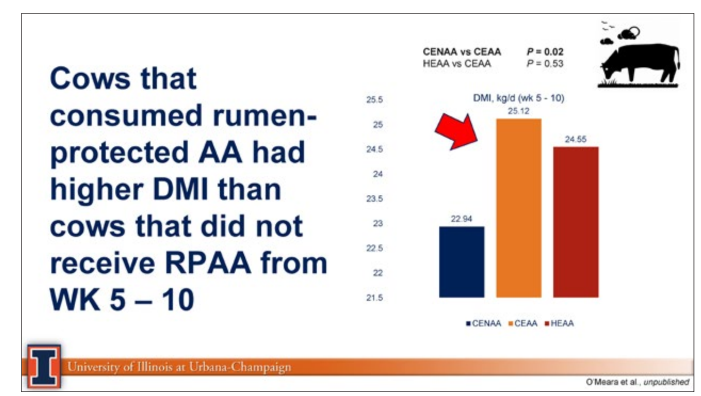

Cows fed Neutral produced similar levels of energy corrected milk and yield similar production of fat components when compared to cows fed the Positive treatment
Milk Yield
ECM
Protein Yield
Fat Yield
+3 kg
+1 kg
Milk Yield, kg
Component Yield, Kg
Negative
Neutral
Positive
No difference in dry matter intake (~28 kg/d)
University of Illinois at Urbana-Champaign
LaPierre et al., 2019

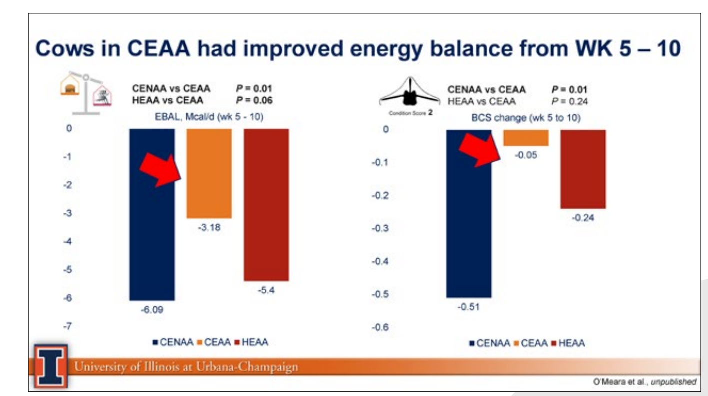

Ultrasound measurement of backfat thickness and muscle depth in Holstein cows
Day -28
Day 70
University of Illinois at Urbana-Champaign
O'Meara et al., unpublished


Cows that consumed RPAA prepartum had reduced muscle depth and back fat change
Back fat, cm (wk -3 to calving)
Muscle depth, cm (wk -3 to calving)
CENAA vs CEAA P = 0.11
HEAA vs CEAA P = 0.88
CENAA vs CEAA P = 0.09
HEAA vs CEAA P = 0.44
CENAA
CEAA
HEAA
University of Illinois at Urbana-Champaign
Data was collected at days -28, -14, -7, and 0
O'Meara et al., unpublished

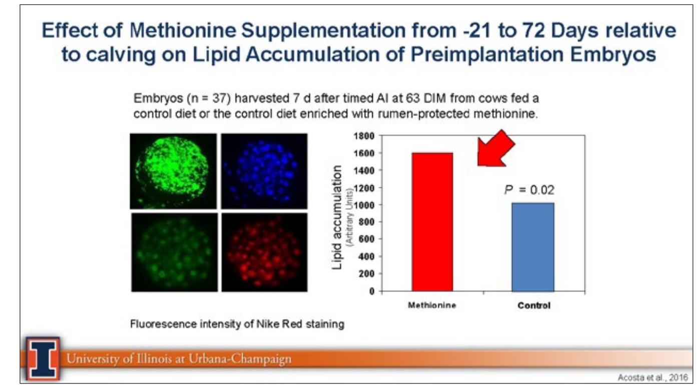

How about dry cows?
University of Illinois at Urbana-Champaign

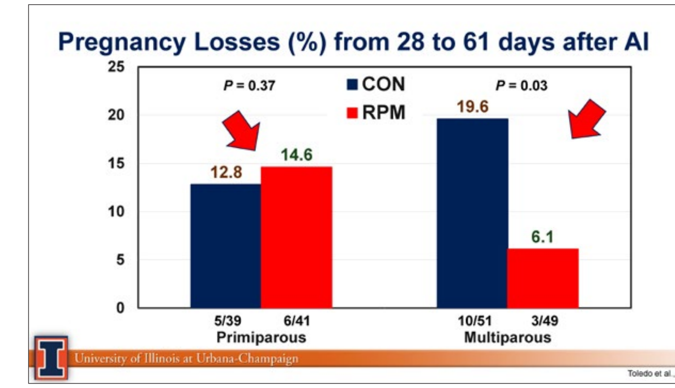

Dietary Recommendations for Dry Cows
NEL: Control energy intake at 18 to 20 Mcal daily [diet ~ 1.43 Mcal/kg (0.65 Mcal/lb) DM]
CNCPS v6.55
Lactation
1.17 g Met / Mcal of ME (1.05 – 1.10)
Met
Lys
2.7:1 Lys:Met
2.9 – 3.20 g Lys / Mcal of ME
Metabolizable protein (MP): > 1,200 g/d
Starch content: 12 to 15% of DM (NFC < 26%)
NDF from forage: 40 to 50% of total DM or 4.5 to 6 kg per head daily (~0.7 – 0.8% of BW). Target the high end of the range if more higher-energy fiber sources (like grass hay or low-quality alfalfa) are used, and the low end of the range if straw is used (2-5 kg)
Total ration DM content: <50% (add water if necessary)
Minerals and vitamins: follow guidelines (For close-ups, target values are 0.40% magnesium (minimum), 0.35 – 0.40% sulfur, potassium as low as possible (Mg:K = 1:4), a DCAD of near zero or negative, calcium without anionic supplementation: 0.9 to 1.2% (~125g) calcium with full anion supplementation: 1.5 to 2.0% (~200g), 0.35 – 0.42% phosphorus, at least 1,500 IU of vitamin E, and 25,000 – 30,000 IU of Vitamin D (cholecalciferol)
University of Illinois at Urbana-Champaign

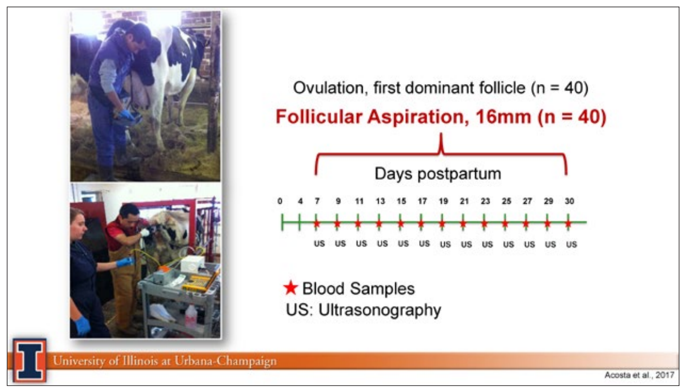

Cows that consumed rumen-protected AA had higher DMI than cows that did not receive RPAA from WK 5 – 10
CENAA vs CEAA P = 0.02
HEAA vs CEAA P = 0.53
DMI, kg/d (wk 5 - 10)
22.94
25.12
24.55
CENAA
CEAA
HEAA
University of Illinois at Urbana-Champaign
O'Meara et al., unpublished

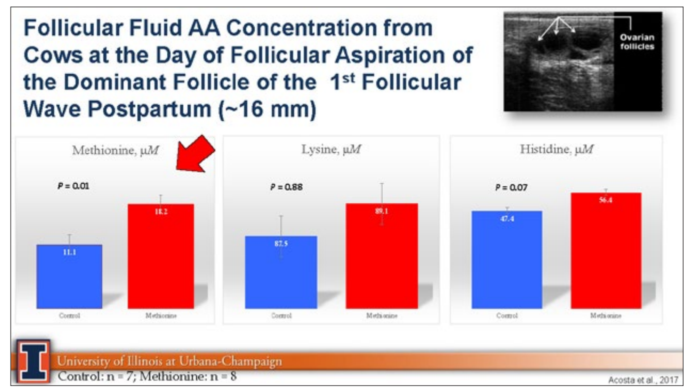

Cows in CEAA had improved energy balance from WK 5 – 10
CENAA vs CEAA P = 0.01
HEAA vs CEAA P = 0.06
EBAL, Mcal/d (wk 5 - 10)
-6.09
-3.18
-5.4
CENAA vs CEAA P = 0.01
HEAA vs CEAA P = 0.24
BCS change (wk 5 to 10)
-0.51
-0.05
-0.24
CENAA
CEAA
HEAA
University of Illinois at Urbana-Champaign
O'Meara et al., unpublished


Theriogenology
Effects of rumen-protected methionine and choline supplementation on steroidogenic potential of the first postpartum dominant follicle and expression of immune mediators in Holstein cows
D.A.V. Acosta, M.I. Rivelli, C. Skenandore, Z. Zhou, D.H. Keisler, D. Luchini, M.N. Corrêa, F.C. Cardoso
University of Illinois at Urbana-Champaign

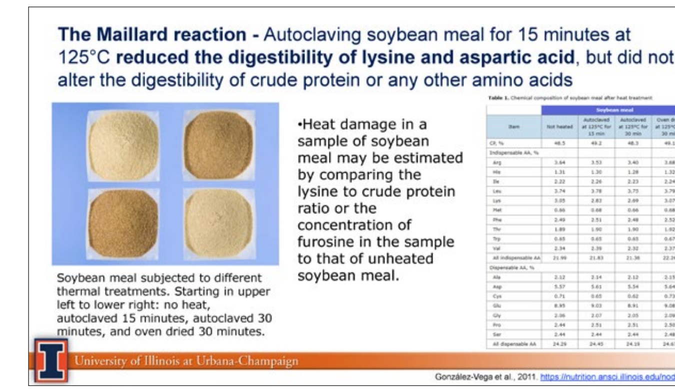

Effect of Methionine Supplementation from -21 to 72 Days relative to calving on Lipid Accumulation of Preimplantation Embryos
Embryos (n = 37) harvested 7 d after timed AI at 63 DIM from cows fed a control diet or the control diet enriched with rumen-protected methionine.
P = 0.02
Methionine
Control
Fluorescence intensity of Nile Red staining
University of Illinois at Urbana-Champaign
Acosta et al., 2016

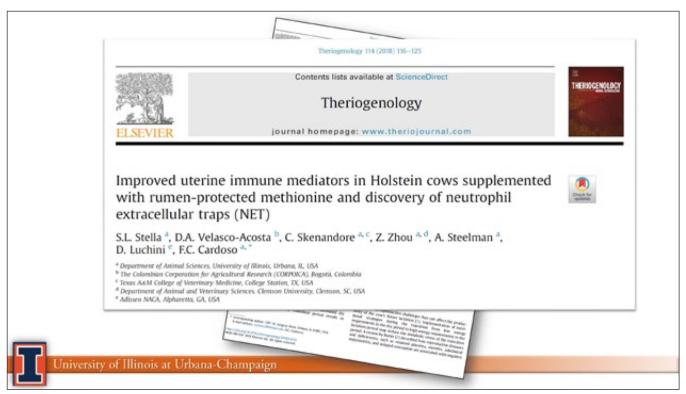

Pregnancy Losses (%) from 28 to 61 days after AI
CON
RPM
P = 0.37
P = 0.03
12.8
14.6
19.6
6.1
5/39
6/41
Primiparous
10/51
3/49
Multiparous
University of Illinois at Urbana-Champaign
Toledo et al., 2017

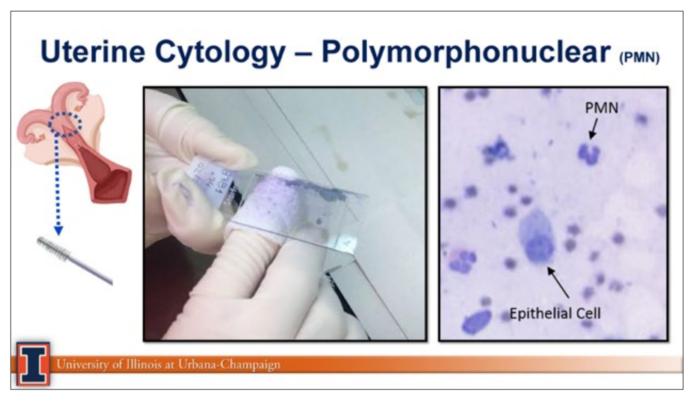

Ovulation, first dominant follicle (n = 40)
Follicular Aspiration, 16mm (n = 40)
Days postpartum
Blood Samples
US: Ultrasonography
University of Illinois at Urbana-Champaign
Acosta et al., 2017

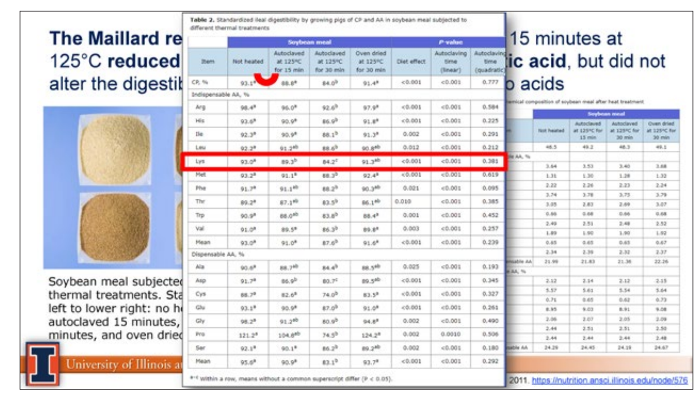

Follicular Fluid AA Concentration from Cows at the Day of Follicular Aspiration of the Dominant Follicle of the 1st Follicular Wave Postpartum (~16 mm)
Methionine, μM
Lysine, μM
Histidine, μM
P = 0.01
P = 0.88
P = 0.07
University of Illinois at Urbana-Champaign
Control: n = 7; Methionine: n = 8
Acosta et al., 2017

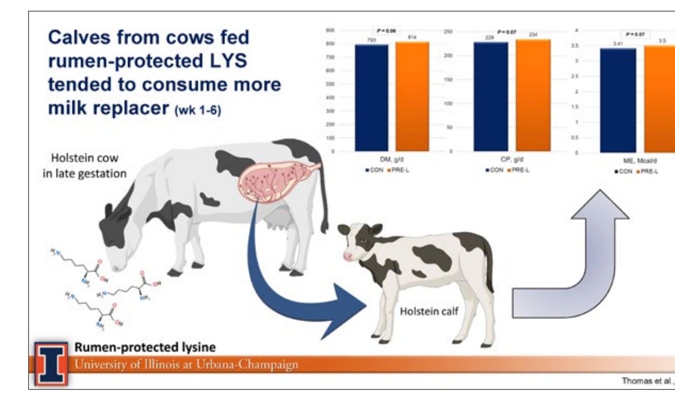

How about Lysine?

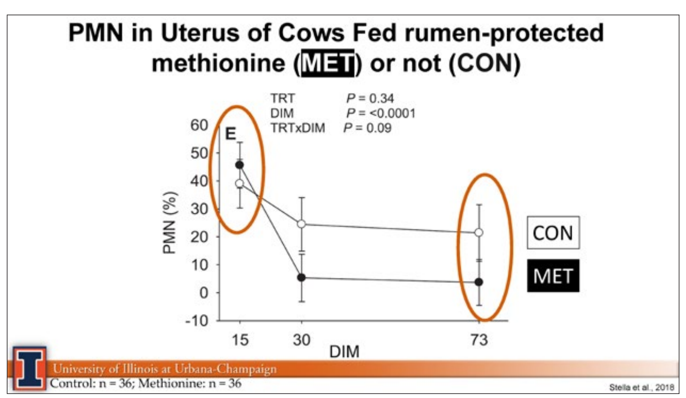

The Maillard reaction - Autoclaving soybean meal for 15 minutes at 125°C reduced the digestibility of lysine and aspartic acid, but did not alter the digestibility of crude protein or any other amino acids
•Heat damage in a sample of soybean meal may be estimated by comparing the lysine to crude protein ratio or the concentration of furosine in the sample to that of unheated soybean meal.
Soybean meal subjected to different thermal treatments. Starting in upper left to lower right: no heat, autoclaved 15 minutes, autoclaved 30 minutes, and oven dried 30 minutes.
University of Illinois at Urbana-Champaign
González-Vega et al., 2011


Theriogenology
Improved uterine immune mediators in Holstein cows supplemented with rumen-protected methionine and discovery of neutrophil extracellular traps (NET)
S.L. Stella, D.A. Velasco-Acosta, C. Skenandore, Z. Zhou, A. Steelman, D. Luchini, F.C. Cardoso
University of Illinois at Urbana-Champaign

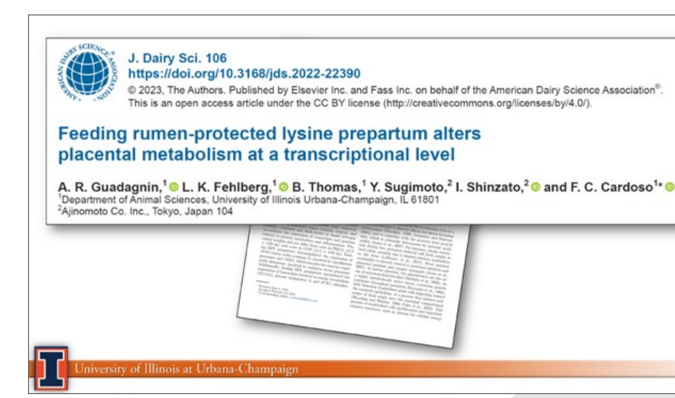

Uterine Cytology – Polymorphonuclear (PMN)
PMN
Epithelial Cell
University of Illinois at Urbana-Champaign

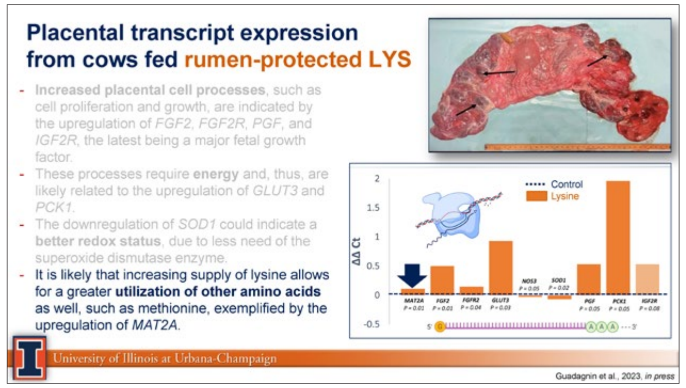

The Maillard re
125°C reduced
alter the digesti
15 minutes at
ic acid, but did not
acids
University of Illinois at Urbana-Champaign


Calves from cows fed rumen-protected LYS tended to consume more milk replacer (wk 1-6)
Holstein cow in late gestation
Holstein calf
Rumen-protected lysine
University of Illinois at Urbana-Champaign
Thomas et al., 2021

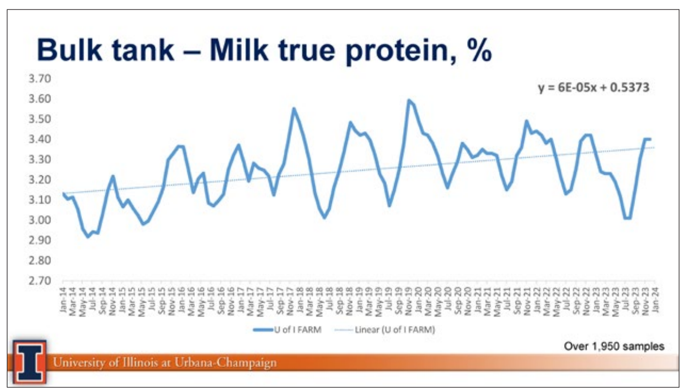

PMN in Uterus of Cows Fed rumen-protected methionine (MET) or not (CON)
TRT P = 0.34
DIM P = <0.0001
TRTxDIM P = 0.09
PMN (%)
DIM
CON
MET
University of Illinois at Urbana-Champaign
Control: n = 36; Methionine: n = 36
Stella et al., 2018

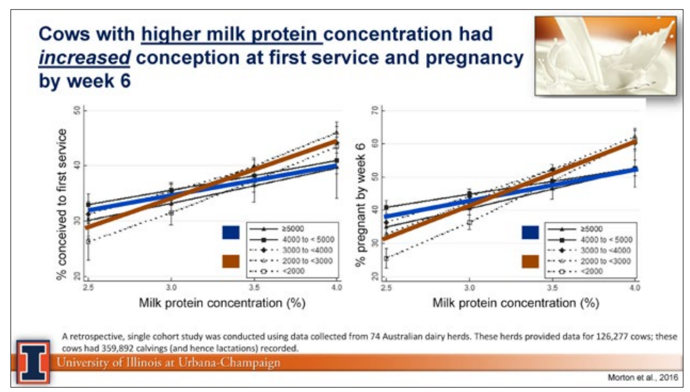

Theriogenology
Effects of rumen-protected methionine and choline supplementation on the preimplantation embryo in Holstein cows
D.A.V. Acosta, A.C. Denicol, P. Tribulo, M.I. Rivelli, C. Skenandore, Z. Zhou, D. Luchini, M.N. Corrêa, P.J. Hansen, F.C. Cardoso
University of Illinois at Urbana-Champaign

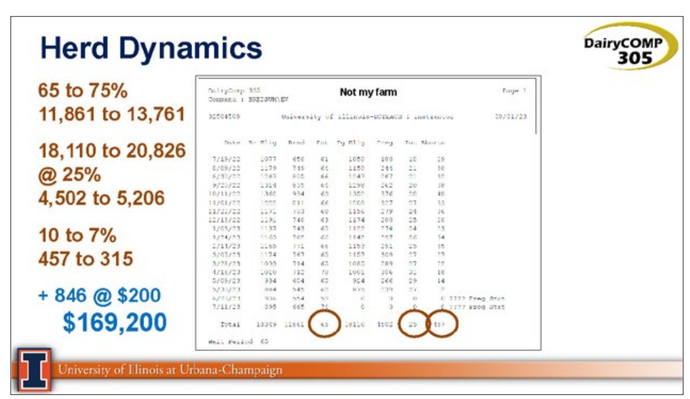

J. Dairy Sci. 106
https://doi.org/10.3168/jds.2022-22390
Feeding rumen-protected lysine prepartum alters placental metabolism at a transcriptional level
A. R. Guadagnin, L. K. Fehlberg, B. Thomas, Y. Sugimoto, I. Shinzato, and F. C. Cardoso
University of Illinois at Urbana-Champaign

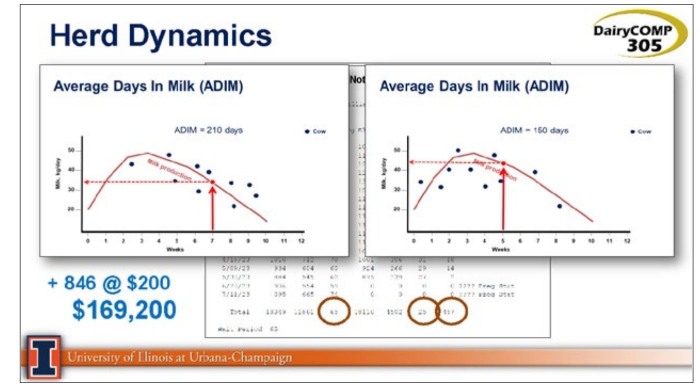

Placental transcript expression from cows fed rumen-protected LYS
Increased placental cell processes, such as cell proliferation and growth, are indicated by the upregulation of FGF2, FGF2R, PGF, and IGF2R, the latest being a major fetal growth factor.
These processes require energy and, thus, are likely related to the upregulation of GLUT3 and PCK1.
The downregulation of SOD1 could indicate a better redox status, due to less need of the superoxide dismutase enzyme.
It is likely that increasing supply of lysine allows for a greater utilization of other amino acids as well, such as methionine, exemplified by the upregulation of MAT2A.
Control
Lysine
University of Illinois at Urbana-Champaign
Guadagnin et al., 2023, in press

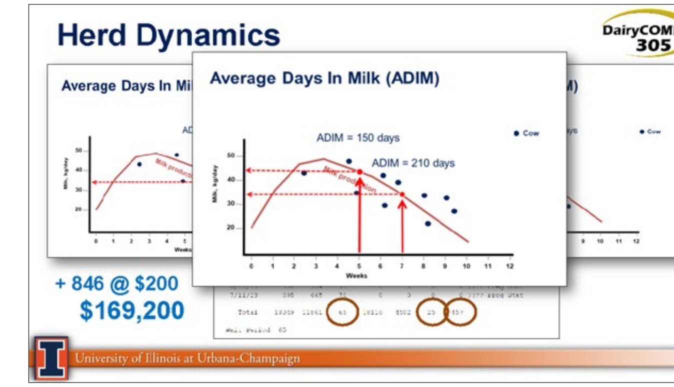

University of Illinois Dairy Farm


Bulk tank – Milk true protein, %
y = 6E-05x + 0.5373
U of I FARM
Linear (U of I FARM)
Over 1,950 samples
University of Illinois at Urbana-Champaign

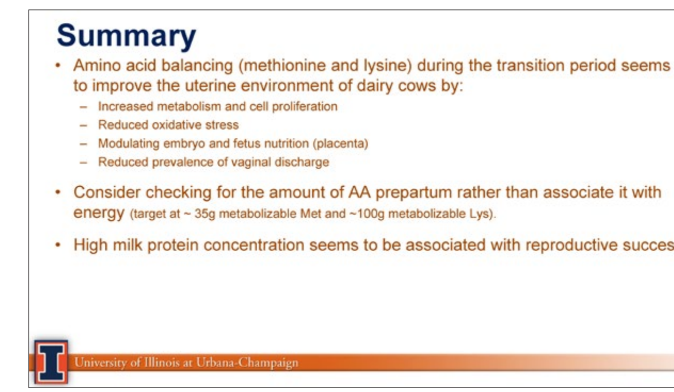

Cows with higher milk protein concentration had increased conception at first service and pregnancy by week 6
% conceived to first service
% pregnant by week 6
Milk protein concentration (%)
Milk protein concentration (%)
A retrospective, single cohort study was conducted using data collected from 74 Australian dairy herds. These herds provided data for 126,277 cows; these cows had 359,892 calvings (and hence lactations) recorded.
University of Illinois at Urbana-Champaign
Morton et al., 2016


Herd Dynamics
DairyCOMP 305
65 to 75%
11,861 to 13,761
18,110 to 20,826
@ 25%
4,502 to 5,206
10 to 7%
457 to 315
+ 846 @ $200
$169,200
Not my farm
University of Illinois at Urbana-Champaign


Herd Dynamics
DairyCOMP 305
Average Days In Milk (ADIM)
ADIM = 210 days
Average Days In Milk (ADIM)
ADIM = 150 days
+ 846 @ $200
$169,200
University of Illinois at Urbana-Champaign


Herd Dynamics
DairyCOMP 305
Average Days In Milk (ADIM)
ADIM = 150 days
ADIM = 210 days
+ 846 @ $200
$169,200
University of Illinois at Urbana-Champaign


Take Home Message!


Summary
Amino acid balancing (methionine and lysine) during the transition period seems to improve the uterine environment of dairy cows by:
– Increased metabolism and cell proliferation
– Reduced oxidative stress
– Modulating embryo and fetus nutrition (placenta)
– Reduced prevalence of vaginal discharge
Consider checking for the amount of AA prepartum rather than associate it with energy (target at ~ 35g metabolizable Met and ~100g metabolizable Lys).
High milk protein concentration seems to be associated with reproductive success
University of Illinois at Urbana-Champaign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Animal Sciences
COLLEGE OF AGRICULTURAL, CONSUMER & ENVIRONMENTAL SCIENCES
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Dairy Focus at Illinois Newsletter

Volume 9, Number 1

Measuring urine pH as an indicator of calcium balance

The transition period—the three weeks before and three weeks after calving—is crucial for maintaining dairy cow health because cows in this period are most susceptible to metabolic diseases. Postpartum metabolic disorders during the transition period include hypercalcemia, milk fever, mastitis, metritis, ketosis, displaced abomasum, retained placenta, and more. The onset of such diseases can create a domino effect that will negatively impact a cow's lactation performance, fertility, life span, and overall health (Glosson et al., 2020). One way to combat this widespread problem is through the supplementation of cations, anions, and calcium in prepartum diets to successfully prepare cows for their postpartum period.

Managing calcium levels is essential for successful lactation and performance. Blood calcium concentration normally ranges from 2.25 to 2.5 mM, and it is regulated by parathyroid hormone (PTH). During the last weeks of their pregnancy, cows only need enough calcium for maintenance, ranging from 20 to 32 g/d (grams per day) (Glosson et al., 2020; Goff & Horst, 1997). After calving, 30 to 50 g/d of calcium is needed for optimal milk production and peak performance. Any factor that interferes with maintenance of these calcium concentrations can have devastating effects on a cow's postpartum health (Glosson et al., 2020; Horst et al., 2005).

One way to prevent metabolic disorders in dry cows is by feeding negative DCAD (dietary cation-anion difference) diets. The equation to describe DCAD is (Na + K) – (Cl + S), with all values expressed in milliequivalents (mEq) per 100 g or kg of dietary dry matter (Oetzel, 2022). Negative DCAD diets are used prepartum to induce compensated metabolic acidosis in the rumen, which can be detected by noting decreased urine pH

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(ranging from 5.5 to 6) and increased calcium excretion in the urine (Glosson et al., 2020). In the state of compensated metabolic acidosis, calcium is absorbed from the rumen and small intestine and utilized by the bones, with the remainder excreted through the urine to maintain rumen and body homeostasis. This cycle allows for a cow to have calcium readily available for when lactation begins. Urine samples can be taken to measure a cow's metabolic response to the diet and to determine if adjustments are needed to maintain the desired pH range to induce acidosis (Glosson et al., 2020).

Experimental setup

Twenty Holstein cows were assessed in a photoperiod barn at the University of Illinois Lincoln Avenue Dairy Research Facility in the fall of 2022. Cows were assigned either a controlled energy (CEAA), high energy (HEAA), or lactation diet (CENAA). Urine pH samples were collected once per week at hour 0 (9 am), hour 6 (3 pm), and hour 24 (9 am). Hour 0 urine was collected in a milk tube and transferred to the University of Illinois Animal Sciences Laboratory to be further measured at hours 6 and 24. Urine pH was also evaluated at the farm at hours 0, 6, and 24.

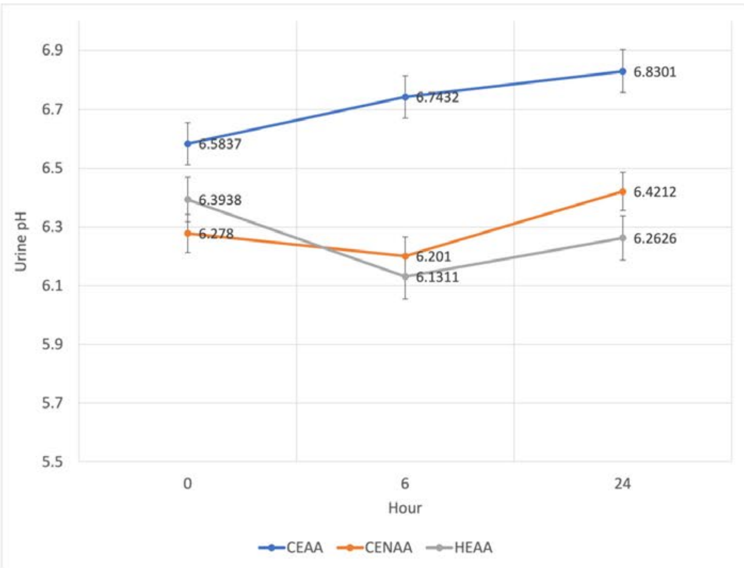

Fig. 1. The three treatments (CEAA, HEAA, CENAA) and urine pH levels at hours 0, 6, and 24.

Urine pH not affected by dietary energy level

Cows fed the three dietary treatments (CEAA, HEAA, CENAA) did not differ in urine pH levels at hours 0, 6, and 24, as shown in **Figure 1** (P = 0.8258).

Evaluating urine samples: farm vs. lab

Additionally, urine samples showed no significant urine pH changes when evaluated at hour 0, hour 6, or hour 24. This was true for samples evaluated at the farm or at the lab. This is illustrated in **Figure 2** (P = 0.8527).

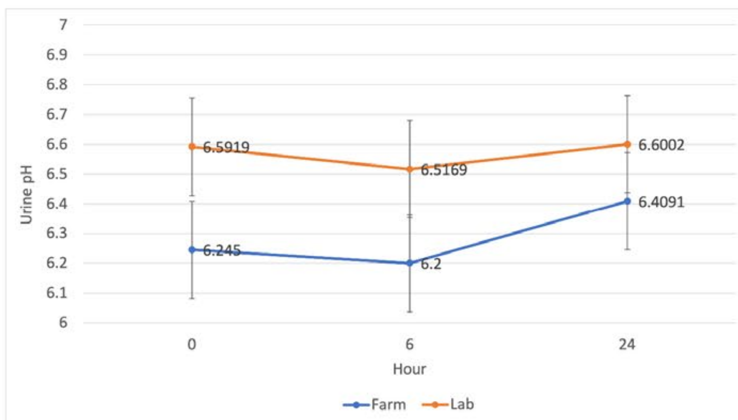

Fig. 2. The environments (farm and laboratory) and urine pH measured at hours 0, 6, and 24.

However, there was a significant difference in urine pH between samples evaluated in the different environments, as shown in **Figure 3** (P = 0.0407).

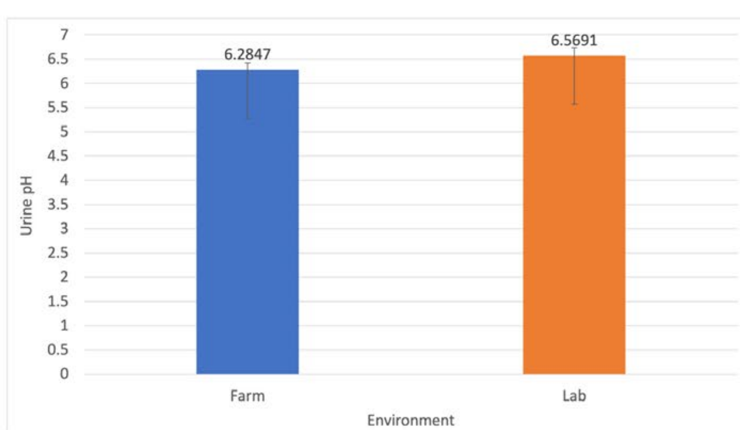

Fig. 3. The environments (farm and laboratory) and average urine pH.

The urine samples evaluated at the laboratory were transported from the farm in milk vials at hour 0 and then placed on a laboratory benchtop for 24 hours. Urine contains bacteria that produce large amounts of ammonia, which can make solutions such as urine more alkaline, increasing pH (Kastl, 2021). Thus, keeping urine samples at room temperature for extended periods can result in inaccurate pH readings.

That said, evaluating urine samples at the farm compared to the lab is preferred, as dairy barns typically contain proper ventilation systems to continuously exchange inside air for drier, cooler outside air (Graves, 2016). These conditions are more desirable for urine pH accuracy, as improper storage and higher temperatures can result in alkaline pH levels.

Urine pH affected by time on DCAD diet

We also evaluated the effects of the environment and DCAD days on urine pH levels, and the results are in **Figure 4** (P = 0.0419). The variable "days" is defined as the time between urine pH collection and the calving date. If samples were taken < 14 days from calving, these samples were classified as "more," as these cows had been on the DCAD diet for longer. Samples taken farther away from calving (> 14 days) were classified as "less" (P < 0.0001). Cows with "less" DCAD time were sampled on average 21.38 days from calving, whereas cows with "more" DCAD time were sampled on average 8.68 days from calving.

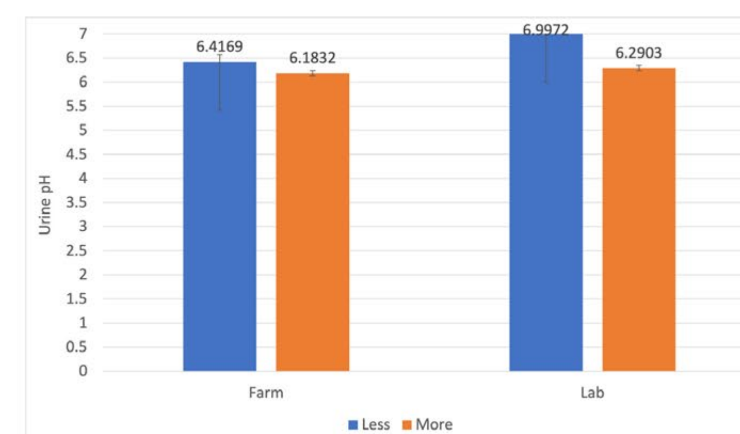

Fig. 4. Effects of the environment and DCAD days on urine pH levels.

DCAD time had a significant impact on urine pH levels; cows with "less" DCAD days had a higher urine pH than cows with "more" DCAD days (**Figure 5**).

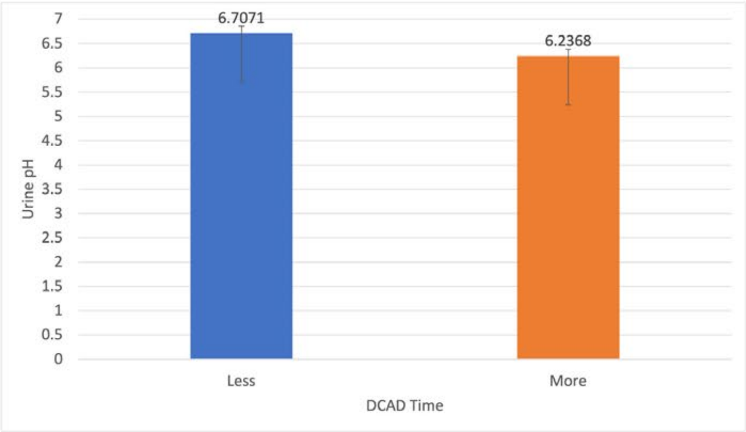

Fig. 5. Effect of DCAD time on urine pH values.

—Emma G. Prybylski, Emily S. O'Meara, and Dr. Phil Cardoso
Dept. of Animal Sciences, University of Illinois

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Volume 9, Number 2

Effect of feeding rumen protected AAs on muscle and adipose tissue

Skeletal muscle and adipose loss occur in the transition period because cows often experience negative energy balance during this time and therefore must use muscle and adipose tissue to meet energy demands after calving [1]. It is important for us to understand these physiological changes prepartum and postpartum to meet cows' demands and assist in replenishing these tissues.

In the prepartum period, the dry cow adjusts her amino acid (AA) utilization to meet the requirements of lactation and her developing fetus [1]. During this time, the uterus will increase in size. In the final stages of gestation, the mammary gland will grow and develop secretory cells and produce large volumes of milk—all while the fetus is developing. These processes all require AAs to support this growth and development.

Postpartum AAs are necessary to keep up with the high demands of milk production [1]. Protein mobilization is the greatest after the first week of lactation up to the fifth week [1]. Many organs, including the liver and digestive tract, will increase in size following parturition and will require more AA [1]. Postpartum, there may not be enough dry matter intake (DMI) to provide dairy cows with adequate digestible AAs; therefore, their bodies resort to using muscle to supply these AAs [1]. They can convert these AAs to glucose to meet the increased glucose requirement post-calving [1]. Positive energy balance is necessary for dairy cows undergoing parturition, as the energy needed for lactation will outweigh the energy needed for other nutrient factors [2]. Energy balance is directly correlated with the development of production disease. DMI is also highly correlated with energy balance [2]. DMI during this time is extremely important, as an adequate DMI will decrease susceptibility to disease and lead to healthy parturition [2].

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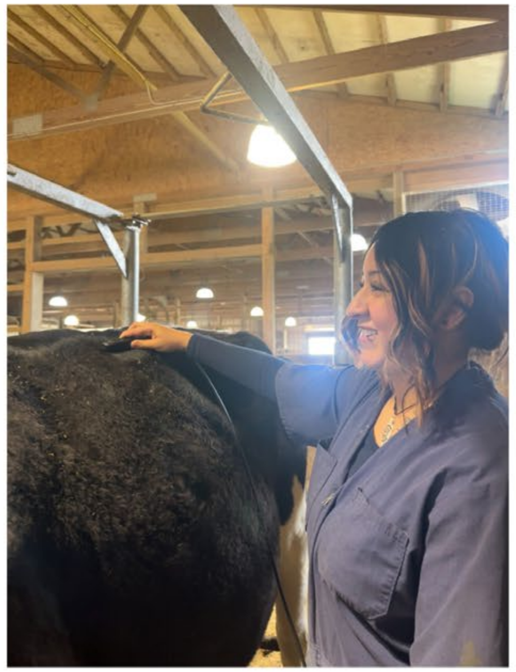
Our lab conducted an experiment to observe how amino acids, rumen-protected lysine (RPL), and rumen-protected methionine (RPM) affected skeletal muscle and adipose loss in cows fed controlled- and high-energy diets. Sixty-two multiparous Holstein cows were fed a controlled-energy diet (straw-based diet, 1.45 NE_L, Mcal/kg of DM) with RPL and RPM [CEAA; 0.15% RPL and 0.09% RPM of dietary dry matter intake (DMI)]; a controlled-energy diet without RPL and RPM (control; CENAA); or a high-energy diet (corn silage based diet, 1.71 NE_L, Mcal/kg of DM) with RPL and RPM (HEAA; RPL 0.22% and RPM 0.12% of dietary DMI). To quantify muscle and adipose depth and change during the transition period, we examined each cow between the second and third rib with an Ibex Pro ultrasound machine to measure back fat and the longissimus dorsi. Image J was used to measure the depth of back fat and muscle depth.

Prepartum cows fed a controlled-energy diet with AA supplementation tended to lose less back fat and muscle depth than cows fed the controlled-energy diet that received no AA. Postpartum, all treatments decreased back fat, and muscle depth decreased from day 3 to 70. There was a tendency for cows on the high-energy diet that received AA to have more back fat than cows on the controlled-energy diet that received AA.

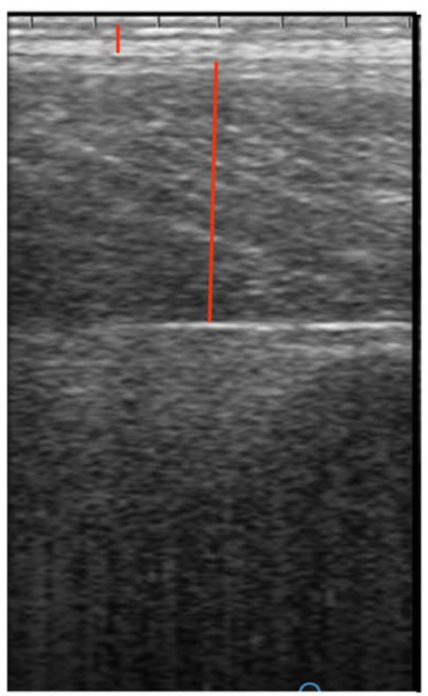
Through the results of the experiment, we were able to understand the importance of feeding AA in the prepartum period. Cows that received supplemental AA in controlled-energy diets seemed to lose less muscle and adipose tissue than cows that were not given AA. This could be due to the increased need for AA in the prepartum period.

—Karla Solis, Emily S. O'Meara, and Dr. Phil Cardoso

Dept. of Animal Sciences, University of Illinois



BS student Karla Solis ultrasounding cow



Day -28 relative to expected calving

Day 70 relative to calving

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Ben Buckner, Ph.D.
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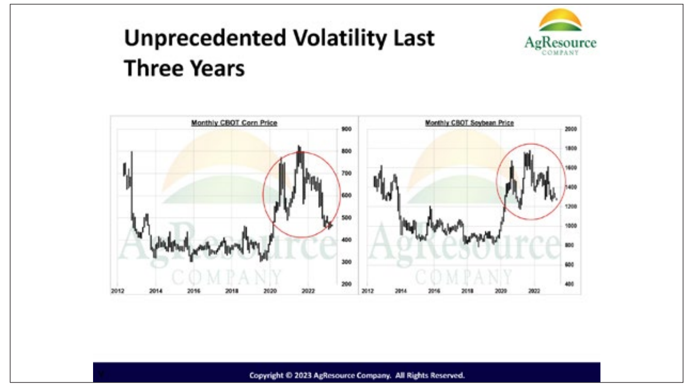
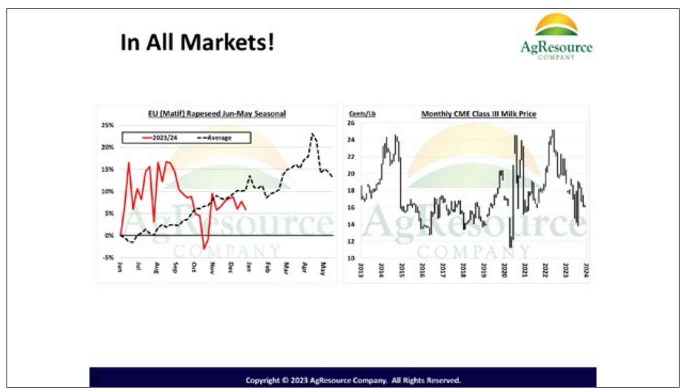
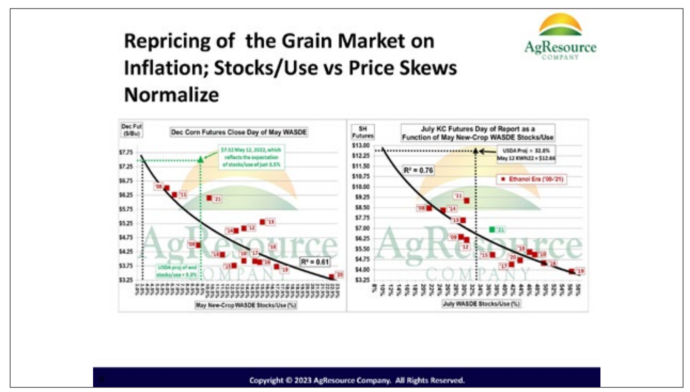
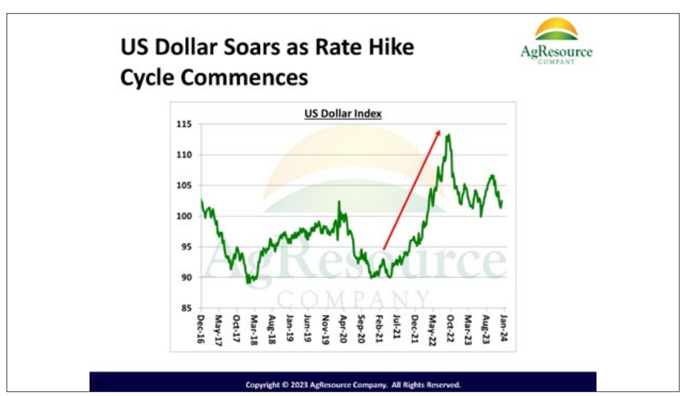
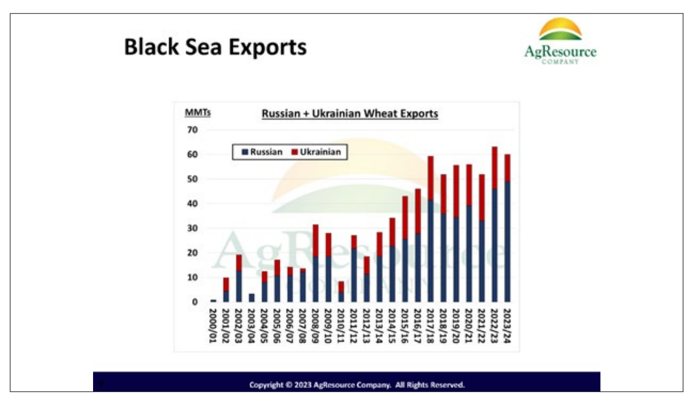
Food Markets Reset in 2023, Volatility Theme of 2024, Geopolitical/Climate Risks Abnormally High

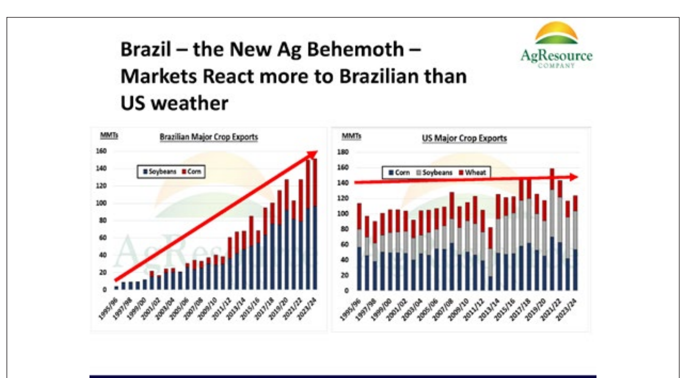


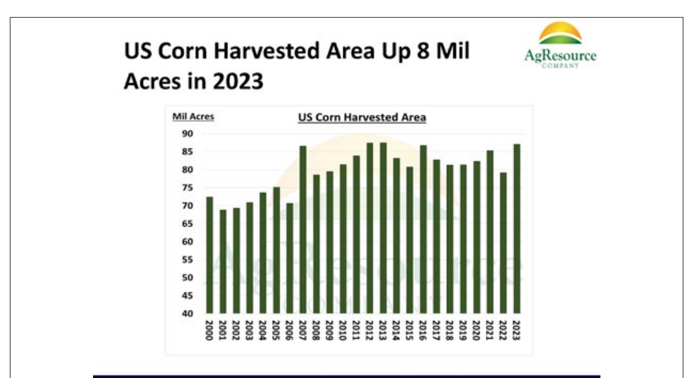


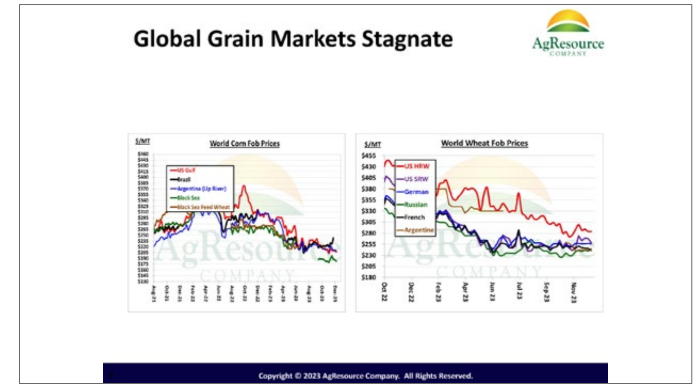


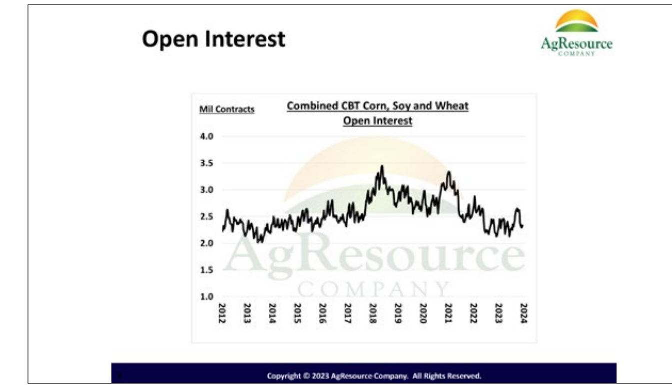


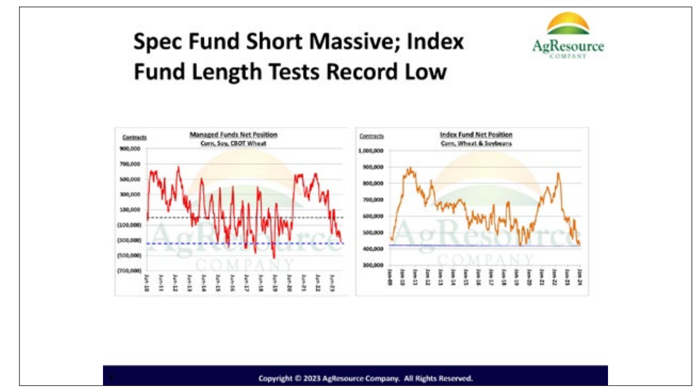


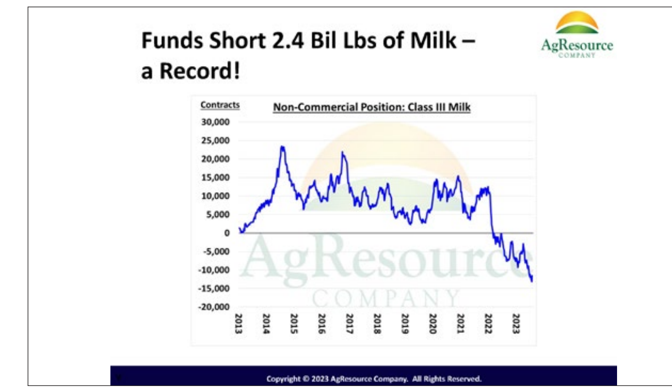


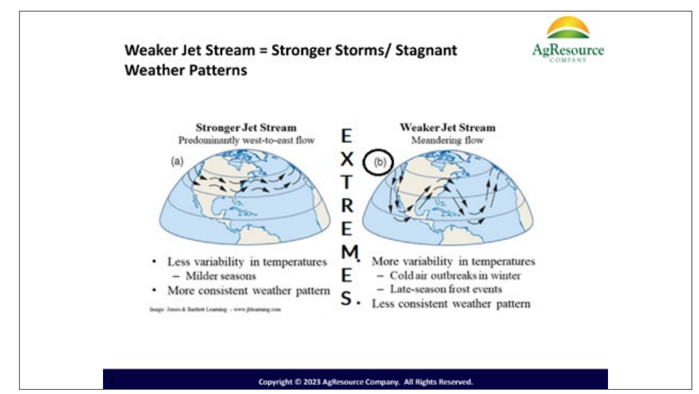


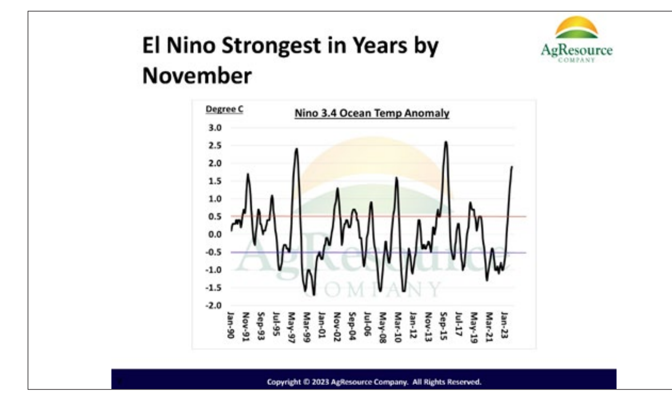


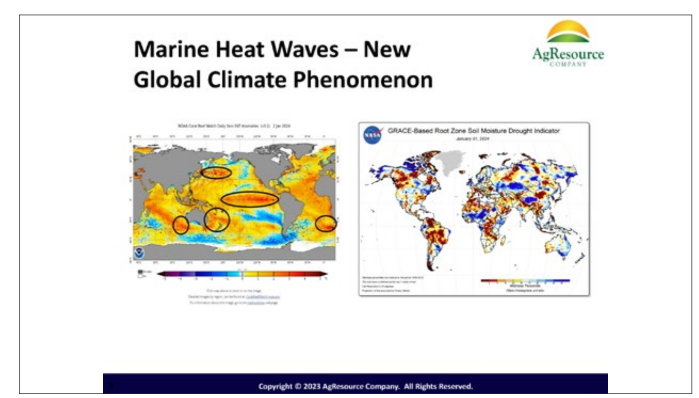


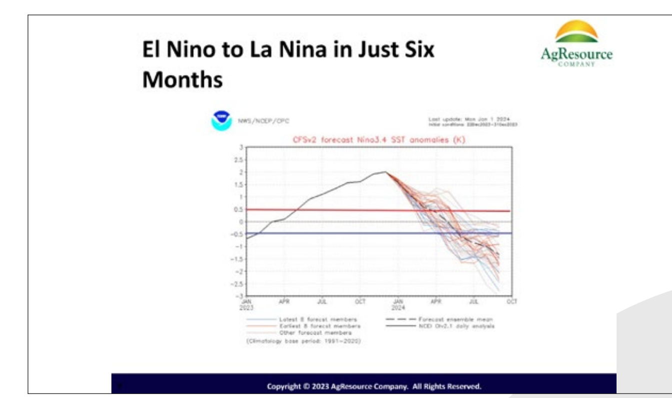


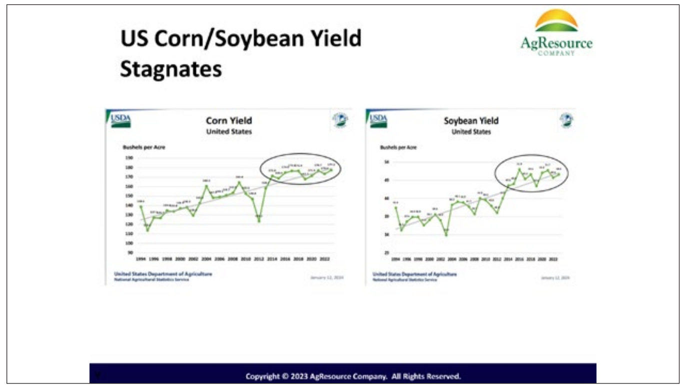











US Corn/Soybean Yield Stagnates
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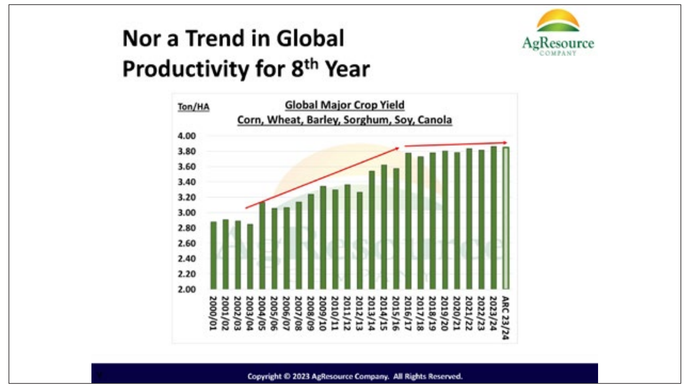
Corn Yield
United States
Soybean Yield
United States


Nor a Trend in Global Productivity for 8th Year
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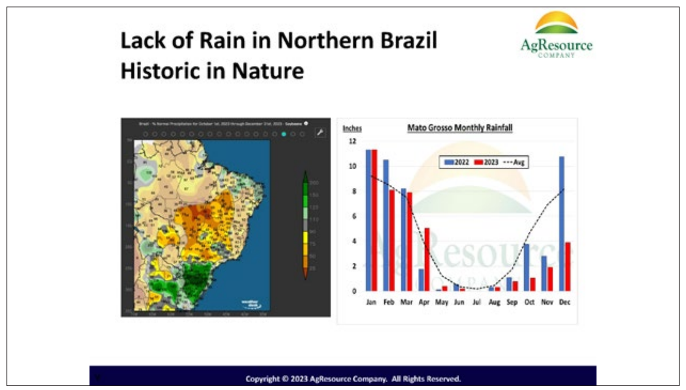
Global Major Crop Yield
Corn, Wheat, Barley, Sorghum, Soy, Canola
Ton/HA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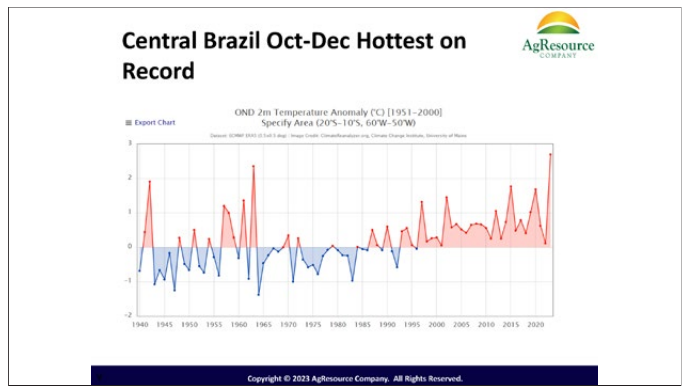
Mato Grosso Monthly Rainfall
Inches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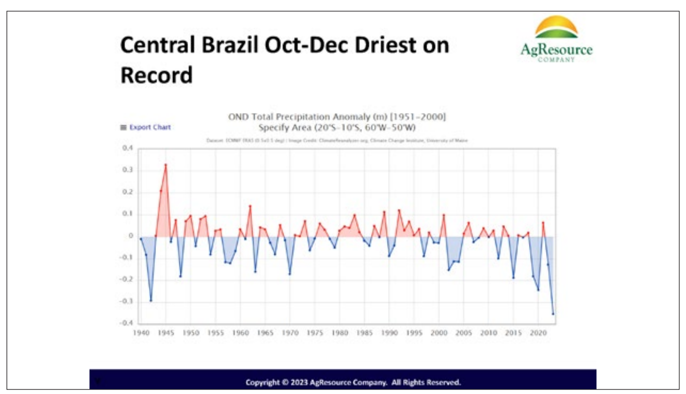
OND 2m Temperature Anomaly (°C) [1951–2000]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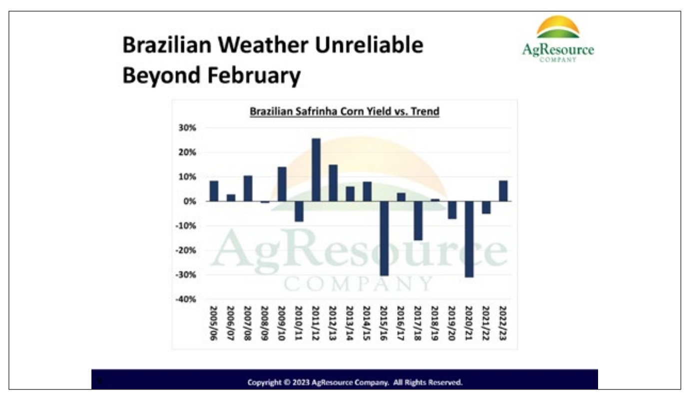
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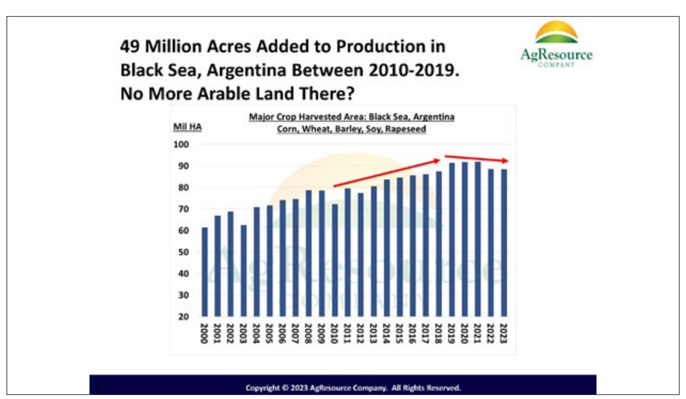
Brazilian Safrinha Corn Yield vs. Trend


49 Million Acres Added to Production in Black Sea, Argentina Between 2010-2019. No More Arable Land There?
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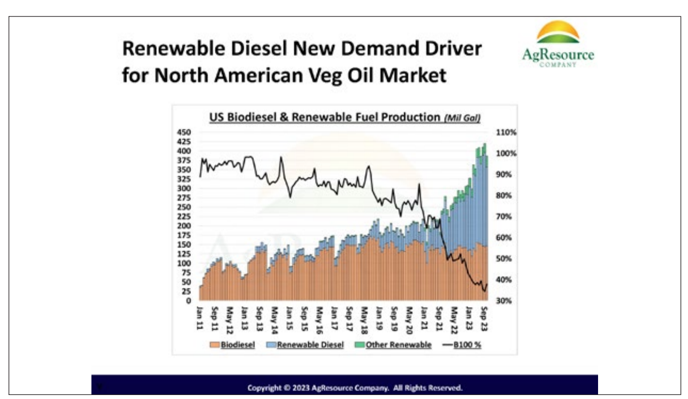
Major Crop Harvested Area: Black Sea, Argentina
Corn, Wheat, Barley, Soy, Rapeseed
Mil HA


Renewable Diesel New Demand Driver for North American Veg Oil Market
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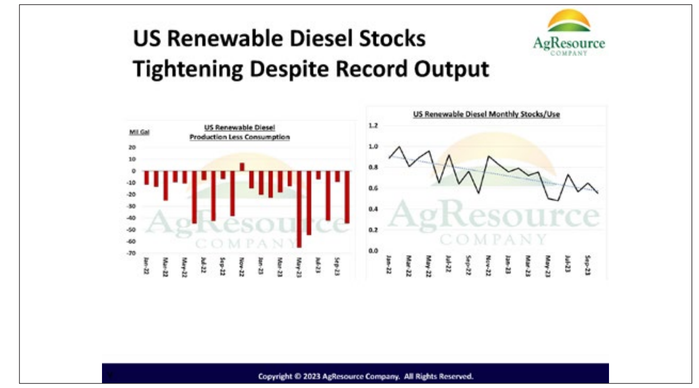
US Biodiesel & Renewable Fuel Production (Mil Gal)
Biodiesel
Renewable Diesel
Other Renewable


US Renewable Diesel Stocks Tightening Despite Record Output
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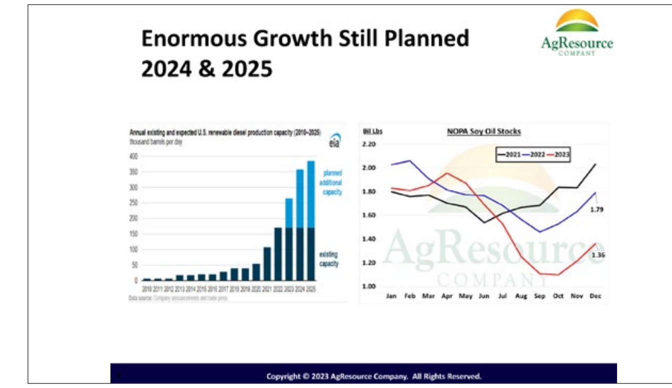
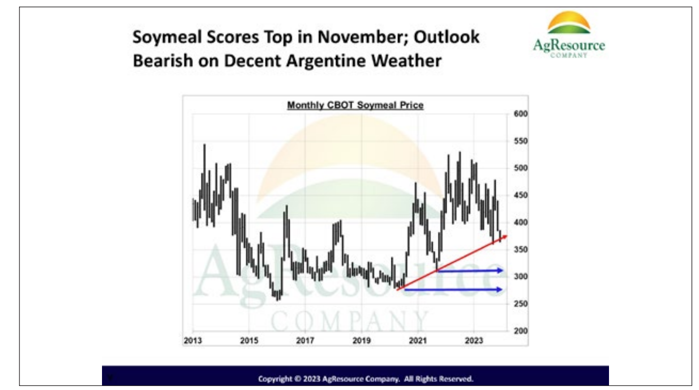
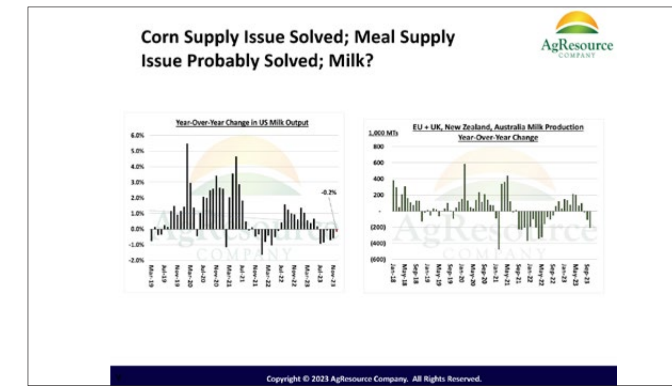
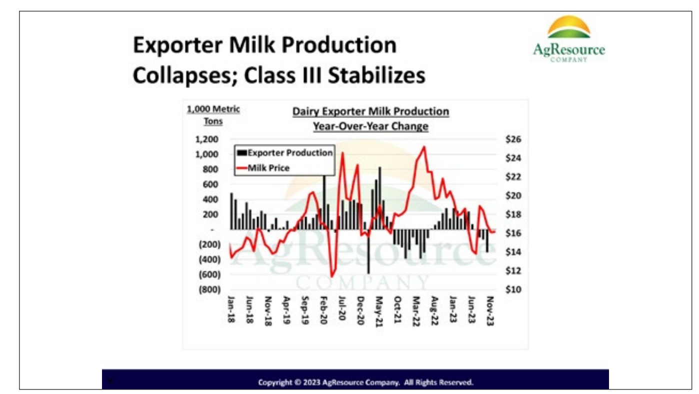
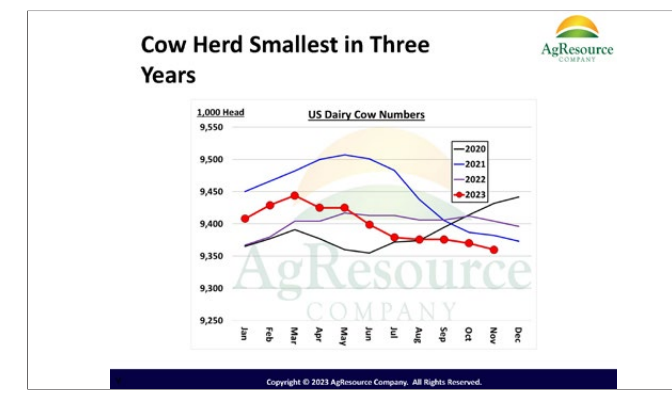
US Renewable Diesel Monthly Stocks/Use

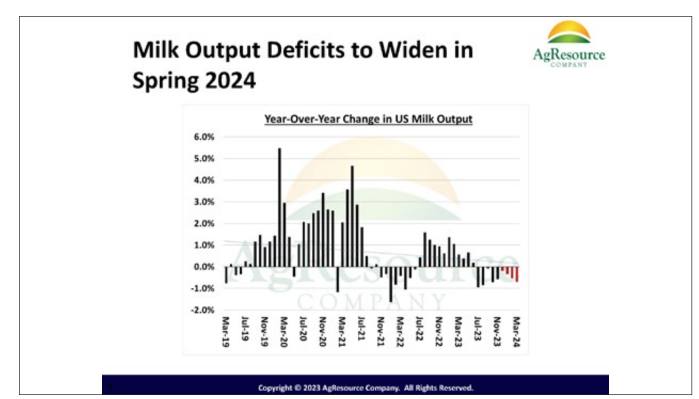

Enormous Growth Still Planned 2024 & 2025
AgResource
NOPA Soy Oil Stocks

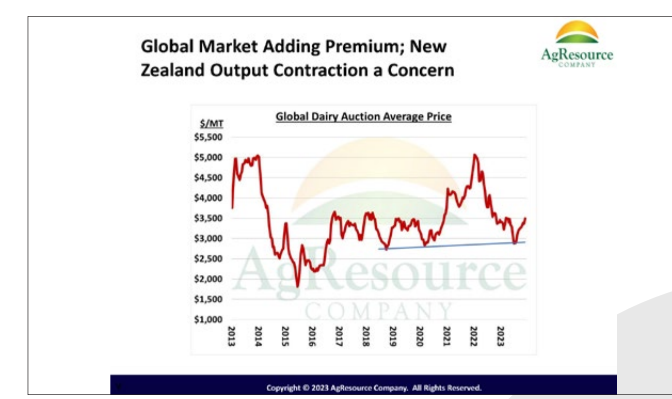

Soymeal Scores Top in November; Outlook Bearish on Decent Argentine Weather
AgResource
Monthly CBOT Soymeal Price


Corn Supply Issue Solved; Meal Supply Issue Probably Solved; Milk?
AgResource
Year-Over-Year Change in US Milk Output

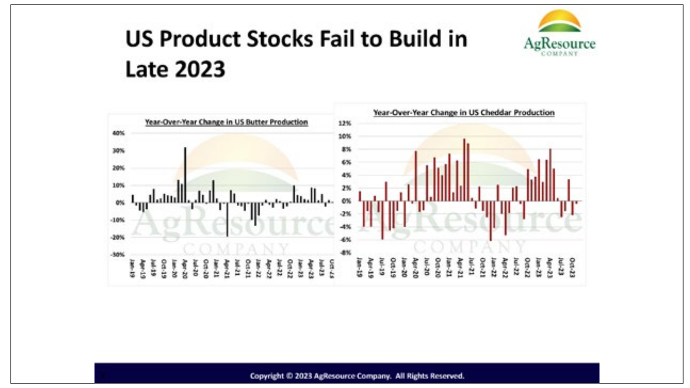

Exporter Milk Production Collapses; Class III Stabilizes
AgResource
Dairy Exporter Milk Production
Year-Over-Year Change
1,000 Metric Tons
Exporter Production
Milk Price

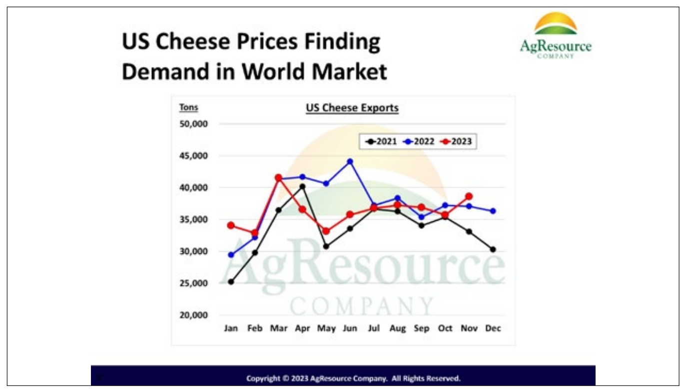

Cow Herd Smallest in Three Years
AgResource
US Dairy Cow Numbers
1,000 Head
2020
2021
2022
2023

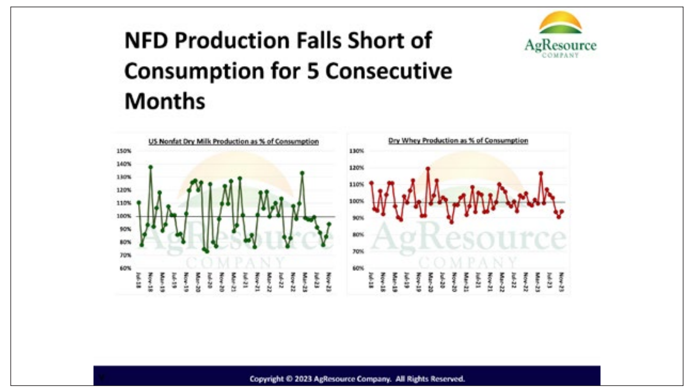

Milk Output Deficits to Widen in Spring 2024
AgResource
Year-Over-Year Change in US Milk Output

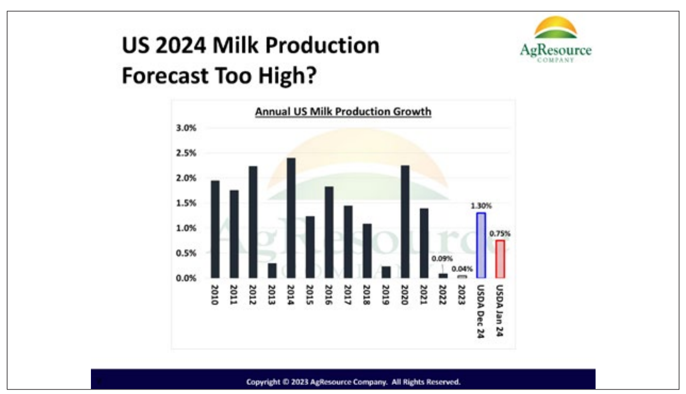

Global Market Adding Premium; New Zealand Output Contraction a Concern
AgResource
Global Dairy Auction Average Price
$/MT

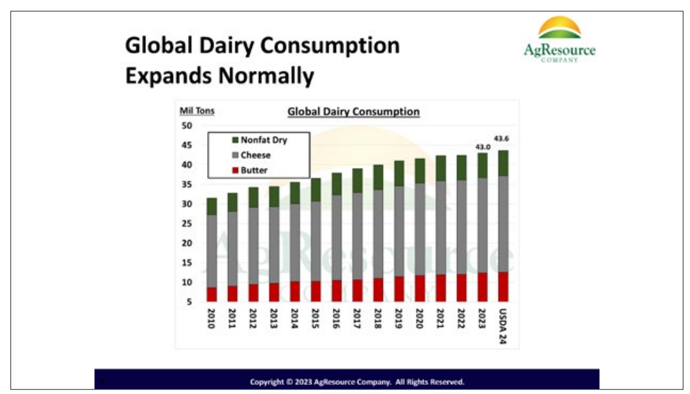

US Products Competitively Priced – Even Butter!
Global Dairy Auction Butter Price Seasonal
Global Dairy Auction Cheddar Price Seasonal

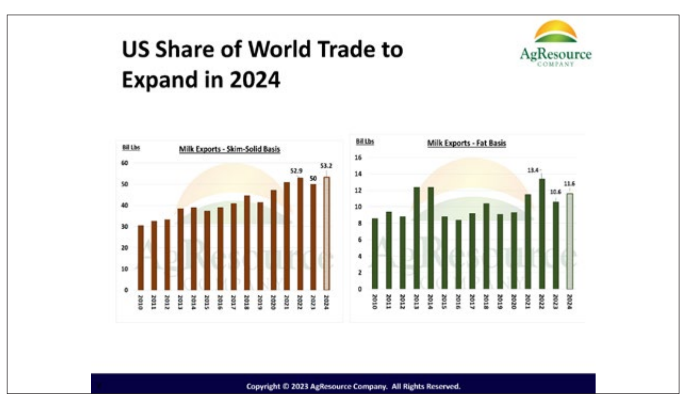

US Product Stocks Fail to Build in Late 2023
Year-Over-Year Change in US Cheddar Production

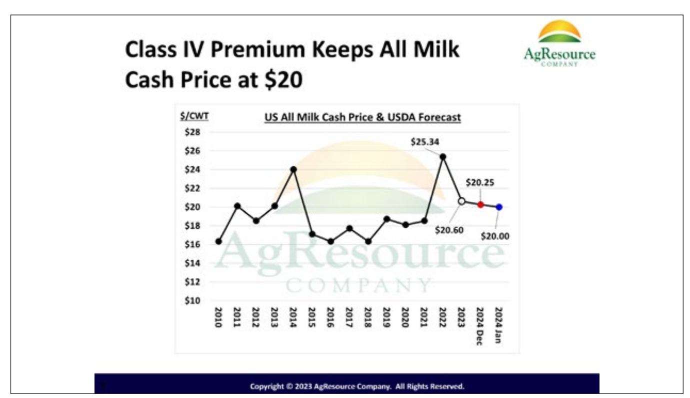

US Cheese Prices Finding Demand in World Market
US Cheese Exports

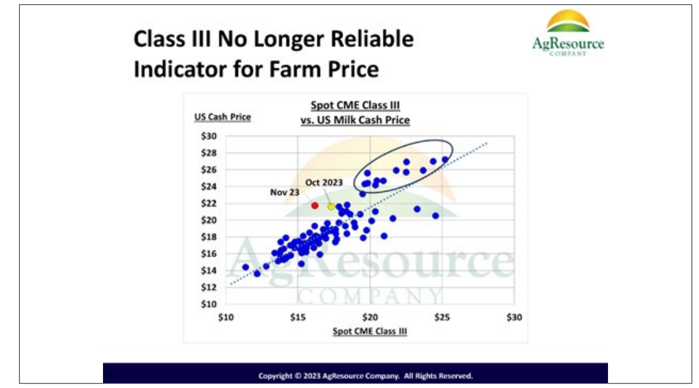

NFD Production Falls Short of Consumption for 5 Consecutive Months

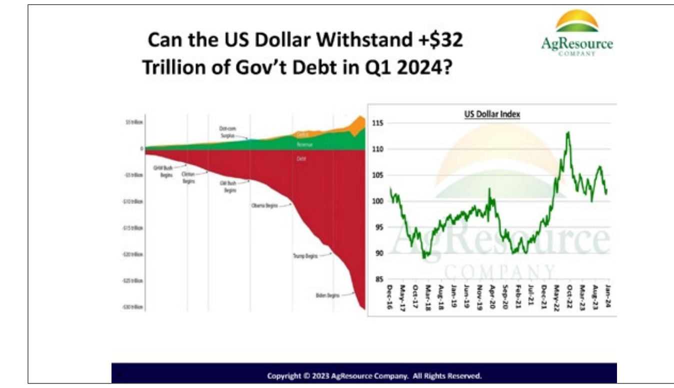

US 2024 Milk Production Forecast Too High?
Annual US Milk Production Growth

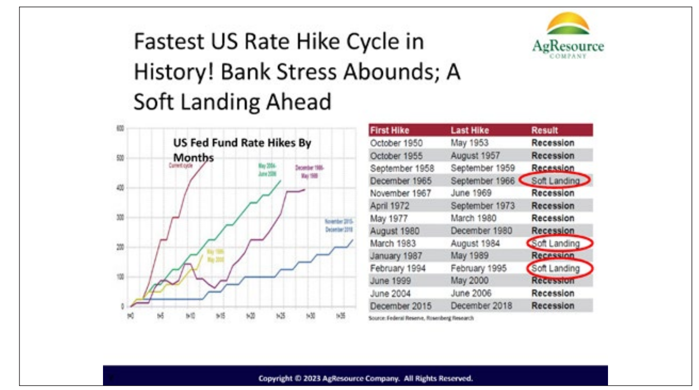

Global Dairy Consumption Expands Normally
Global Dairy Consumption

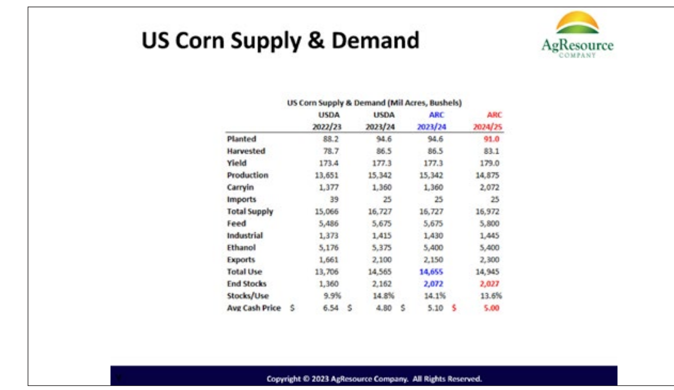

US Share of World Trade to Expand in 2024

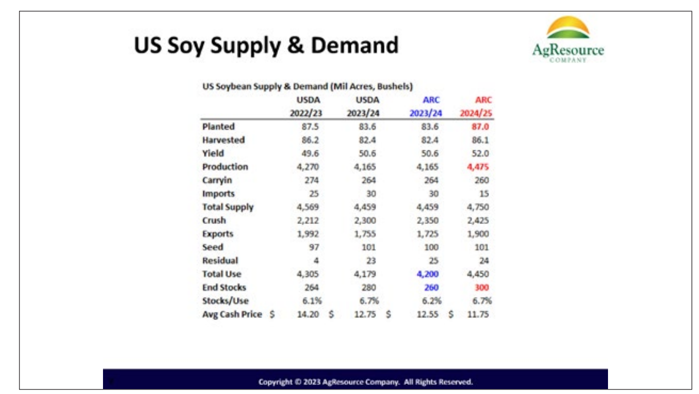

Class IV Premium Keeps All Milk Cash Price at $20
US All Milk Cash Price & USDA Forecast


Class III No Longer Reliable Indicator for Farm Price
Spot CME Class III vs. US Milk Cash Price

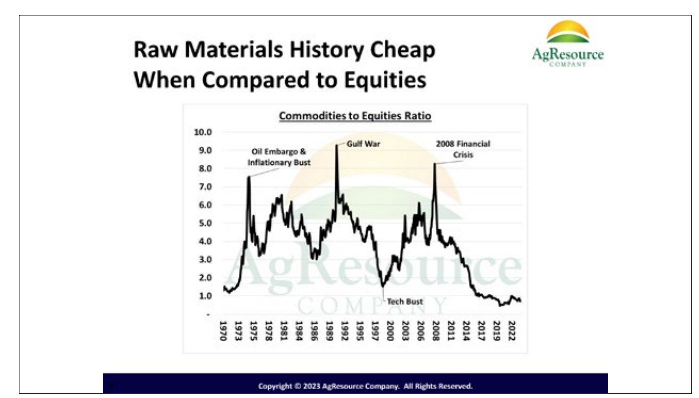

Can the US Dollar Withstand +$32 Trillion of Gov't Debt in Q1 2024?
US Dollar Index


Fastest US Rate Hike Cycle in History! Bank Stress Abounds; A Soft Landing Ahead
US Fed Fund Rate Hikes By Months


US Corn Supply & Demand


US Soy Supply & Demand


A Third of World Decides on Leadership in 2024
2024, a worldwide election year


Raw Materials History Cheap When Compared to Equities
Commodities to Equities Ratio
Gulf War
2008 Financial Crisis
Tech Bust


It's not enough to know the news.
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Thank You
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DEREK NOLAN

Gauge Operating Finances

The USDA released a report last month indicating we can expect an average decrease of 20% in income between 2023 and 2024. Dairy farm income is expected to drop 81%. The report suggests the decline will mainly be due to volatility in milk and input prices. Ohio State University has examined dairy farms' financial benchmarks for the past 25 years to determine where the most competitive dairies fall. The following three benchmarks focus on the operating costs associated with the dairy.

BENCHMARKS TO FOCUS ON:

1. Energy Corrected Milk (ECM) Per Worker

Labor costs are becoming a larger piece of the operating cost pie. Calculating ECM per worker can help determine labor efficiency issues. The Ohio State study determined the most competitive farms sell 1,000,000 lb. of ECM per worker per year. If numbers are below the competitive level, herd productivity and labor utilization should be evaluated.

> "Like other benchmarking, we have to remember every farm is different when using financial benchmarks."

2. Feed Costs Per CWT of Milk Sold

Feed costs can be looked at a number of different ways, either including all animals on the farm (heifers and dry cows) or only lactating cows. Including all animals will provide a better sense of the financial situation. The most competitive fell within the top 25% of farms for the given value. Other sources suggest the total feed costs should be below 45% of the milk check. When goals are not met, forage quality should be examined first. Forage quality has the single greatest impact on total feed costs.

3. Operating Expense Ratio

The operating expense ratio is calculated by dividing the total operating expenses (minus interest) by the gross income. Farms should strive to be less than or equal to 70%. An expense ratio greater than 70% may be due to high expenses or low income. When operating expense ratios are not met, high feed costs are often to blame.

Like other benchmarking, we have to remember every farm is different when using financial benchmarks. Farm size and labor allocations can affect how farms are compared to others. The three gauges included in this article are focused on operating costs. Operating costs should be evaluated at least quarterly or when management or feed changes occur to determine how changes can impact day-to-day costs and income to the farm. Capital, solvency and liquidity reports should be done at least once a year to determine the full financial health of the dairy.

Derek Nolan, dairy education and Extension specialist, University of Illinois, Urbana-Champaign

Derek Nolan, Ph.D.
University of Illinois

Managing Cows and Costs to Strive for Dairy Profitability

Managing cows and costs to strive for dairy profitability

Dairy Extension
ILLINOIS ACES

Derek Nolan
Illinois Dairy Summit
February 7th, 2024

ILLINOIS

Outline

- What profitability measures can be benchmarked?
- Trends in operating costs
- Benchmarking costs
- Assigning cow value
- Benchmarking cow value
- Take Home Points

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15 Measures of Dairy Farm Competitiveness - OSU

- Focus on operating and easily measured factors
  - Energy Corrected Milk per Worker
  - Feed Costs per CWT of Milk Sold
  - Operating Expense Ratio

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Energy Corrected Milk per Worker

- ECM = (7.2 x lb protein) + (12.95 x lb fat) + (0.327x lb milk)
- Increased in the cost of labor (increased minimum wage)
- ECM/(Total hours/2,000)
- Goal: Greater than 1,000,000 ECM per worker

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Not meeting goals?

- Evaluate herd productivity
- Labor efficiency
  - 40 to 50 cows per FTE
  - 4.5 turns in parlor an hour

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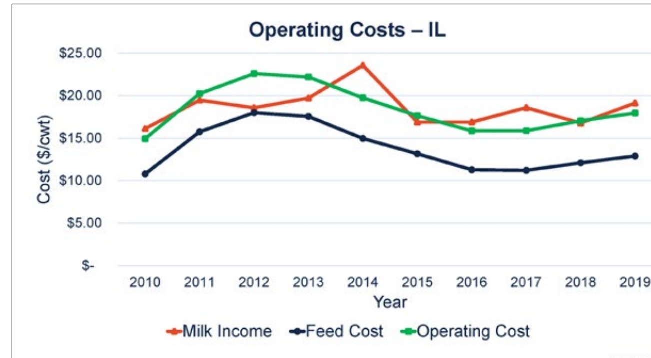

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Operating Costs

Operating Costs ($/cwt)	US	IL
Purchased feed	$ 7.20	$ 8.00
Homegrown harvested feed	$ 3.32	$ 4.85
Grazed feed	$ 0.07	$ 0.04
Total, feed costs	$ 10.59	$ 12.89
Veterinary and medicine	$ 0.78	$ 1.35
Bedding and litter	$ 0.20	$ 0.20
Marketing	$ 0.19	$ 0.14
Custom services	$ 0.67	$ 1.06
Fuel, lube, and electricity	$ 0.69	$ 0.95
Repairs	$ 0.66	$ 1.19
Other, operating costs	$ -	$ -
Interest on operating capital	$ 0.14	$ 0.18
Total, operating costs	$ 13.92	$ 17.96

USDA ERS

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Feed Costs per CWT of Milk

- Total costs of feed to herd / total $ per cwt of milk sold
- More informative than IOFC
- Includes all feed costs on the farm
- Goal: Less than 45% of milk check

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Not meeting goals?
- Quality forages are a must
- Grouping of animals
- Crop production costs
- Feed shrink
- General cow management

Operating Expense Ratio
- ((Total cash operating expenses – interest) / gross farm income)*100
- Evaluates farm income used to pay expenses
- Goal: Less than or equal to 70%

Not meeting goals?
- Less than 70% - are production goals similar to other herd? – great!
- Higher the 70%
  - Large expenses or low income
  - Check feed costs first
  - Check milk sold per worker

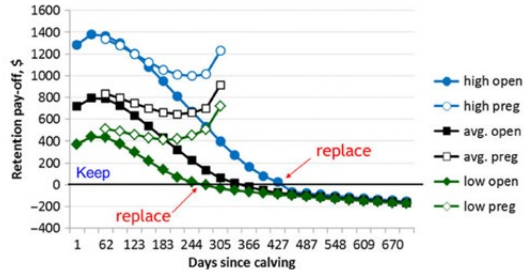
Assign cow values
- Profitable cows = profitable dairy
- Culling decisions (emotional) should be thought of as a business decision
- Cattle prices look good – lead to more profit for the dairy (if selecting the right animals)

Retention Pay Off Value
- Consider the potential income of cow in question vs potential income of replacement heifer (over a specific period of time)

Incomes	Costs
Milk Production	Cost of replacement
Value of the Calf	Feed costs
Slaughter Value	Insemination
	Cost of Days Open
	Disease Costs
	Probability of Survival

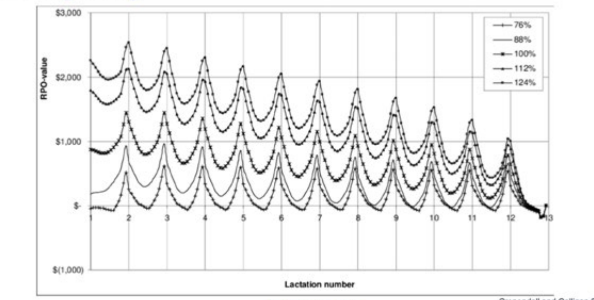
Retention Pay Off Value
- Positive = the amount of the money that should be spent keeping the cow in the herd
- Zero = optimal time of culling
- Negative = cow should be culled from the herd

Retention Pay Off



Impacts on RPO
- Milk yield
- Pregnancy status – potential value of the calf
- Days open – decrease RPO rather quickly
- Assumes replacements are readily available

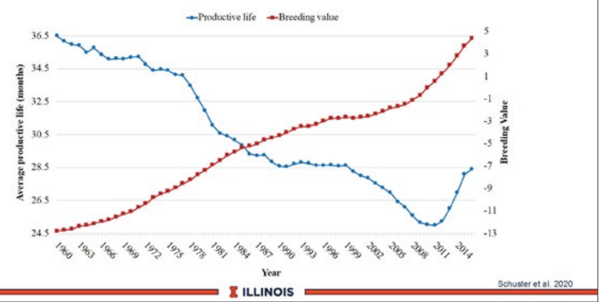
Longevity



Considering Cow Longevity
- Culling decisions based on cow age
- Cull old cows to make room for new genetics
- Potentially worth it to keep older cows around?

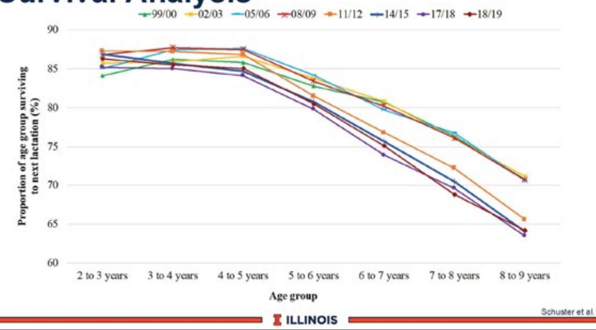
Longevity?
- Ability to live a long life
- Herd life – time from birth to culling
- Productive life – time from first calving to culling

Breeding Value vs Productive Life



Schuster et al. 2020

Survival Analysis



Schuster et al. 2020

Costs associated with longevity
- Calf value opportunity costs – Not producing calves that can be sold because they are needed for replacements
- Aged cow cost – past peak lifetime milk yield (increased vet costs)

Impacts of longevity costs
- Calf value opportunity costs – Decreases with with increased productive life
- Aged cow costs – Increases with increased productive life

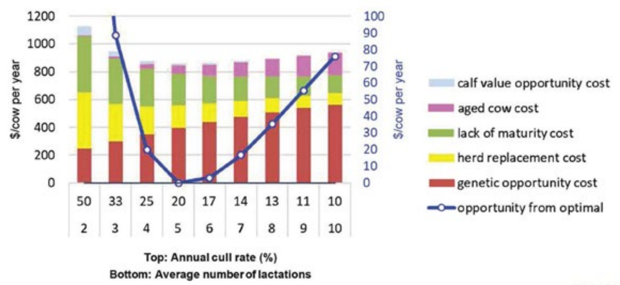
Costs associated with longevity

- Lack of maturity cost – lactations 1 to are less efficient milk producers
- Herd replacement costs – cost of heifer minus price received when cow leaves herd
- Genetic opportunity costs – cost of having older, less genetically improved cows

Impacts of longevity costs

- Lack of maturity costs – Decreases with longer productive lifespan
- Herd replacement costs – Decreases with longer productive lifespan
- Genetic opportunity costs – Lower with younger herd

Optimal Productive Lifespan



De Vries (2020)

Impacts of Productive Life

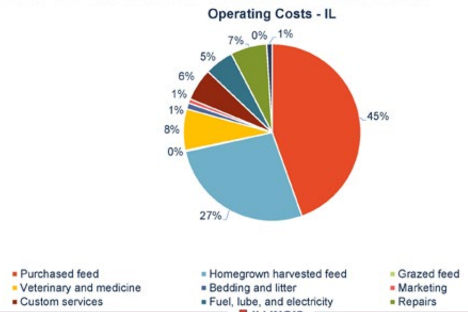
- Influx of heifers – pushing cows out
- Many of same culling reasons
  - Low production
  - Failure to conceive
  - Health problems

University of MN study

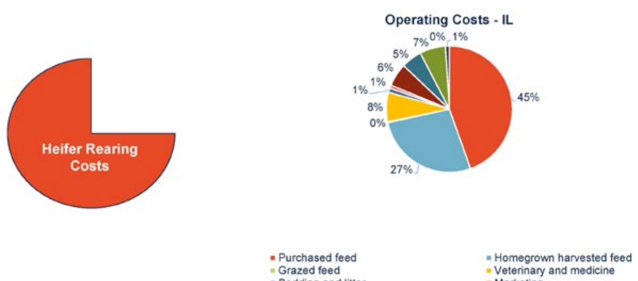
- Combined DHIA and financial data
- Profitable herds had greater percentage of herd over 3rd lactation
- Consider break even costs of production
- Cumulative vs annual

Dr. Joleen Hadrich, 2021

Milk Production Costs – Annual



Milk Production Costs – Cumulative



University of MN Study

- Profitable farms – keep cows past cumulative breakeven
- Money made minus costs = profit
- Resilient Farms – over 50% of cows have broken even
  - 50% of cows culled before they hit breakeven
  - Even with income from selling the cow

Dr. Joleen Hadrich, 2021

Culling Rates

Heifer Rearing Cost	Profit $/cow/yr	Preg Rate	Annual Cull Rate	Surplus Heifer Calves
$1,400.00	$818.00	25%	59%	-22%
$1,600.00	$720.00	25%	41%	8%
$1,800.00	$647.00	25%	34%	21%
$2,000.00	$584.00	24%	30%	28%
$2,200.00	$526.00	24%	28%	32%
$1,400.00	$801.00	21%	64%	-30%
$1,600.00	$696.00	20%	44%	2%
$1,800.00	$617.00	20%	36%	15%
$2,000.00	$550.00	20%	32%	22%
$2,200.00	$488.00	20%	30%	26%

De Vries (2017)

Other Culling Considerations

- Longevity – spend the time and money to get your cows to pay off point
- Breakeven depends on cost of heifer raising
- Genetic testing
- Other selection options

Take Home Messages

- Focused on operating benchmarking operating cost
- Not meeting goals – start with feed costs and labor
- Labor going to continue to increase
- Keeping and evaluating records is **very** important

Take Home Messages

- Retention Pay Off gives optimal time of culling
  - Very in depth analysis
- Breakeven costs more reasonable estimate
- Survival through time should be considered
- Culling is not always an economic decision

Thank you

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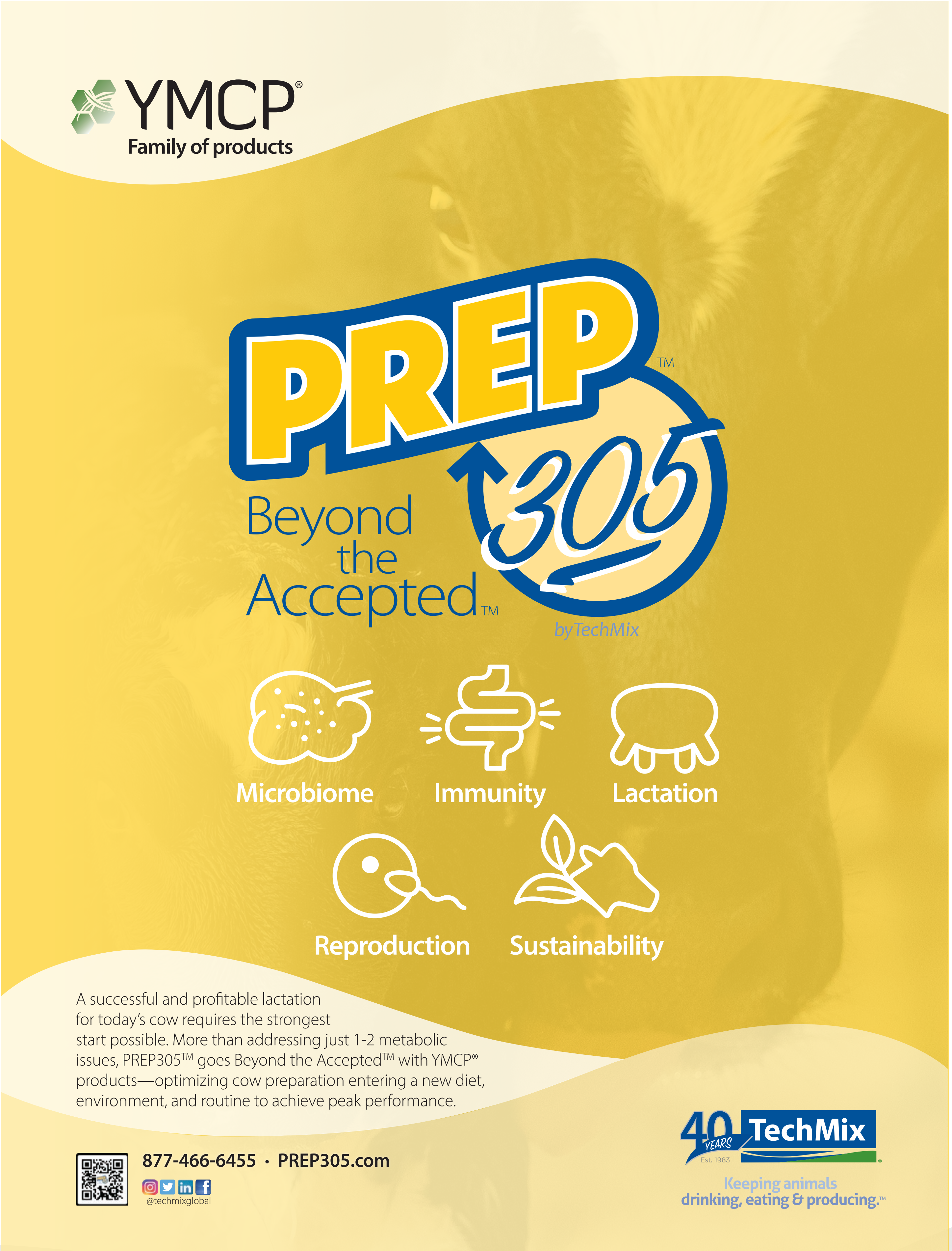

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