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Beef Cattle Institute Research Summaries

August 8th, 2025

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Evaluating the efficacy of Maternal Bovine Appeasing Substance (MBAS) (FerAppease®) administration on pain outcomes in calves after cautery dehorning and surgical castration

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Background

- Maternal Bovine Appeasing Substance (MBAS) is a pheromone that is naturally secreted by the skin of the mammary gland and is thought to provide calming effect for nursing calves
- FerAppease® is a synthetic analog of MBAS that is administered topically

Objective

- To determine if administering MBAS in addition to lidocaine, or in combination with lidocaine and meloxicam, would provide pain relief after surgical castration and cautery disbudding in calves

Study Design

49 Calves Randomized Across 6 Treatments

Lidocaine (Lid)	Lidocaine + MBAS (MBAS)	Lidocaine + Meloxicam (Mel)	Lidocaine + Meloxicam + MBAS (Combo)	Sham	No analgesia (Control)
n=9	n=10	n=10	n=9	n=6	n=5

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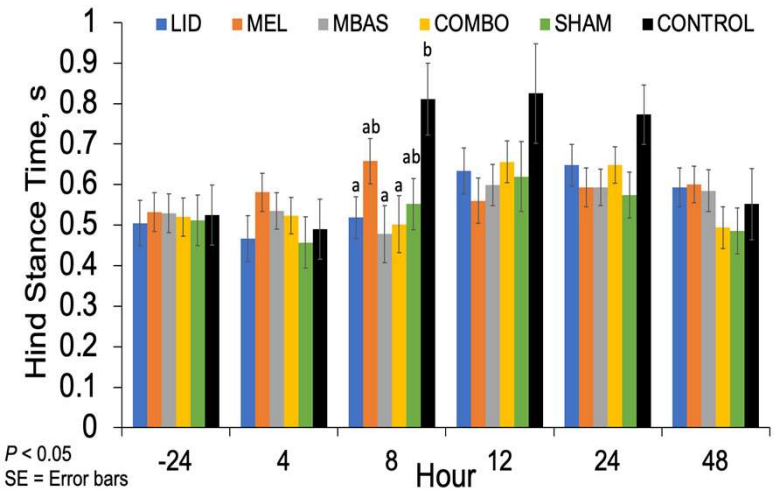
Gait Analysis

Hind Stance Time	
Treatment	*P*=0.99
Time	***P*<0.01**
Treatment x Time	***P*=0.02**

- Calves that received no analgesia (CONTROL; *n* = 5) had a higher stance time than all other treatments at timepoint 8, 12, 24



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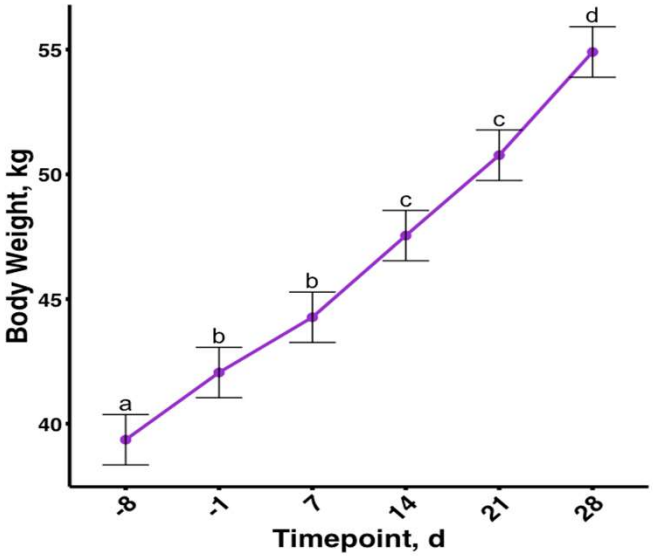
Performance – Body Weight

Body weight	
Treatment	*P*=0.58
Time	***P*<0.01**
Treatment x Time	*P*=0.99

- Steadily gained weight as study went on, regardless of treatment group



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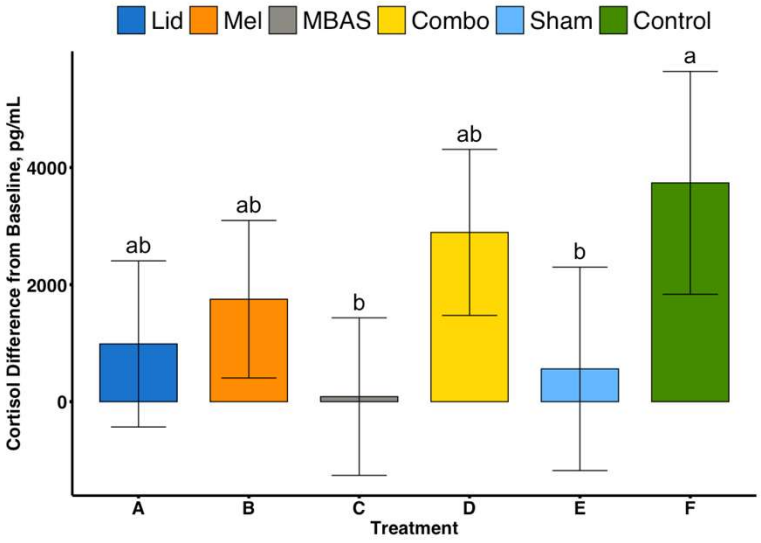
Plasma Cortisol

Cortisol	
Treatment	***P*<0.01**
Time	***P*<0.01**
Treatment x Time	*P*=0.12

- CONTROL group significantly different than MBAS and SHAM groups



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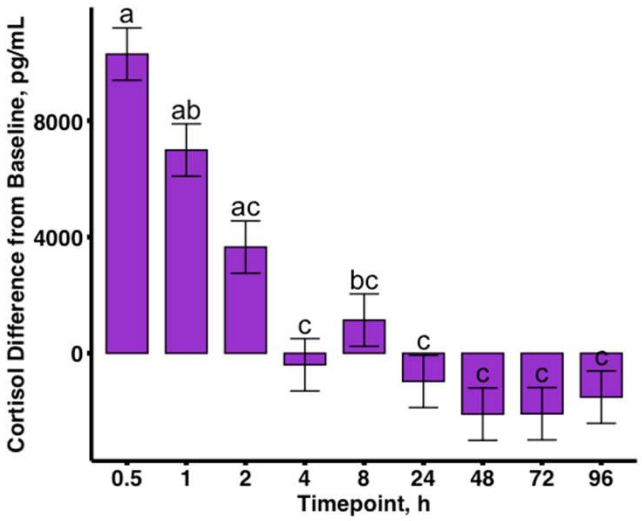
Plasma Cortisol

Cortisol	
Treatment	***P*<0.01**
Time	***P*<0.01**
Treatment x Time	*P*=0.12

- Cortisol peaked 0.5 h after castration and disbudding, regardless of treatment group
- Continued to decrease over time



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Conclusions

- Significant treatment and treatment x time differences in gait analysis and cortisol were due to CONTROL group, no differences between other treatment groups
- We do not have evidence that MBAS is more effective than only lidocaine when administered to dairy calves undergoing surgical castration and cautery disbudding

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Questions?
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The effect of shade on steer performance after terminal sort

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The effect of shade on steer performance after terminal sort

STUDY OBJECTIVES AND DESIGN

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Study Objectives:

- Compare performance outcomes of steers allowed shade to steers allowed no shade
  - Panting behavior
  - Water consumption
  - Feed delivery
  - Health
  - Carcass traits (HCW, quality grade, yield grade)

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Study Design:

- Randomized controlled trial
- Pen: experimental and observational unit
- Study groups
  - Shade (S; n=12, ~350 hd/pen)
    - 30 ft^2/head
    - 100% solar block
  - No shade (NS; n=12 , ~350 hd/pen)

- Blocked by week of allocation (n=4)
  - 6 pens enrolled each week
- T-sort pens (approx. 60 days from projected ship date; n=3)
  - T-1: small
  - T-2: medium
  - T-3: large
- Randomized individual animals to shade or no shade in respective T-sort group (n=6)

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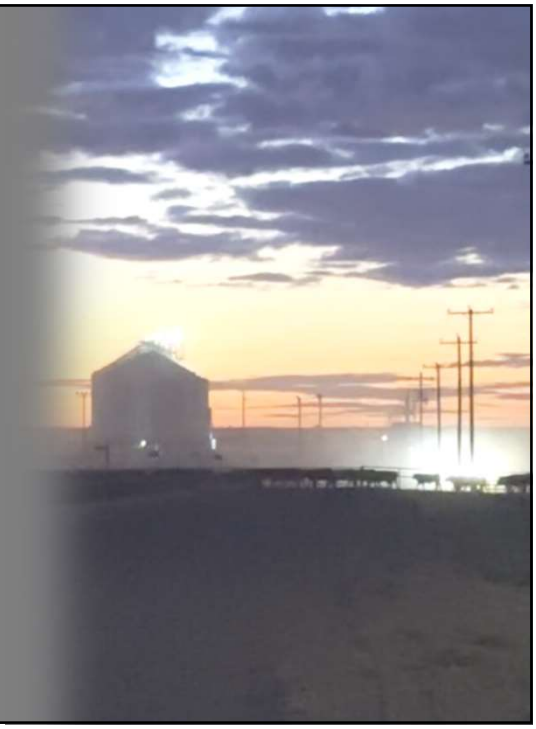
The effect of shade on steer performance after terminal sort

MATERIALS AND METHODS



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Beef Cattle Temperature Humidity Chart

Temperature (°F) \ Relative Humidity (%)	30	35	40	45	50	55	60	65	70	75	80	85
100	84	85	86	87	88	90	91	92	93	94	95	97
98	83	84	85	86	87	88	89	90	91	93	94	95
96	81	82	83	85	86	87	88	89	90	91	92	93
94	80	81	82	83	84	85	86	87	88	89	90	91
92	79	80	81	82	83	84	85	85	86	87	88	89
90	78	79	79	80	81	82	83	84	85	86	86	87
88	76	77	78	79	80	81	81	82	83	84	85	86
86	75	76	77	78	78	79	80	81	81	82	83	84
84	74	75	75	76	77	78	78	79	80	80	81	82
82	73	73	74	75	75	76	77	77	78	79	79	80
80	72	72	73	73	74	75	75	76	76	77	78	78
78	70	71	71	72	73	73	74	74	75	78	76	76
76	69	70	70	71	71	72	72	73	73	74	72	75

Temperature Humidity Index (THI)

Normal <75 | Alert 75-78 | Danger 79-83 | Emergency >84

Figure 1: Cattle Temperature Humidity Index Chart

https://beef.unl.edu/handling-cattle-through-high-heat-humidity-indexes/

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Materials and Methods:

- Panting behavior: shaded pen

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Materials and Methods:

- Panting behavior: shaded pen

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Materials and Methods:

- Panting behavior: unshaded pen

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Materials and Methods:

- Panting behavior: unshaded pen

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Materials and Methods:

- Pens shipped: August 4 – October 9, 2024
- Carcass collections:
  - Lot level data from commercial packing plant
  - Combined to pen level data
    - HCW/head
    - Quality grade
    - Yield grade
- Generalized linear mixed effects models
  - Outcome: count of quality grade/yield grade/dark cutters
  - Fixed effects: treatment
  - Random effects: sort group within block

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The effect of shade on steer performance after terminal sort

RESULTS

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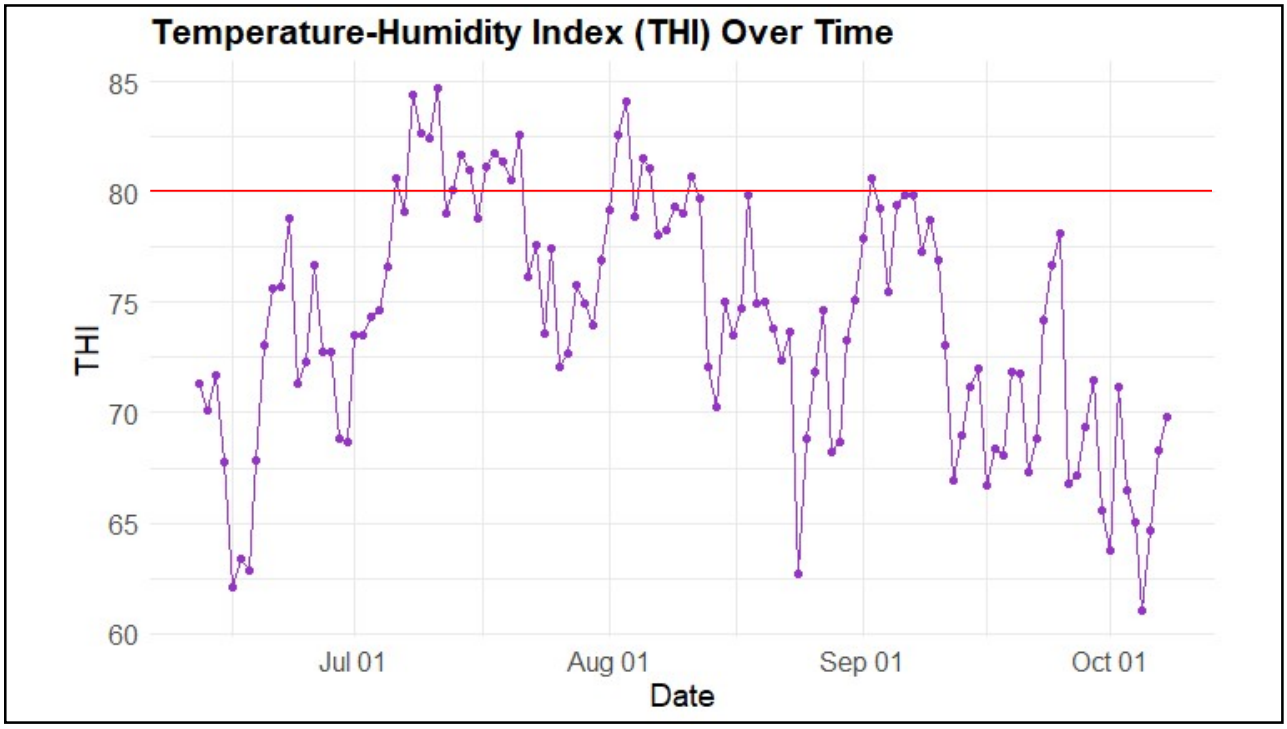

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Results:

- Water data (gallons consumed per 1000 lbs BW)*
  - treatment $p<0.05$

Treatment	Model estimated mean (back transformed)	SEM (transformed)
No shade	9.4 gal/1000 lbs	0.008
Shade	8.0 gal/1000 lbs	0.008

*Box-Cox transformation performed to obtain normality, SEM and P are reported as transformed, and means are reported as back-transformed

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Results:

- Water data (gallons consumed per 1000 lbs BW)*
  - treatment $p<0.05$

Treatment	Model estimated mean (back transformed)	SEM (transformed)
No shade	9.4 gal/1000 lbs	0.008
Shade	8.0 gal/1000 lbs	0.008

15% decrease

*Box-Cox transformation performed to obtain normality, SEM and P are reported as transformed, and means are reported as back-transformed

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Results:

- Water data (gallons consumed per 1000 lbs BW)*
  - THI $p<0.05$

THI	Model estimated mean (back transformed)	SEM (transformed)
Less than or equal to 80	7.8 gal/1000 lbs	0.01
Greater than 80	9.69 gal/1000 lbs	0.01

*Box-Cox transformation performed to obtain normality, SEM and P are reported as transformed, and means are reported as back-transformed

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Results:

- Water data (gallons consumed per 1000 lbs BW)*
  - THI $p<0.05$

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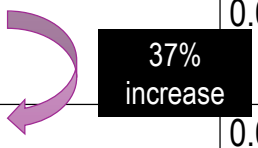

*Box-Cox transformation performed to obtain normality, SEM and P are reported as transformed, and means are reported as back-transformed

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Results:

- Daily feed delivery data (DM delivered/head)
  - Previous days THI $p<0.05$
  - Treatment * Yesterdays THI $p<0.05$

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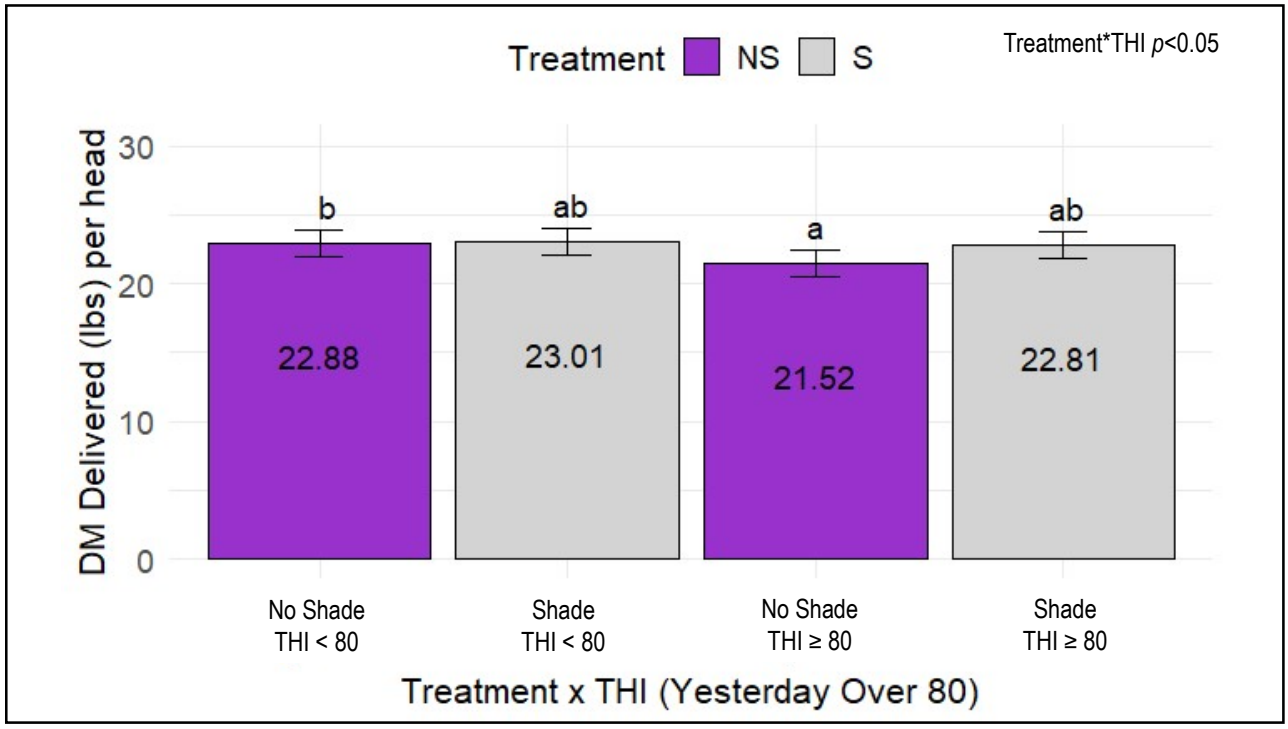

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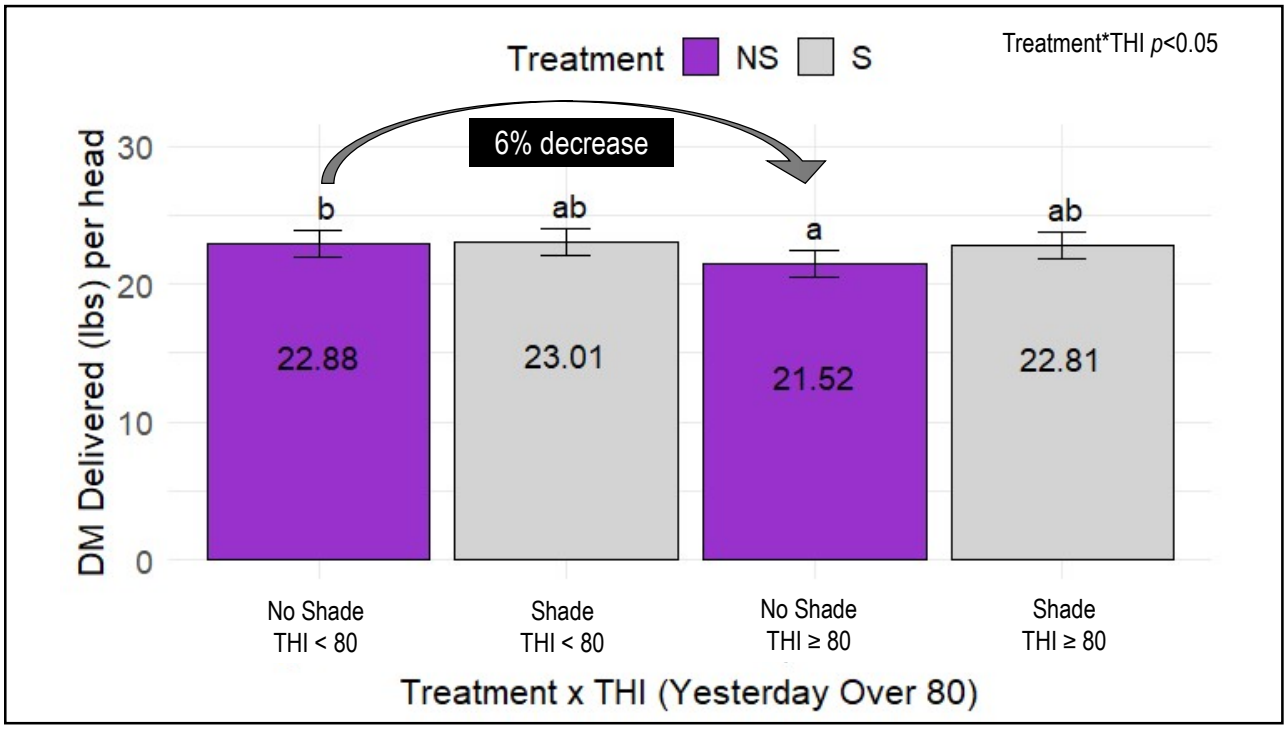

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Results:

- Health outcomes:
  - Morbidity $p>0.05$
  - Mortality $p>0.05$
  - Did not finish $p>0.05$
  - Railers $p<0.05$

Treatment	morbidity (%)	mortality (%)	railer (%)
shade	9.2%	0.9%	0.4%
no shade	9.8%	0.9%	0.7%

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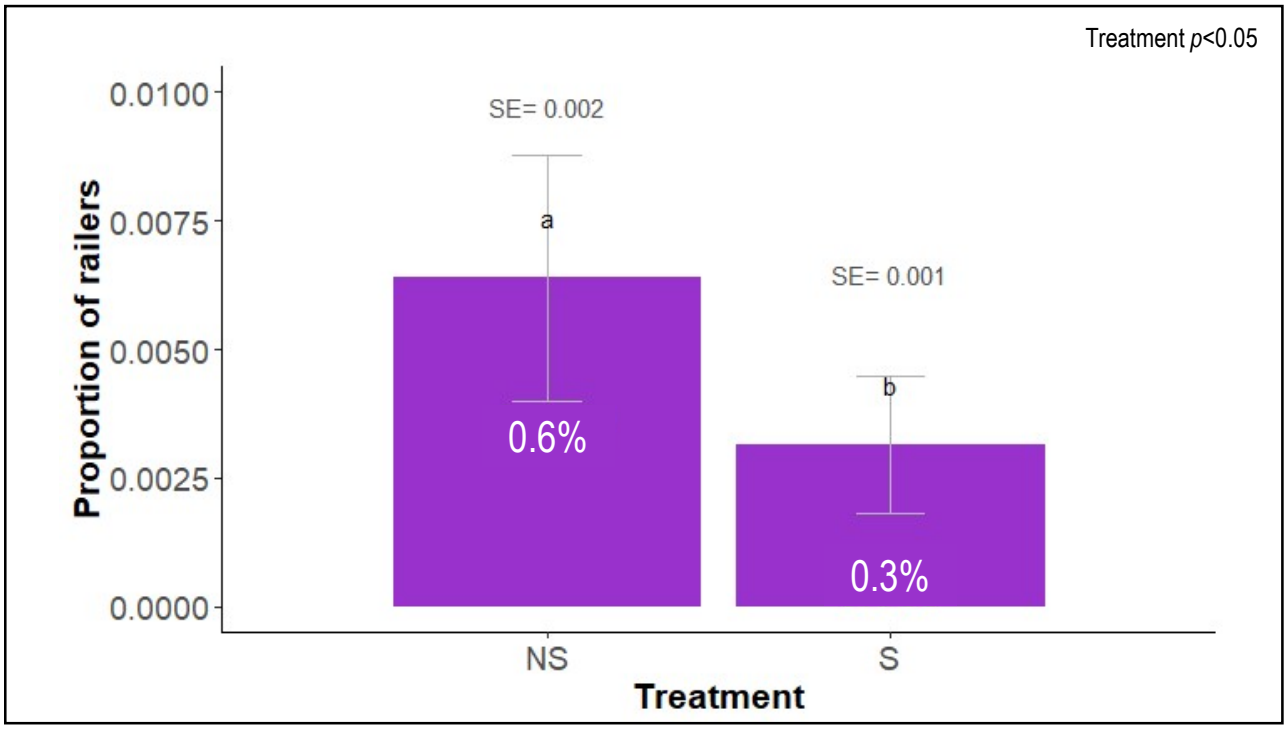

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Results:

- Panting behavior outcomes
  - Treatment $p<0.05$
  - THI over 80 $p<0.05$
  - Location $p<0.05$
- Interactions tested ($p > 0.05$)

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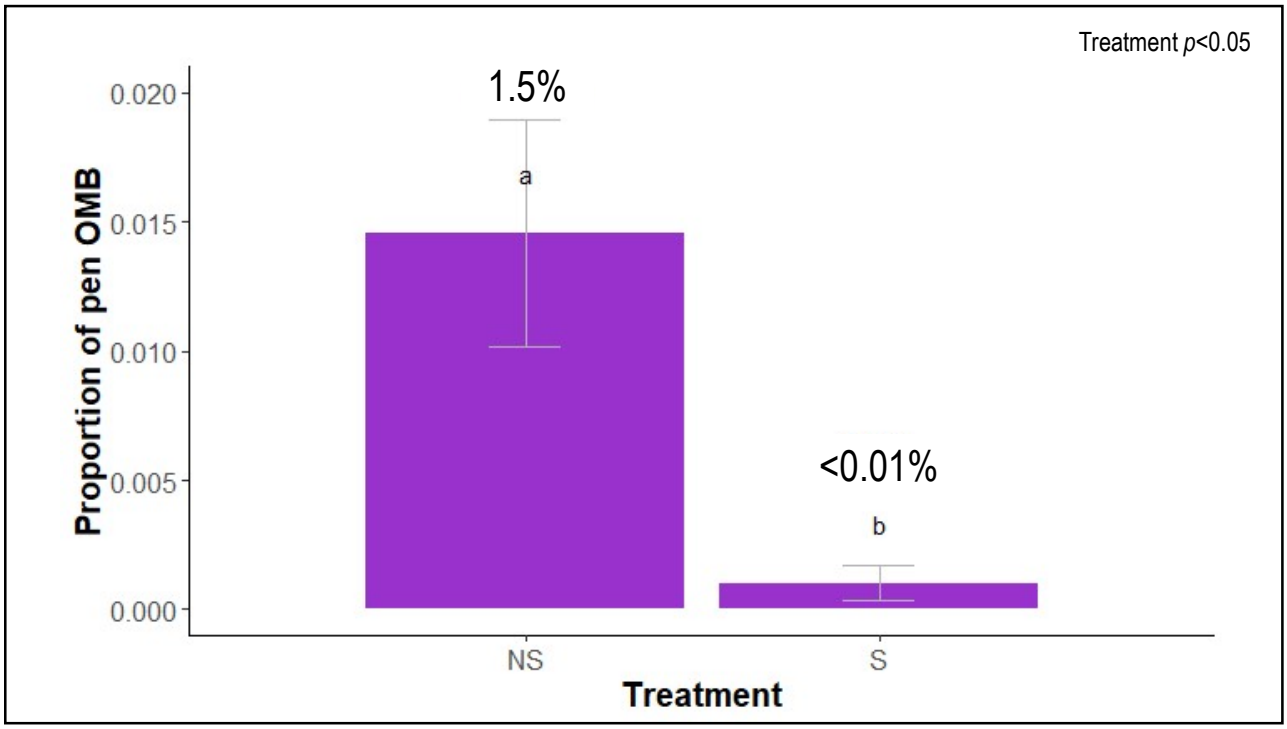

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Results:

- Pen level at enrollment

Outcome	Model estimated means (SEM)		*P-value*
	Shade	No shade	
Enrollment:			
Head count	325 (7.1)	324 (6.9)	0.92
Total pen weight (lbs)	431,462 (21897)	432,633 (20537)	0.94
Average weight/head (lbs)	1327 (50)	1336 (42)	0.64

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Results:

- Pen level at enrollment

Outcome	Model estimated means (SEM)		*P-value*
	Shade	No shade	
Enrollment:			
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Average weight/head (lbs)	1327 (50)	1336 (42)	0.64

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Results:

- Pen level at finish

*Box-Cox transformation performed to obtain normality, SEM and P are reported as transformed, and means are reported as back-transformed

Outcome	Model estimated means (SEM)		*P-value*
	Shade	No shade	
Finish:			
Average live weight/head (lbs)	1593 (25.5)	1589 (20.3)	0.88
Average HCW/head (lbs)	1013 (15.8)	1001 (12.6)	0.53
ADG/head (lbs)*	3.5 (1.9)	3.4 (1.8)	0.75
F:G/head (lbs)*	6.12 (0.003)	5.98 (0.003)	0.54

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Results:

- Yield grade
  - Pen level
    - Categorized as yield grade 1, 2, and 3, versus 4, and 5
    - Treatment $P > 0.05$, no detectable difference

	Average percent Yield Grade				
Treatment	**1**	**2**	**3**	**4**	**5**
shade	5%	28%	46%	19%	2%
no shade	5%	28%	47%	19%	2%

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Results:

- Quality grade
  - Pen level
    - Categorized as prime and choice versus select
    - Treatment $P < 0.01$, significantly different

	Average percent Quality Grade			
Treatment	**prime**	**choice**	**select**	**other**
shade	3%	88%	9%	1%
no shade	3%	85%	10%	2%

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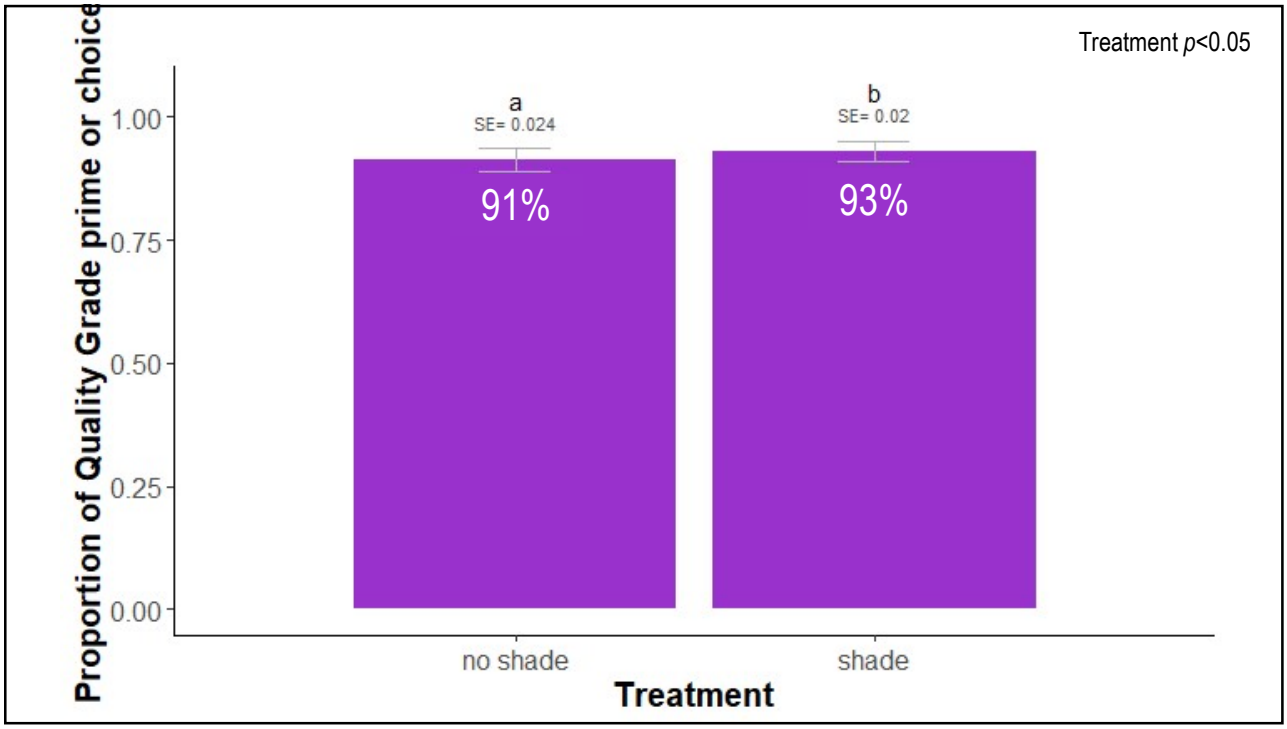

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Results:

- Dark cutters
  - Pen level
    - Treatment $P < 0.001$, significantly different

Treatment	Avg percent dark cutter
shade	1%
no shade	2%

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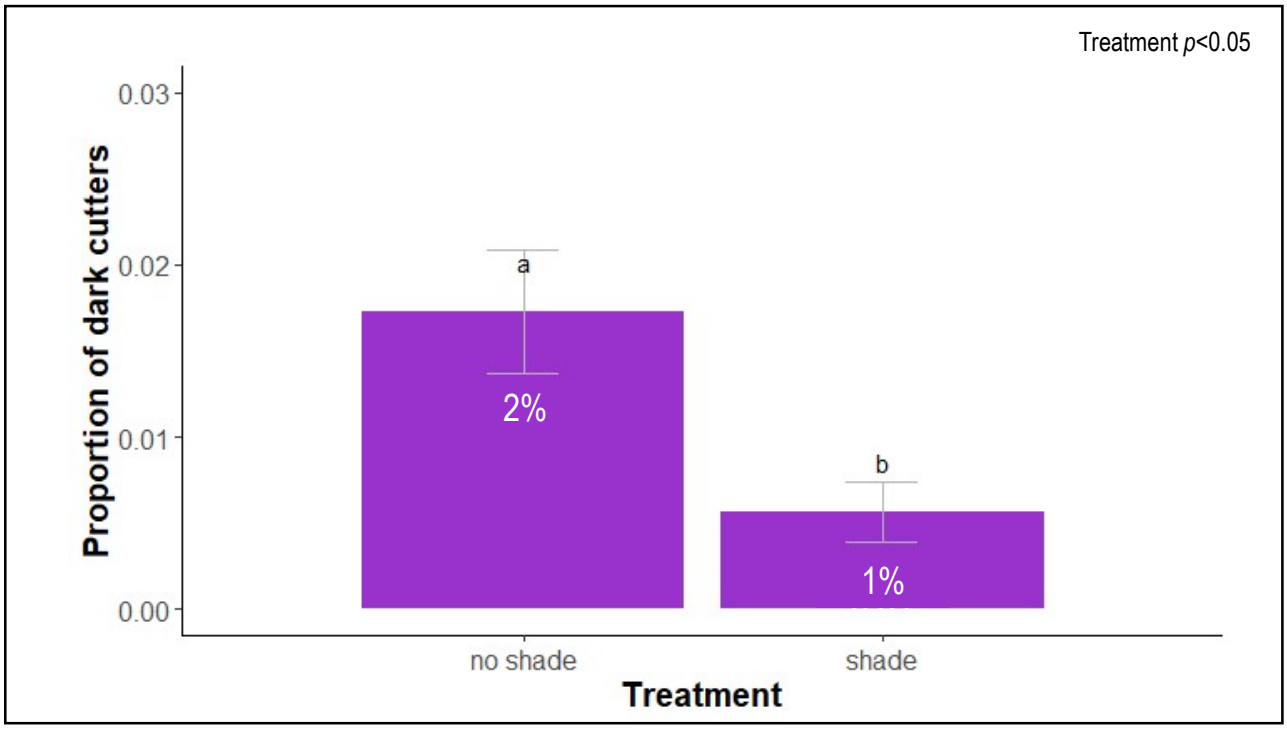
Treatment p<0.05
Proportion of dark cutters
0.03
0.02
0.01
0.00
a
2%
b
1%
no shade
shade
Treatment

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The effect of shade on steer performance after terminal sort
CONCLUSIONS

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Conclusions:

- **Shade** was shown to:
  - Increase
    - Quality grade prime and choice vs. select

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Conclusions:

- **Shade** was shown to:
  - Increase
    - Quality grade prime and choice vs. select
  - Decrease
    - Water consumption
    - Panting behavior
    - Railer count
    - Dark cutter count

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Conclusions:

- **Shade** was shown to:
  - Increase
    - Quality grade prime and choice vs. select
  - Decrease
    - Water consumption
    - Panting behavior
    - Railer count
    - Dark cutter count
- No difference in feed delivery between THI categories

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Thank you!

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Management practices of pre-weaned beef-on-dairy calves on commercial calf ranches

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Background

- Increasing number of beef-on-dairy calves
- A calf ranch raises calves from a young age to a targeted weight or age

https://www.dairyforward.com/news/424224/Halls-Calf-Ranch-Innovative--caring.htm

https://www.northernag.net/wp-content/uploads/2024/09/Beef-on-Dairy.jpg

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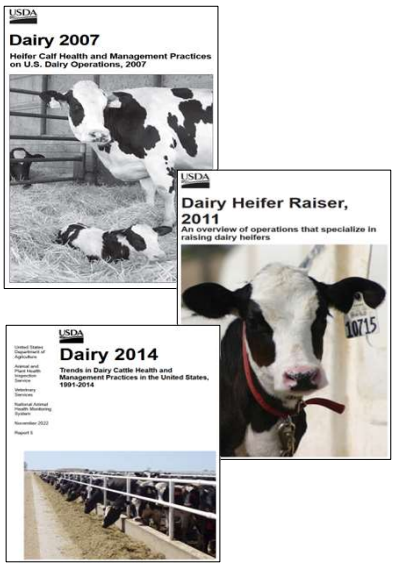
Background

- Multiple national surveys have been conducted on **management of replacement dairy heifers**
  - Dairy 2007
  - Dairy Heifer Raiser 2011
  - Dairy 2014



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Objective

- To describe management practices of beef-on-dairy calves implemented on commercial calf ranches

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Materials and Methods

- A comprehensive survey was developed
  - Designed in discussion with commercial calf ranch owners, managers and consulting veterinarians
- A total of 15 calf ranches were surveyed
- Surveys conducted in-person or via video call between November 2023 and June 2024

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Materials and Methods

- Survey consisted of 10 sections:
  - General information/ranch demographics
  - Calf arrival processing procedures
  - Pre-weaning housing
  - Milk feeding protocol
  - Starter feed formulation and feeding protocol
  - Weaning protocol
  - Health challenges and vaccine/treatment protocols
  - Water offerings
  - Movement/management of group pens
  - Transition/grower diet formulation and feeding protocol

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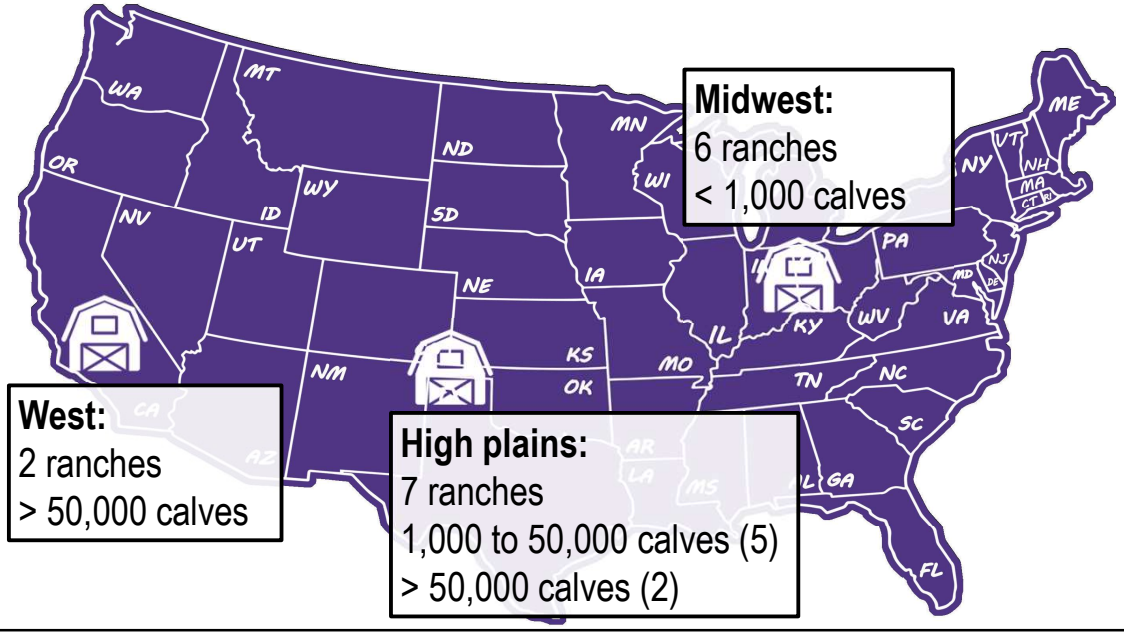
Results: Demographics



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Results: Calf Arrival & Pre-weaning Housing

- All ranches received calves that were 4 days old or younger
- 4 types of pre-weaning housing:
  - Group housing (7%; 1 ranch)
  - Plastic hutches with runs (27%, 4 ranches)
  - Wooden hutches (33%, 5 ranches)
  - Individual pens (33%, 5 ranches)

Washington State University Extension, EM045E

https://calfhutch.com/products/rancher-calf-hutches/

https://www.agriland.ie/farming-news

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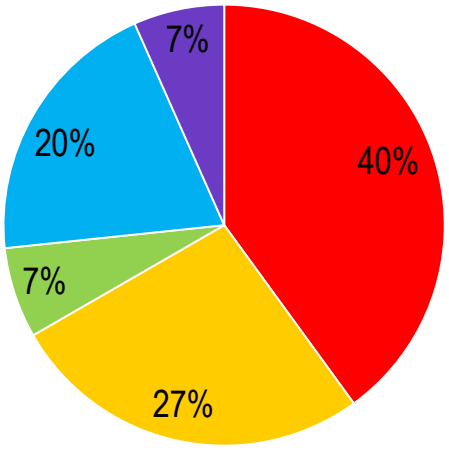
Results: Milk Feeding Protocol

- Types of milk fed:



Milk replacer

Milk replacer; Nonsaleable milk

Milk replacer; Saleable milk

Milk replacer; Nonsaleable milk; Saleable milk

Saleable milk

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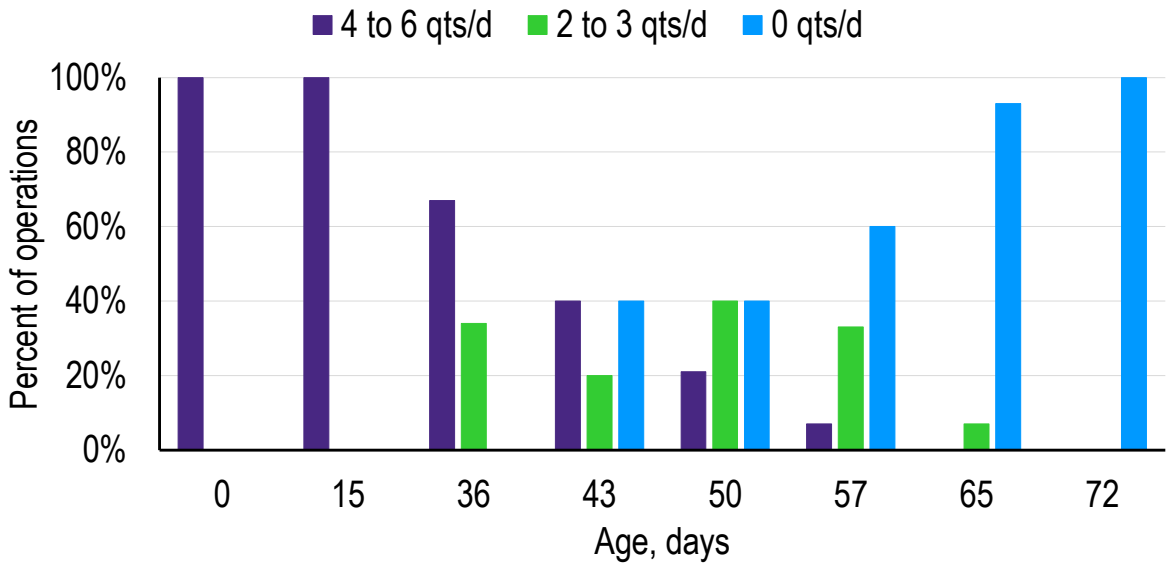
Results: Milk Feeding Protocol



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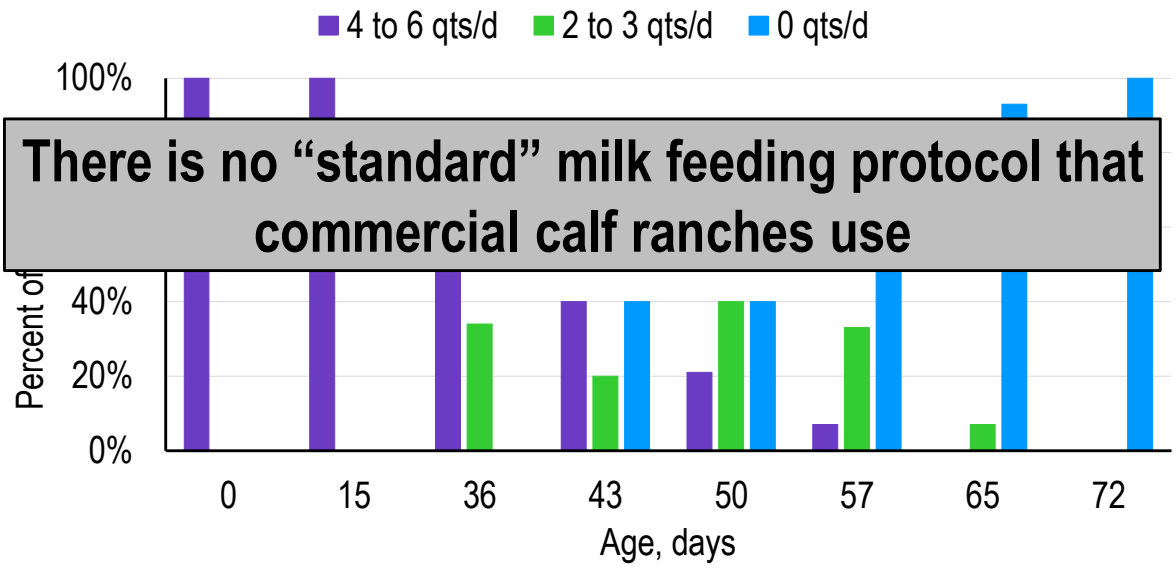
Results: Milk Feeding Protocol



There is no "standard" milk feeding protocol that commercial calf ranches use

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Results: Calf Starter Diets

- Calf starter was offered upon arrival at all ranches
- Three types of feed:
  - Pelleted feed (40%; 6 ranches)
  - Texturized feed (47%; 7 ranches)
  - Total mixed ration (13%; 2 ranches)

https://cms-static.wehaacdn.com/hoards-com/images/201025_648-Calf-Starter.19570.jpg

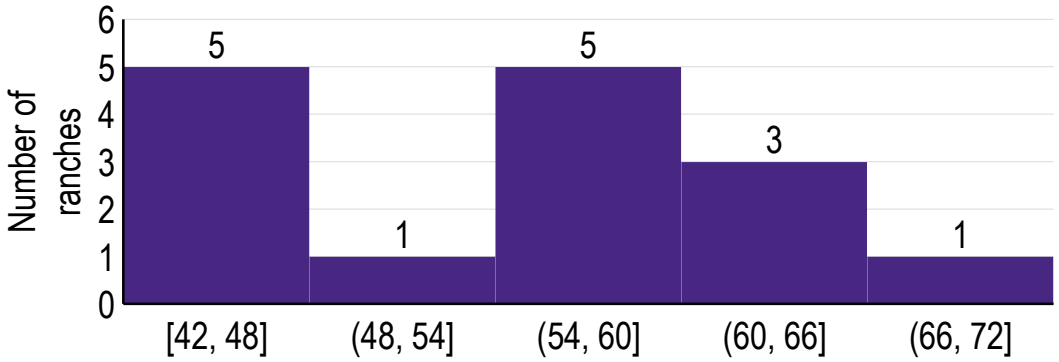
https://www.farmerscoop.com/wp-content/uploads/2022/05/18-Calf-Grower-2021-768x1024.jpg

https://cdn11.bigcommerce.com/s-h1tvr2w36j/images/stencil/1280x1280/products/19419/22305/KJC50406__54049.1696449085.jpg?c=1

60

Results: Weaning

- Weaning age ranged between 42 and 72 days
- 87% of operations gradually weaned calves



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Results: Calf Health

- Treatment of respiratory disease:
  - Antimicrobial (73%; 11 ranches)
  - Antimicrobial & anti-inflammatory drug (27%; 4 ranches)
- Treatment of digestive disease:
  - IV fluids (7%; 1 ranch)
  - Electrolytes (7%; 1 ranch)
  - Electrolytes and additional therapies (86%; 13 ranches)

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Conclusions

- This research highlights the knowledge gap in the industry
- Management of beef-on-dairy calves within commercial calf ranches has not been previously described
  - Speculation about differences between management of dairy and beef-on-dairy calves (Machado & Ballou, 2022)
- There is no "standard" way to manage these calves in this setting

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Questions?

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Automated Machine Learning and Facial Imaging for Feedyard Cattle Outcome Prediction

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Objective

This study evaluated the potential of facial images taken at time of BRD treatment to predict feedyard cattle outcomes (Finish or Did not Finish) following 60 days post-treatment

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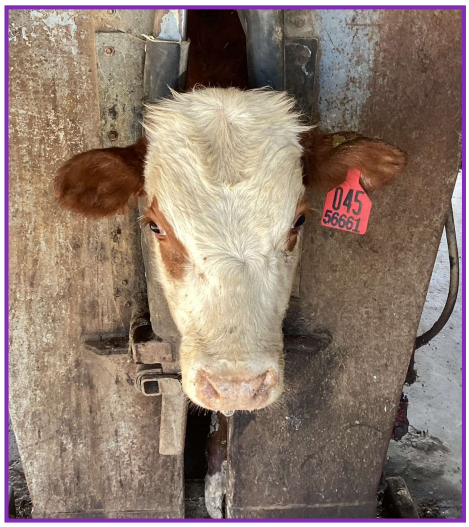
Methods

Cross-sectional observational study

2 hospitals in a feedyard in the High Plains region



Outcomes determined 60 days post-enrollment

- Finish
- DNF
  - Culled
  - Death

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Microsoft Azure

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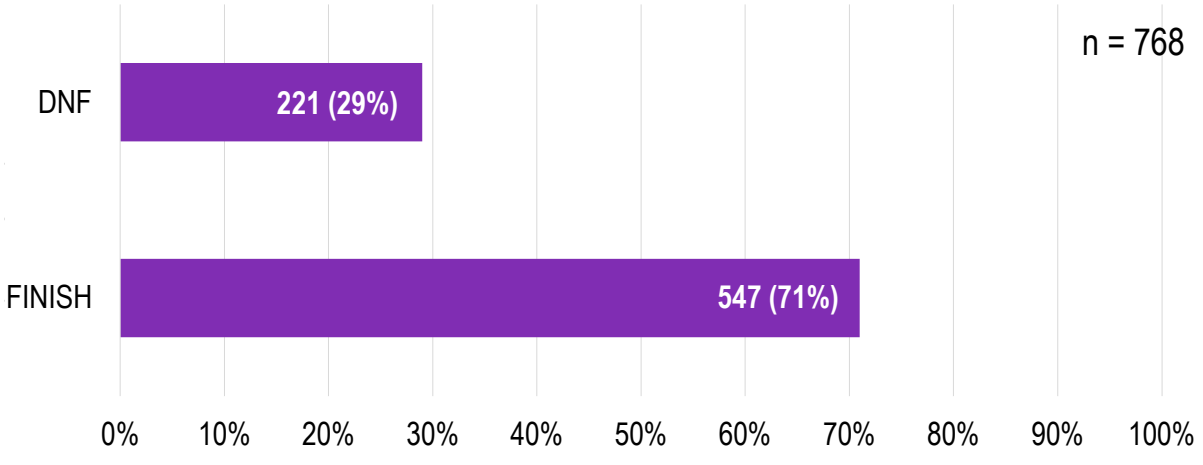
Label Classification Distribution



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Guess what
Finish or Did not Finish?

- Hands up for Finish
- Hands down for DNF

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DNF

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Finish

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DNF

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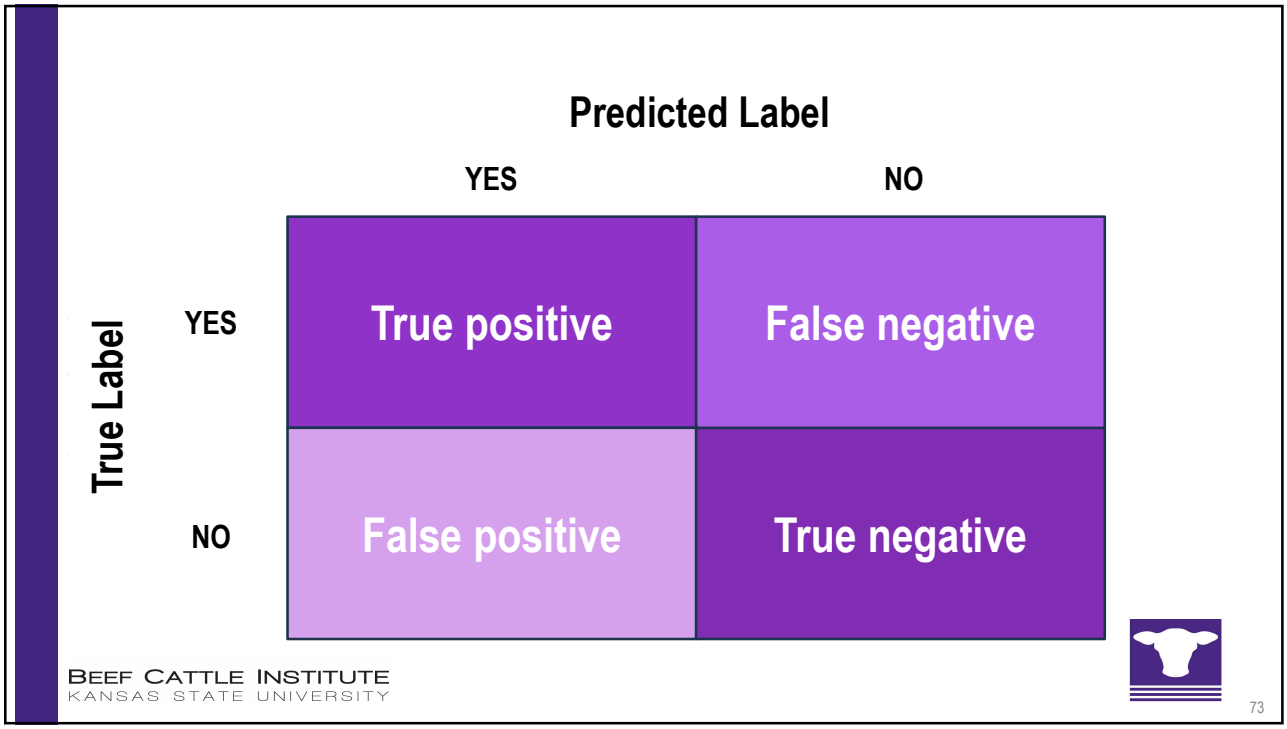
Predicted Label
YES
NO
True Label
YES
NO
True positive
False negative
False positive
True negative
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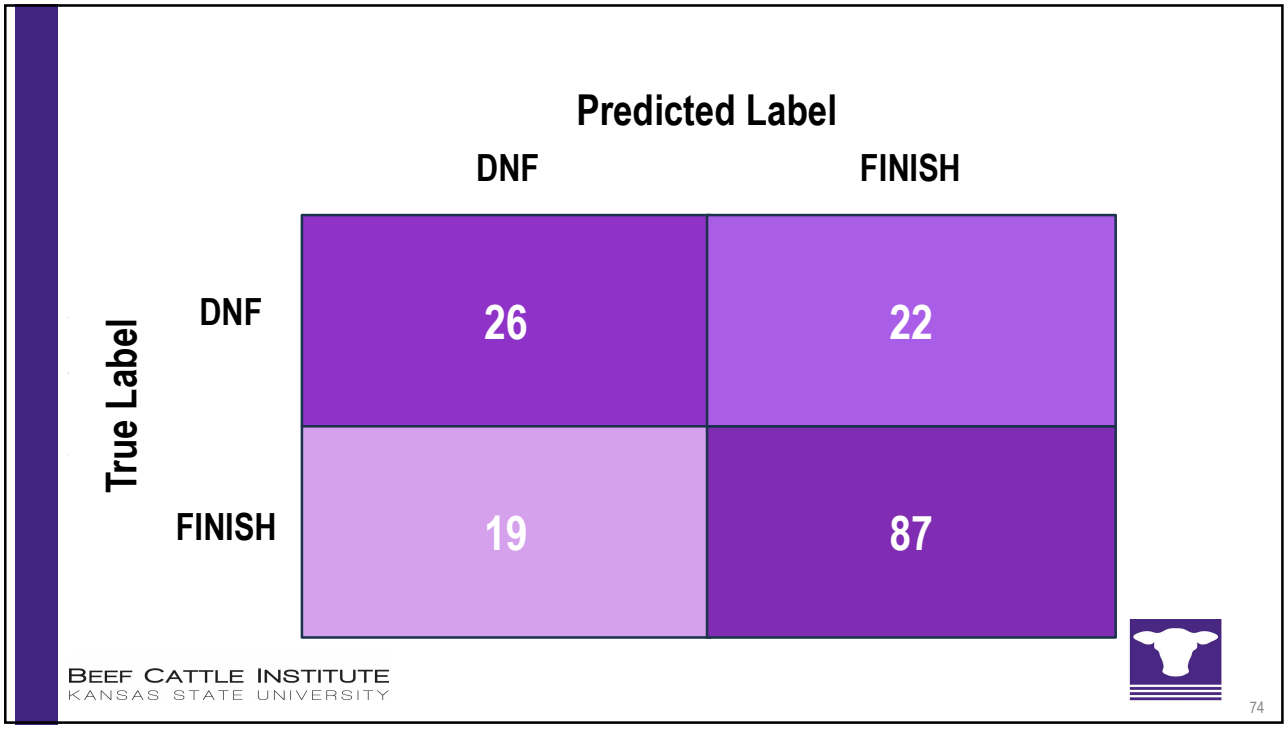
Predicted Label
DNF
FINISH
True Label
DNF
FINISH
26
22
19
87
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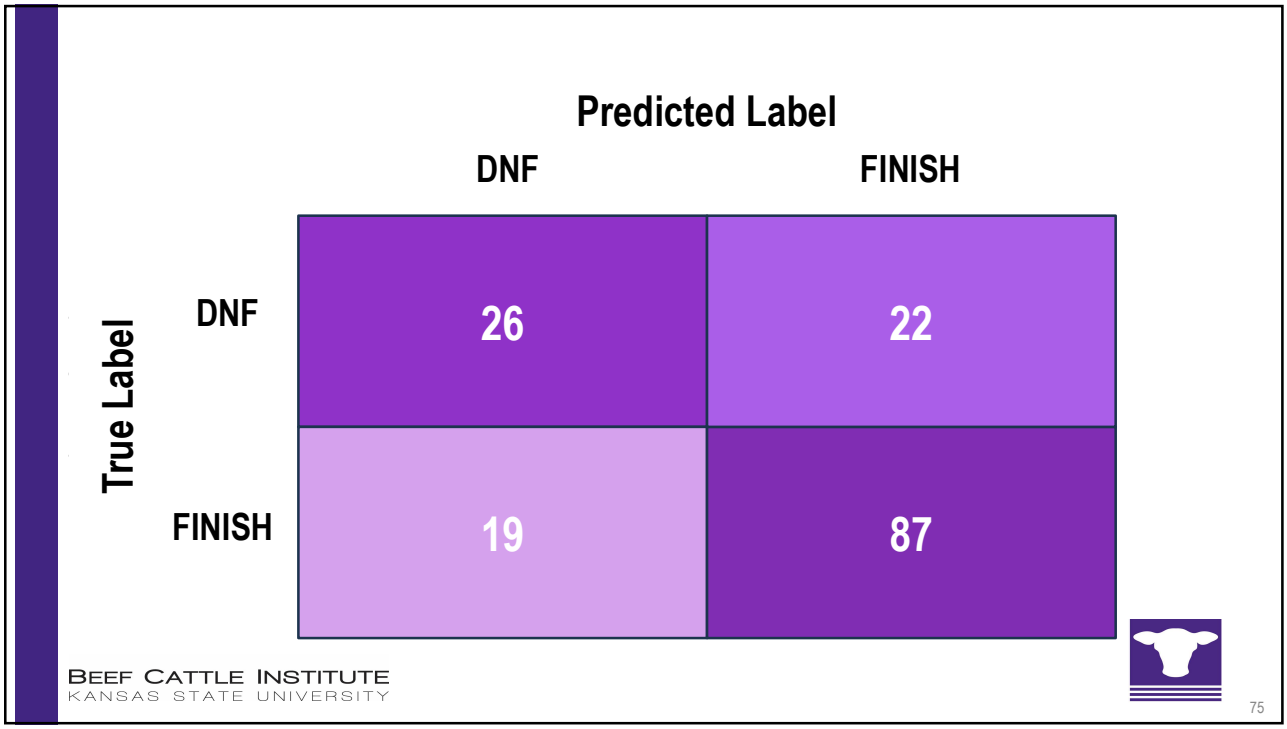

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Model performance

Class	Se%[2]	Sp%[3]	PPV%[4]	NPV%[5]	AUC[6]	Acc[7]
DNF[1]	54	82	57	79	0.69	0.73

[1]DNF – Did Not Finish; [2]SE – Sensitivity; [3]SP – Specificity; PPV - [4]Positive Predictive Value; [5]NPV – Negative Predictive Value; [6]AUC – Area Under the Curve; [7]Acc – Max Accuracy.

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Conclusion

Facial imaging-based models showed potential for predicting cattle outcomes in this dataset.

Combining these models with other diagnostic tools could improve management strategies in feedyard operations.

Limitations and next steps

Limitations and next steps

- Background and ear tag removal
- Light exposure and image shadow
- Model refinement

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Questions?
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What can predictive models do for the industry?

LILLI HEINEN

PhD Student

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Issues we face…

- Demand for a high-quality product at an affordable price
  - How do I still make money?
  - How do I account for the ever-changing market?
  - Efficiency!
- Huge amounts of data sitting unused
- Balance the consequences of risk-taking

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Where do predictive models fit in?

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BCI Predictive Models

- Utilize vast amounts of feedlot data to…
  - Predict individual animal outcome at the time of first and second BRD treatment
  - Predict which lots of cattle will experience high morbidity due to BRD (≥ 15%)
  - Determine which lots of cattle should receive metaphylaxis based on economic outcome

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BCI Predictive Models

- Types of data
  - Feed delivery data
  - Cattle demographic characteristics → lot arrival weight, sex, etc.
  - Data collected at treatment → rectal temperature, weight
  - Weather data → precipitation, ambient temperature, wind speed, etc.
- Types of models/algorithms
  - Linear techniques → logistic regression
  - Non-linear techniques → decision tree, neural network, random forest

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Evaluation of predictive models to determine metaphylaxis application to cattle arriving at the feedlot

Outcome of interest: best metaphylaxis application strategy (no metaphylaxis or metaphylaxis)

Data

- Demographic data at arrival
- Origin data
- External economic data

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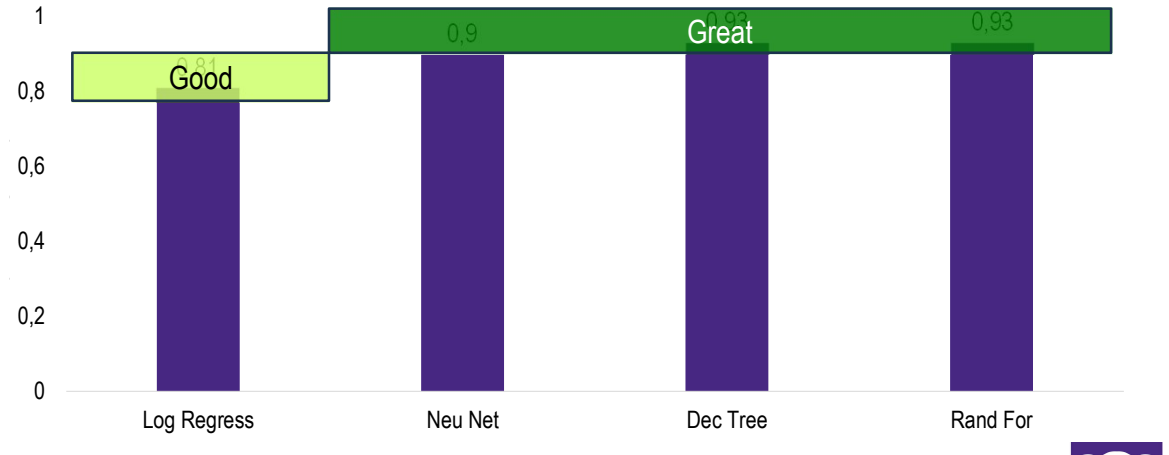
Model Results – Demographic Data Alone



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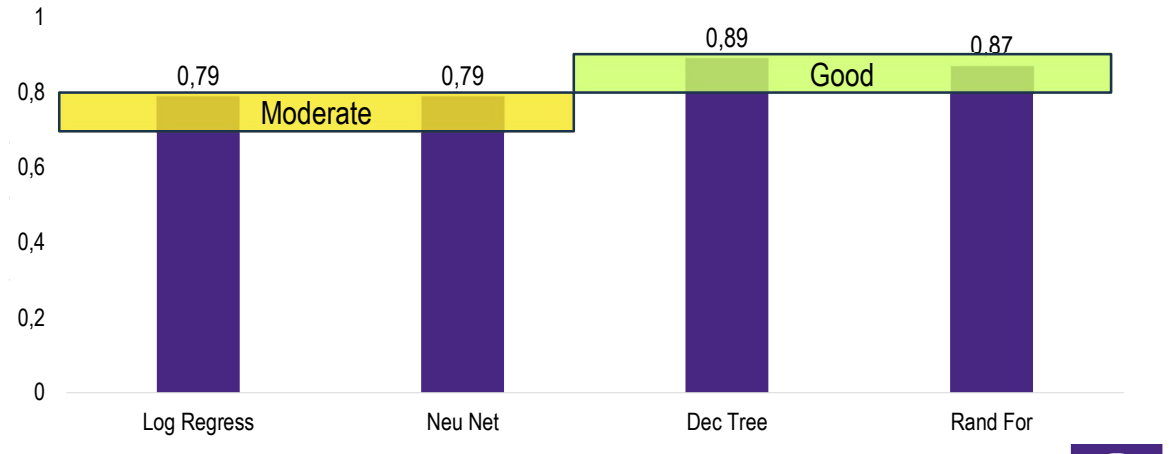
Model Results – Incl. Origin Data



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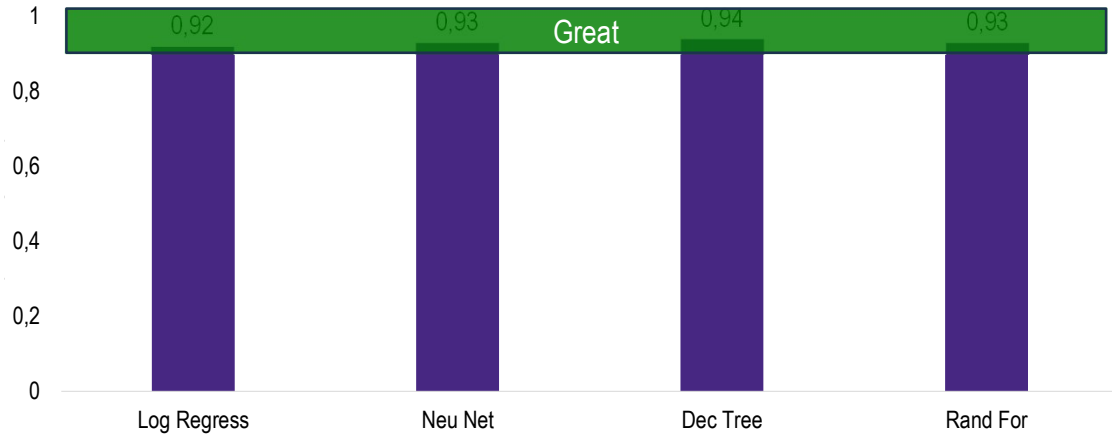
Model Results – Incl. External Econ Data



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Key Takeaways

- Predictive model application to feedlot challenges is feasible
- Process and good data matters
- Will not and CANNOT replace the labor on the ground

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