2025 Ranch Management Field Day

Larson Ranch • Leoti

Thursday, August 21 • 3:30 p.m.

Sponsored by:

Larson Ranch

Background

Larson Ranch was established in 2014 by Brady and Kyla Larson. Both have deep roots in the cattle industry, with each having grown up on family operations that instilled in them a passion for land and livestock.

Over the past decade, the Larsons have built a seedstock operation focused on producing superior-quality Angus and Charolais cattle. Their cowherd is about 75% registered Angus and 25% registered Charolais. They extensively use artificial insemination, embryo transfer and in vitro fertilization in their breeding program.

In 2020, the Larsons had the opportunity to purchase land in Wichita County. Two years later, they began the process of building an all-purpose facility to host an annual production sale, better manage cows during winter calving and enhance their bull development program. Included in the design is a calving barn, working chute and half-mile-long bull traps with water at one end and feed at the other to ensure proper exercise.

In addition to their headquarters operation in Wichita County, the Larsons have grass in Greeley, Logan, Ottawa and Seward counties.

Being located in Western Kansas—where trees are scarce, wind is plentiful, and temperatures can reach 110° F or higher in the summer and -25° F or below in the winter—can bring a unique set of challenges when raising cattle. However, the Larsons have embraced that challenge and maintained a progressive mindset in an effort to make improvements every day in the water, land and cattle in their care.

This is something they hope to pass down to their five children—Cauy, Crue, Camri, Coby and Cord.

Factsheet (Update: April 2022)

Genetic testing for bovine congestive heart failure (BCHF) in feedlot cattle

> ***What's new?*** A scientific report describing the discoveries is now publicly available[1]. Additional DNA sequence variants (markers) in the *NFIA* gene have been identified as having increased association with disease when two copies are present. Additional linked markers for *ARRDC3* have also been identified and provide flexiblity for chosing genotyping platforms and test designs.

1. **What is bovine congestive heart failure (BCHF)?** BCHF is a significant cause of death in feedlot cattle in the Western Great Plains of North America. Mortality from BCHF has reached 7% in severely affected pens of cattle, with annual losses exceeding $250,000 at a single operation[2].

2. **What are genetic risk factors?** Genetic risk factors are specific DNA sequence variants associated with disease. Examples in people include DNA variants associated with breast cancer, lung cancer, or heart disease. However, an individual that has a genetic risk factor for a disease is not guaranteed the disease will occur. There are many important non-genetic factors such as lifestyle and environment that may be needed for disease to develop. In cattle, research has identified two significant bovine genetic risk factors that predispose feedlot cattle to BCHF at moderate altitudes [1].

3. **How were these genetic risk factors for BCHF discovered?** Beginning in 2017, more than 140,000 Western Plains feedlot cattle were screened by experienced pen riders for signs of BCHF. A set of 102 matched pairs of BCHF-affected and unaffected (normal) pen mates were chosen for genetic evaluation[2]. Pairs from 30 ranch sources were matched for their breed type (appearance), arrival date, sex, and origin. Matching the cattle pairwise helped standardize their genetic background and exposure to similar environments.

4. **How can only 102 diseased cattle be used to identify genetic risk factors?** Cases were screened from a group of 140,000 feedlot cattle. A well-defined veterinary case definition, together with meticulous evaluation at necropsy by trained veterinarians and researchers provided additional power. The genetic information from 560,000 DNA markers for each BCHF case was compared to that of its matched unaffected pen mate in a genome-wide study to discover chromosomal regions associated with BCHF. The results from all 102 pairs of animals were combined in a computer analysis to identify two distinct chromosomal regions that had statistically outstanding associations with BCHF. Each of the two associated regions spanned a different gene (*ARRDC3* and *NFIA,* respectively). Two copies of specific markers at **each** gene are associated with risk for BCHF in feedlot cattle in this study[1]. This result is a refinement of preliminary findings.

5. **How does a BCHF genetic test work?** A test for predisposition to BCHF detects the animal's genetic information (genotype) for at least one specific DNA marker at each of the two implicated genes. The animal's genotypes for BCHF markers identifies the genetic risk factors present in that animal. Research showed that feedlot animals with risk factors from one of either gene, died from BCHF at a rate 8-times higher than animals with neither risk factor present. Animals with risk factors at both genes died from BCHF at a rate 28-times higher than animals with neither risk factor present. Cattle

with both genetic risk factors for BCHF represented 29% of the disease cases compared to only 2% of unaffected cattle.

6. **What does the outcome of a genetic test for BCHF really indicate?** Cases are expected to arise in animals with both risk factors at a rate 28-fold higher than those with no risk factors in pens of Western Plains feedlot cattle affected with BCHF.

7. **How well do these two BCHF risk factors predict if a feedlot animal <u>will not</u> die from BCHF?** The two-gene BCHF test was the most accurate at identifying animals that were not likely to become BCHF cases in the affected feedlots. If an animal had neither of the two risk factors for BCHF, there was only a 1% chance that they became a BCHF case in this study. Knowing which animals have minimal BCHF risk BCHF may be particularly useful in selective breeding.

8. **How well do these two BCHF risk factors predict if a feedlot animal <u>will</u> die from BCHF?** Not all cattle with both risk factors developed BCHF in the study. However, 29% of BCHF cases had both risk factors compared to only2% of the matched unaffected pen mates. These results illustrate the likelihood of other genetic and environmental factors contributing to the development of BCHF. Thus, the positive predictive value of the two-gene test is relatively low[1]. Regardless, identifying which feedlot cattle have both risk factors may be useful in future research aimed at interventions.

9. **Is a two-gene BCHF test similar to Genomically-Enhanced-EPDs?** No. Genomically-enhanced expected progeny differences (GE-EPDs) estimate an animal's genetic merit through prediction equations based on pedigree, performance information, and genetic information from 50 to 778k+ DNA markers. The two-gene BCHF test here estimates an animal's genetic risk for heart failure without prediction equations, pedigree, performance information, or the use of other DNA markers.

10. **Are these two gene markers genetic defects?** Genetic defects or otherwise known causes of BCHF have not been identified yet. Although its plausible that one of the linked *ARRDC3* markers represents a loss of function, it is not known which specific DNA sequences are causing the increased risk for disease. Thus, the causes and mechanisms of BCHF have yet to be determined.

11. **Are these two gene markers predictive of heart failure in all cattle breeds?** The study population consisted of 140,000 feedlot cattle without regard for breed. However, the 102 BCHF cases that met the study criteria were 93% solid black, 5% solid red, and 2% red/white face. Most of the affected animals in the study were likely from Angus or Angus-influenced germplasm based on breed prevalence and coat color in these feedlots. The predictive value of these two BCHF risk factors in other breeds is completely unknown.

12. **How can feedlot operators benefit from using a two-gene BCHF test?** DNA testing was developed from BCHF research in Western Plains feedlots. Operators of affected feedlots in similar environments may benefit from testing. Once high-risk animals are identified, options are available for selectively managing animals grouped by genetic predisposition to BCHF. Research on beneficial management options is ongoing.

13. **How can cattle breeders benefit from a two-gene test?** Cattle producers affected by BCHF can benefit by selecting animals that do not carry risk factors in *ARRDC3* and *NFIA* genes. Reducing these risk factors in breeding herds is predicted to reduce the impact of disease in subsequent calf crops. The percentage of sires without both risk factors varies by breed and has been estimated[1].

14. **Who will not likely gain benefits from a two-gene BCHF test?** Producers not experiencing BCHF problems with their cattle will gain little from this test, unless they are selling breeding animals to other producers affected by or concerned about BCHF.

15. **Should I be culling all my animals with high BCHF risk?** This decision depends on the cost of BCHF in your operation. In most situations, reducing the frequency of these two risk factors in the breeding herd is predicted to reduce BCHF risk in the calf crop over time while maintaining desirable production characteristics. In herds with a known high prevalence of BCHF in finishing cattle, aggressive culling of breeding animals with the highest potential for transmitting risk to their offspring is predicted to reduce the frequency of future BCHF cases.

16. **Is the problem of BCHF now solved?** Not yet. It is unknown whether these discoveries are generalizable to other cattle and other environments. However, a two-gene BCHF test provides a tool for affected producers to begin reducing disease impact now. As new research results are obtained, DNA tests with better predictive values are anticipated, along with information about applicability to breeds, management systems, environments, and conditions.

17. **When will better genetic tests for BCHF risk be available?** The most useful genetic tests for disease risk require knowledge of the causal variants. The search is underway to identify and confirm causal variants for BCHF risk. A mechanistic understanding of their mode action is also being sought.

18. **How do I test my cattle?** Producers are encouraged to reach out to contact Dr. Vander Ley or their genotype provider for additional information on the most current options for genetic testing.

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Literature cited:

1. Heaton MP, Harhay GP, Bassett AS, Clark HJ, Carlson JM, Jobman EE, Sadd HR, Pelster MC, Workman AM, Kuehn LA, Kalbfleisch TS, Piscatelli H, Carrie M, Krafsur GM, Grotelueschen DM, Vander Ley BL. **Association of *ARRDC3* and *NFIA* variants with bovine congestive heart failure in feedlot cattle.** F1000Research 2022, **11**:385.

2. Heaton MP, Bassett AS, Whitman KJ, Krafsur GM, Lee SI, Carlson JM, Clark HJ, Smith HR, Pelster MC, Basnayake V, Grotelueschen DM, Vander Ley BL. **Evaluation of EPAS1 variants for association with bovine congestive heart failure**. F1000Research 2019, **8**:1189.

Funding, collaboration, and disclaimers
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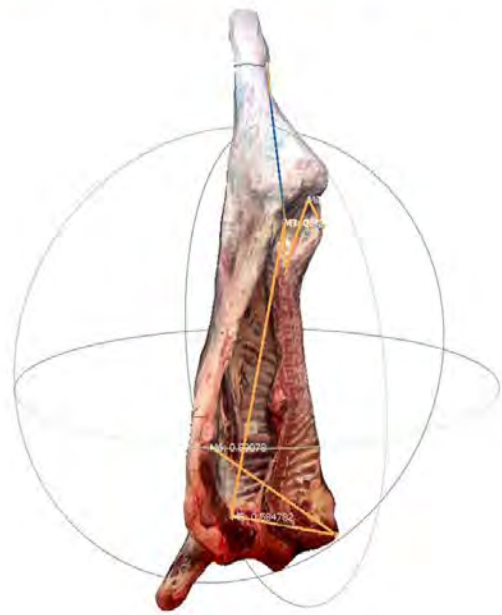


A New Era: Technologies for Beef Yield Grade

Dale R. Woerner, Ph.D.
Professor and Cargill Endowed Professor in Sustainable Meat Science
Texas Tech University

1

YG-1

YG-3

YG-5

USDA Yield Grades

Yield Grades:
Reflect differences in yield of closely trimmed, boneless retail cuts from the round, loin, rib, and chuck.

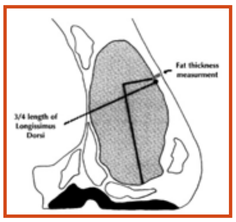
YG-1 more than 52.3%
YG-2 50.1 to 52.3%
YG-3 47.8 to 50.0%
YG-4 45.5 to 47.7%
YG-5 45.4% or less

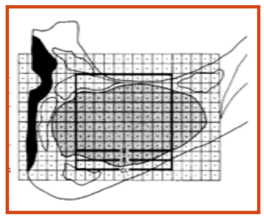
2

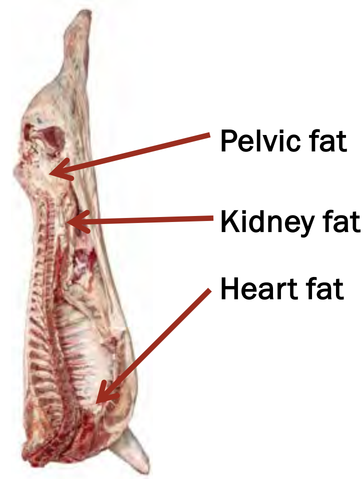
USDA Yield Grade Factors

- Thickness of Fat over the ribeye (adjusted)
- Ribeye area
- Estimated % kidney, pelvic and heart (KPH) fat
- Hot carcass weight

YG = 2.5 +(2.5*FT) – (.32*REA) + (.2*KPH) + (.0038*HCW)







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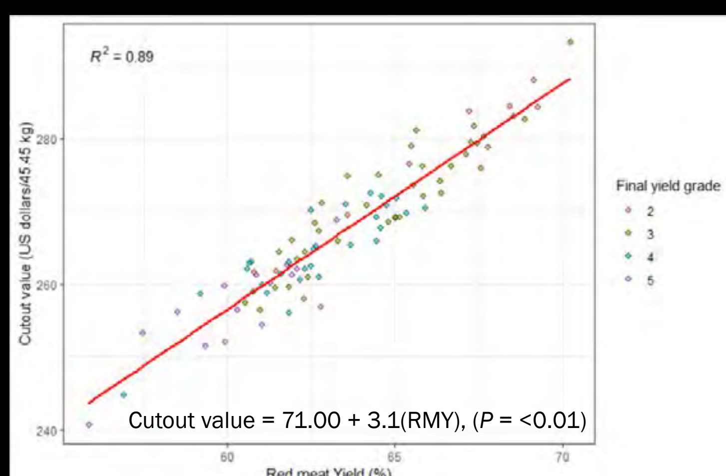
Red Meat Yield = Cutout Value



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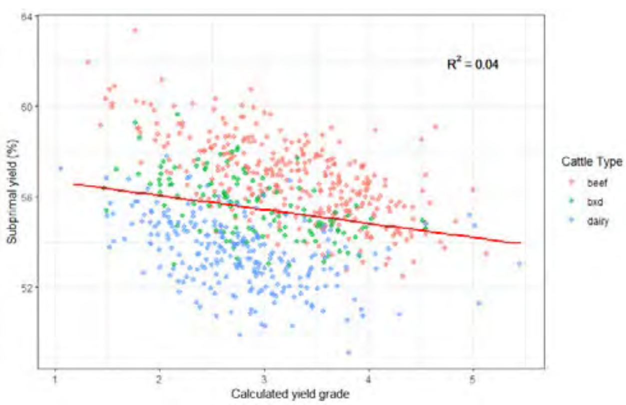
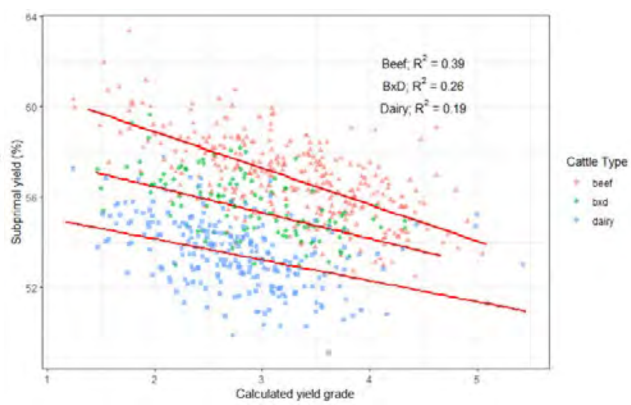
Camera Grading Systems

5

Accuracy current USDA beef yield equation





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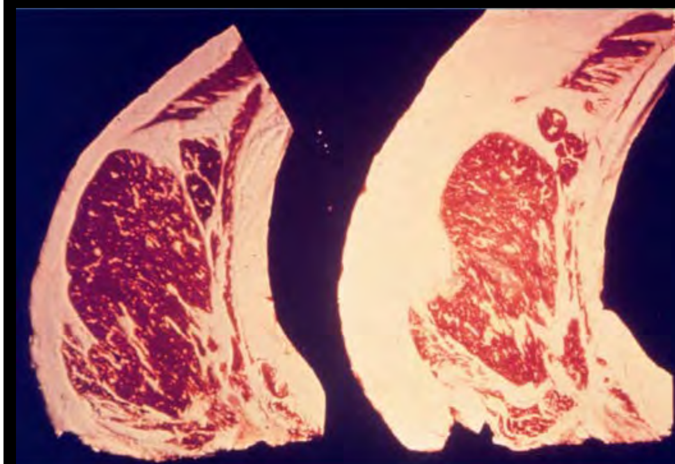
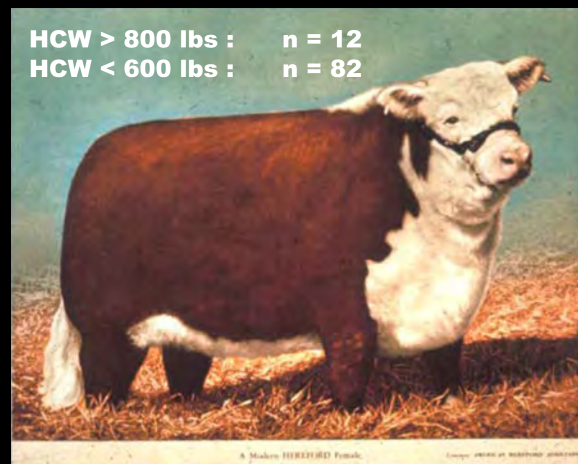
Murphey, 1960 (N = 162)

BCTRC (R-L-R-C) = 51.34 – (5.78*FT) – (.462*%KPH) – (.0093*HCW) + (.74*REA)

One unit YG (e.g., 2.0 to 3.0) = 2.3% BCTRC





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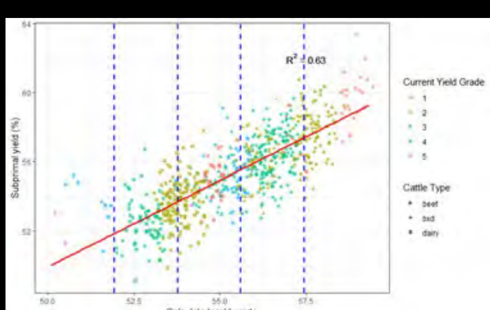
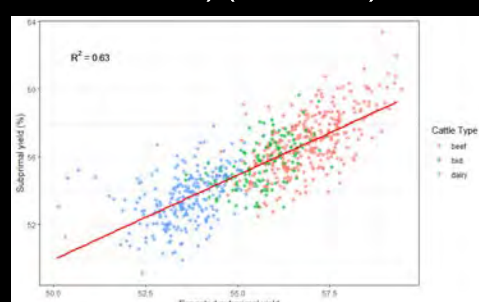
Accuracy modified subprimal yield equation ~ Adjusted for cattle type

Subprimal yield = 56.94+(0.40*REA)–(0.0042*HCW)-(3.57*FT)

- Beef Adjustment = 0 (baseline)
- BeefxDairy Adjustment = -1.76
- Dairy Adjustment = -4.02





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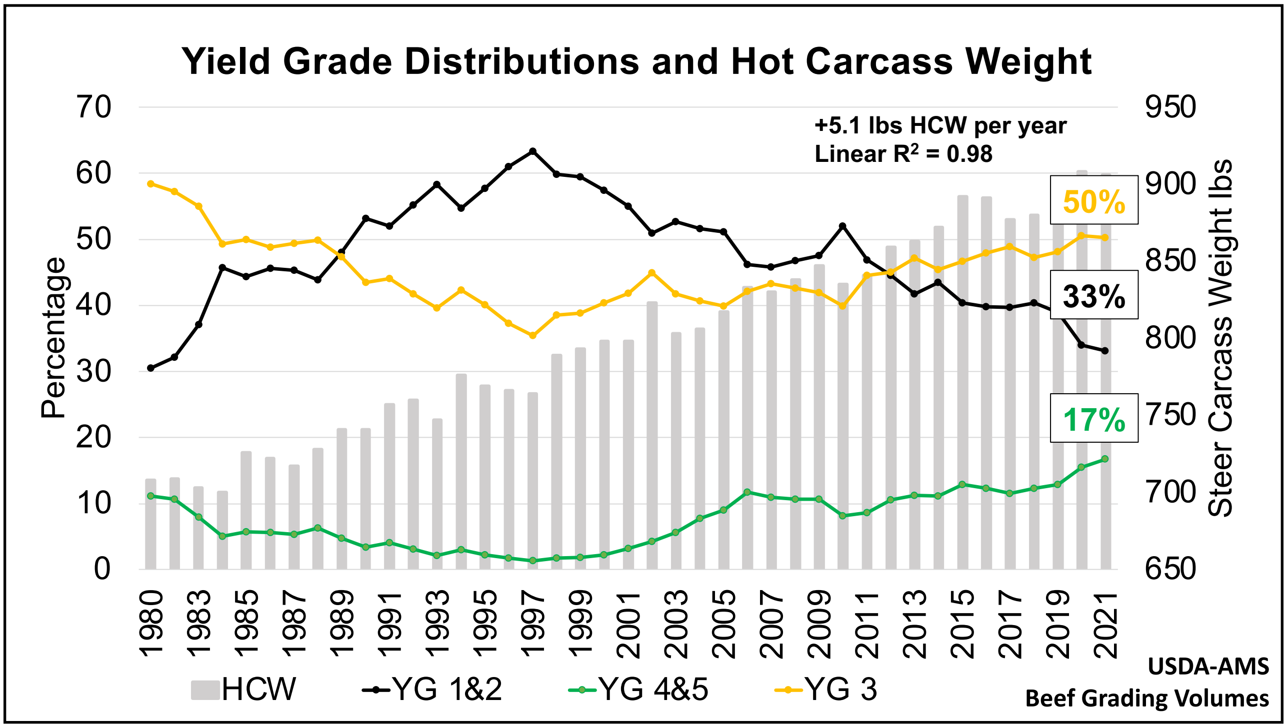

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Expression of Phenotype & Red Meat Yield

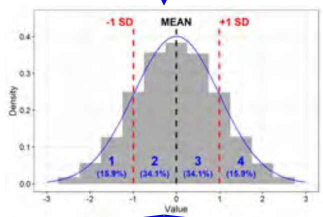
10

Phenotype's Relationship to Red Meat Yield

6 pens of steers
3 pens of heifers

Sire: Angus or SimAngus
Dam: Holstein

Processing Time	Days on Feed	BW, lbs
Arrival	0	777
Re-Implant	104	1,234
Harvest	180	1,417



Muscling: 1 (dairy) to 9 (beef)
Frame size: 1 (dairy) to 9 (beef)
Phenotype score = muscling + frame size

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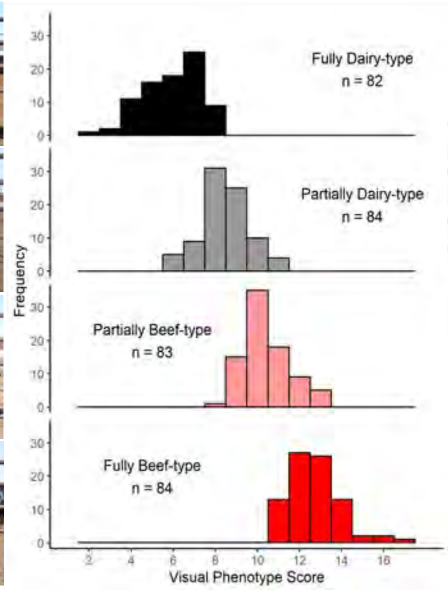
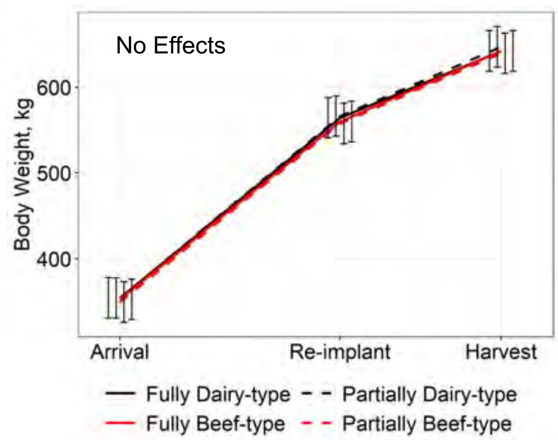
Phenotype Groups





No difference ($P = 0.81$) in marbling score between phenotype groups (means ranged from 480 to 493).

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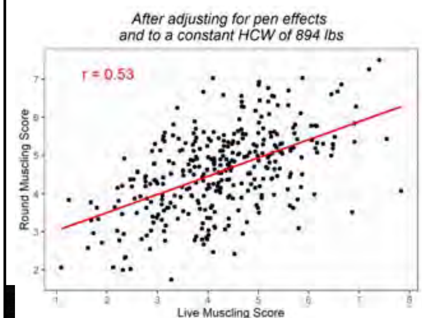
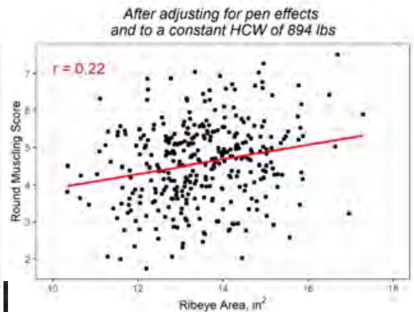
Muscling Considerations

Trait	Fully Dairy-type	Partially Dairy-type	Partially Beef-type	Fully Beef-type	*P*-value
Live muscling score	2.8[d]	4.0[c]	4.5[b]	5.6[a]	<0.01
Ribeye area, in^2	13.2	13.5	13.6	13.5	0.30
Round muscling score	3.8[c]	4.5[bc]	4.8[ab]	5.3[a]	<0.01





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Weight:	**1480 lbs**	**1510 lbs**
12th Rib Fat:	**0.68 in**	**0.64 in**
Ribeye Area:	**18.2 sq in**	**18.7 sq in**
Yield Grade:	**2.4**	**2.2**
Quality Grade:	**Low Choice**	**Low Choice**

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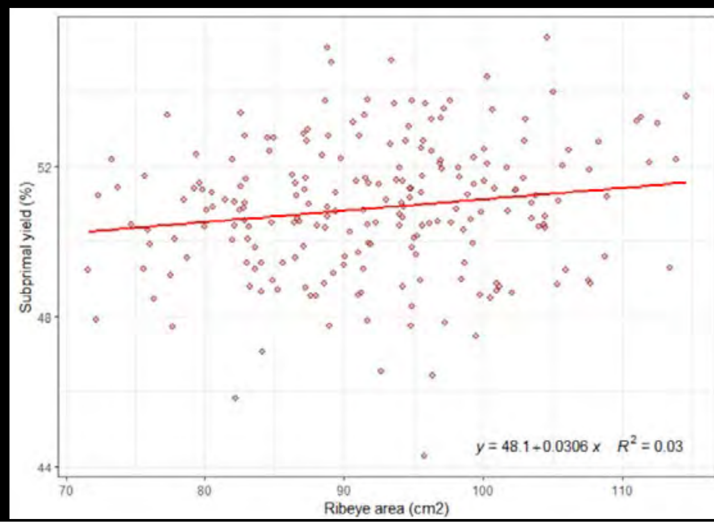
RIBEYE AREA : SUBPRIMAL YIELD

- 3% VARIATION EXPLAINED AS A SINGLE FACTOR



15

Accuracy modified subprimal yield equation ~ Adjusted for cattle type

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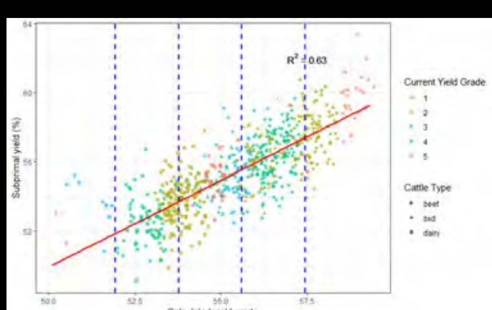

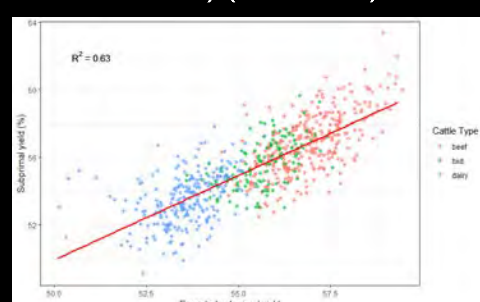

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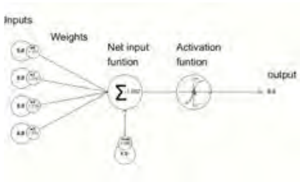

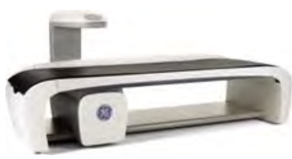

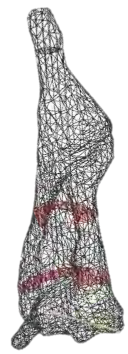

- DXA (Dual X-Ray Absorptiometry)
- 3D Imaging
- CT (Computerized Tomography)

Andres Mendizabal, Ph.D., Blake a. Foraker, Ph.D., and Dale R. Woerner, Ph.D.

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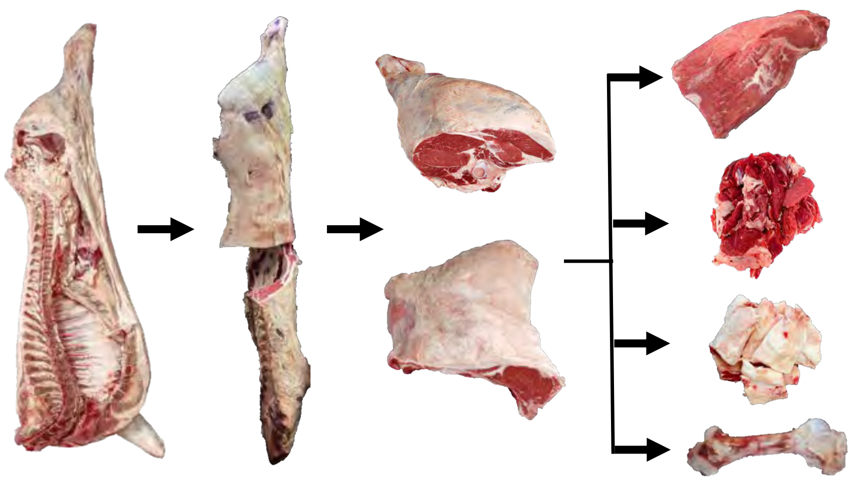
Carcass Fabrication



(FOSS FoodScan 78800; Dedicated Analytical Solutions, Hilleroed, Denmark)

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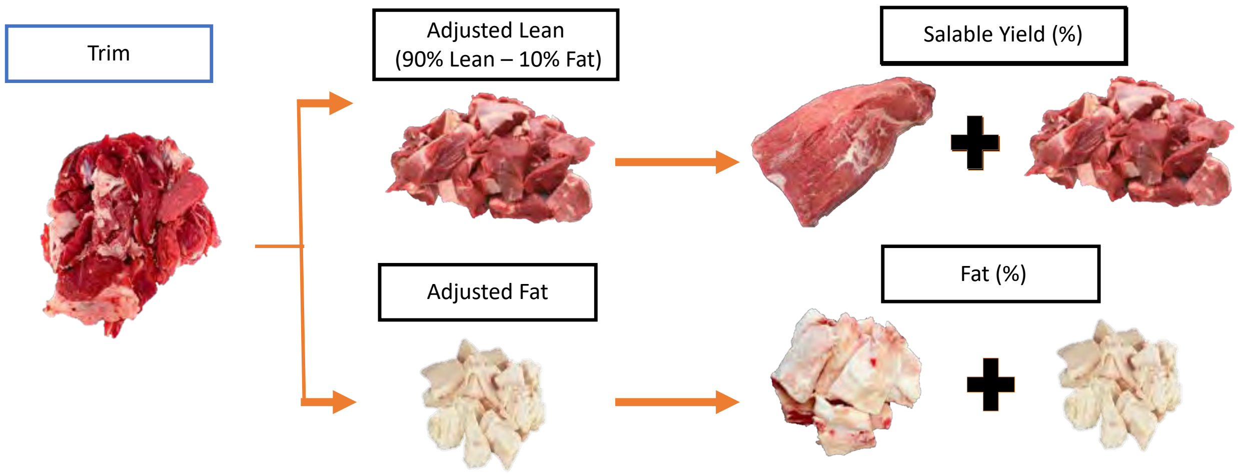
Materials and Methods
Data Management



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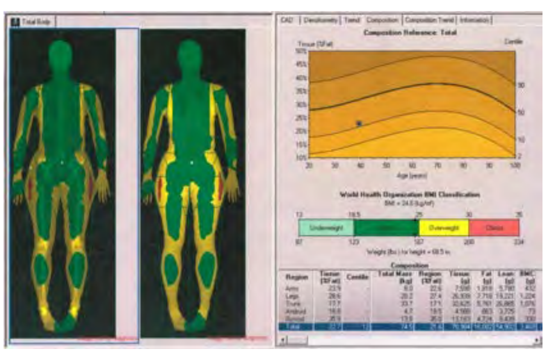
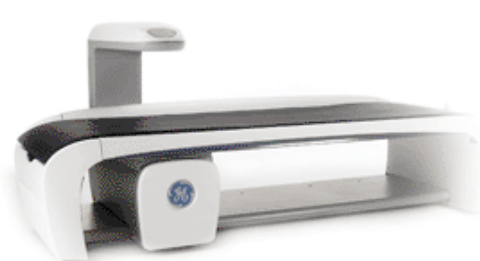
BEEF Funded by the Beef Checkoff





Exploring iDXA (Dual X-Ray Absorptiometry)

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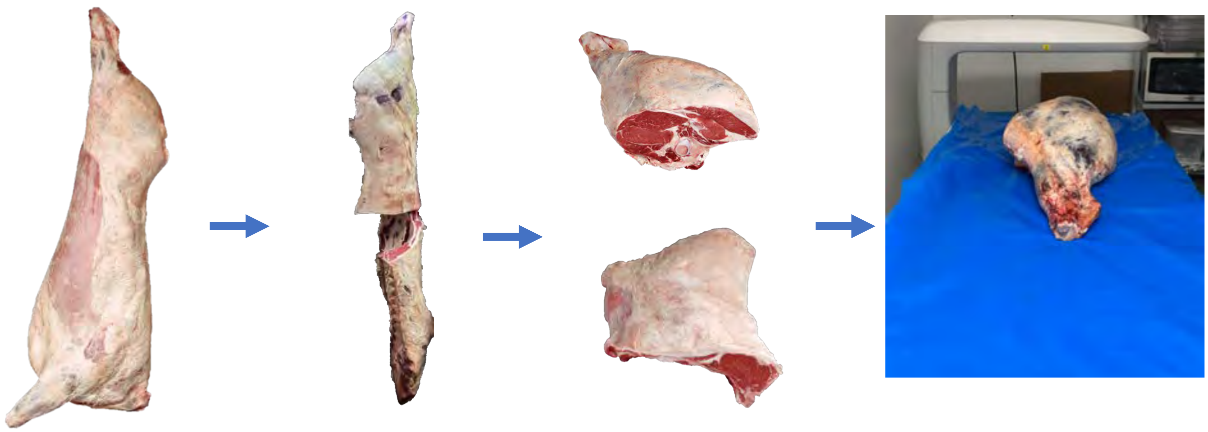
DXA Imaging Primals



48h Conventional Chilling

Graded

Small Animal - Low Resolution

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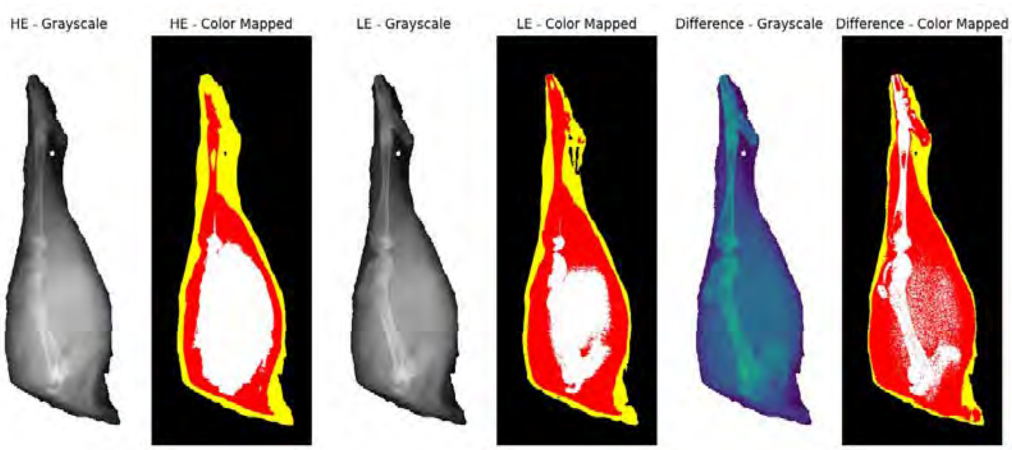
Data Analysis Matrix (Pixel Value)



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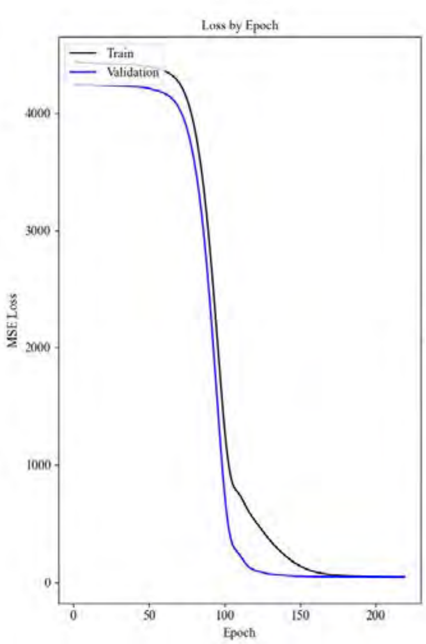
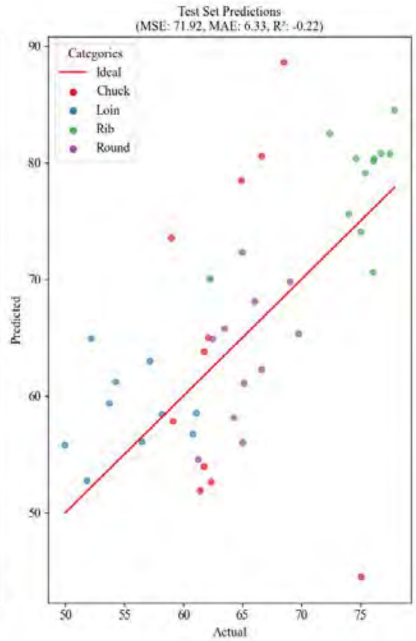
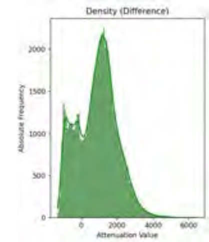




Results Neural Network



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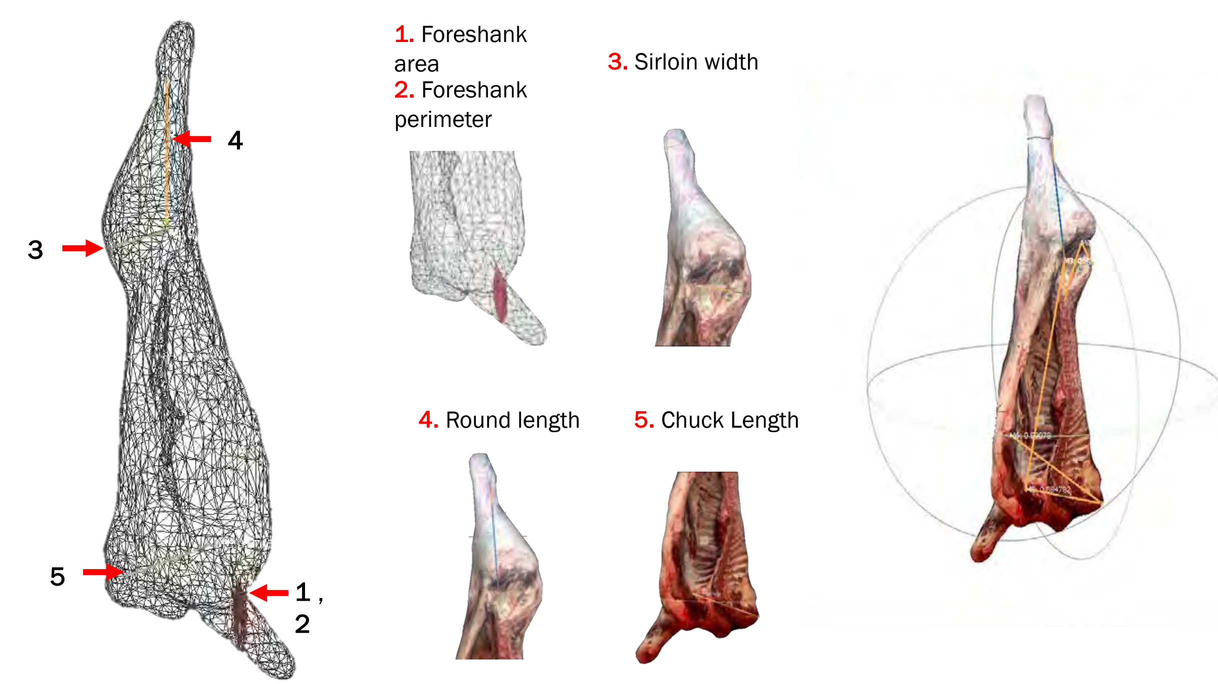

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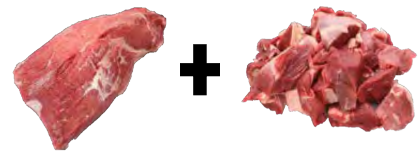
N	Predictors	R^2	Adjusted R^2	CP	AIC
1	Comp.7	0.27	0.22	45.11	83.40
2	Comp.4 Comp.7	0.50	0.43	28.54	78.86
3	Comp.1 Comp.4 Comp.7	0.62	0.53	21.48	76.43
4	Comp.1 Comp.4 Comp.7 Comp.12	0.72	0.63	15.03	72.92
5	Comp.1 Comp.3 Comp.4 Comp.7 Comp.12	0.80	0.71	10.99	69.47
6	Comp.1 Comp.3 Comp.4 Comp.6 Comp.7 Comp.12	0.87	0.80	6.97	63.43
7	Comp.1 Comp.3 Comp.4 Comp.6 Comp.7 Comp.9 Comp.12	0.93	0.88	4.53	55.42
8	Comp.1 Comp.3 Comp.4 Comp.6 Comp.7 Comp.9 Comp.11 Comp.12	0.95	0.89	5.30	53.12
9	Comp.1 Comp.3 Comp.4 Comp.6 Comp.7 Comp.9 Comp.10 Comp.11 Comp.12	0.96	0.91	6.25	50.39
10	Comp.1 Comp.2 Comp.3 Comp.4 Comp.6 Comp.7 Comp.9 Comp.10 Comp.11 Comp.12	0.96	0.89	8.16	51.88
11	Comp.1 Comp.2 Comp.3 Comp.4 Comp.6 Comp.7 Comp.8 Comp.9 Comp.10 Comp.11 Comp.12	0.96	0.88	10.09	53.50
12	Comp.1 Comp.2 Comp.3 Comp.4 Comp.6 Comp.7 Comp.8 Comp.9 Comp.10 Comp.11 Comp.12 Comp.13	0.96	0.85	12.04	55.25
13	Comp.1 Comp.2 Comp.3 Comp.4 Comp.5 Comp.6 Comp.7 Comp.8 Comp.9 Comp.10 Comp.11 Comp.12 Comp.13	0.96	0.80	14.00	57.02

Red meat yield prediction

Red Meat Yield (%)



Subprimal + Trim (Adjusted to 90% lean)

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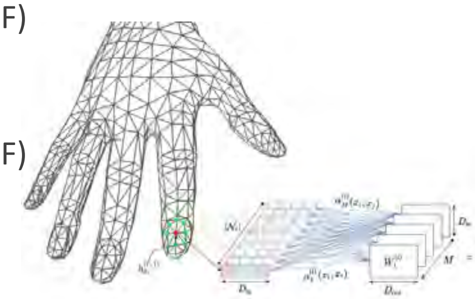
Materials and Methods Predictors

- Neural Networks
  - Current yield grade predictors (HCW, REA, BF)
  - 3D derived measurements
- Extreme Gradient Boosting (XGBoost)
  - Current yield grade predictors (HCW, REA, BF)
  - 3D derived measurements
- Graphical Neural Network
  - Global Pooling
  - Global Features



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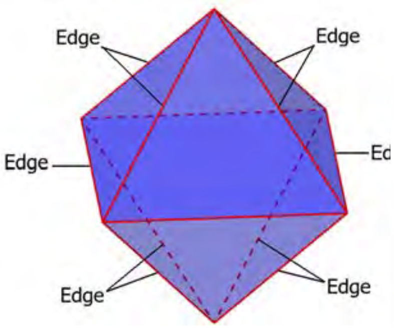
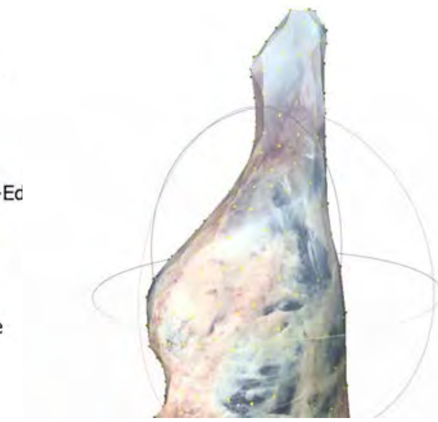
Graphical Neural Network





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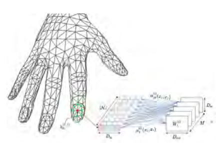
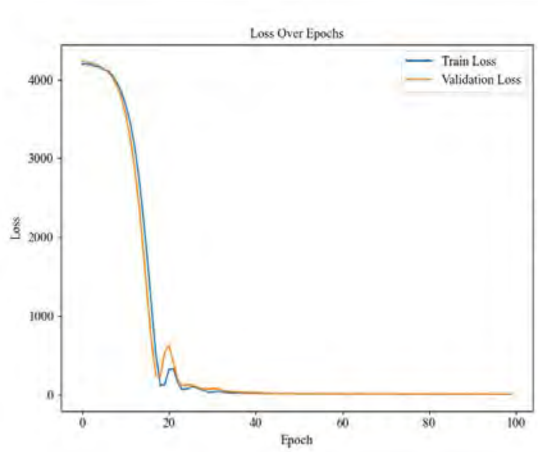
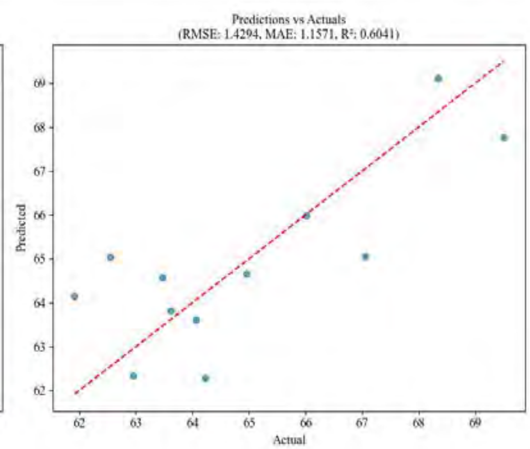
Results
Graphical Neural Network







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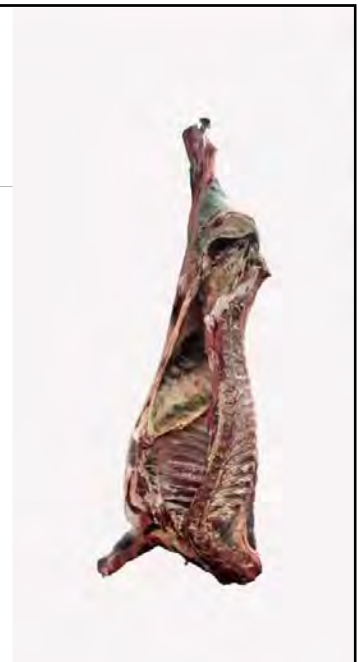
Conclusions for 3D

- 3D imaging combined with deep learning outperforms current USDA Yield Grade predictors.
- Future research should focus on increasing sample sizes and exploring alternative modeling techniques.



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ASSESSING CT (COMPUTERIZED TOMOGRAPHY) RMY ESTIMATION

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Materials and Methods
CT Data Collection

Collected in a commercial beef packing plant

N = 30

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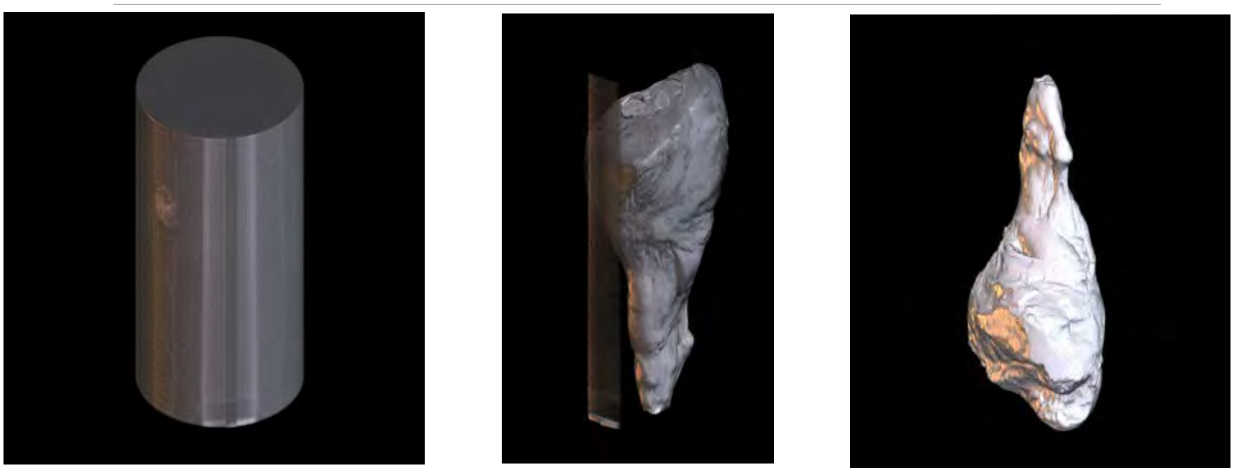
Initial Mask Separations



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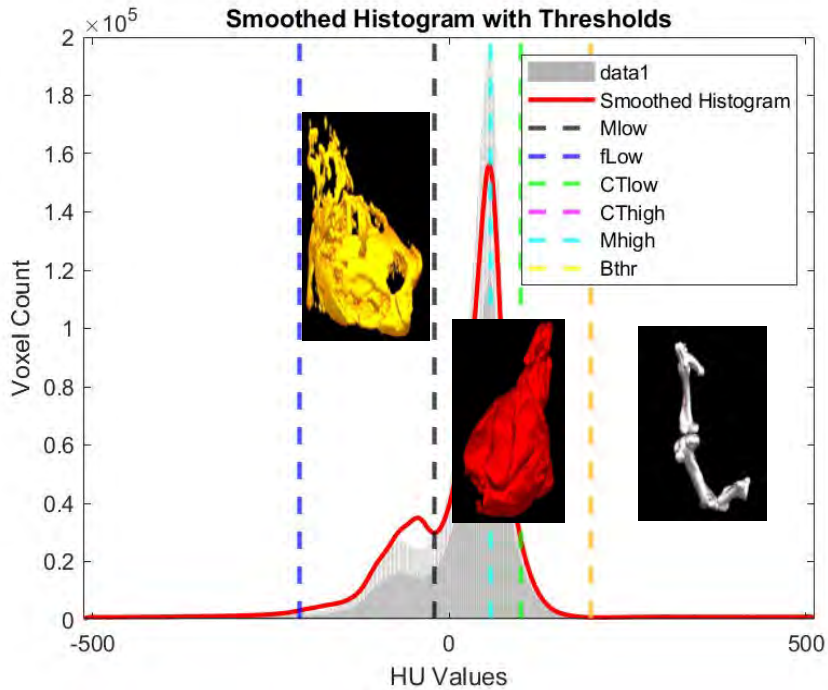

Data Analysis Initial Tissue Segmentation

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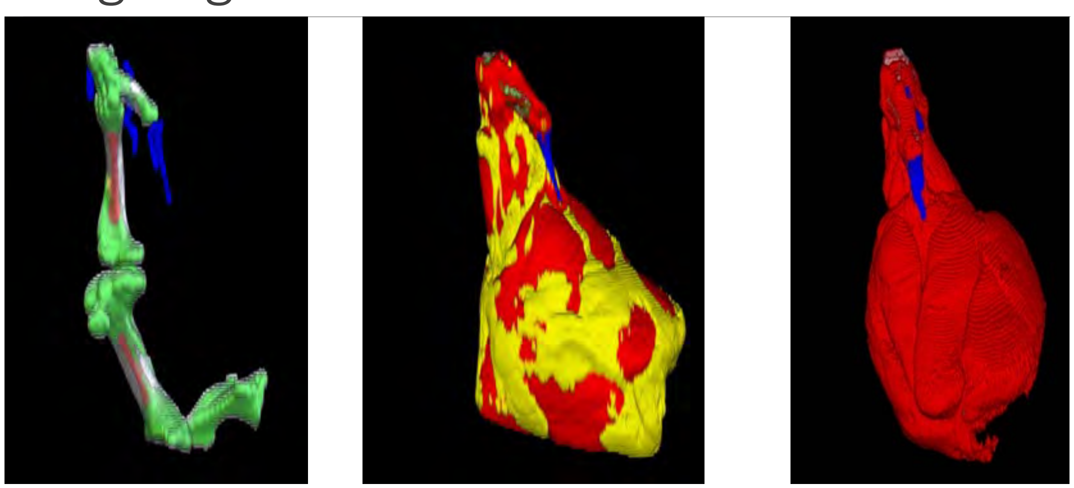
Ongoing Research



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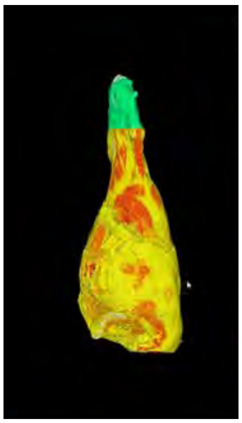
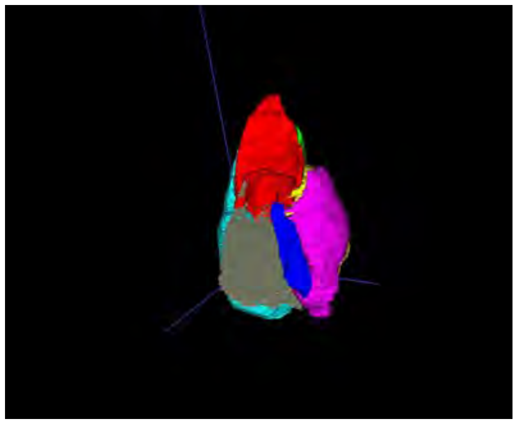
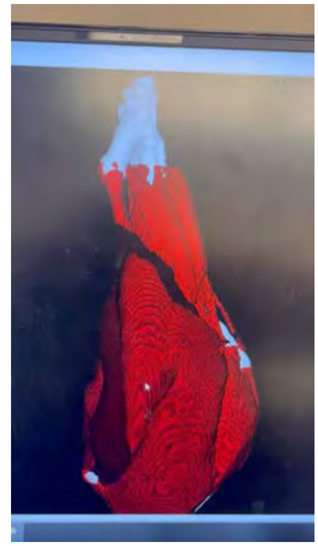
Manual Labels - Interpolation







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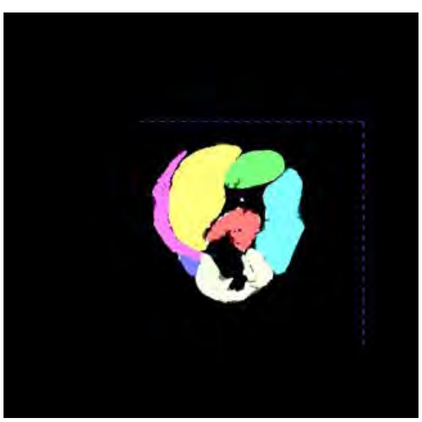
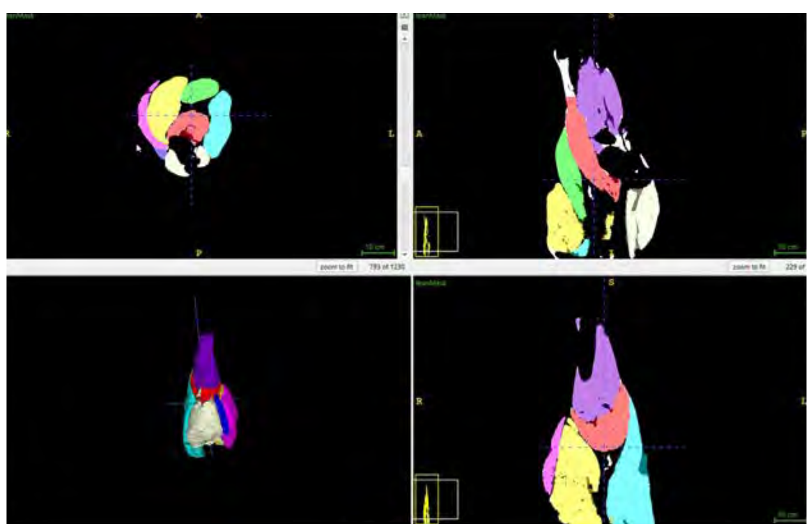
Muscle Separation





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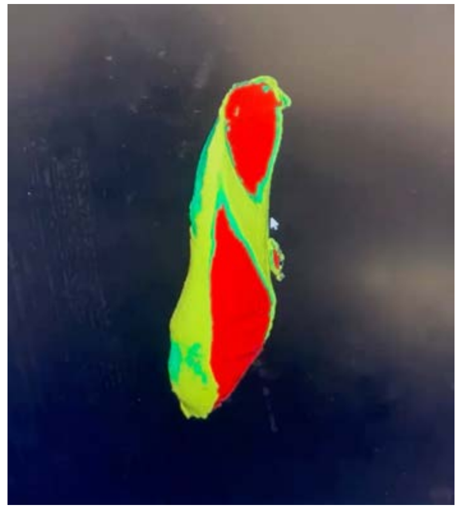
Virtual Trimming and Cutout



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Future Work

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Future Work

<u>Objective 1:</u> Establishing CT Scanning as a Gold Standard Measure for RMY (relating CT to saleable yield)

-Mobile CT Scan used at large-scale packing facilities (≥ 3) on carcass sides
-Traditional cutout data being manually captures alongside CT
-Random sampling of carcasses to mimic the consist of cattle composition
-Sample size > 400 hd

- mix of steers/heifers
- native and dairy
- northern, midwestern, and southern cattle

<u>Objective 2:</u> Providing Opportunity for Instrument Development and Accuracy Determination

-Based on the presumption that CT will be an effective Gold Standard
-Gathering large sample sizes (>1,000) of CT-scanned carcass
-Allowing instrument providers the opportunity to aquire data from carcasses simultaneous to CT scanning
-Designating carcasses for instrument development
-Maintaining carcasses for instrument validation (accuracy)

BEEF

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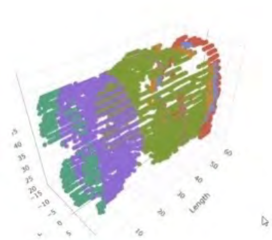
Measuring Morphology of Live Cattle



sizeR
PRECISION RADAR BODY MEASUREMENT

Dr. Blake Foraker - Blake.Foraker@ttu.edu

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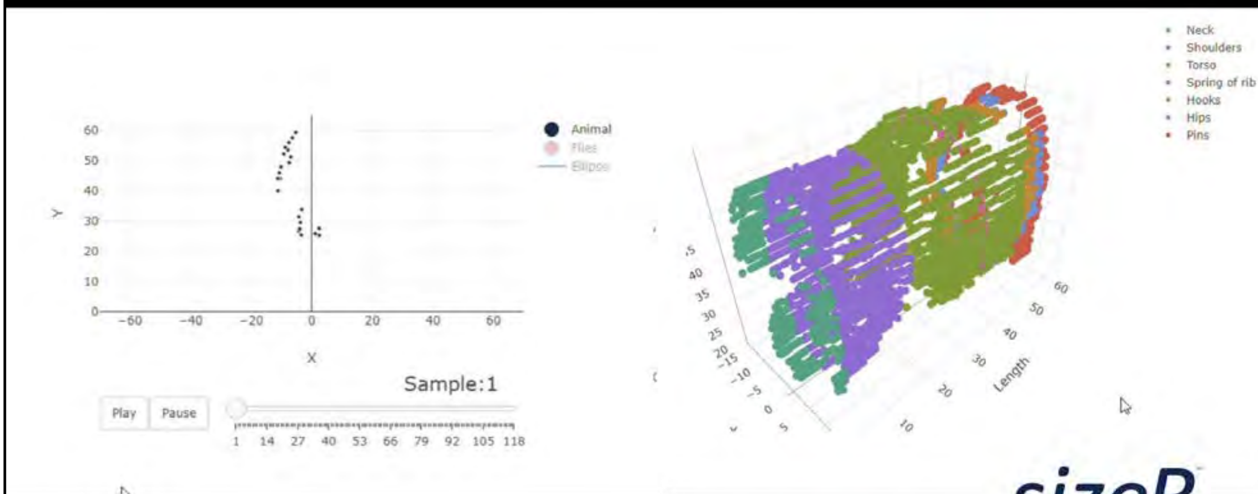

sizeR
PRECISION RADAR BODY MEASUREMENT

Dr. Blake Foraker - Blake.Foraker@ttu.edu

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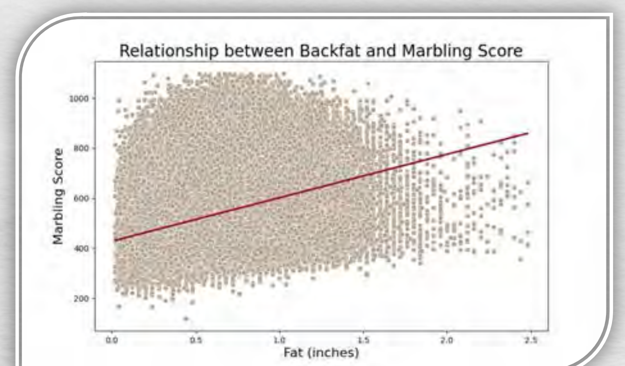
2023 Consist Data



2.22 M Head

The average amount of backfat needed for a 900 lb carcass to reach a marbling score of 500 (modest^{00})

Year	Backfat
2023	0.39
2022	0.39
2020	0.44
2019	0.46

*Linear regression of marbling score against hot carcass weight, and backfat thickness.

** 2019 n=2.32M, 2020 n=3.75M, 2022 n=1.77M, 2023 n=2.22M

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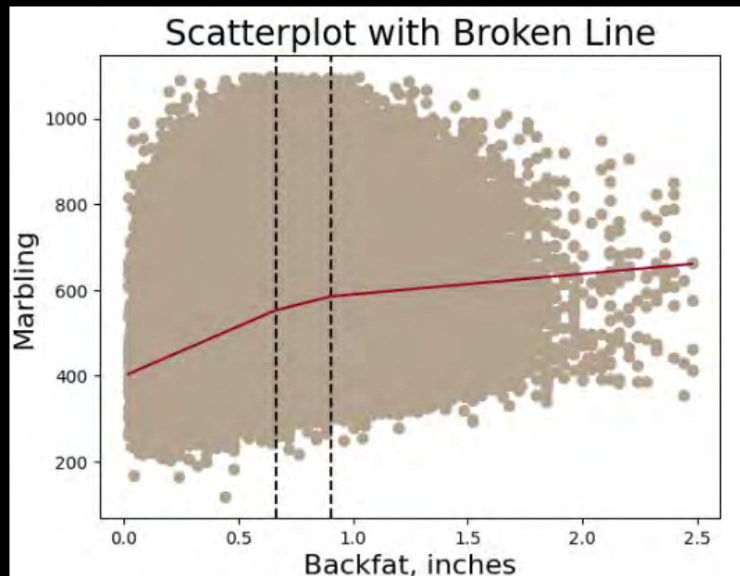
Marbling Score vs. Backfat

- Marbling increases with increasing backfat.
- The rate of increase slows at:
  - 0.66”
  - 0.91”

2023 Consist Data



2.22 M Head

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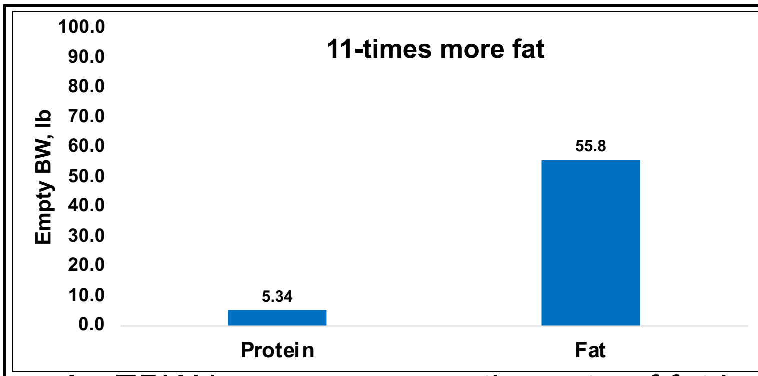
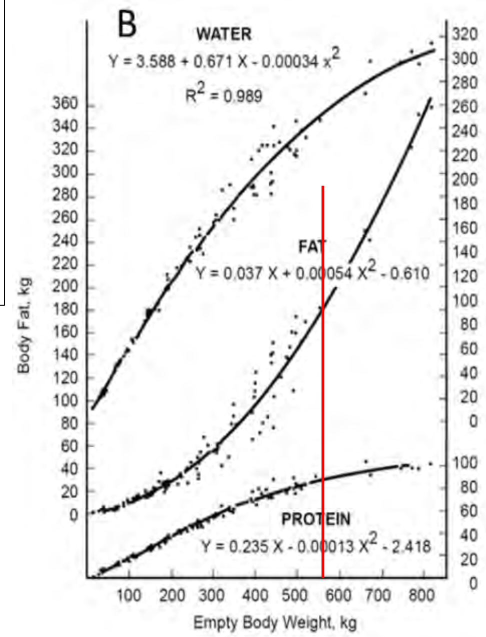


- As EBW increases, accretion rate of fat is greater than the accretion rate for protein
- Fat is stored with greater efficiency
  - 70% efficiency of ME use for fat
  - 25% efficiency of ME use for protein
- More water is stored with deposited protein than deposited fat
  - Protein tissue gain is 4X as efficient as accretion of fat (body weight gain basis)



Cost of Fat: Dr. Kristin Hales et al., 2024 TTU BXD Symposium

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Discussion

- What is the **PRIORITY** in reducing waste fat, inefficiency, and carbon, while increasing red meat yield in the U.S. Beef Supply?
  - Increase propensity for marbling at an earlier and leaner endpoint.
  - Reduce days on feed.
  - Increase feed efficiency for marbling.
  - Improve total animal/carcass phenotype/conformation for red meat yield.
  - **MAINTAIN FOCUS ON PRODUCING HIGH QUALITY, GREAT TASTING BEEF!**

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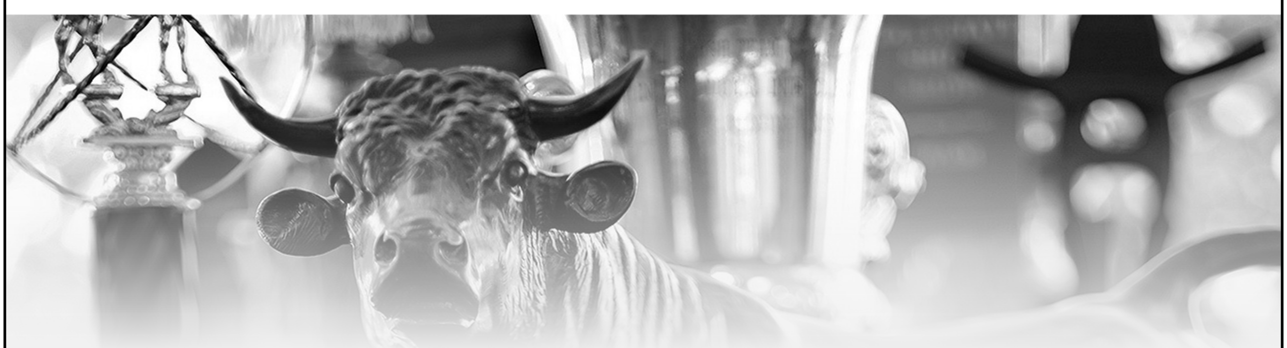

Dale.Woerner@TTU.edu

TEXAS TECH UNIVERSITY
Davis College
Animal & Food Sciences™

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WORKING FOR THE

AGRICULTURE INDUSTRY SINCE 1894

Kansas Livestock Association | NCBA National Cattlemen's Beef Association

Advancing the business interests of its members is KLA's mission. Volunteer leaders and staff work to achieve this goal every day by working with legislators and regulatory agencies to advance KLA policy. Our affiliation with NCBA extends our influence to Washington, DC, where the NCBA legislative affairs team represents cattle producers' and landowners' interests before Congress and federal regulators. KLA and NCBA invite anyone with a financial stake in Kansas agriculture to join us in our work on their behalf. Visit kla.org and ncba.org for more details.

We've got your back.

- Protecting private property rights of agricultural producers.
- Ensuring that county and municipal zoning and building regulations do not restrict agriculture.
- Supporting increased weight limits for trucks carrying agricultural inputs, supplies and commodities.
- Defending agricultural exemptions from sales and property taxation.
- Working with state government and groundwater management districts to ensure availability of water for agriculture and other uses well into the future.

Join both associations and receive discounts on:

AmeriWind | Big Bend Trailers | Cabela's | Bass Pro Shops | Caterpillar | Cowboy Cauldron Co. | Dell Technologies
Elanco | Gallagher | John Deere | Montana Silversmiths | New Holland | Roper & Tin Haul | Kubota

KLA/NCBA MEMBERSHIP APPLICATION

Name: ____________________

Spouse: ____________________

Farm/Ranch Name: ____________________

Address: ____________________

City: ____________________ State: __________

County: ____________________ Zip: __________

E-mail: ____________________

Home Phone: ____________________

Cell Phone: ____________________

Recruited By: ____________________

Type of Operation: ____________________

• Kansas Livestock Association Dues:

Fair Share # cattle *over* 100 head _____ x 50¢ = $_______

plus Base KLA Dues Investment $ 180.00

• National Cattlemen's Beef Association Dues:

Cow/Calf Producer (Based on herd size)

❐ 1-100	$170	❐ 501-750	$736	❐ 1251-1500	$1,586
❐ 101-250	$340	❐ 751-1000	$1,020	❐ 1501-1750	$1,870
❐ 251-500	$510	❐ 1001-1250	$1,304	❐ 1751-2000	$2,154
❐ 2001 +	$2,154 plus .4307¢/head over 2000				

Stocker/Feeder

❐ $170 + (.4307¢ x _______ head = $_________)

plus NCBA Dues Investment $________

Total Dues Investment $_______

The portion of KLA and NCBA dues not directly allocable to lobbying expenditures is tax deductible for most members as an ordinary and necessary business expense. For KLA, dues are 92% deductible; NCBA dues are 90% deductible.

Return this application with your dues investment to:

Kansas Livestock Association
6031 SW 37th Street • Topeka, Kansas 66614

Ranch Management Field Days 2025

NOTES

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