Sexing® TECHNOLOGIES

STgenetics™

WELCOME

THE BEST WAY TO PREDICT
THE FUTURE IS TO
Create It

Sexing® TECHNOLOGIES & STgenetics®

- Sister companies.
- Offer a variety of livestock reproductive services globally.
- Part of the Inguran LLC family of companies based in Navasota, Texas.

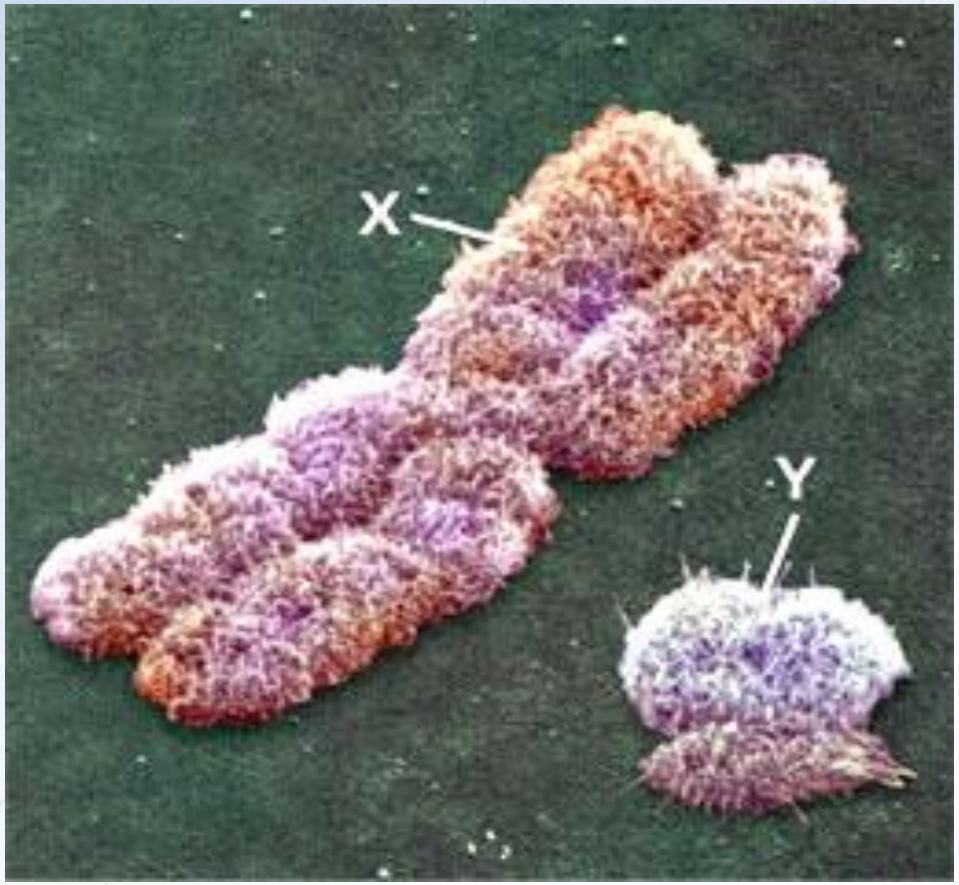
Sexing® TECHNOLOGIES

- Is a service company best known for sex sorting semen from cattle, deer, horses, sheep, goats and pigs.
- Dairy cattle industry is the largest customer.
- Sorts semen for most of the major cattle genetics companies around the world.
- Sorts deer, horse, sheep and goat semen for individual customers.

Sexing® TECHNOLOGIES

- Has commercially sorted semen since 2004.
- Sorts using Flow Cytometers — computers that will count whatever you teach them to count.
  - Flow cytometric sorting process developed by USDA in cooperation with several federal research labs.
  - Semen is put into a media that nourishes and protects the sperm.
  - Media also contains a dye that is attracted to genetic material. The more DNA present, the more dye is absorbed.

- X-Chromosome (female) is larger and contains more genetic material than does the Y-Chromosome (male). X-bearing sperm cells absorb more dye than Y-bearing sperm cells.
- Sperm enter flow cytometer and are oriented in a single file line.
- Each sperm is hit by a laser and fluoresces. The more dye in the cell, the more it fluoresces.
- Proprietary software on the sorters determines if the cell is carrying an X or Y Chromosome based on the fluorescence.
- The sorter then attaches a slight electric charge to the cell based on the chromosome it carries.
- The cell exits the sorter by passing between two charged plates. These plates direct the cell into the container appropriate for the chromosome it carries.
- The process is consistently 90 percent gender accurate.

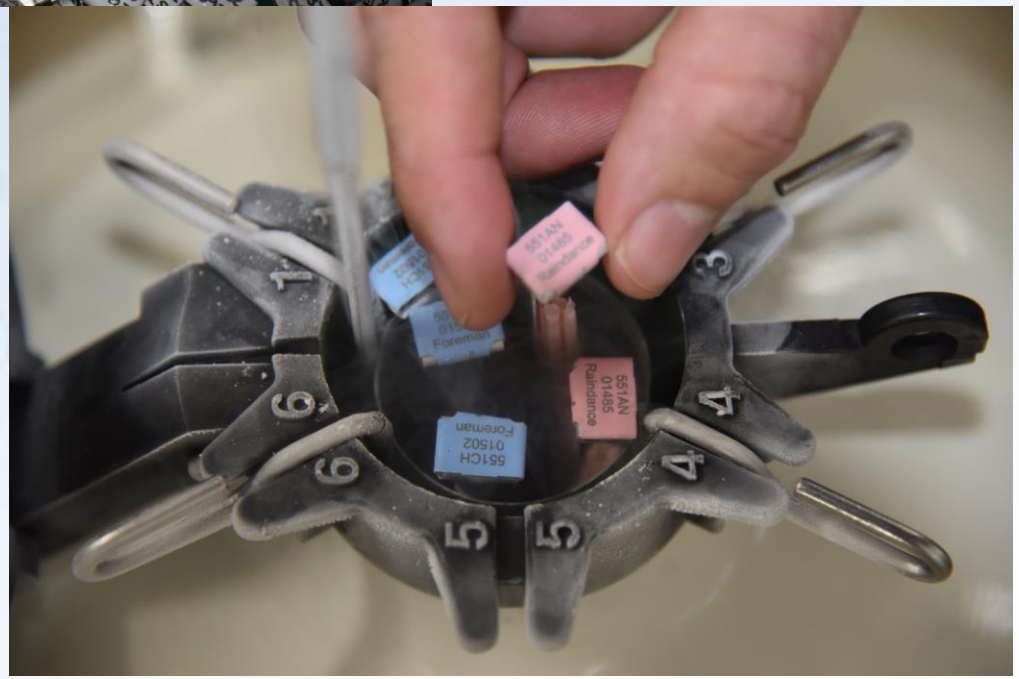


Sexing® TECHNOLOGIES

- Currently has 8 sorting facilities in the U.S. and 15 sorting facilities in 10 foreign countries:
  - Argentina, Australia, Italy, United Kingdom, Canada, China, Germany, Netherlands, Brazil, New Zealand, India(2), France(2) and Switzerland
- The Navasota headquarters also provides a dedicated facility for embryo transfer and in-vitro fertilization services.

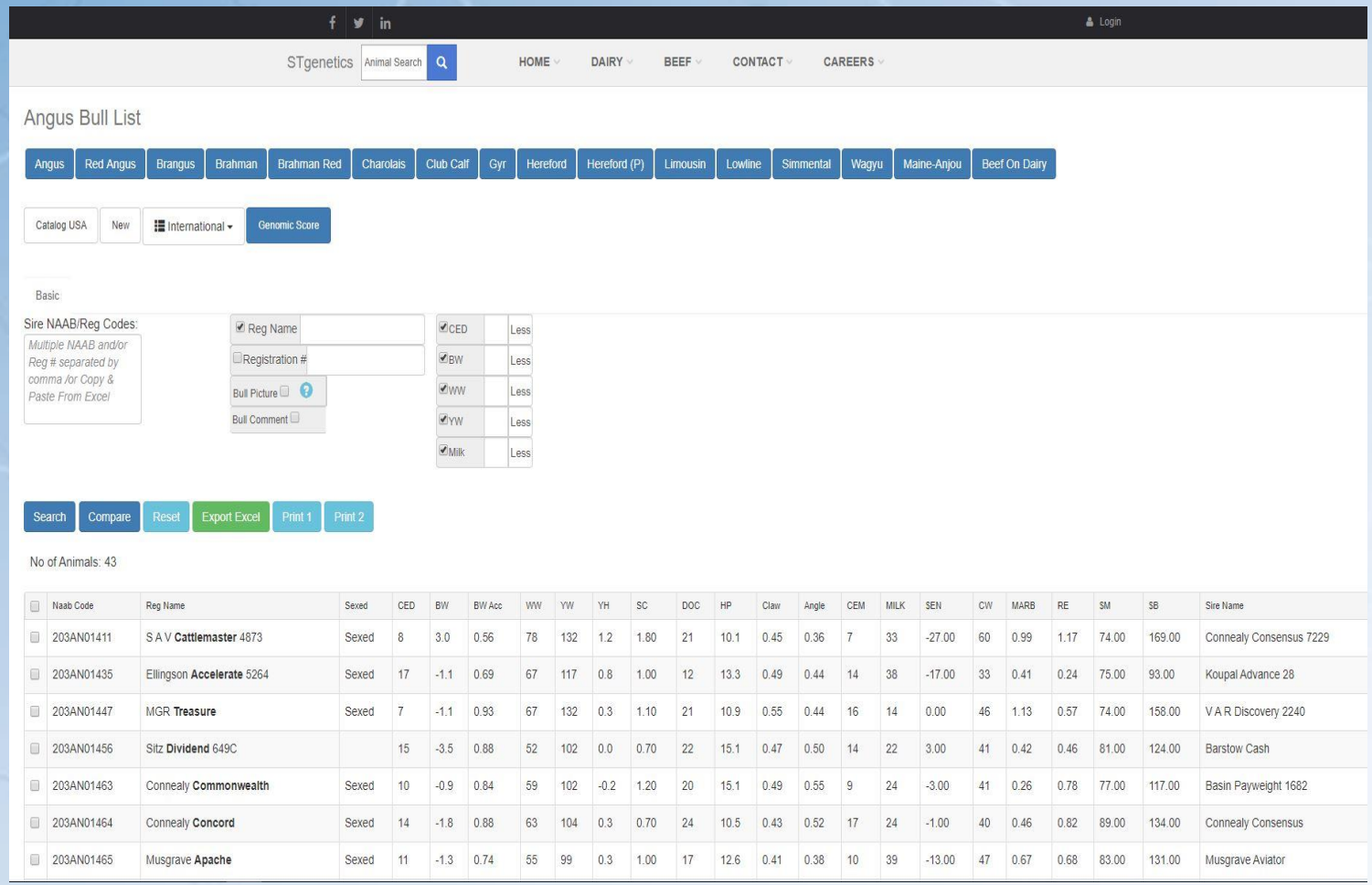
ST Genetics®

- Is a livestock genetics company launched in 2015 and specializing in dairy and beef cattle genetics.
- Features an impressive lineup of elite genomic dairy and beef sires.
- Sells bull semen around the world through a network of sales reps and independent distributors.
- Operates three bull studs: Navasota, TX; Fond du Lac, WI; Tiffin, OH; and Mehoopany, PA.

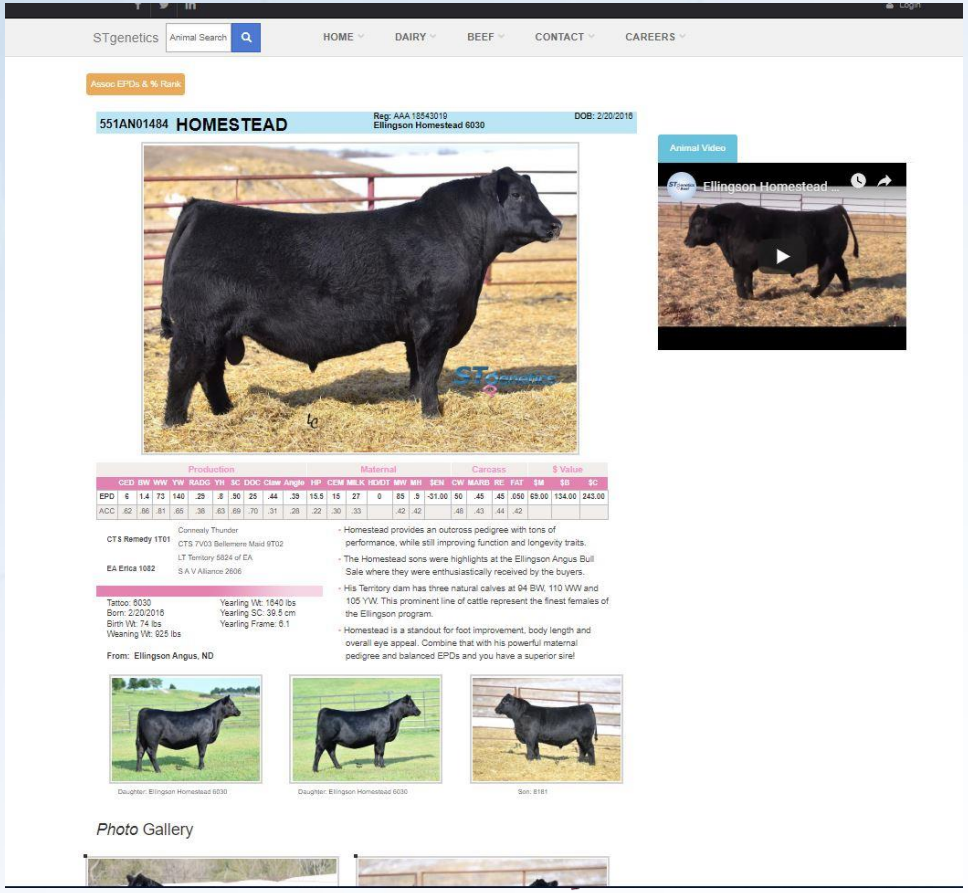


STgenetics®

- ✧ Runs the website STgen.com.
- ✧ Website features an advanced sire selector.



Naab Code	Reg Name	Sexed	CED	BW	BW Acc	WW	YW	YH	SC	DOC	HP	Claw	Angle	CEM	MILK	$EN	CW	MARB	RE	$M	$B	Sire Name
203AN01411	S A V **Cattlemaster** 4873	Sexed	8	3.0	0.56	78	132	1.2	1.80	21	10.1	0.45	0.36	7	33	-27.00	60	0.99	1.17	74.00	169.00	Connealy Consensus 7229
203AN01435	Ellingson **Accelerate** 5264	Sexed	17	-1.1	0.69	67	117	0.8	1.00	12	13.3	0.49	0.44	14	38	-17.00	33	0.41	0.24	75.00	93.00	Koupal Advance 28
203AN01447	MGR **Treasure**	Sexed	7	-1.1	0.93	67	132	0.3	1.10	21	10.9	0.55	0.44	16	14	0.00	46	1.13	0.57	74.00	158.00	V A R Discovery 2240
203AN01456	Sitz **Dividend** 649C		15	-3.5	0.88	52	102	0.0	0.70	22	15.1	0.47	0.50	14	22	3.00	41	0.42	0.46	81.00	124.00	Barstow Cash
203AN01463	Connealy **Commonwealth**	Sexed	10	-0.9	0.84	59	102	-0.2	1.20	20	15.1	0.49	0.55	9	24	-3.00	41	0.26	0.78	77.00	117.00	Basin Payweight 1682
203AN01464	Connealy **Concord**	Sexed	14	-1.8	0.88	63	104	0.3	0.70	24	10.5	0.43	0.52	17	24	-1.00	40	0.46	0.82	89.00	134.00	Connealy Consensus
203AN01465	Musgrave **Apache**	Sexed	11	-1.3	0.74	55	99	0.3	1.00	17	12.6	0.41	0.38	10	39	-13.00	47	0.67	0.68	83.00	131.00	Musgrave Aviator



SexedULTRA 4M™

- There are 4 million sperm cells per straw, which is packaged in a ¼ cc straw.
- Conception rates compared to conventional.
- 50 million sexed sorted semen units have been produced at ST labs in the past 10 years.
- More than 20 million calves born using sexed-sorted semen between dairy and beef.

ULTRAFertility™

- At STgenetics, all sires must consistently produce high quality semen and every collection is required to pass our rigorous pre- and post-thaw quality evaluation, or it is discarded.
- STgenetics has the opportunity to work with cooperating herds to create an internal evaluation system that compares conception rates throughout the industry.
- A critical number of inseminations allows STgenetics to highly recommend these sires for Fixed Time AI protocols, embryo production and sexed semen superiority.
- **Using ULTRAFertility sires will maximize conception rates and keep your business running efficiently.**

STyle Genetics™

STyle Genetics are sires available in SexedULTRA 4M® and Conventional that provide a balance between production and favor the show ring.

STyle Sires:

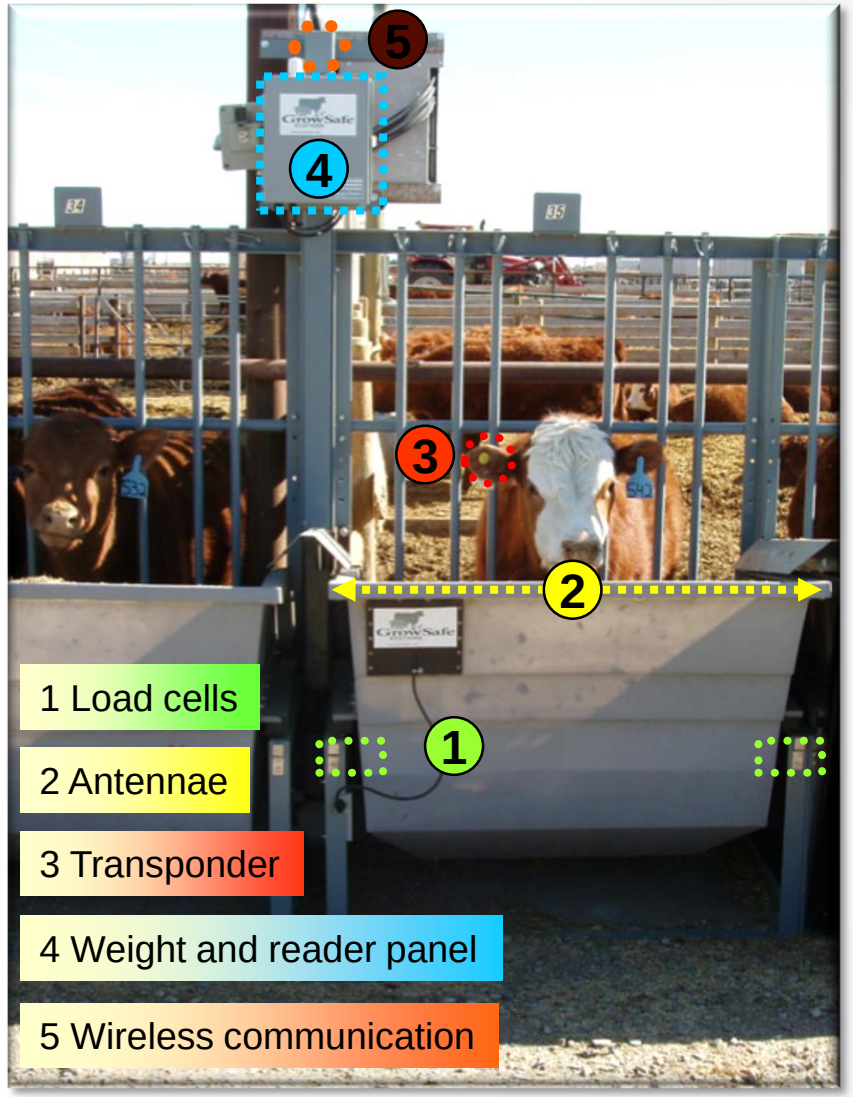
551AN01499	PVF **Surveillance** 4129
551AR01515	Pelton **Wideload** 78B
551HH01704	H FHF **Advance** 628 ET
551CH01505	CCC WC **Resource** 417 P
551CH01506	WC **Milestone** 5223 P
551CH01508	LT **Patriot** 4004 PLD
551SM09024	MG/GSC **Authority** W14C
551SM09027	RFG/K-LER **Elevation** 727E
551SM09029	SFI **Brigade** D21
551SM09030	OMF **Epic** E27
551SM09032	HILB **Oracle** C033R
203BR01371	Mr. H **Bogota** Manso 253/1
203BR01600	Mr. **Karu** Manso 800
203BR01913	Mr SNS **Omaha** 273/6
203RR00473	+Mr **Winchester** Magnum 999/3
203RR01190	3X-HK **Arquitecto**
203RR01478	3X-HK Mr. 966 **'Parallel'**
203RR01503	+Mr. SG 111/1 **'Jack'**
551RR01606	HK **X-Ray**
551XB02000	**Fur Trader**
551XB02001	**X-Factor**
551MA01301	BOE **Game Changer** ET

genetic™
Development
Center


1/4/2017 3:10 pm
1/3/2017
1/4/2017
20 pens of 200’ x 60’
375 ft² / head
640 heads one time capacity
Dr. Temple Grandin design in working pens
© 2016 Google
Google Earth
00:00
1995
Imagery Date: 11/19/2016 30°28'20.96" N 96°11'07.58" W elev 313 ft eye alt 1865 ft

Genetics of Feed Efficiency | Available technologies

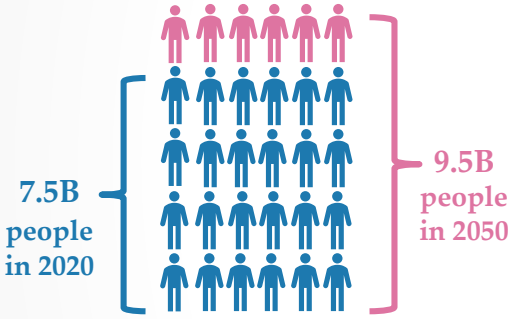
- Technology now available to measure feed intake and feeding behavior in cattle—*GrowSafe Systems™*
- GDC is the 2nd largest facility in North America equipped with GrowSafe technology to measure feed efficiency in beef cattle.
- 20 pens with 4 bunks each approx. 640 heads capacity.



GrowSafe™ feed-intake & feeding-behavior system

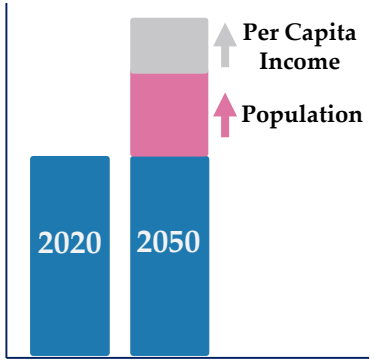
Creating a sustainable future

We need to feed more people…



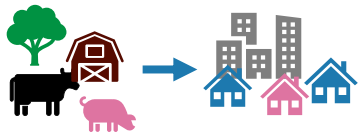
> 26%
increase
from 2020
to 2050

Who will eat more food…

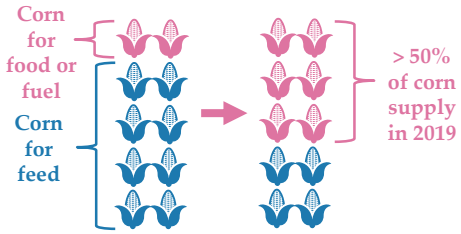


Demand will exceed the population increase

With fewer, more expensive inputs…



- 175 acres/hour of agricultural land lost to development



- Increasing demand for grains as food or fuel

While reducing emissions…

Source: US Census Bureau, International database; American Farmland Trust; USDA, Economic Research Service, Feed Grains Database

Creating a sustainable future

Goals

↑ production outputs

↓ inputs

↓ environmental impact

Solution

↑ Feed efficiency

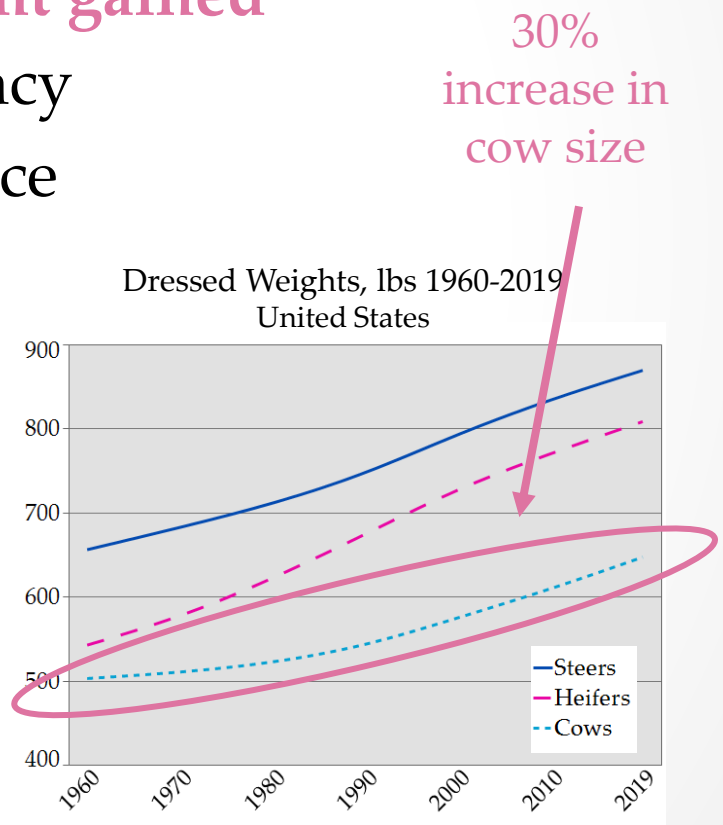
Feed efficient progress

- Feed efficiency progress for groups:
  - Management
  - Grain processing
  - Beta agonist
- Considerable variation exist between the feed efficiency of individual-animals
- Need for identifying animals with divergent feed efficiency:
  - Improve understanding of mechanisms associated with feed efficiency
  - Investigate phenotypic or genetic biomarkers for feed efficiency
  - Implement selection programs to improve feed efficiency

Measures of feed efficiency

AgriLIFE RESEARCH
Texas A&M System

- Feed to gain ratio **(F:G)**
  - Amount of **feed consumed** ÷ **weight gained**
  - Traditional measure of feed efficiency
  - Used to monitor animal performance
  - Questionable trait for genetic selection:
    - Strong correlations between F:G and growth traits *(Koots et al., 1994; Smith et al., 2010)*
    - Ratio traits may cause bias in breeding value prediction *(Gunsett, 1984)*



Measures of feed efficiency

- Residual feed intake **(RFI)**
  - RFI is a trait that measures the variation in feed intake beyond that needed to support maintenance and performance requirements *(Koch et al., 1963)*

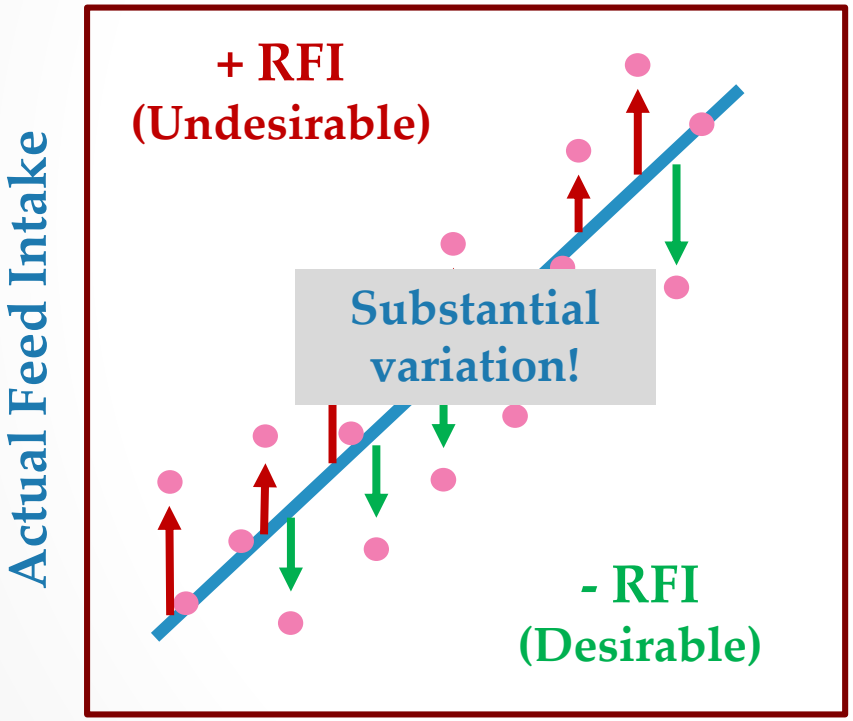
RFI = Actual Feed Intake – (β_1Mid-test BW$^{0.75}$ + β_2ADG)

  - More appropriate selection trait for feed efficiency:
    - Independent of performance and body size *(Arthur, 2001)*
    - Not genetically related to growth or mature body size
    - Heritable *(Schenkel et al., 2004, Williams et al., 2011, Veerkamp et al., 1995)*
    - Favorable effects on methane emissions *(Hegarty, 2007; Basarab et al. 2013)*

What is residual feed intake?

RFI = Actual Feed Intake – Expected Feed Intake

Based on body size and performance

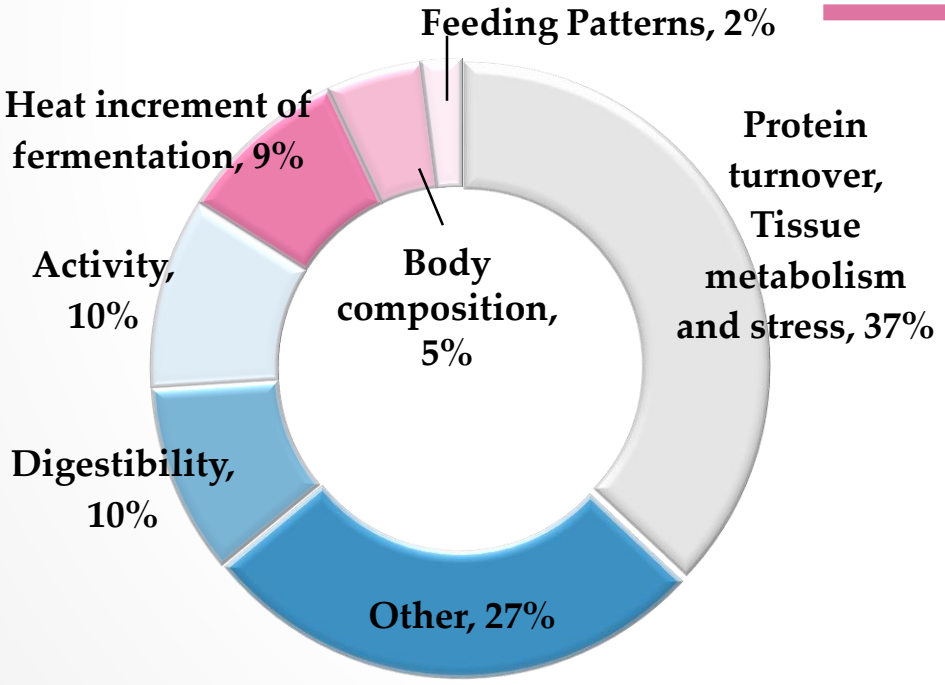


- Calves that eat **more** than expected will have a **positive** RFI
- Calves that eat **less** than expected will have **negative** RFI

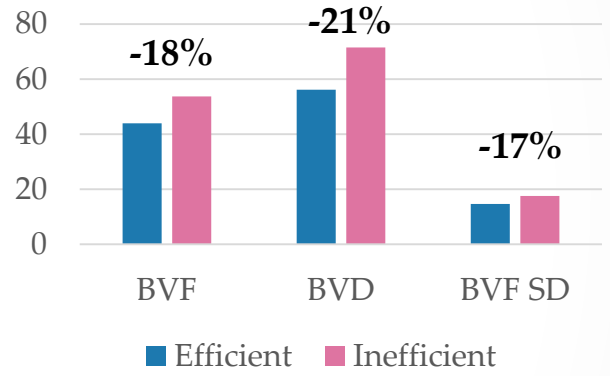
What is residual feed intake?

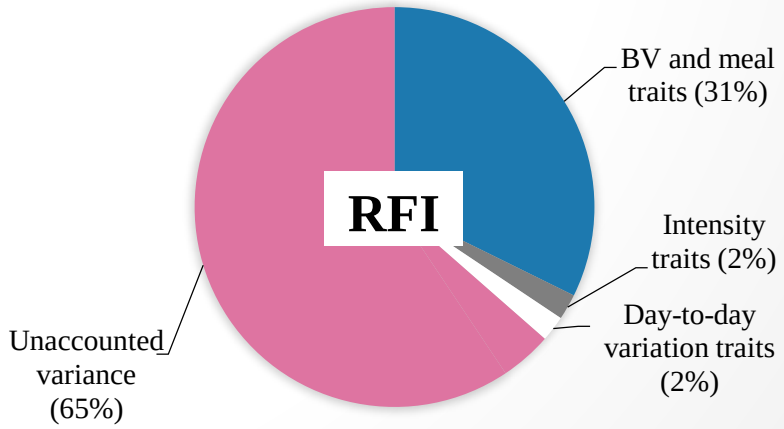
- RFI reflects differences in biological mechanisms associated with feed efficiency

Biological mechanisms associated RFI



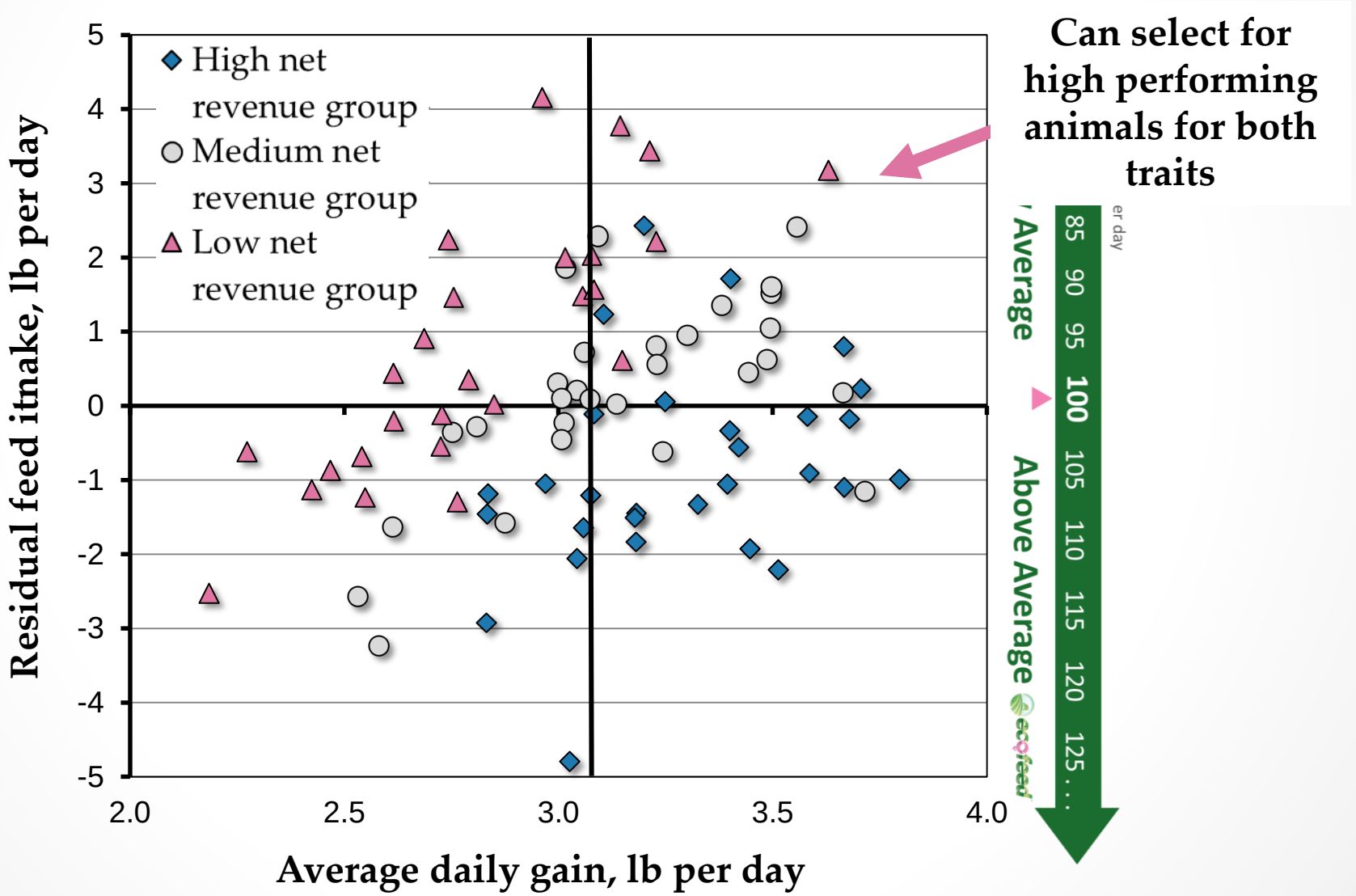
Feeding behavior patterns



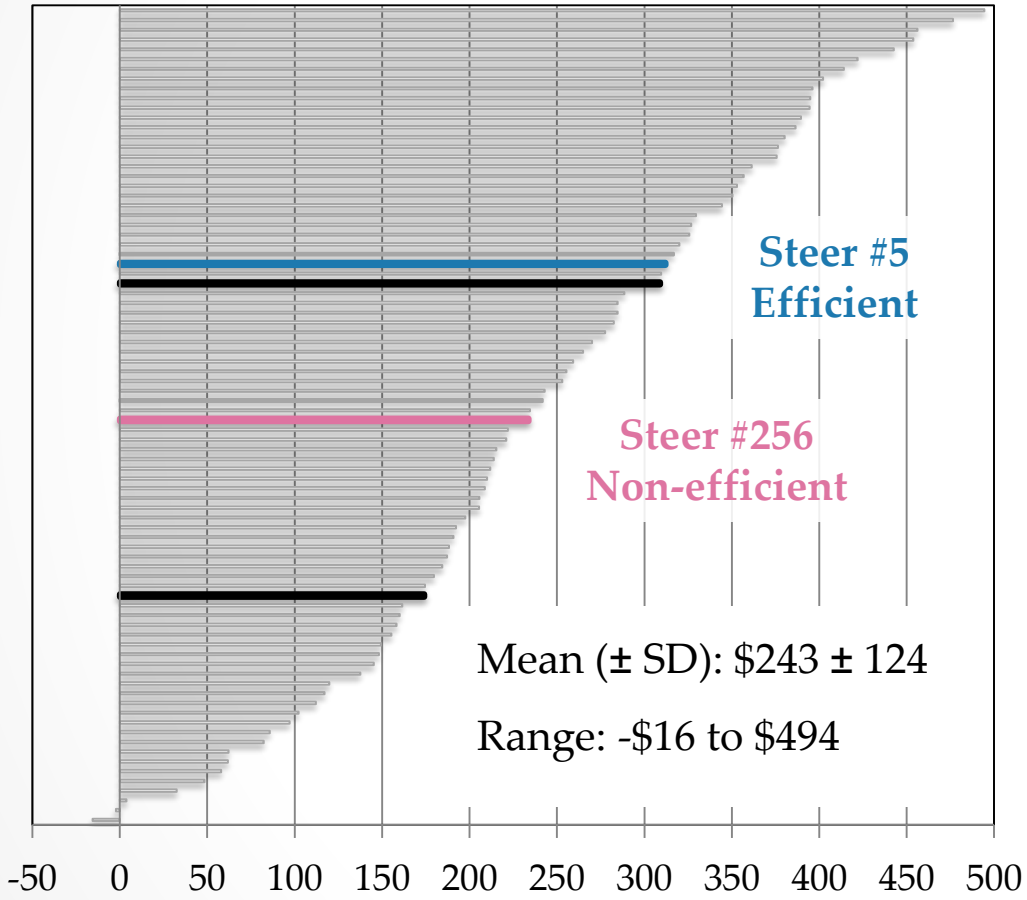


Herd and Richardson, 2004

Texas A&M feed efficiency study



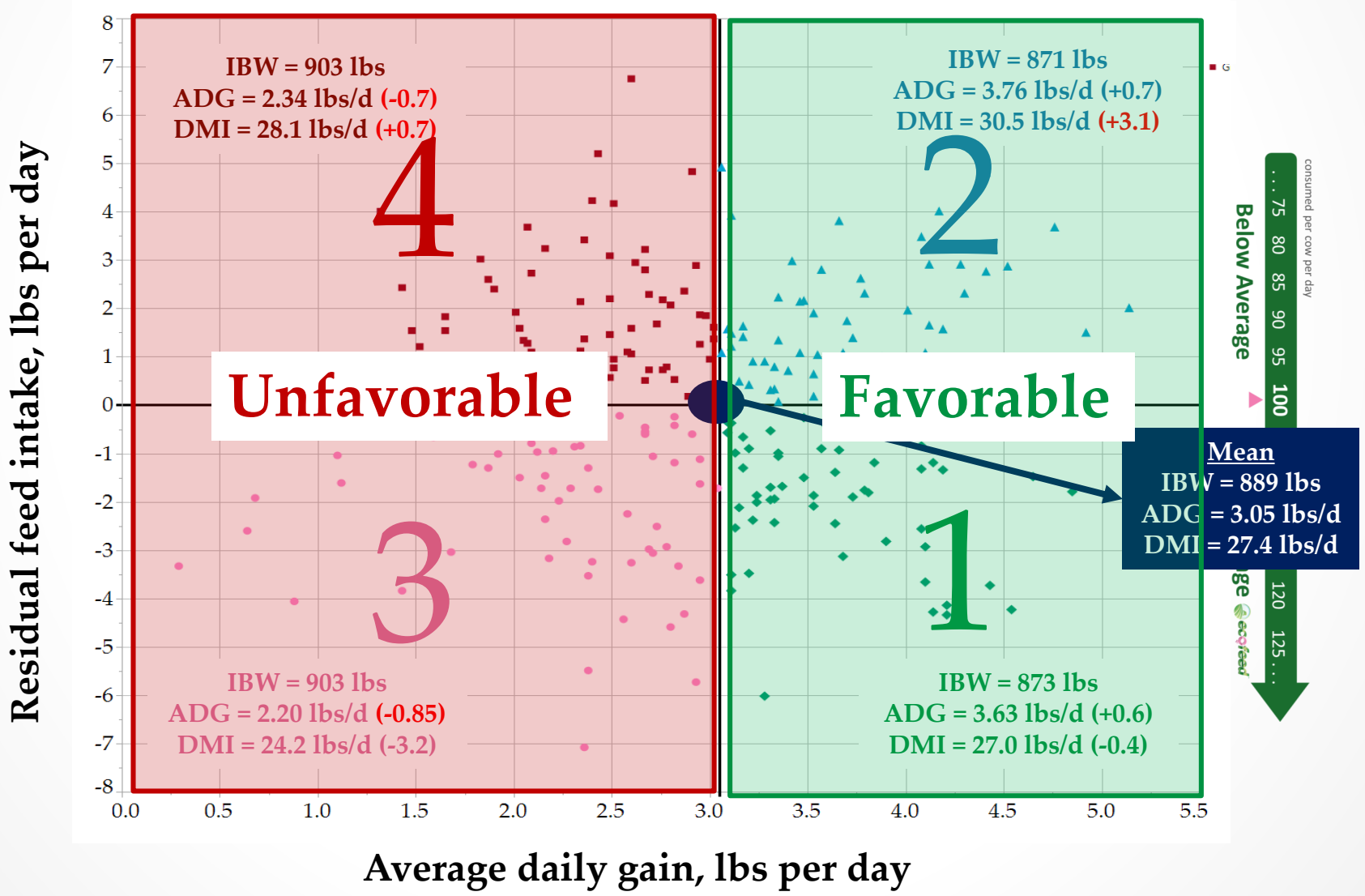
Texas A&M feed efficiency study



Item	Low Profit	High Profit
Profit, $ per hd	$103	$380* **($277)**

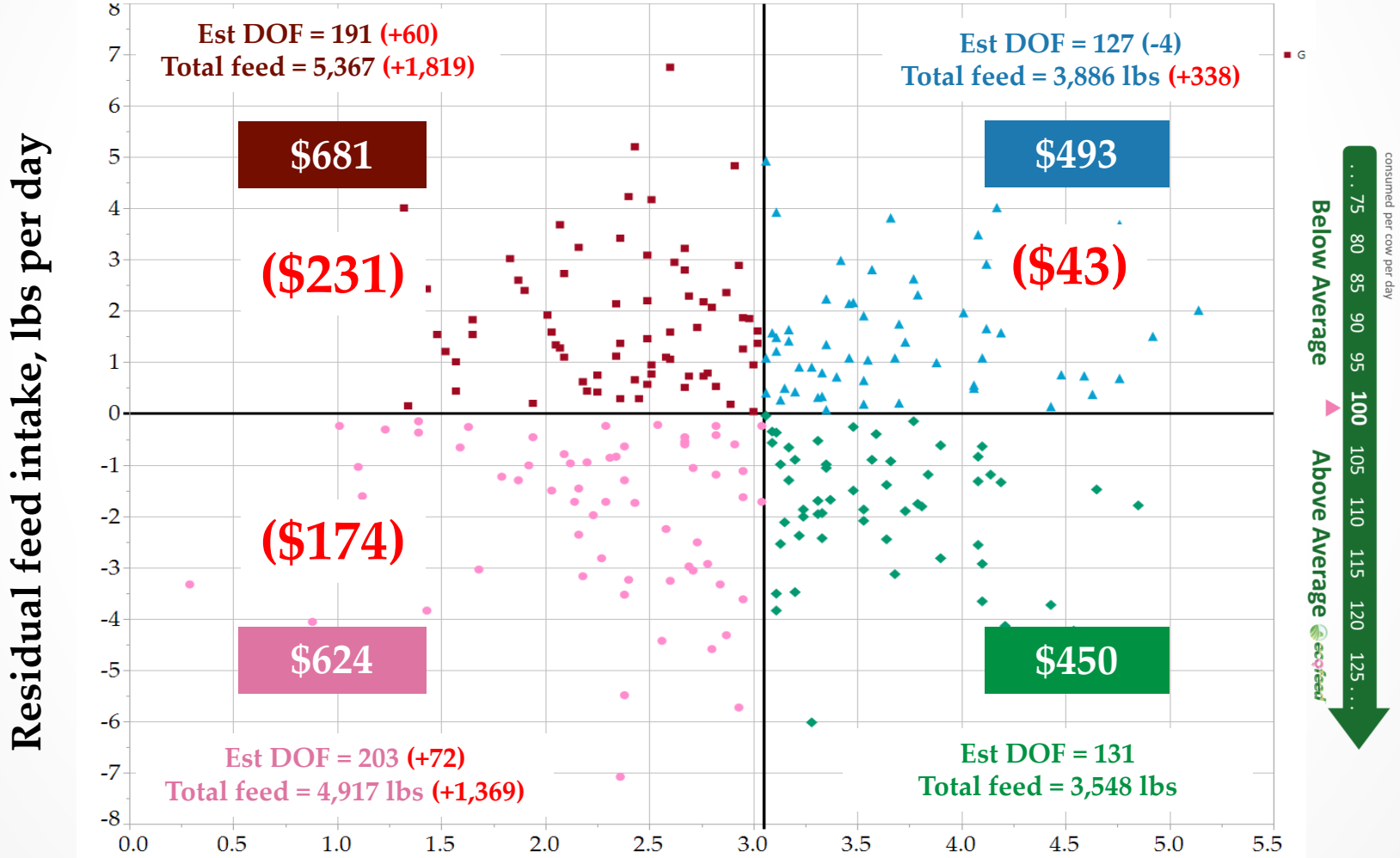
**Low vs high Profit ± 0.5 SD from mean.*

Angus bull test results (n = 252)



Angus bull test results (n = 252)

Estimations based on 1,350 lb end weight, feed cost of $198/ton, and DM 78%

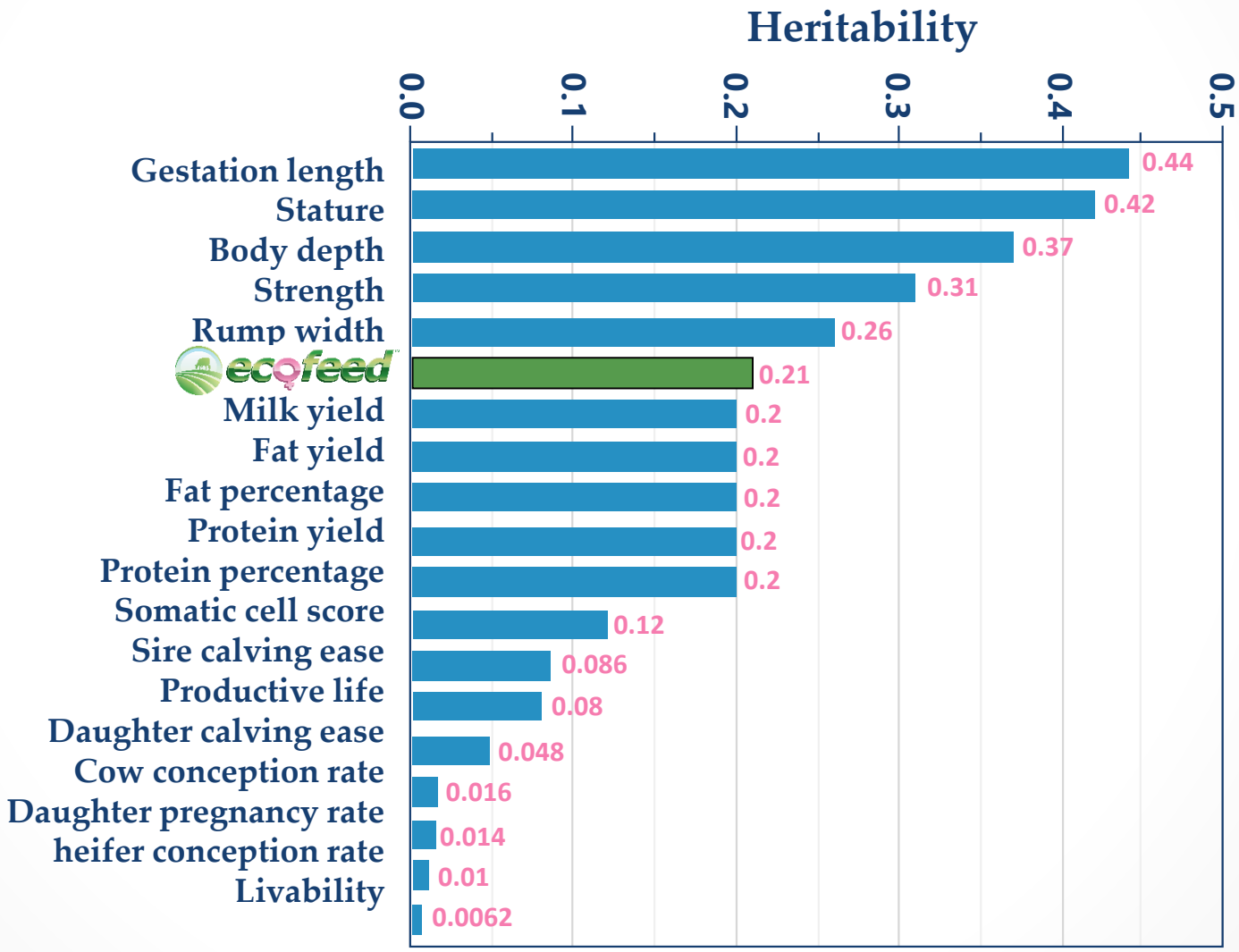


STgenetics is creating the future

Solution

↑ Feed efficiency

- Independent of growth and mature size
- Uncorrelated with other economically relevant traits
- Reflects biological differences in feed efficiency
- Heritable and responds to selection
- Can provide reliable genomic prediction values

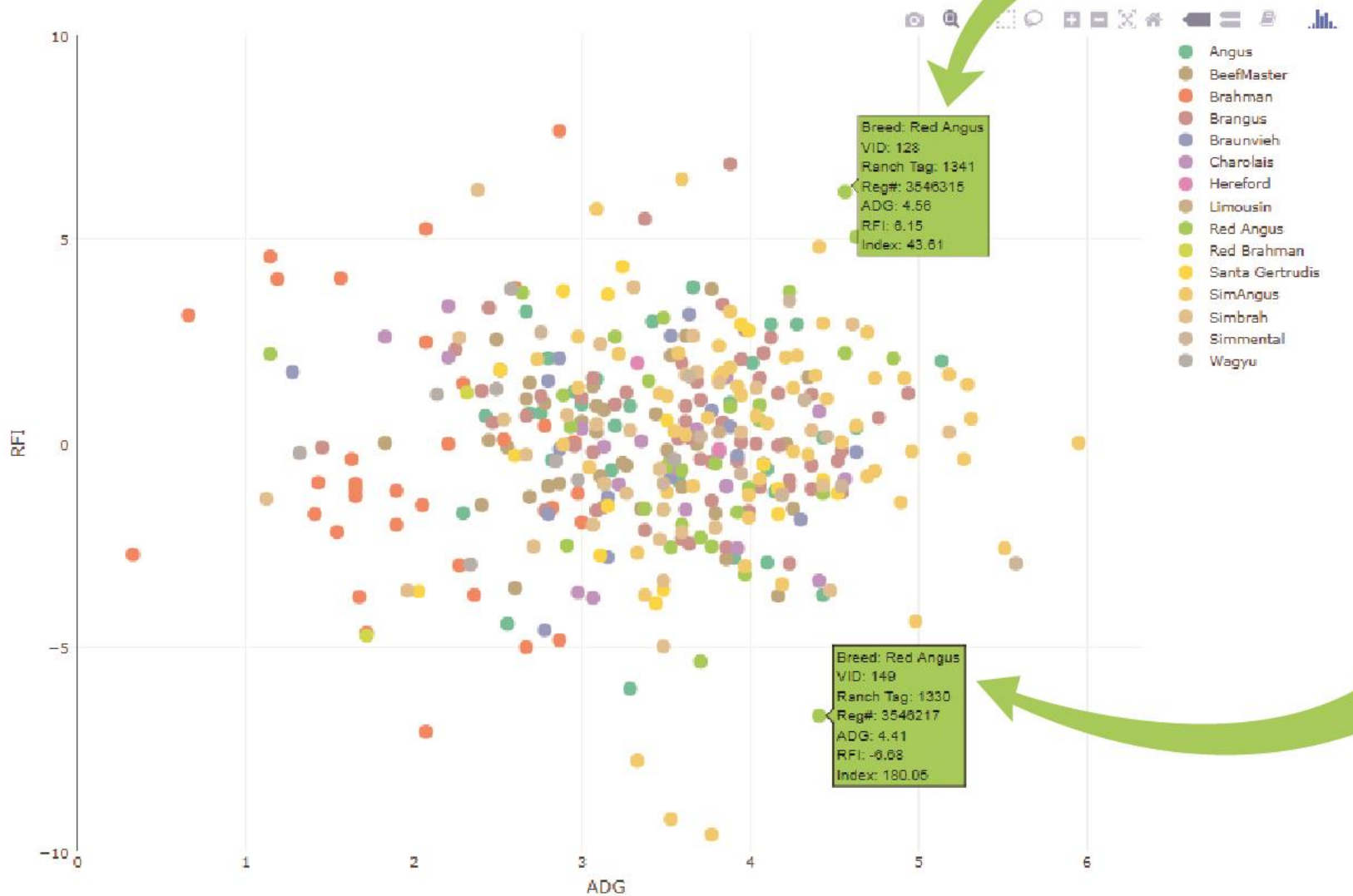

Heritability
0.0
0.1
0.2
0.3
0.4
0.5
Gestation length
Stature
Body depth
Strength
Rump width
ecofeed
Milk yield
Fat yield
Fat percentage
Protein yield
Protein percentage
Somatic cell score
Sire calving ease
Productive life
Daughter calving ease
Cow conception rate
Daughter pregnancy rate
heifer conception rate
Livability
0.44
0.42
0.37
0.31
0.26
0.21
0.2
0.2
0.2
0.2
0.2
0.12
0.086
0.08
0.048
0.016
0.014
0.01
0.0062

Fall Test 2016

October 16 - March 17

Average Daily Gain plotted against Residual Feed Intake.

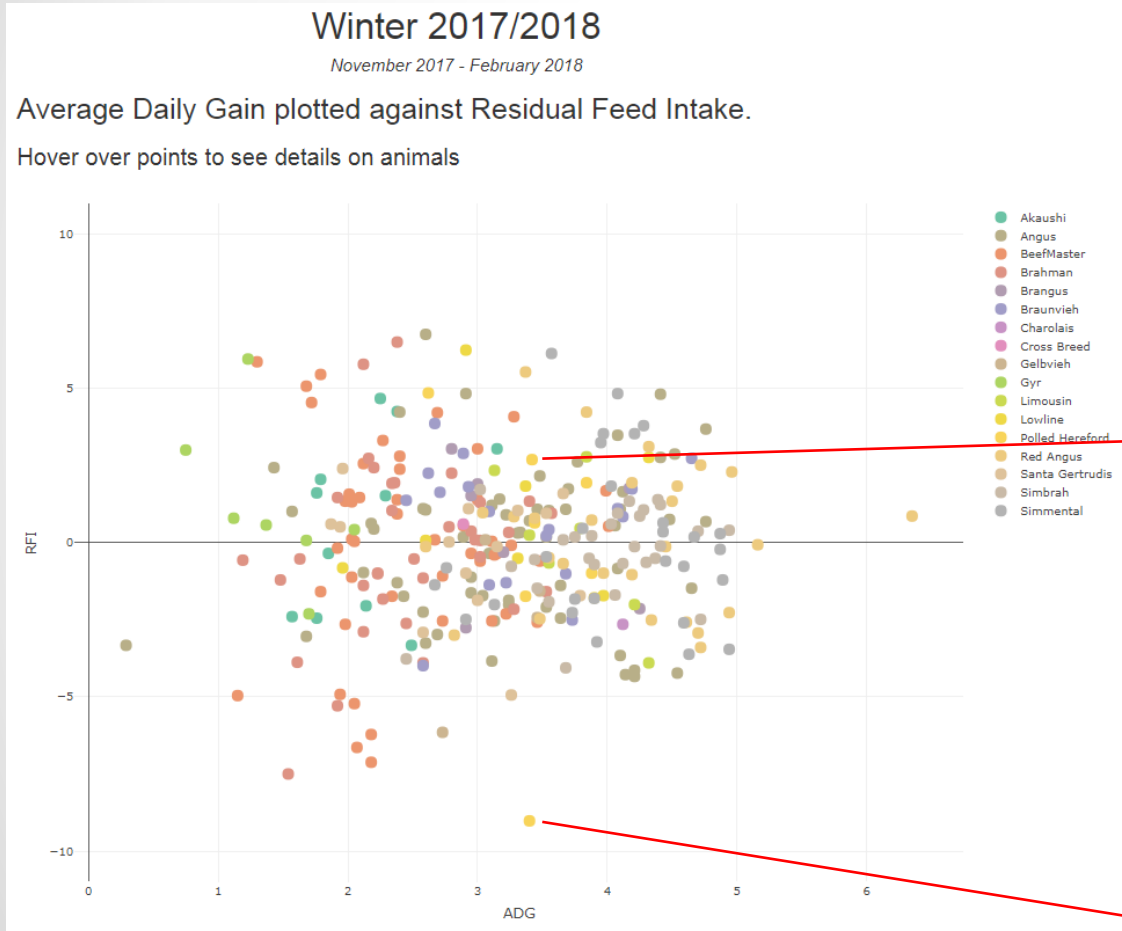
Hover over points to see details on animals

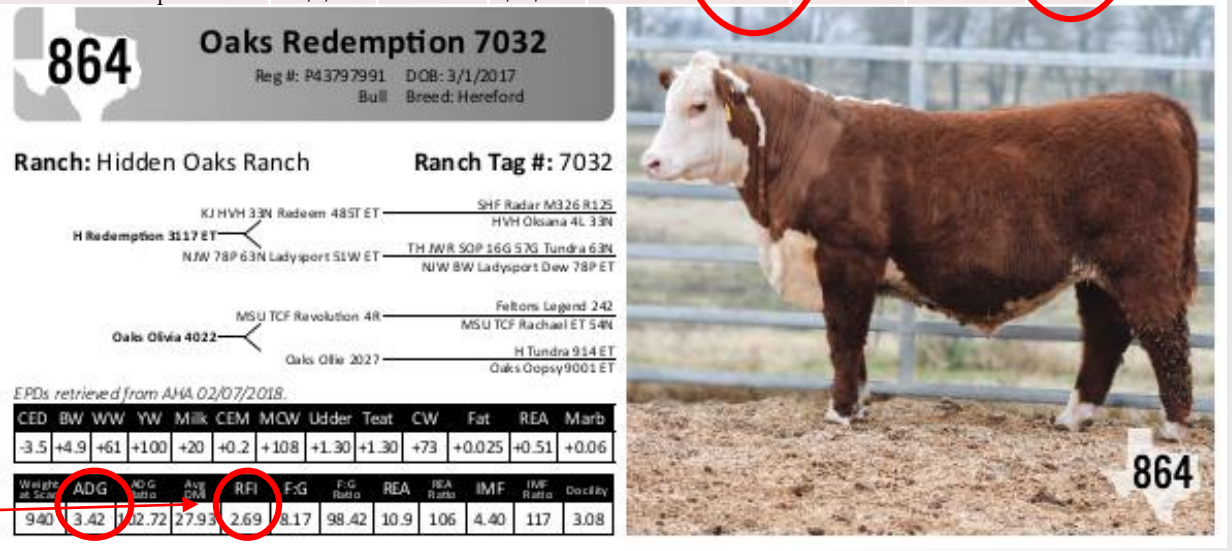


BREED: RED ANGUS
VID: 128
RANCH TAG: 1341
REG#: 3546315
ADG: 4.58
RFI: 6.15
INDEX: 43.61

BREED: RED ANGUS
VID: 149
RANCH TAG: 1330
REG#: 3546217
ADG: 4.41
RFI: -6.68
INDEX: 180.05

EID	VID	RanchTag	DOB	Breed	Sex	Origin	Pen	TrialNum	StartDate	Strt Wt (lbs)	FinishDate	End Wt (lbs)	ADG (lbs)	MidWT (lbs)	AvgDMI (lbs)	RFI (lbs)
982000421033848	864	7032	3/1/2017	Polled Hereford	Bull	Hidden Oaks Ranch	Pen 3	Sexing Navasota end 2018-02-14 pen 3	12/5/2017	697.00	2/14/2018	939.61	3.42	818.30	27.93	2.69
982000421033388	869	7026	2/13/2017	Polled Hereford	Bull	Hidden Oaks Ranch	Pen 3	Sexing Navasota end 2018-02-14 pen 3	12/5/2017	837.90	2/14/2018	1078.93	3.40	958.43	20.68	-9.02





Forces Shaping Agriculture

- Massive growth in food demand
- Hyper-science/Artificial Intelligence
- Retail and packaging innovation drive ag decisions (intelligent packaging)
- The energy opportunity
- Convenience and health take center stage
- Direct consumer-producer relationships
- **Continued improvement in efficiency**


THE BEST WAY TO PREDICT
THE FUTURE IS TO
Create It
STG
Thank You

Sexed Semen Beef Cattle Economics and Decision Aids

Dr. Jim McGrann

Ranch Management Economist

Professor Emeritus TAMU

My Thank to Many for This Education Event

- Adelyn Allen
- Luke Bradford and Gustavo Toro
- Haley Herzog
- All the support group at Sexing Technologies
- HCalf program – Matt Rickaway & Berry Summerour

Handout Provides

- Sexed Semen Overview.
- Census Date on Herd Size.
- Decision Aids Available and Source.
- Slides Presented Content
- CattleFax Feeder Price Data
- Select sheets from sexed semen use examples.

Choosing Breeding System
Defining Your Business Objectives and Goals

- Size of cow-calf operation is a key driver for earnings expectations.
- Producing cattle that meets the **market demand.**
- Having a controlled breeding season.
- Seedstock – again meeting market demands.

Defining Business Objectives and Goals

- Change the genetics currently used
- Specialized markets – replacement heifers
- Retained ownership and or program cattle
- Commit to a high level of labor and management
- Necessity for making a living in the cattle business

You Need to Consider Using Sexed Semen If

- Currently using conventional AI.
- In seedstock business.
- Producing replacement heifers.
- Changing cow herd genetics.
- Using a crossbred breeding system.

Economic Reality of Breeding Systems

- Breeding system cost is irrelevant as a % of total production cost or calf value.
- Semen is a small percent of costs.
- Key is pregnancy and value of calves.
- Management and labor requirement is higher.

Other Positive Economic Factors With AI

- Fewer herd bulls required.
- Improved genetics with AI
- More calves born early in the calving season.
- Increased potential for cow herd with life time early calves.

Why Breeding Costs are Economically Irrelevant

- It’s a small percent of total production costs or calf Value.
- The difference in cost is small between breeding alternatives.
- Change in net revenue can be very significant.
- You **don’t save** by having a poor or cheap breeding system.

Comparing Breeding System Alternatives

It comes down to **added revenue** versus **added cost.**

Don’t Tell the Semen or Breeding Service Provider

- They mostly compete on semen price and service costs.
- Seldom measure or know the benefits to producer.
- All bull owners think **their bull is the best!**
- You can blame providers if anything goes wrong!

Key Variables When Comparing Breeding System

- Gender Value Difference.
- Cattle market difference.
- Pregnancy and Weaning Percentages.
- Difference in Breeding System Protocol Cost.

Alternative Breeding System to Compare

1. Sexed Semen AI
2. Natural Service – with same bull genetics
3. Conventional AI

Key Economic Variables – Gender Difference

- Bull or steer price
- Heifer price
- Replacement heifer price
- Weight of Weaned Calves

Pregnancy and Weaning Percent by Breeding System

- By breeding system – overall % won’t differ much.
- Timed AI – 55% to 60% pregnancy
- All use cleanup bulls.
- Overall - 88% to 90 % pregnancy is a goal!
- Calving ease can be improved when using AI.

Replacement Heifers Comparison

- AI versus natural service.
- Compare alternatives with same genetics.
- Same **initial heifer cost** and production costs.
- **You buy a profit** when purchasing heifers to breed.
- Synchronized breeding easier to employ with heifers.

Rely on Top Professionals in a Team to Assist

- Breeding service and semen (genetics) provider.
- Your veterinarian.
- Your auction barn owner for market information.

Females Must be Managed Correct

- Breeding system can’t solve poor female management.
- All starts with proper female management.
- BSE for cleanup bulls.
- Breeding protocols must be implemented.

Breeding Systems Do Differ

- Protocol and semen costs differ. Not much as % of total cost.
- Cleanup bulls' (genetics) costs are the same for fair comparison to AI.
- Management requirement of system.
- Need to get the professional team to be involved.

TAMU-Ag. Econ. Spreadsheet Decision Aids

- Organization of data and assist in doing the calculations.
- Facilitate “What if” analysis
- Make an effort to get your own data.
- Measure results – start with this last breeding season.

Steps for Implementation

- Get information and choose breeding system with team.
- Team can assist in choice of genetics to use.
- Do the economic budget or projection of expected results.
- Get your plan down on paper.
- Get the job done correctly. Timing is critical.
- Document your performance.

Buyers of Replacement Heifers

- You can now better understand what is behind the a superior AI production system.

- These AI produced replacements are worth more!

Get Your Management Information System (MIS) in Place

- Quick Books™ for accounting.
- CattleMax™ for production record.
- SPA preproduction – use TAMU spreadsheet.
- Spreadsheet based decision aids.

Recall you manage what you measure!

Sexing Technology - the Experienced Team

Supported across the U.S.

See website for supporting information.

WWW.STgen.com

Examples of Decision Aids Use

1. Hereford-Braham F1 – Sexed Semen Versus Natural Service

2. F1 – Replacement Heifer Budget or Projection