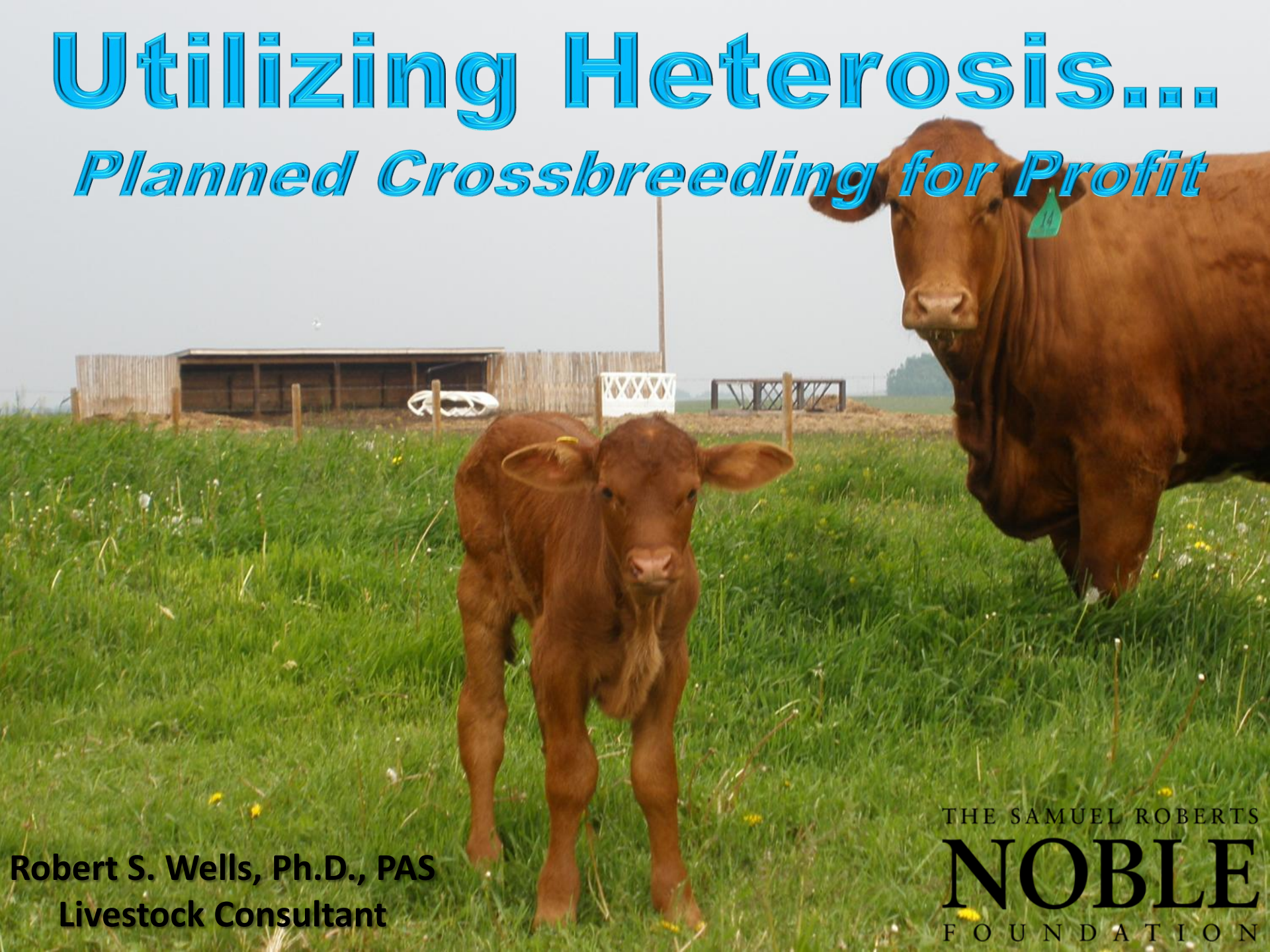
Utilizing Heterosis…

Planned Crossbreeding for Profit



Robert S. Wells, Ph.D., PAS
Livestock Consultant

THE SAMUEL ROBERTS
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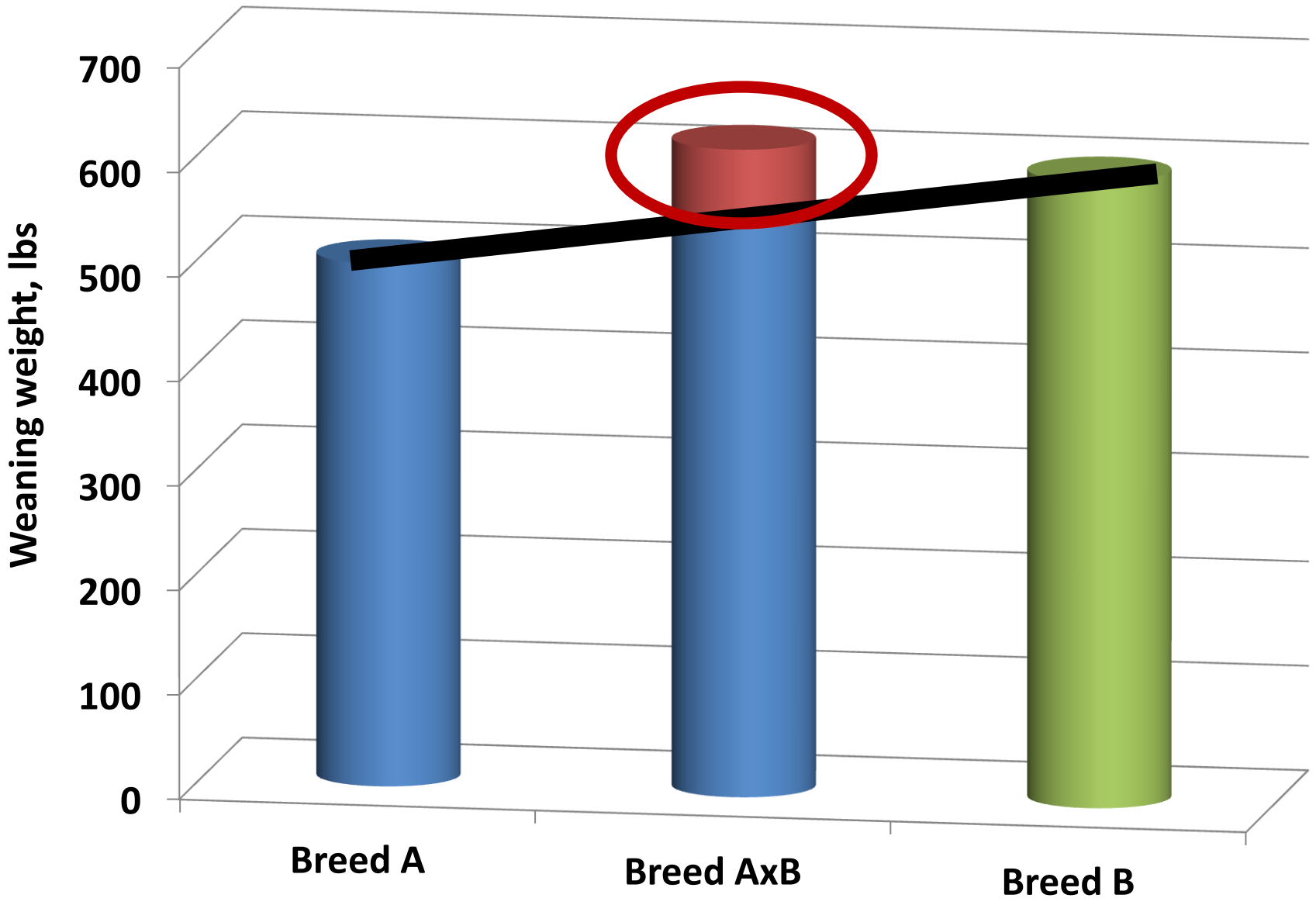
FOUNDATION

- Heterosis
  - Individual
  - Maternal
  - Paternal
- Complementarity
- Putting it together to increase profit
  - Maternal replacements
  - Bull replacements
- Offer marketing opportunities
  - Alliances – *Branded programs*
  - Cooperatives

Heterosis = Hybrid Vigor

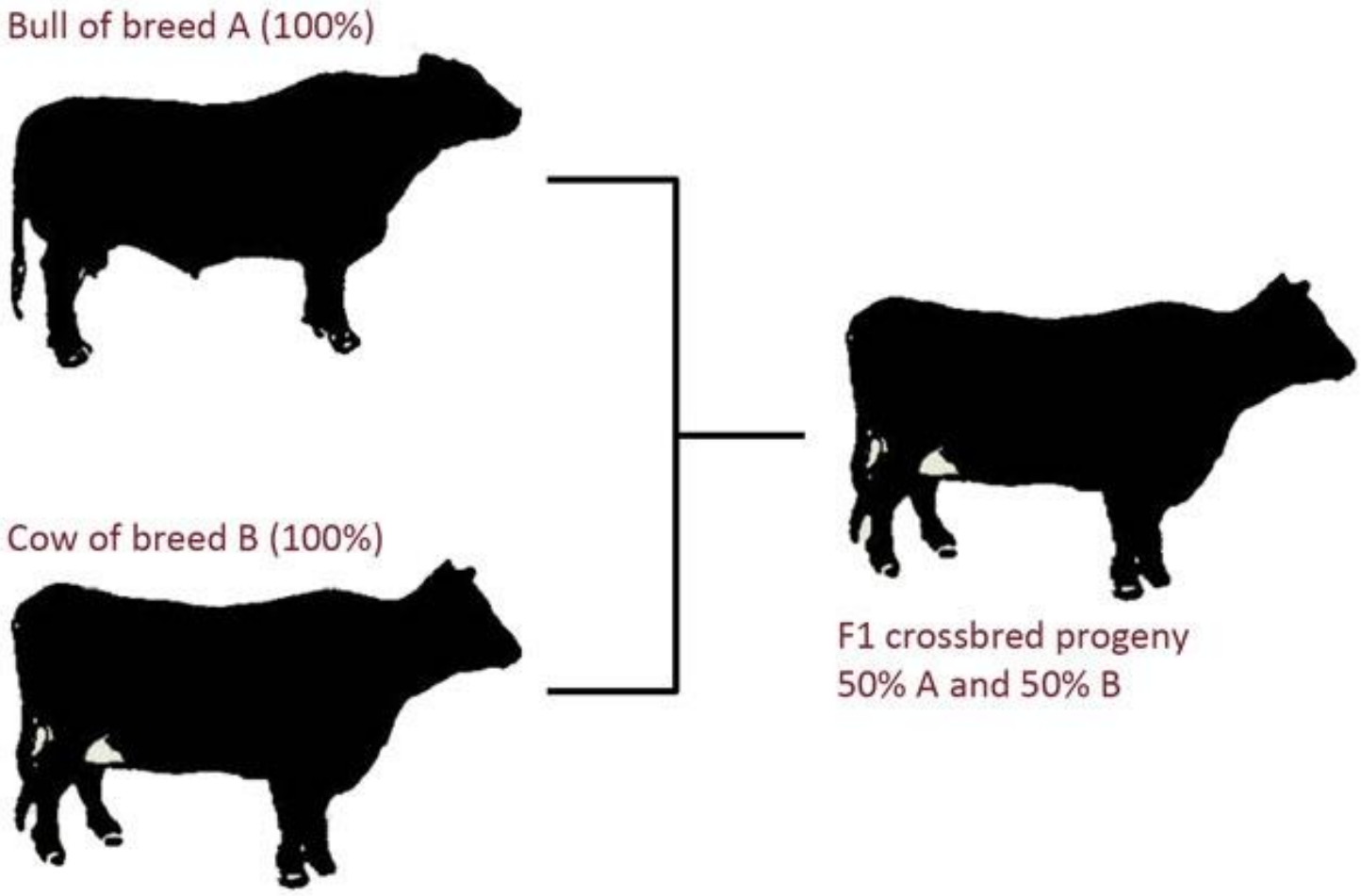


3 Types of Heterosis

Individual

Individual Heterosis

The degree to which crossbred calves deviate from the average of calves of the parental breeds.



Heterosis Levels for Selected Traits

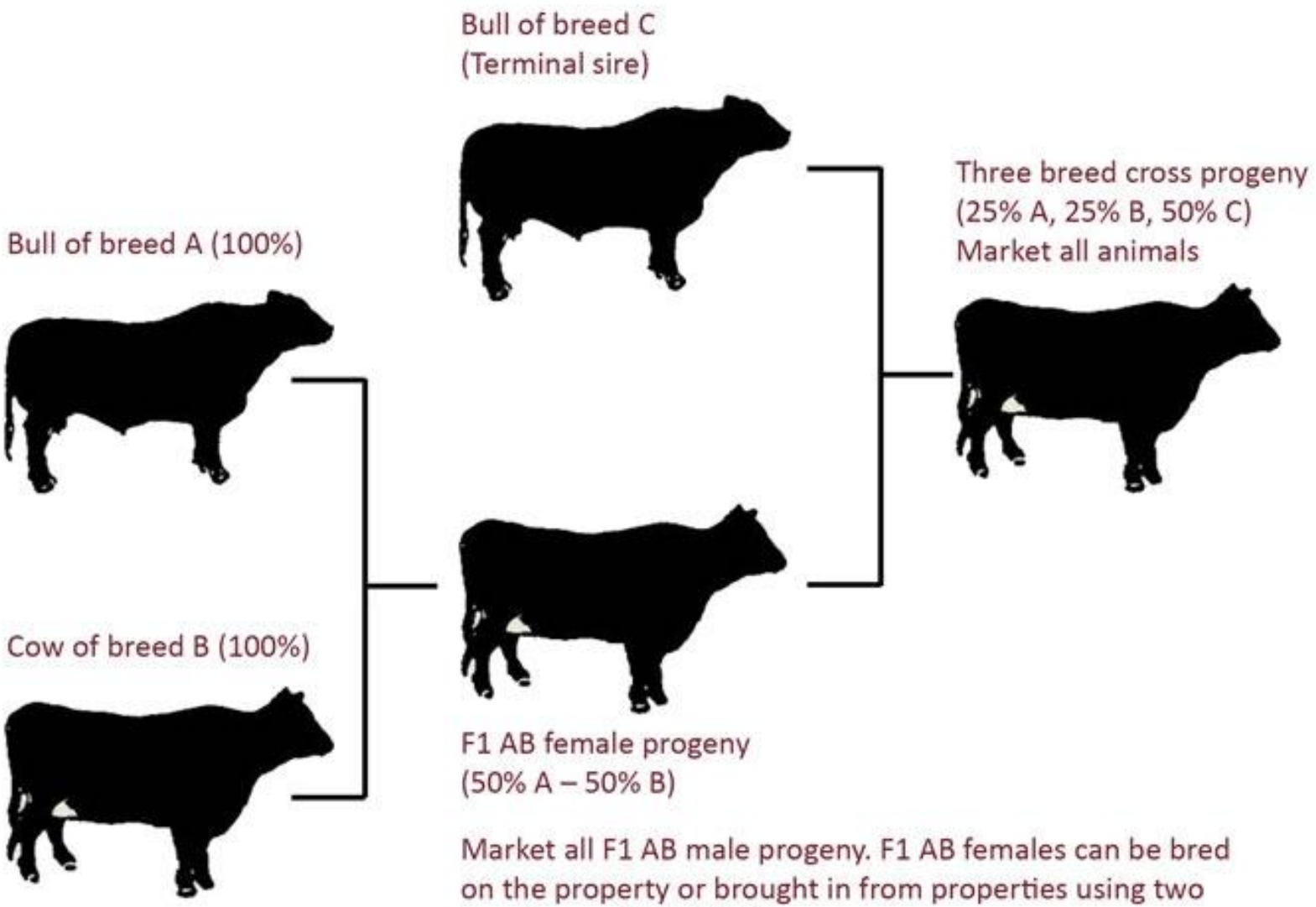
Trait	Individual Heterosis	Maternal Heterosis	Total Heterosis
Cow lifetime productivity			25
Cow longevity			38
Calving rate	0	6	6
Calf weaning wt/exposed cow			18
Weaning rate	0	8	8
Weaning weight	**5**	**6**	**11**
Yearling weight	**4**		**4**
% reaching puberty at 15 months	**15**		**15**
Days on feed	**-4**		**-4**
Carcass weight	**3**		**3**
USDA carcass grade	**2**		**2**

3 Types of Heterosis

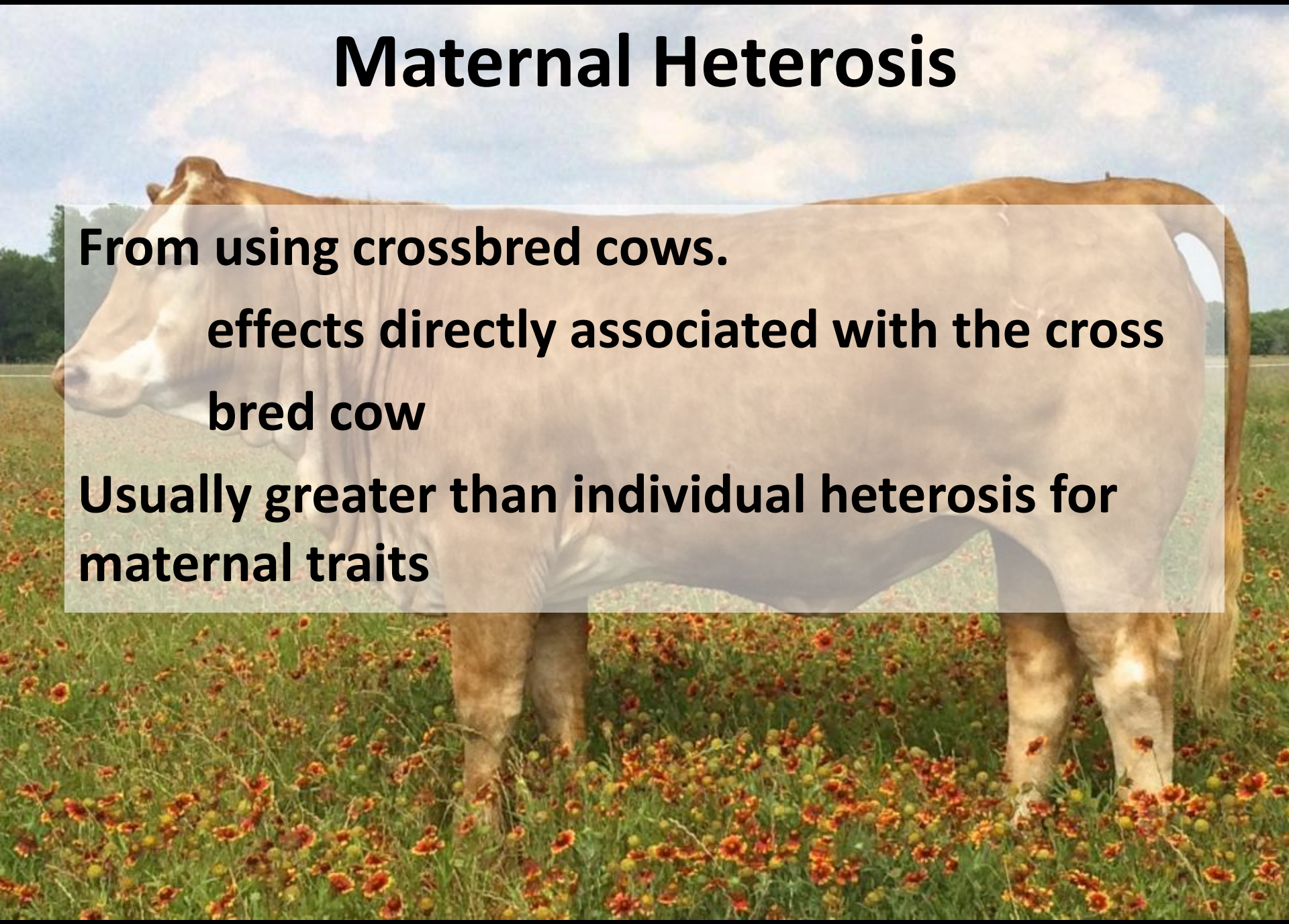
Individual

Maternal

Maternal Heterosis



Maternal Heterosis



From using crossbred cows.

effects directly associated with the cross bred cow

Usually greater than individual heterosis for maternal traits

Heterosis levels for selected traits

Trait	Individual Heterosis	Maternal Heterosis	Total Heterosis
Cow lifetime productivity			25
Cow longevity			38
Calving rate	0	6	6
Calf weaning wt/exposed cow			18
Weaning rate	0	8	8
Weaning weight	5	6	11
Yearling weight	4		4
% reaching puberty at 15 months	15		15
Days on feed	-4		-4
Carcass weight	3		3
USDA carcass grade	2		2

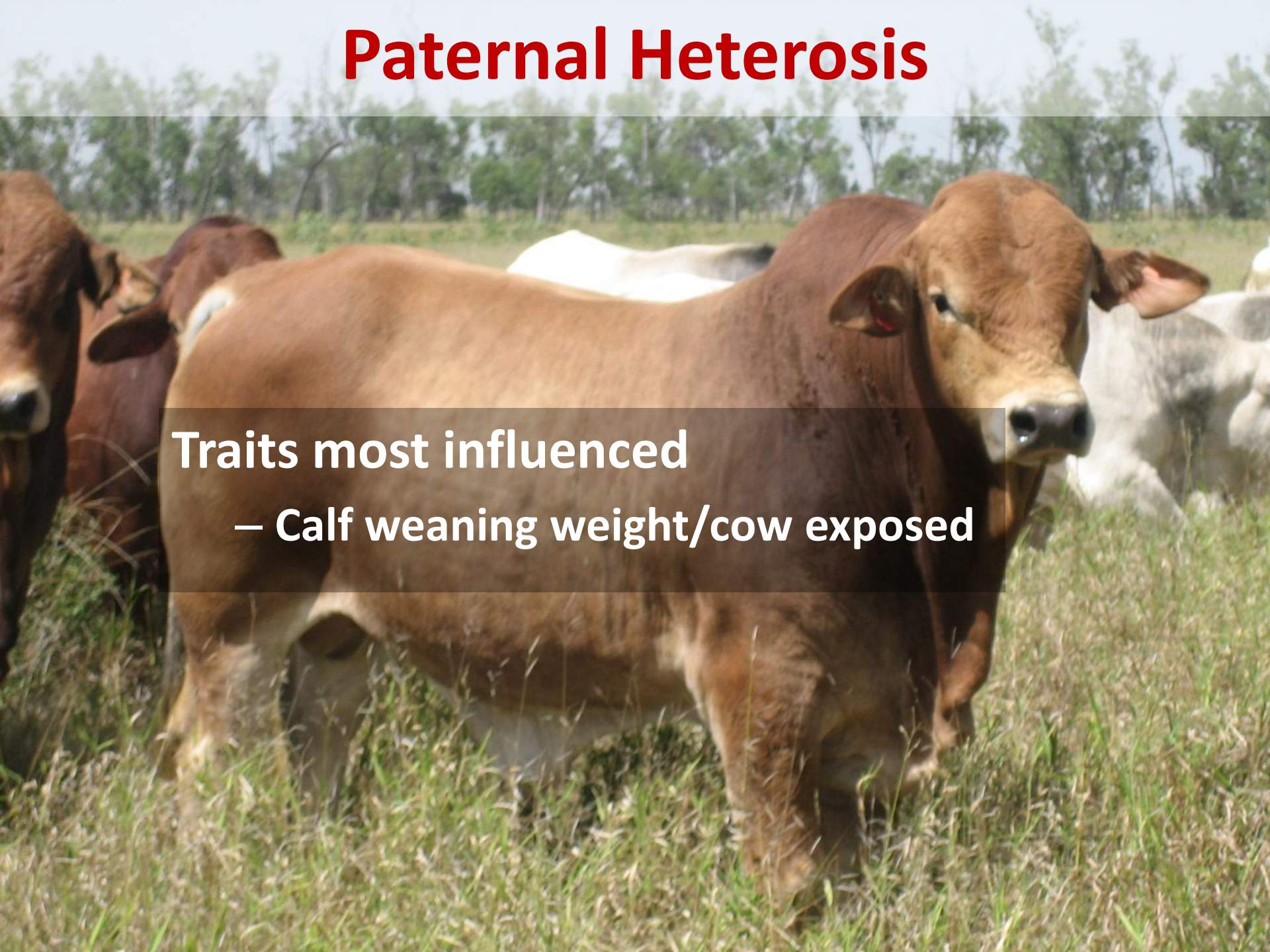
3 Types of Heterosis

Individual

Maternal

Paternal

Paternal Heterosis



Traits most influenced

– Calf weaning weight/cow exposed

Heterosis levels for selected traits

Trait	Individual Heterosis	Maternal Heterosis	Total Heterosis
Cow lifetime productivity			25
Cow longevity			38
Calving rate	0	6	6
Calf weaning wt/exposed cow			18
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% reaching puberty at 15 months	15		15
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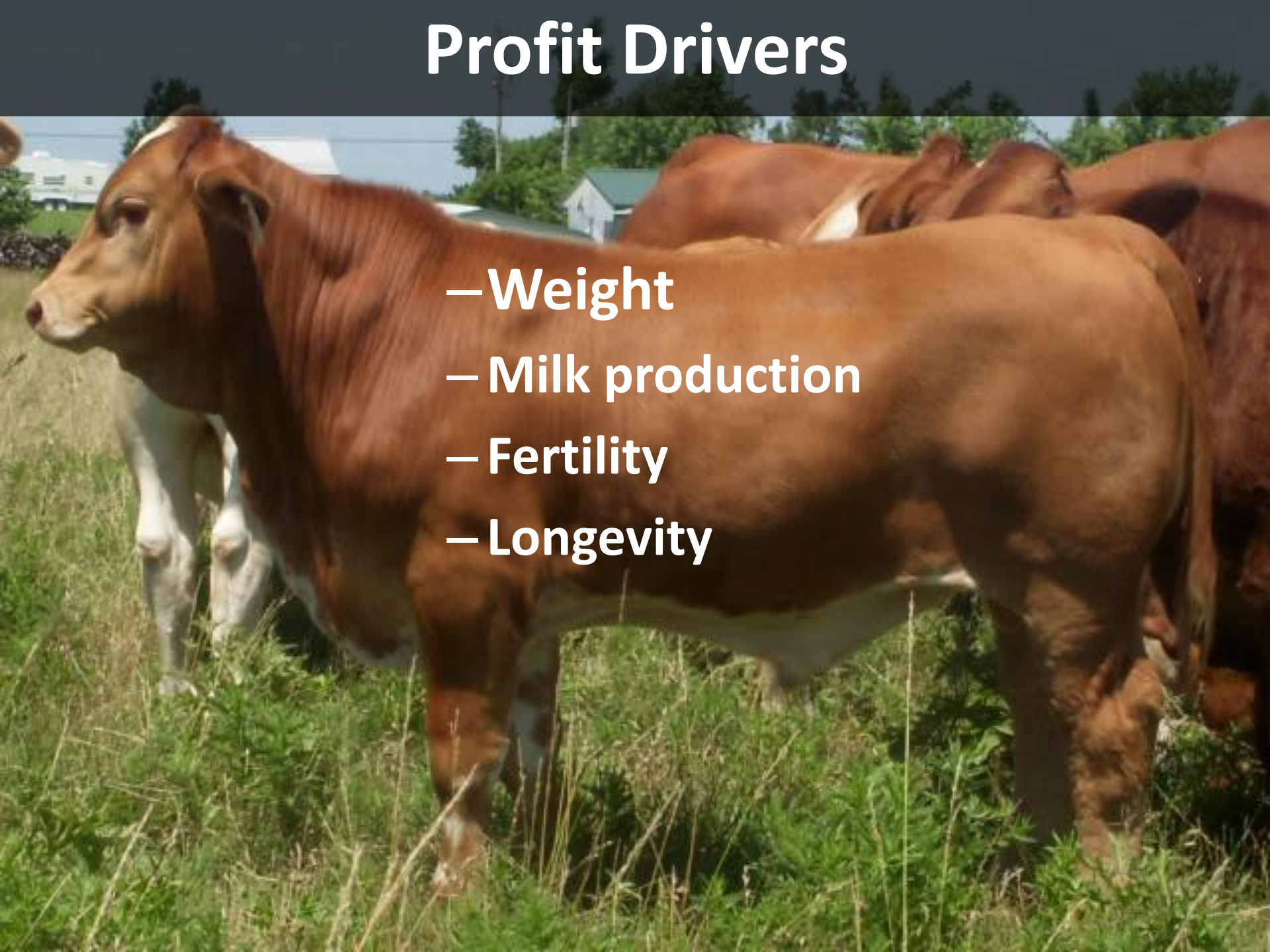
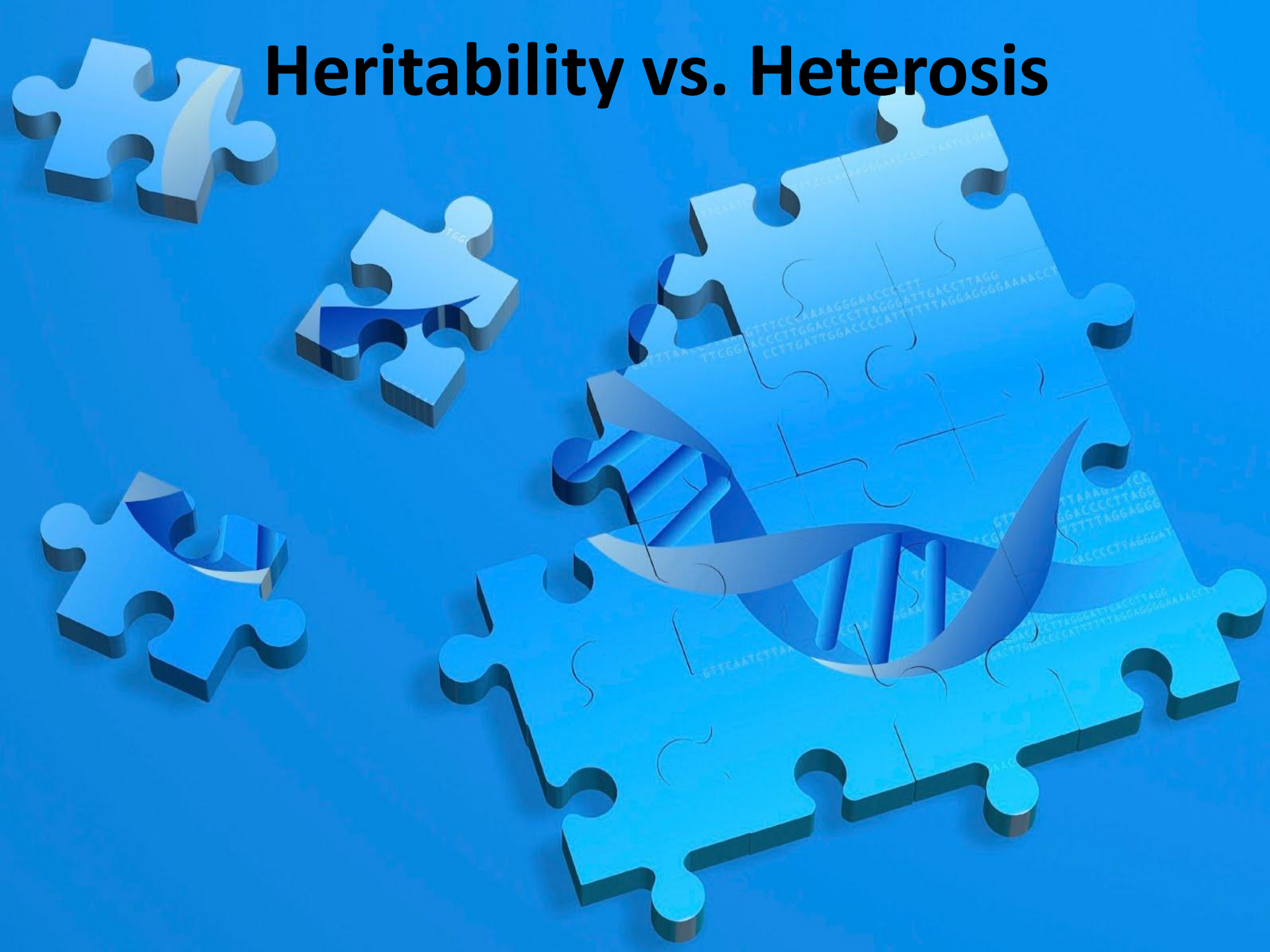
Carcass weight	3		3
USDA carcass grade	2		2

Profit Drivers



- Weight
- Milk production
- Fertility
- Longevity

Heritability vs. Heterosis



Heritability (h^2)and Total heterosis by trait class

Trait	Heritability	Total Heterosis
Carcass	High (0.4 - 0.6)	Low (0 – 5%)
Growth	Medium (0.2 – 0.4)	Moderate (5 – 10%)
Reproduction	Low (< 0.2)	High (10 – 30%)

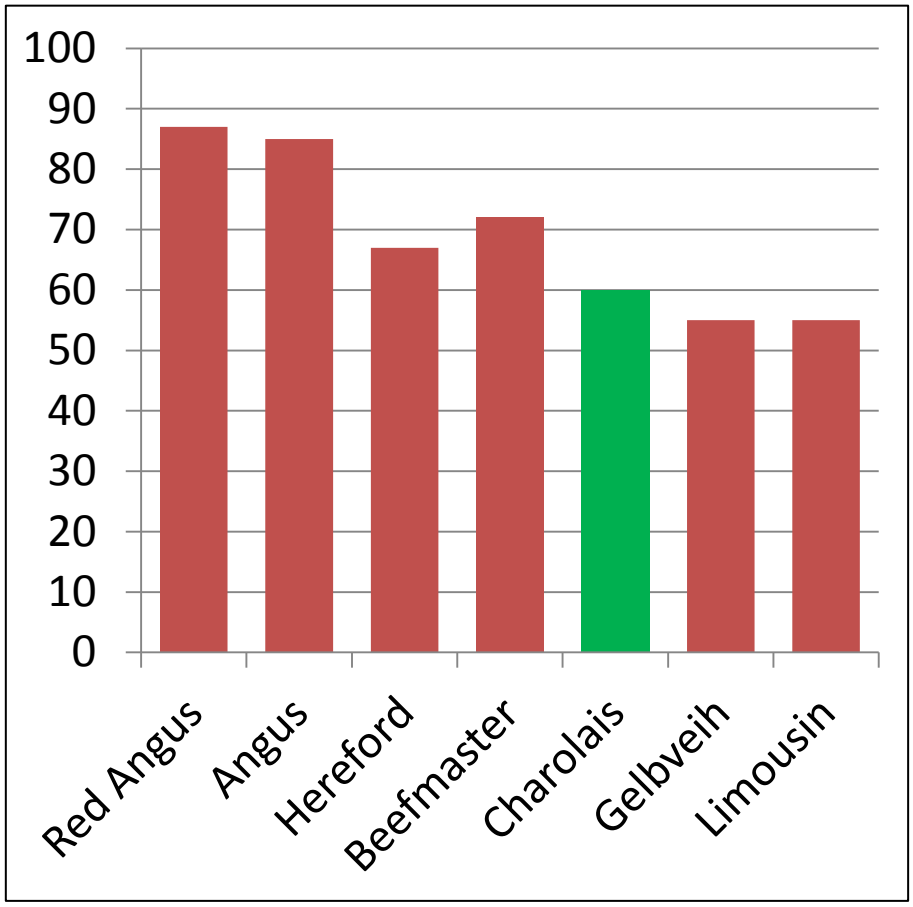
Few traits have $h^2 > 0.6$

Heritability Estimates

Height	0.85
REA	0.70
Tenderness	0.60
Birth weight	0.45
Feedlot gain	0.34
Weaning weight	0.24
Fertility	0.10
Calving interval	0.08
Conception rate	0.07

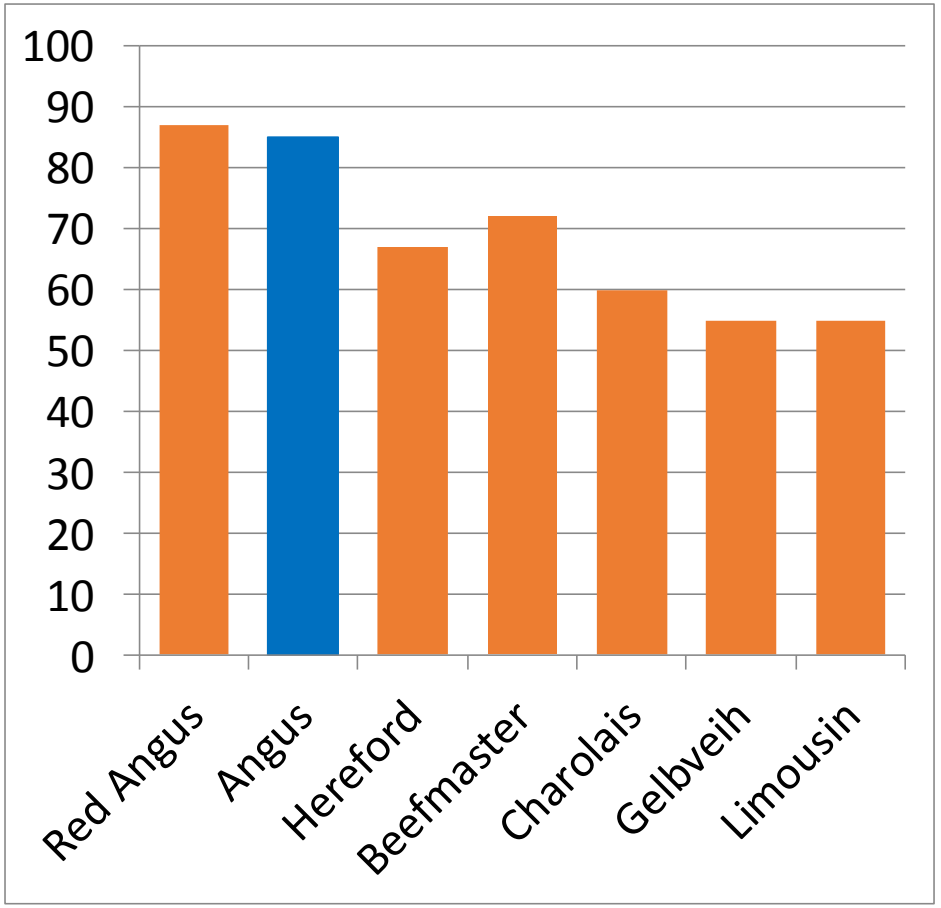
Breed Complementarity

~60% Choice



Quality Grade; % Choice

~85% Choice

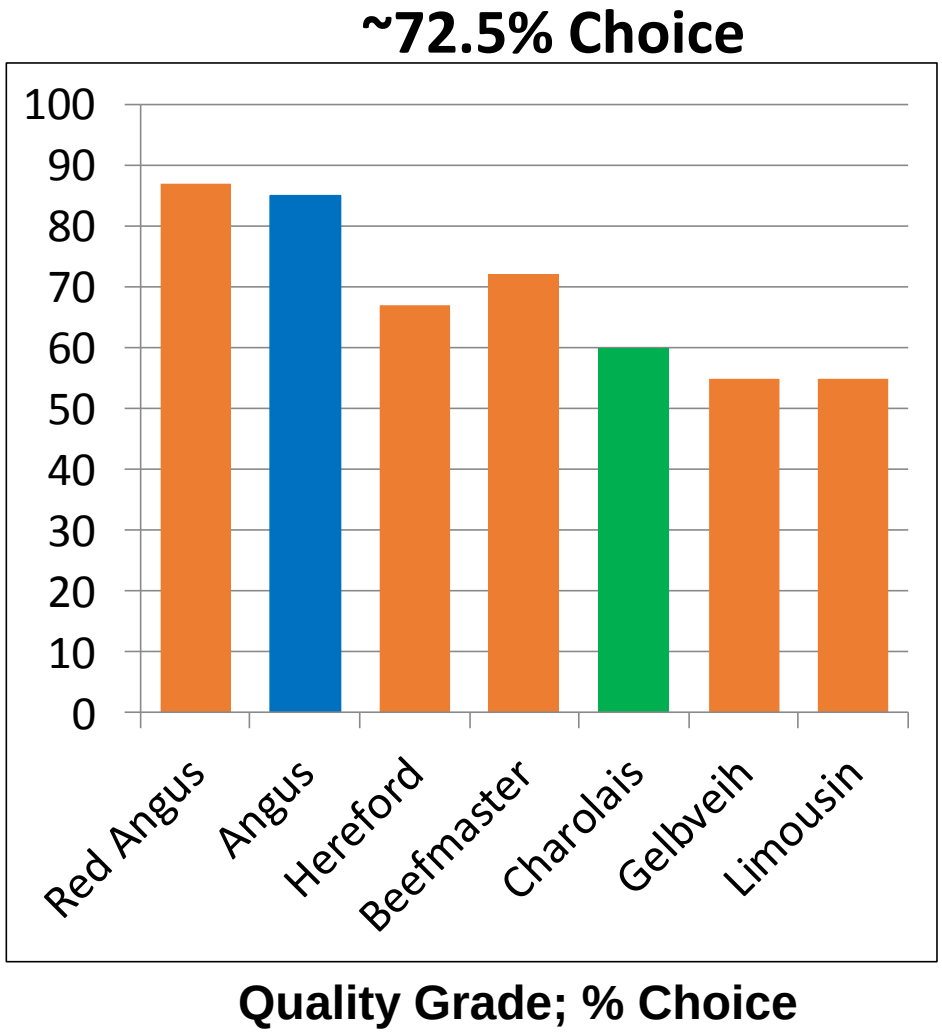


Quality Grade; % Choice

Cundiff et al., 2004

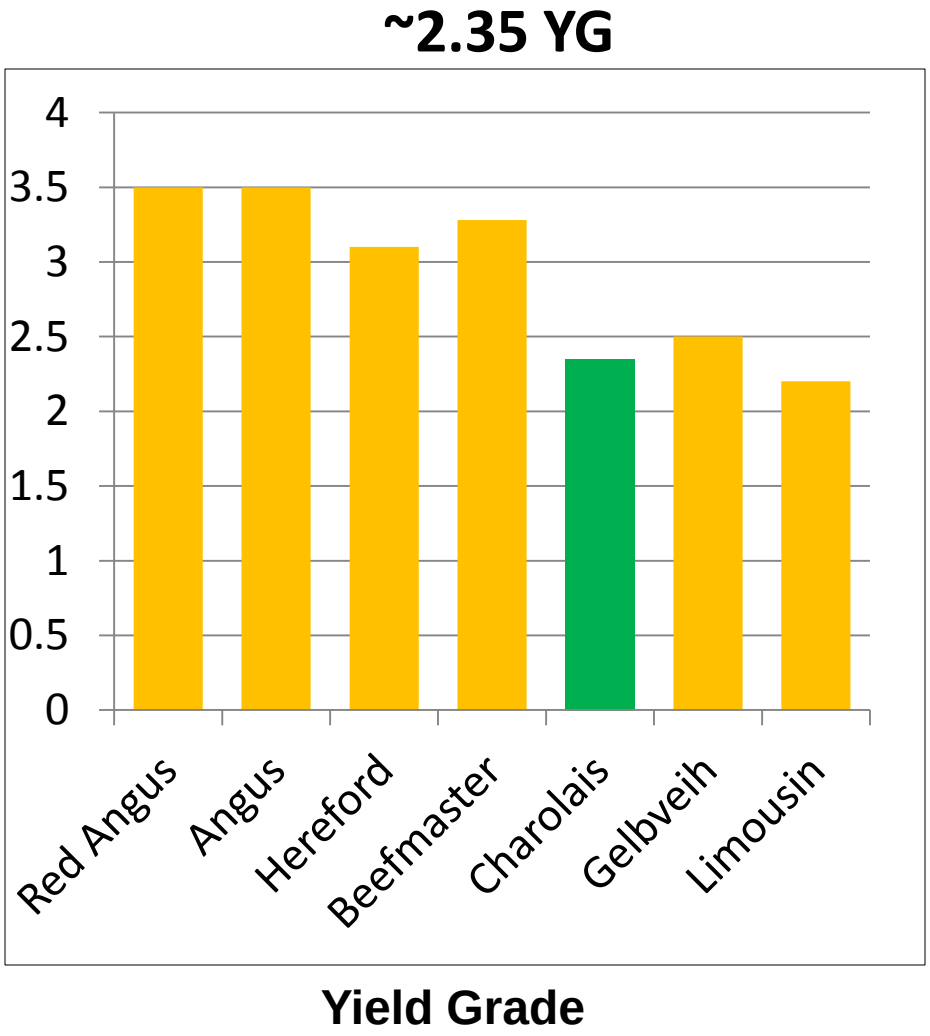
Breed Complementarity

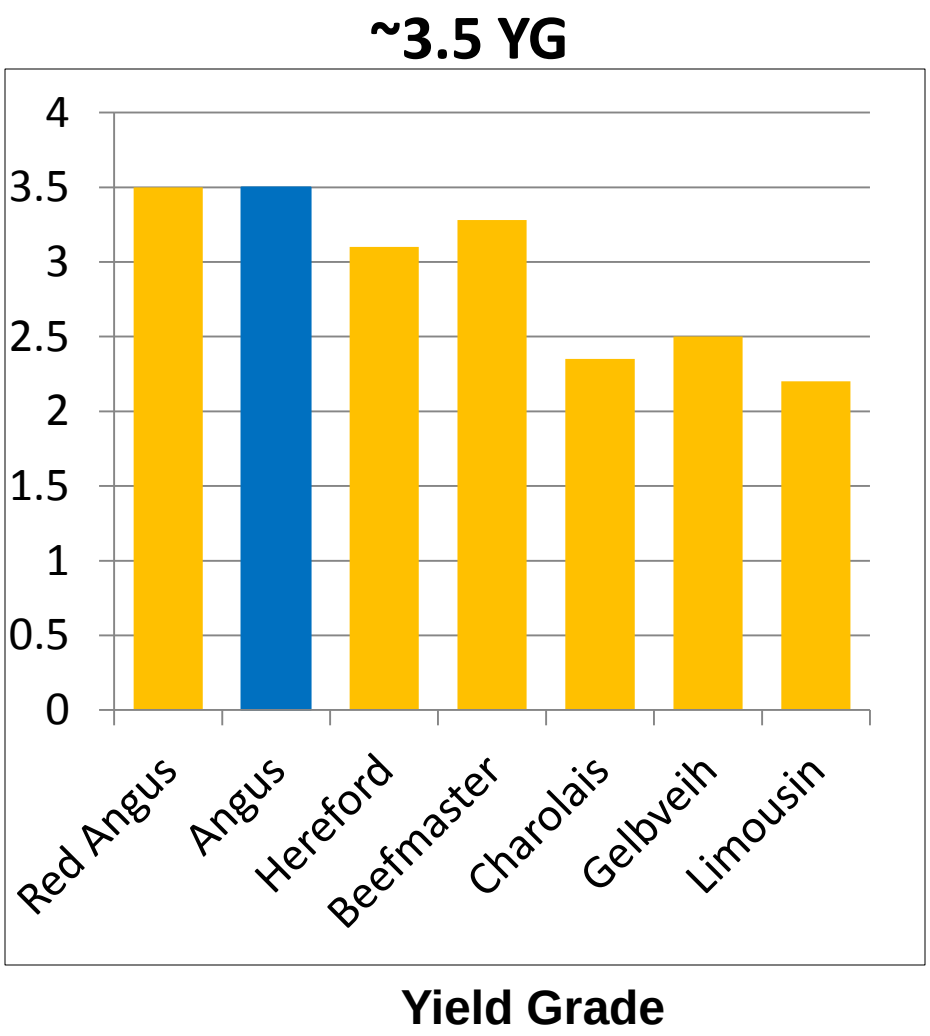
F1 offspring



Cundiff et al., 2004

Breed Complementarity



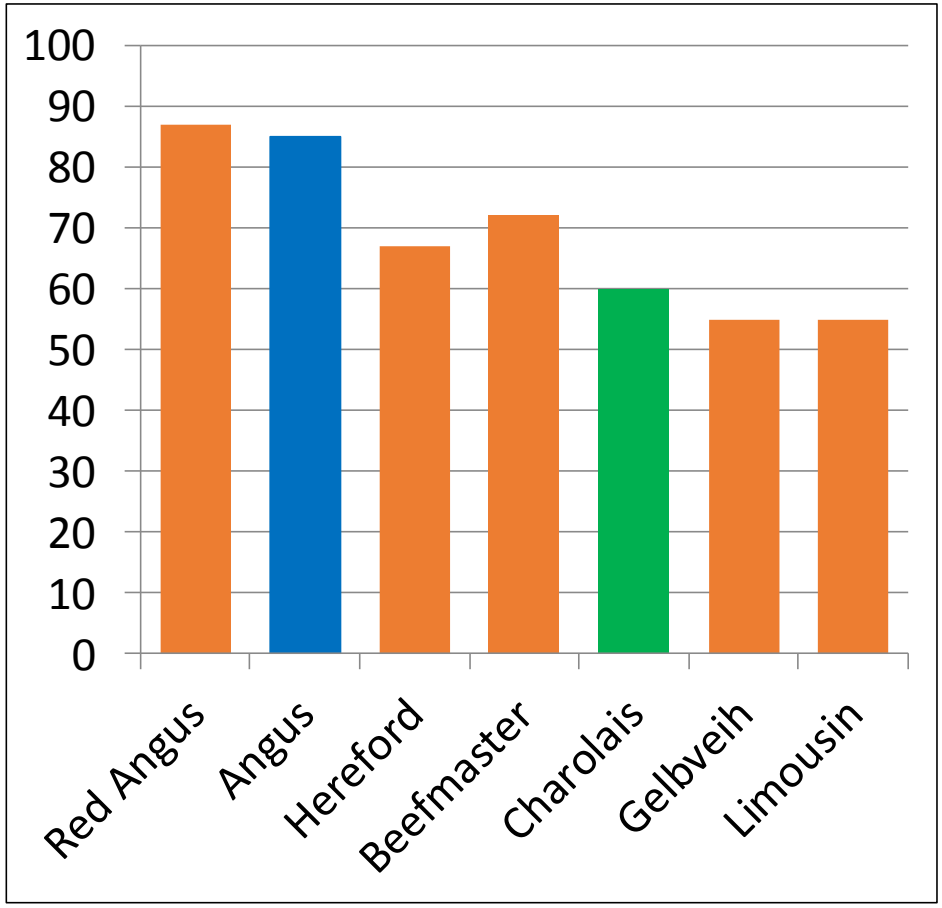


Cundiff et al., 2004

Breed Complementarity

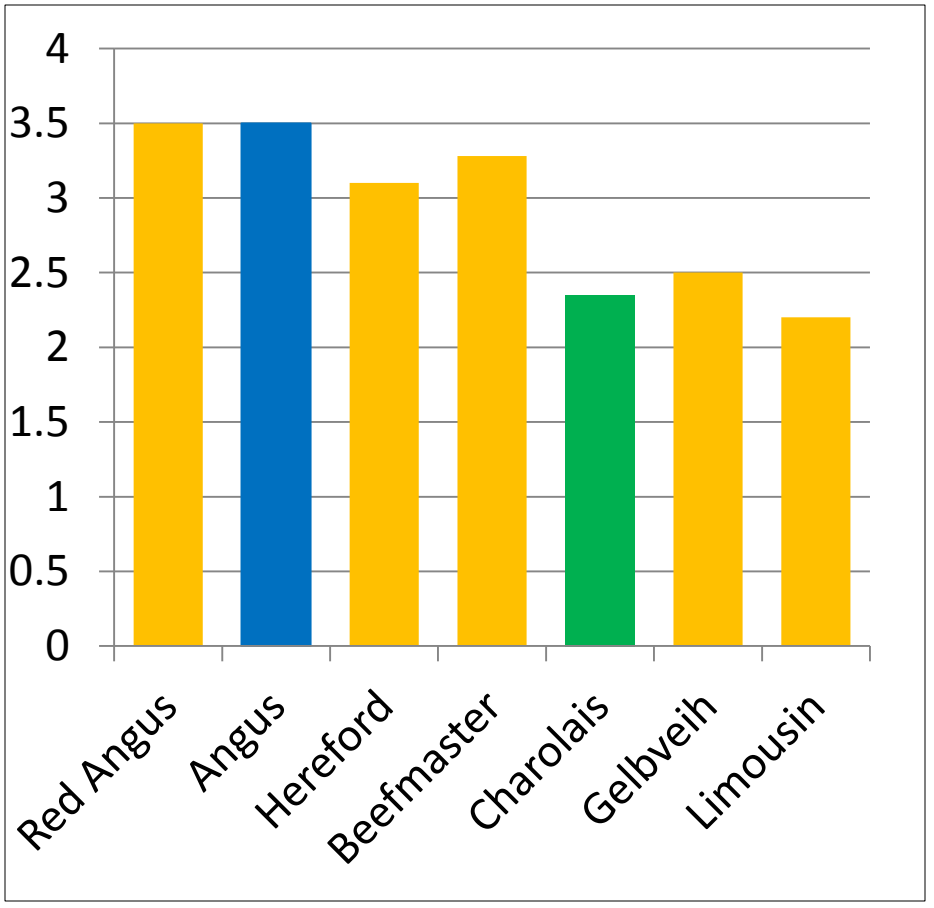
F1 offspring

~72.5% Choice



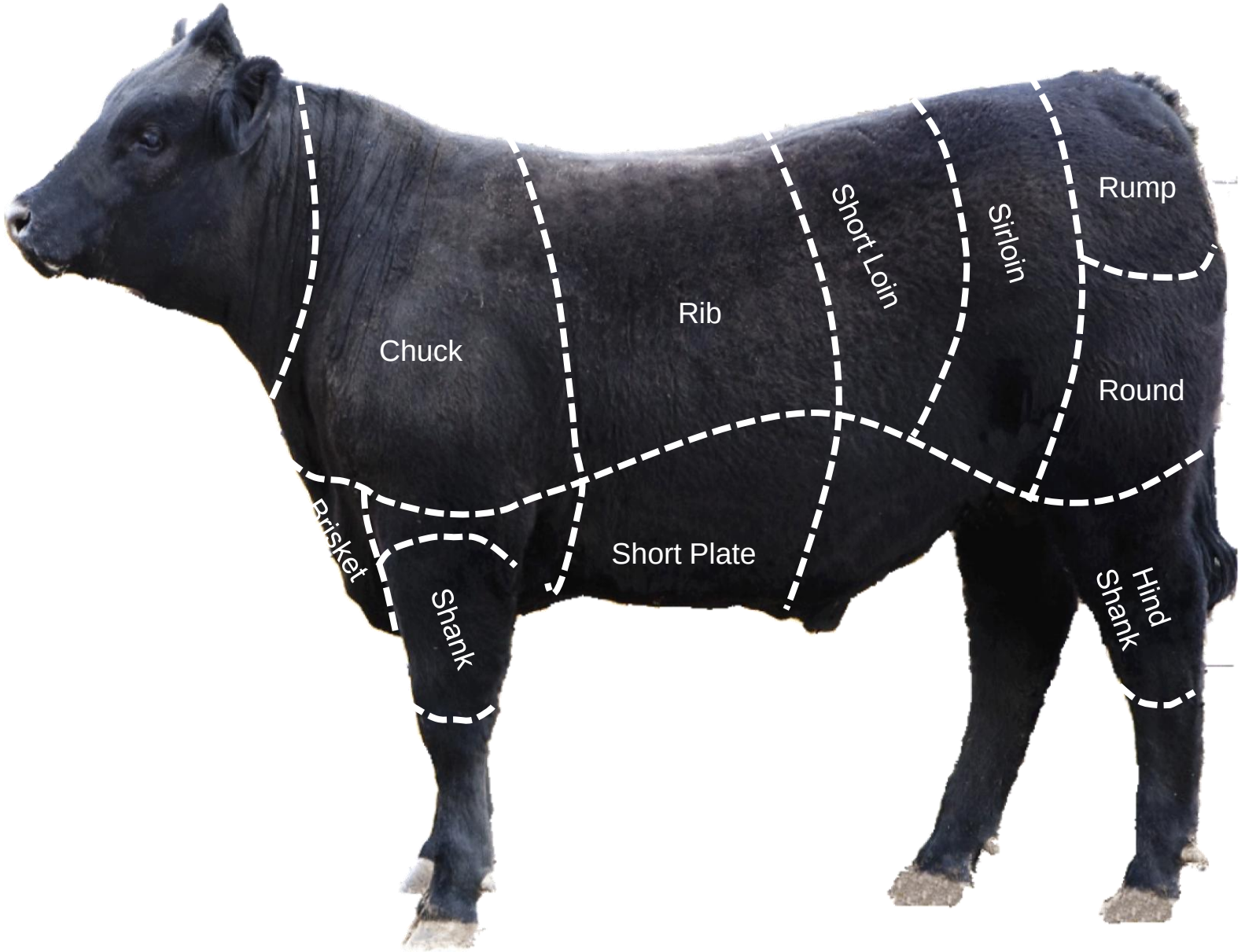
Quality Grade; % Choice

~2.9 YG



Yield Grade

Cundiff et al., 2004


Chuck
Rib
Short Loin
Sirloin
Rump
Round
Brisket
Shank
Short Plate
Hind Shank

Lost Opportunities

Quality Grade		-$25.25
Yield Grade	-$37.77	-$5.77
Carcass Weight		-$6.75
Offal		-$5.15
Hide/Branding		-$0.74
Total		-$43.66

NBQA 2011

USDA Quality and Yield Grade Distribution

USDA Yield Grade	Prime, %	Choice, %	Select, %	Other, %
1	0.0	3.6	7.3	1.4
2	0.4	22.8	15.3	2.4
3	1.8	25.9	8.0	1.5
4	0.5	6.3	1.4	0.4
5	0.1	1.3	0.1	0.1

NBQA 2011

Table 1. Example Grid, as Presented by a Packer ($/dressed cwt.)

Choice YG3 550-950 lbs.	Base Price
Prime-Choice Price Spread	+6.00
Choice-Select Price Spread	-6.00
Select-Standard Price Spread	-10.00
Yield Grade 1	+5.00
Yield Grade 2	+3.00
Yield Grade 4	-20.00
Yield Grade 5	-25.00
Dark Cutters	-20.00
Light Carcasses (<550 lbs.)	-10.00
Heavy Carcasses (>950 lbs.)	-20.00

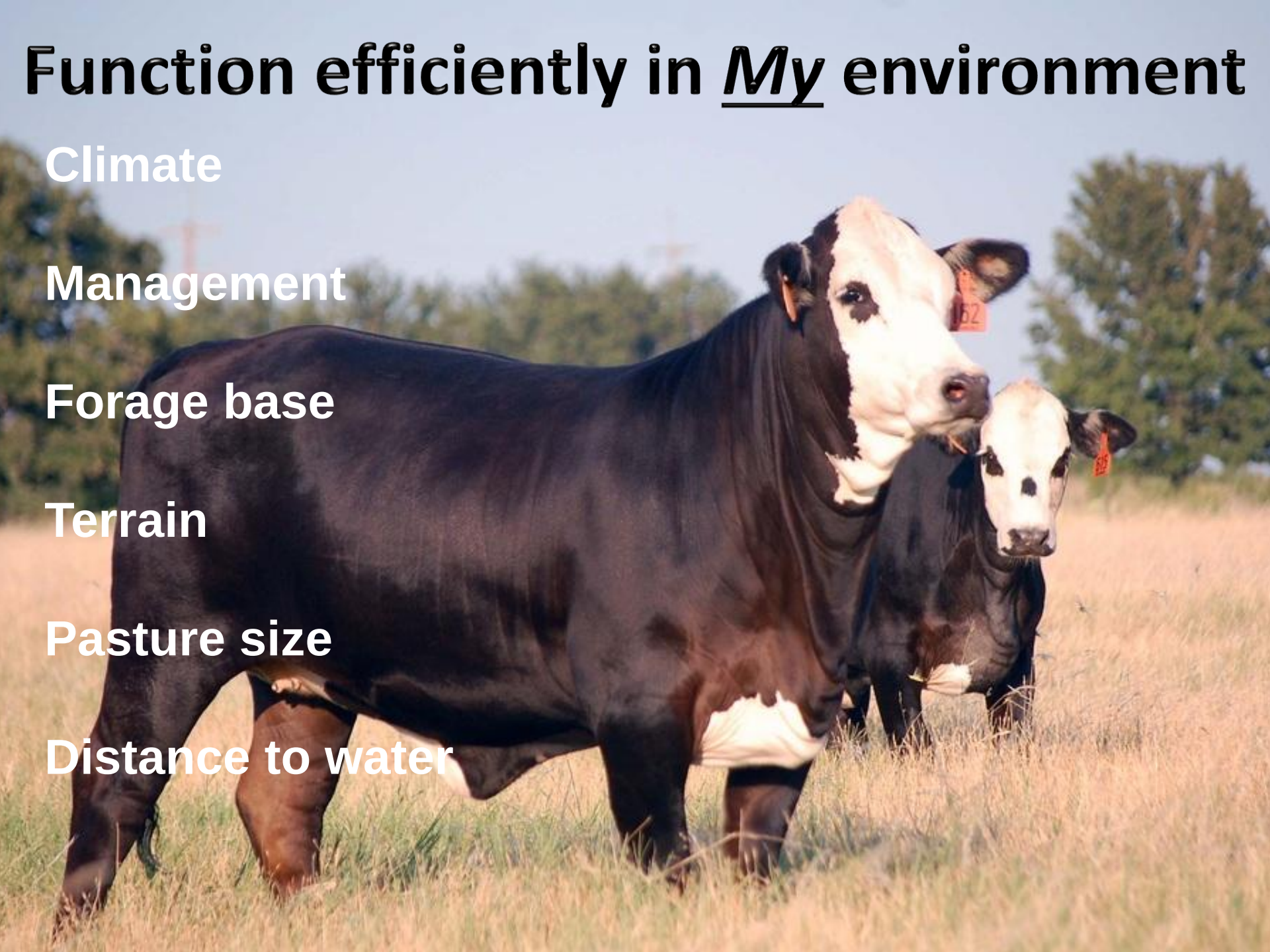
USDA Quality and Yield Grade Distribution

USDA Yield Grade	Prime, %	Choice, %	Select, %
1	$11	$5	-$1
2	$9	$3	-$3
3	$6	$0	-$6
4	-$14	-$20	-$26
5	-$19	-$25	-$31

Dark Cutter =-$20; Light Carcass (<550 lbs) = -$10; Heavy Carcass (>1000 lbs) = -$20

Match cow to Environment

Function efficiently in *My* environment



Climate

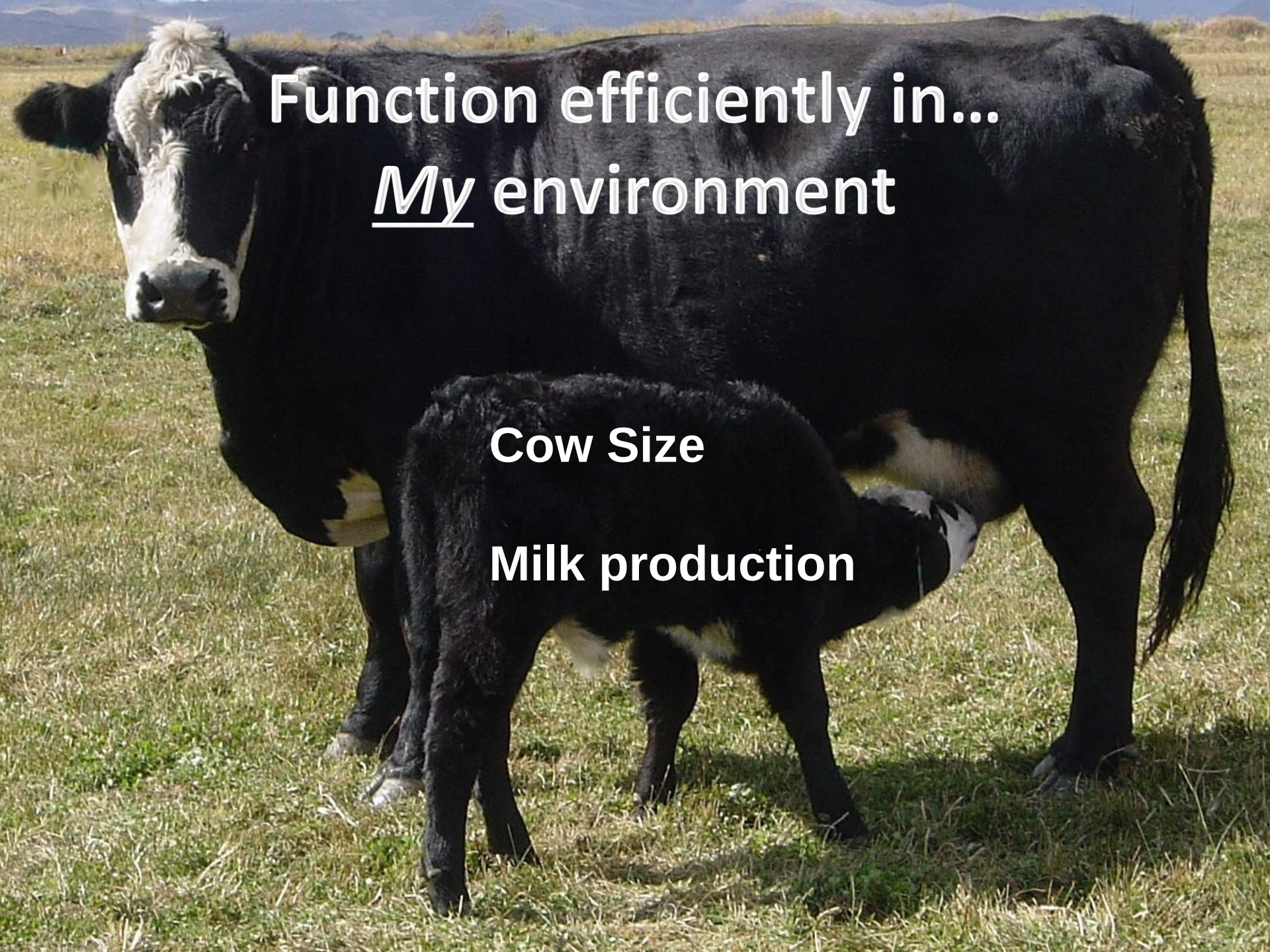
Management

Forage base

Terrain

Pasture size

Distance to water


Function efficiently in…
My environment
Cow Size
Milk production

Nutrient Requirements

1100# Cow vs 1300# Cow

Average Milk

	Calving to Breeding		Breeding to Weaning		Weaning to Last 1/3		Last Trimester	
Dry Matter, lbs	26.4	29.1	25.5	28.5	21.4	24.2	22.7	25.8
CP, lbs	2.75	3.06	2.18	2.5	1.41	1.6	1.93	2.03
TDN/Energy, lbs	15.5	17.3	14.3	15.7	10.1	11.4	11.9	13.57

12% ↑ DMI

Function efficiently in *My* environment

Cow Size

Milk production

Nutrient Requirements

Average Milk vs Superior Milk

1100# Cow

	Calving to Breeding		Breeding to Weaning		Weaning to Last 1/3	Last Trimester
Dry Matter, lbs	**26.4**	**29.2**	**25.5**	**27.25**	**21.4**	**22.7**
CP, lbs	**2.75**	**3.66**	**2.18**	**2.82**	**1.41**	**1.93**
TDN/Energy, lbs	**15.5**	**18.7**	**14.3**	**16.70**	**10.1**	**11.9**

Nutrient Requirements

1100# Cow

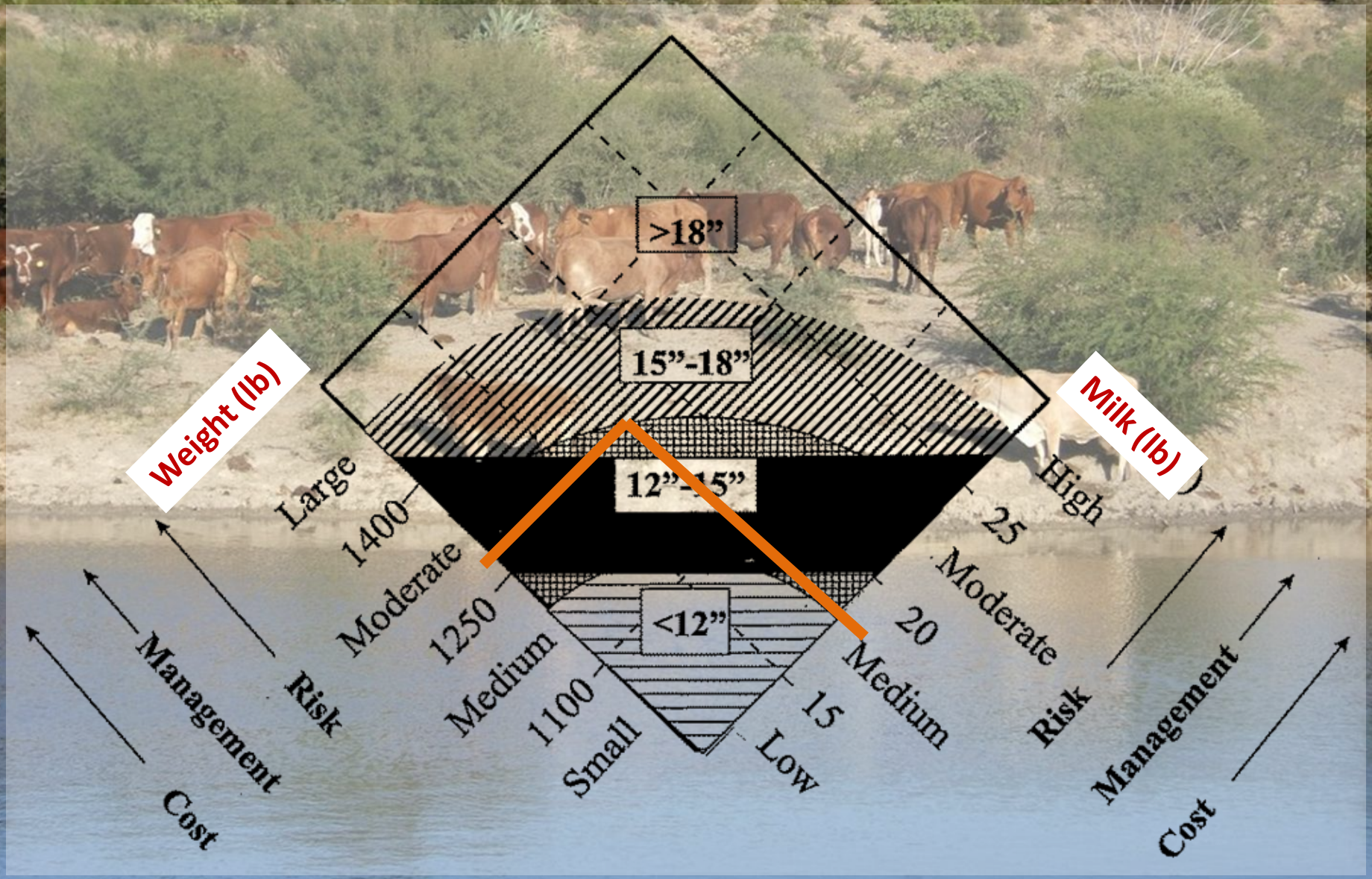
Average Milk vs Superior Milk

	Calving to Breeding (80 d)		Breeding to Weaning (160 d)		Weaning to Last 1/3 (30 d)	Last Trimester (95d)
Dry Matter, lbs	26.4	29.2	25.5	27.25	21.4	22.7
Total DMI; + lbs	224		280		1.41	1.93

+504 lbs

8% more grazing pressure during the growing season

Match cow and environment



Weaning a calf is 5x more important than growth

A cow's ability to wean a calf (reproductive performance) is directly related to how well she fits my environment.

Capturing Heterosis

Generation	Breed A Fraction	Breed B Fraction	Individual Heterosis
1	1/2	1/2	100 %
2	3/4	1/4	50 %
3	7/8	1/8	25 %
4	15/16	1/16	12.5 %
5	31/32	1/32	6.25 %

Match bull to the market

Use EPD's to your advantage

Heifers

Birth Weight

Milk

Total Milk

Scrotal Circumference

Carcass

Terminal program

Birth Weight

Weaning Weight

Yearling Weight

Retained ownership

Yearling Weight

IMF

Back Fat

REA

Economics of Heterosis

- What does it cost?
- It depends.
- Cow size
  - About 6 % increase/100 lbs BW
- Milk production
  - ~1.5 % increase in energy/lb of milk
  - ~2.7 % increase in CP/lb of milk
- Make sure she fits your environment
  - Stocking rate
  - Supplemental feed

Economics of Heterosis- Angus cow x Terminal bull

Original Scenario:

- 100 cows; Angus cow x Angus Bull
- 525 lb weaning weight
- Average weaning rate 82%
- 43,050 lbs marketed

Switch to

- Angus cow x Beefmaster bull
- Individual heterosis (+5%)
  - 551 lb weaning weight F1 calf
- 45,203 lbs marketed
- +2152 lbs/year * $1.67 = +$3,594/year

Economics of Heterosis- F1 cow x Terminal bull

Original Scenario:

- Angus cow x Angus bull
- 525 lb weaned calf
- Average weaning rate 82%
- 43,050 lbs marketed

Switch to

- F1 cow X (Terminal Bull Breed C)
- +WW total heterosis +25% {↑ Weaning rate (90%) & weight(11%)}

Capturing Heterosis

System	% Max Heterosis	% Increase in Calf Wt./Cow Exposed
Pure breeds	0	0
2 breed rotation	67	16
3 breed rotation	86	20
2 breed composite	50	12
3 breed composite	63	15
Term. Sire/purch. F1 female	100	23-28

Brett Barham, Univ. of Arkansas

Economics of Heterosis- F1 cow x Terminal bull

Original Scenario:

- Angus cow x Angus bull
- 525 lb weaned calf
- Average weaning rate 82%
- 43,050 lbs marketed

Switch to

- F1 cow X (Terminal Bull Breed C)
- +WW total heterosis +25% {↑ Weaning rate (90%) & weight(11%)}
- 656 lb calf
  - +131 lbs
- 59,040 lbs
- +15,990 lbs * $1.48 = +$23,665

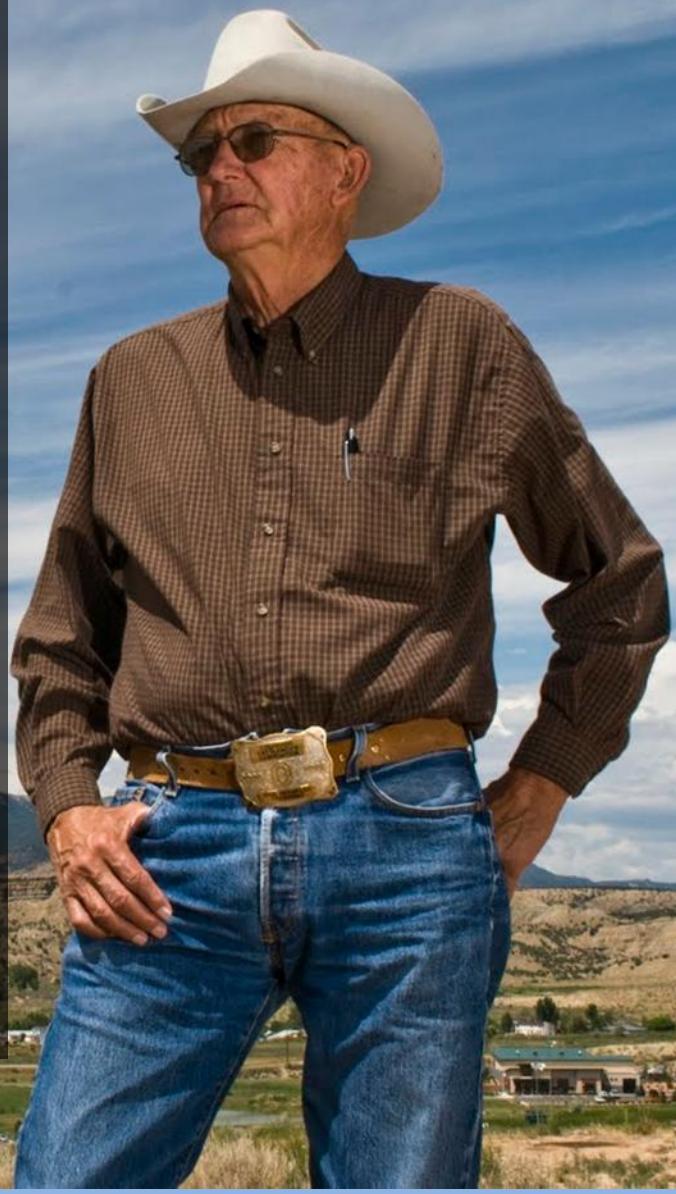
Economics of Heterosis

- +$3,594 increased weaning weight *(Bull Affect)*
  - *Angus cow x terminal bull*
  - *(½ Angus Calf x ½ Terminal bull breed calf)*
- +$23,665 increase in weaning rate & weight
  - *F1 cow x terminal bull breed*
  - *(½ F1 x Terminal bull breed calf)*

OK weighted average weights on 10-24-14, USDA-AMS data

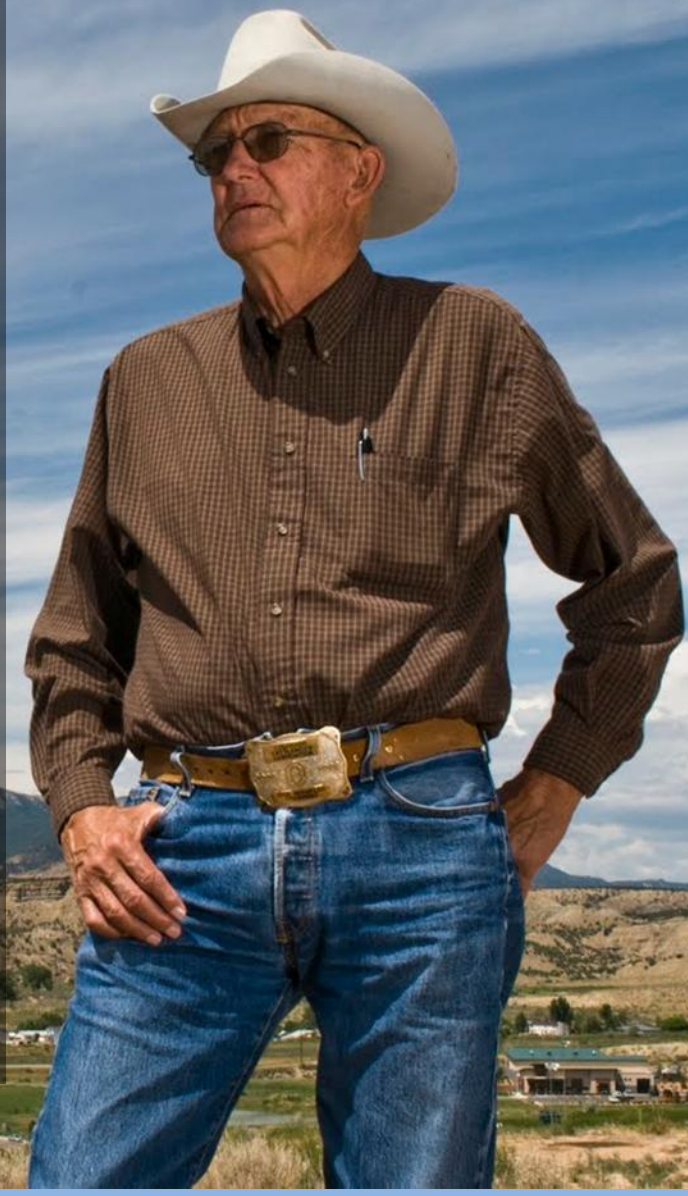
Parting Thoughts

- Must be able to manage for the benefits
- Heterosis will not make up for poor animal husbandry/management
- Heterosis will not make up for poor bull selection



Parting Thoughts

- Heterosis works
  - Makes you money
- Match cows to their environment
- Match bulls to your market
- Educate yourself to benefits of crossbreeding



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Develop Regional Marketing Alliances

PROVEN EXCELLENCE IN CATTLE PRODUCTION

ALLIANCE

Integrity Beef Program

Outcome from consultation program

Mission:

To simplify cow/calf producer management decisions and increase the marketability of their calves through the production of high quality, uniform, value added and preconditioned cattle.

Additionally, negotiate contracts for inputs and potentially develop a replacement female program.

***Terminal production system*

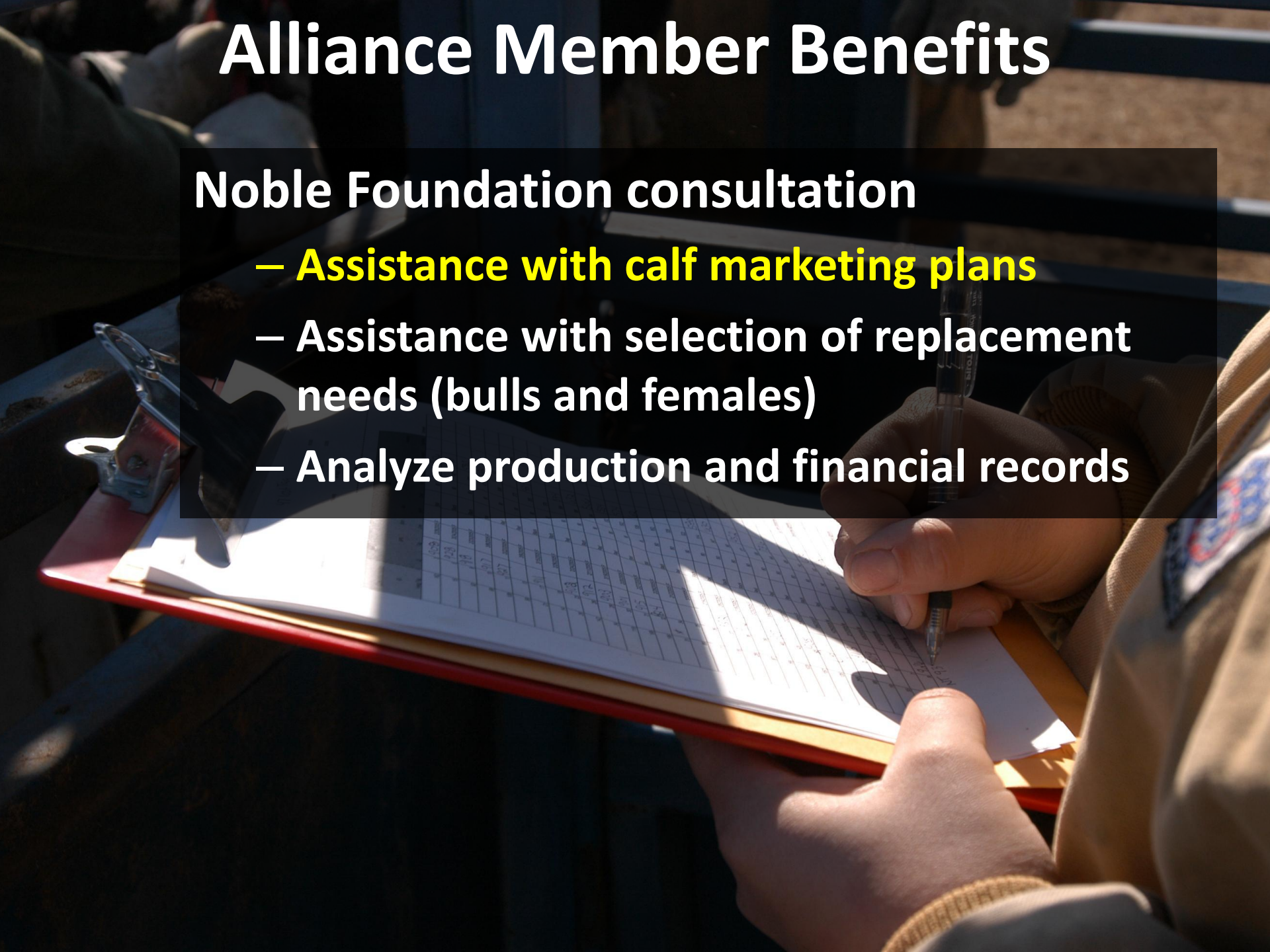
Objectives

- Develop production and marketing processes to:
  - Increase product quality and uniformity
  - Improve production and marketing efficiencies
  - Increase marketing opportunities
- Educate members and public to:
  - Promote best practices and develop uniform protocols
    - Sustainable production
    - Humane treatment
    - Simplify management decisions
- Increase producer profits

Alliance Member Benefits

- Provide Best Management Practices
- Produce the highest quality product
- Provide better marketing for small to mid-size producers
  - Helps larger producers as well
- Increased weight gain
- Increased revenue
- Moves marketing to better time of year

Alliance Member Benefits



Noble Foundation consultation

- **Assistance with calf marketing plans**
- Assistance with selection of replacement needs (bulls and females)
- Analyze production and financial records

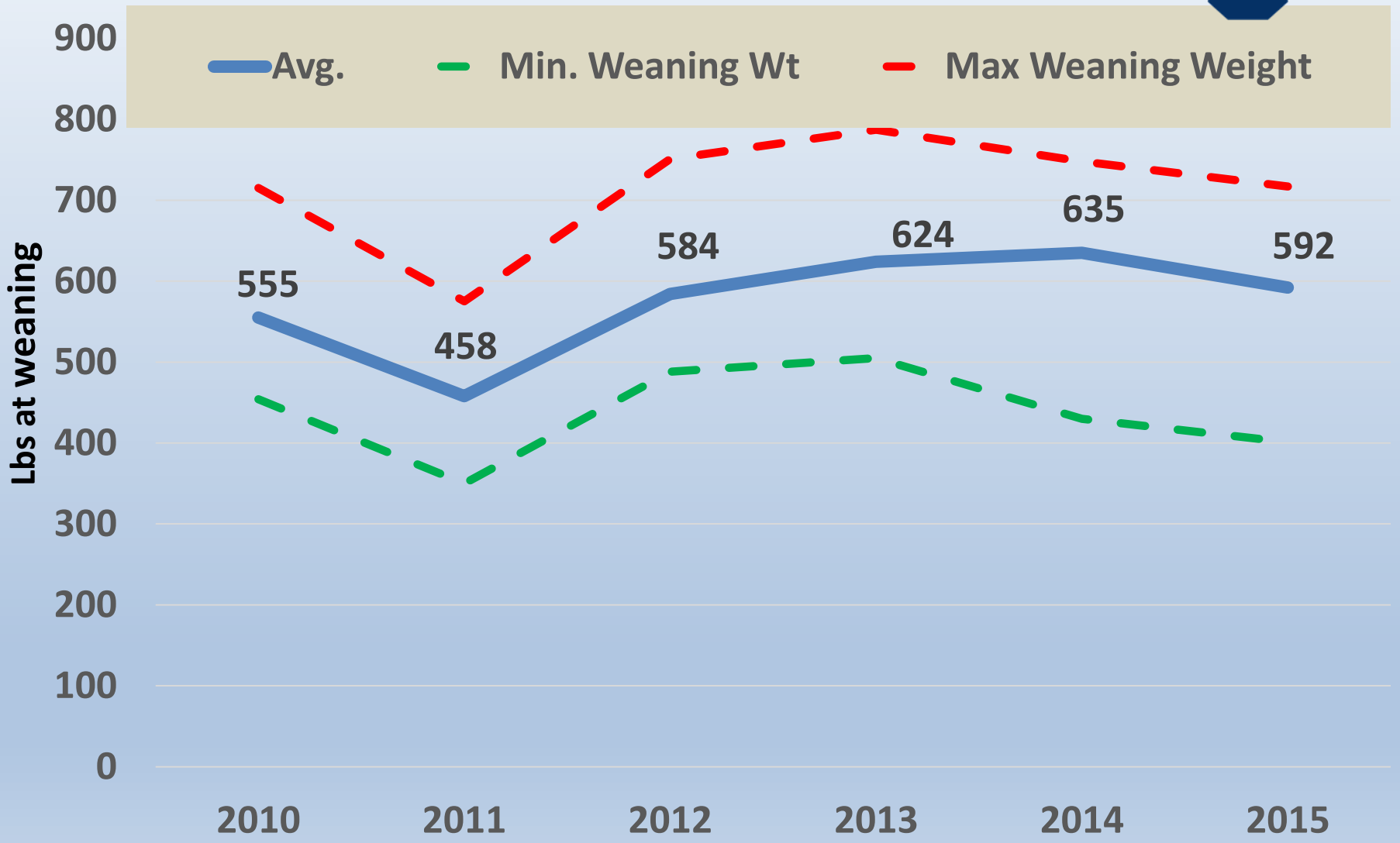
Participation in a *"Value Stacked"* program

- VAC-60 program
- Superior genetics
- Increased uniformity
- Comingled into truck load lots
- Marketing assistance

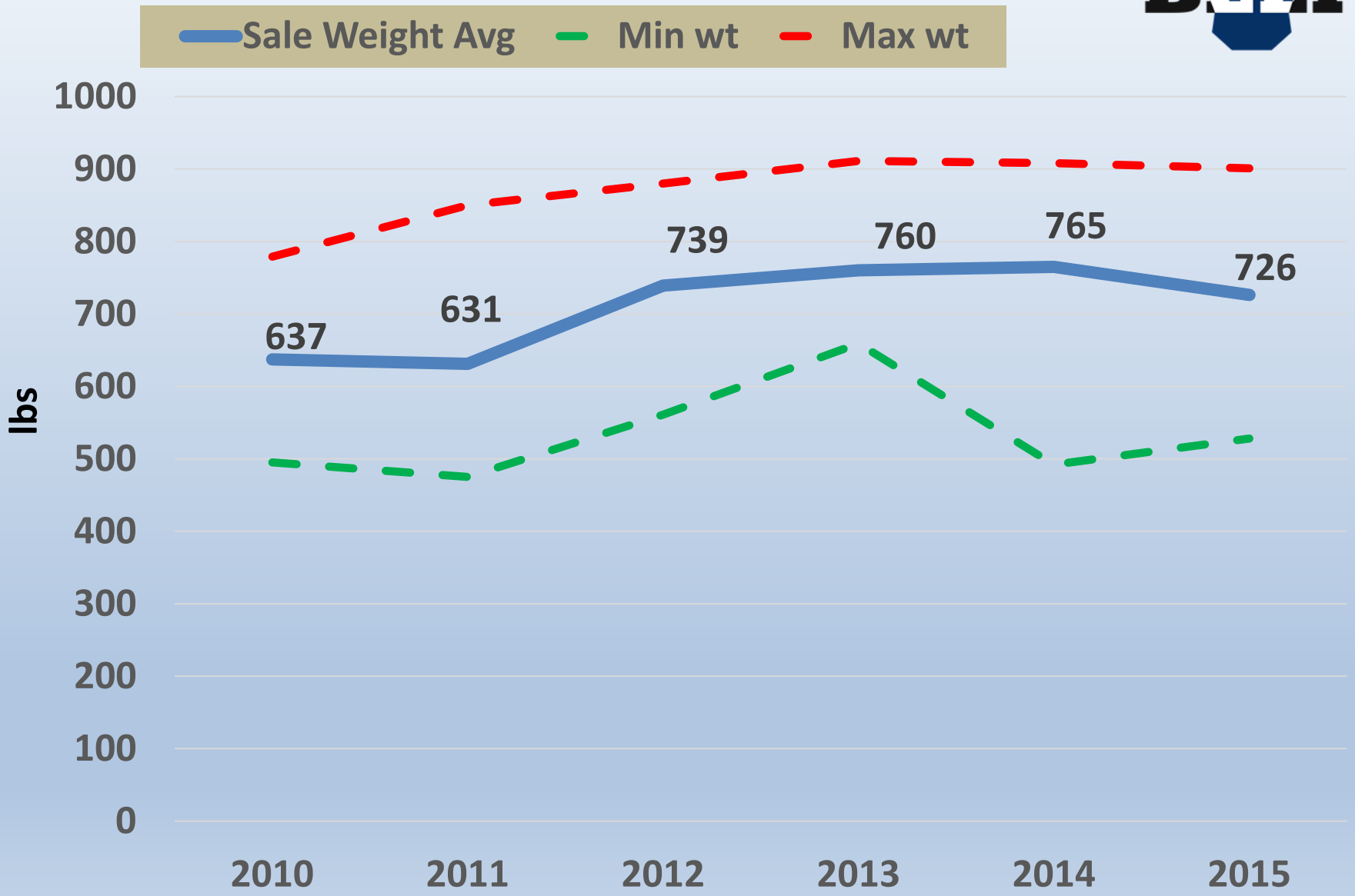
Bull Production Requirements

- Charolais or Angus (AAA)
- EPD's in top 20 percent for weaning weight and yearling weight (interim discouraged)

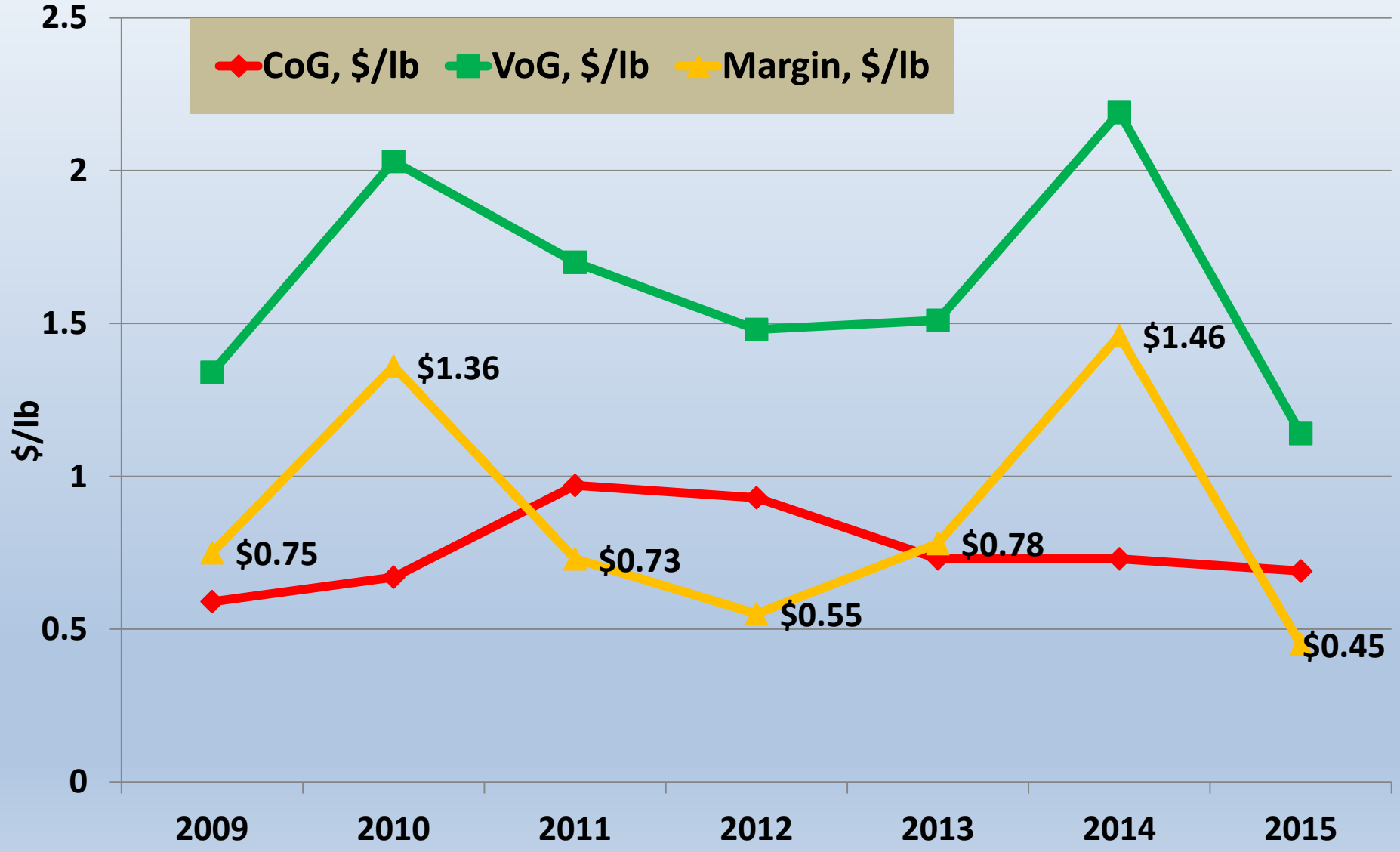
Weaning Weight



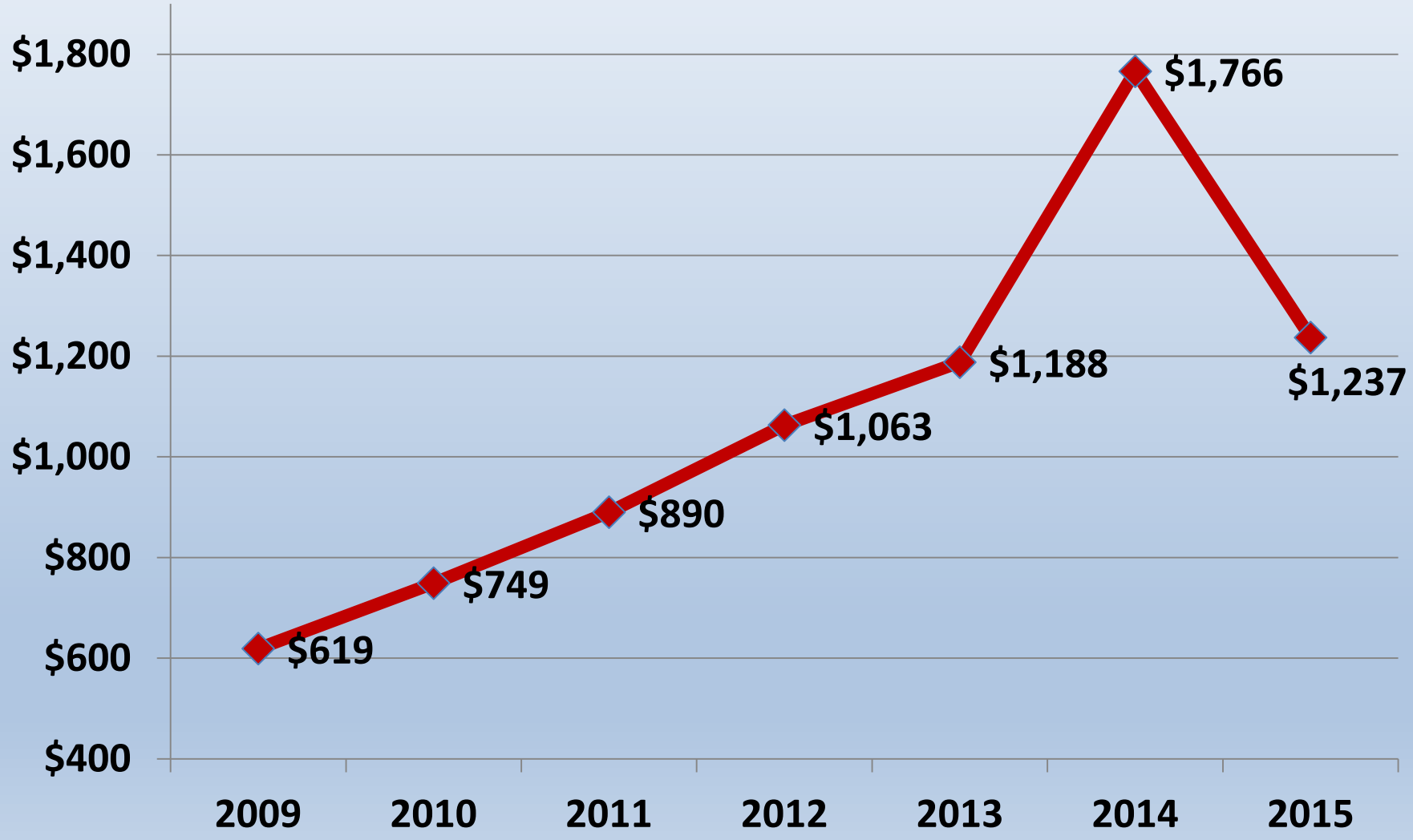
Sale Weight


Sale Weight Avg
Min wt
Max wt
1000
900
800
700
600
500
400
300
200
100
0
lbs
637
631
739
760
765
726
2010
2011
2012
2013
2014
2015

Value vs. Cost of Gain



Gross Revenue/hd



Program Observations

- Feed cattle aggressively
- Reducing shrink overall
- Reduced commission
- Synergies with OQBN
- Sale day is special feeder calf sale
  - Over 9,000 hd sold last year
  - Sounded like a feedlot in the back
- "Coat-tailers" bias USDA Market report comparison
- *Quality, HEALTHY cattle will bring a premium!*

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