Data Driven Decisions:

Electronic ID Tags and Genetic Selection

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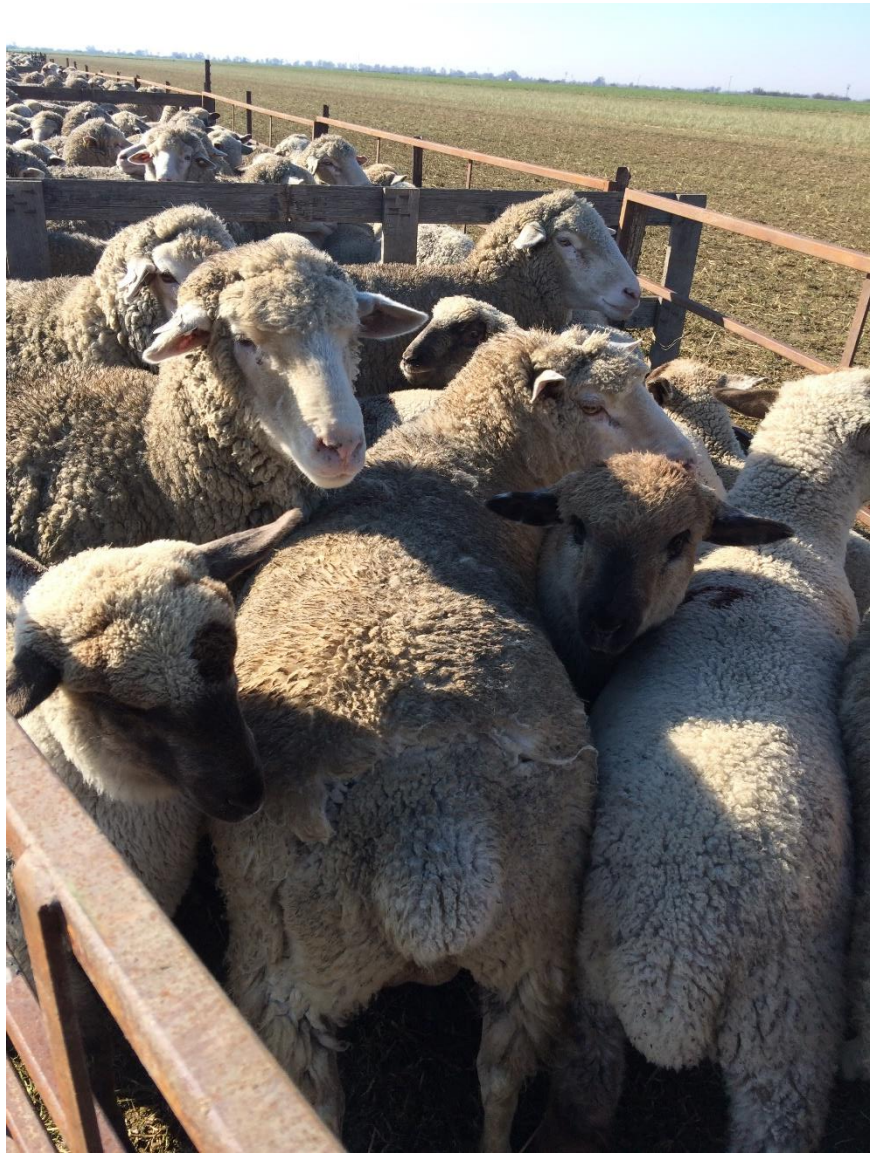
Sheep Industry in US

- 56 million sheep in 1942; 5.23 million in 2017
- **US sheep numbers drop 1-2% each year**
- 400 million pounds of lamb consumed in 2017
- **>60% of lamb consumed is imported**



Project to Help Determine Value of EID Use

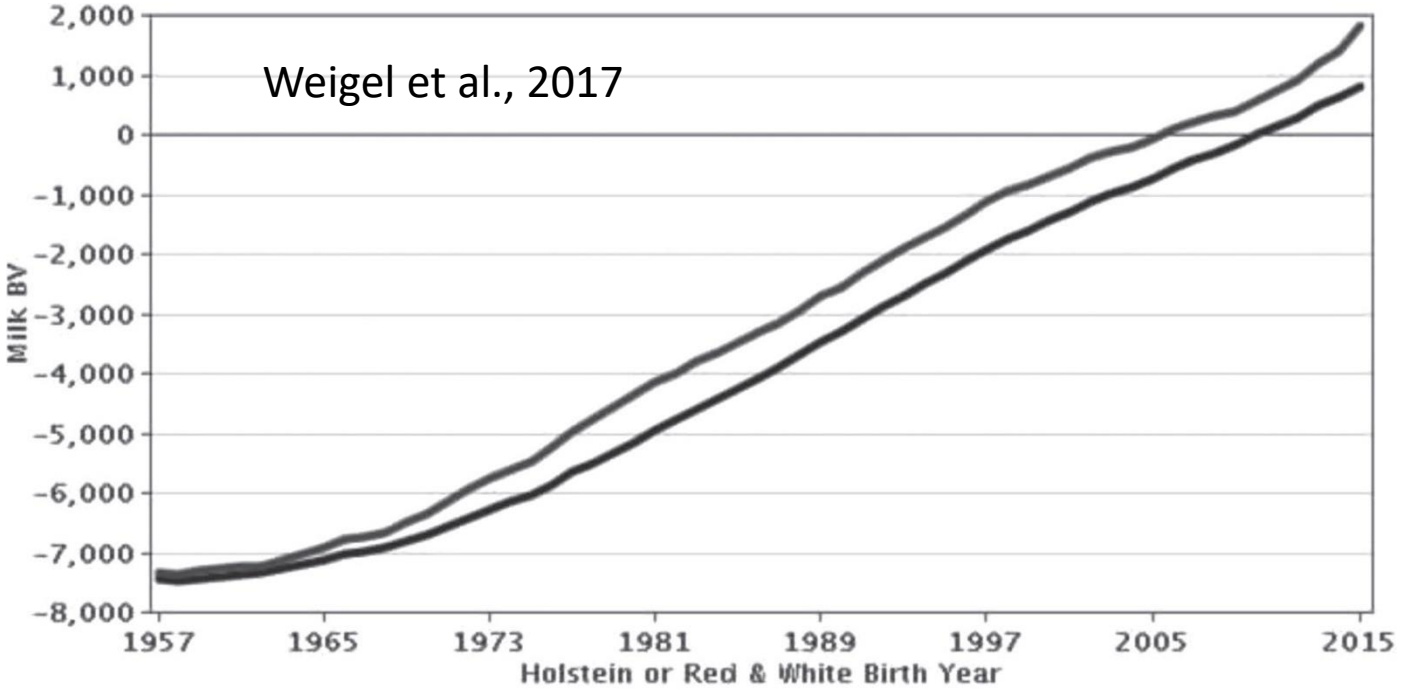
- Collect DNA (tissue) samples and tag rams & lambs – 5 ranches
- Use Superior's Flock 54 test
- Determine parentage of lambs
- Focus on market lambs
- Attribute lamb carcass qualities to rams

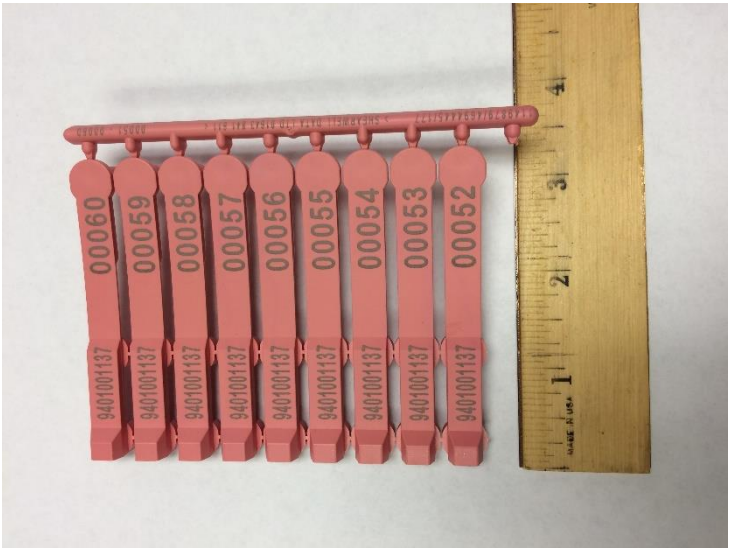
	Ranch A	Ranch B	Ranch C	Ranch D	Ranch E
Flock size	**Large**	**Large**	**Small**	**Large**	**Large**
Breeds of Rams	Black and White-face	White-face	Black-face	Composite	Black and White-face
Ram:Ewe Ratio	**1:10**	**1:35**	**1:30-35**	**1:50**	**1:40**
Average Lamb Crop	145%	130%	140-150%	145-150%	115%
Length of Breeding Season	75 days	75 days	62 days	120 days	185 days
Avg Weaning Weights	**85-110 lbs**	**70-95 lbs**	**60 lbs (110-115 days; ~4 mos)**	**105-110 lbs (4-7 mos)**	**110-115 lbs**
Use EID's	**Yes**	**Yes – on maternal flock**	**Yes – on all animals**	**No**	**No**
Traits tracked with EID's	None	Health, pregnant vs. open, twins, wool microns	Disease, BCS, vaccines, wormers, dam of lambs	n/a	n/a
Measure Lamb Vigor or Ewe Mothering	**Informal observation**	**Tag problem ewes**	**Yes - EZ Care System**	**Herders mark poor mothers**	**No**
Preg Check	No	Yes – separate singles and doubles	No	Yes	No
Track Twins	Yes	Yes	Yes – EID's	No	Yes – paint brand
$$/Ewe/Year	$113	$120	$99 (no labor costs)	$210	$150
Comments	Major focus on twinning	Goal of breeding program is to eliminate bottom-end producers	EID data is more actionable	Focus on culling bottom 1/3 of flock	

Tools for Genetic Selection

- Visual Assessment
- Individual Animal ID (no EID)
- Paper Records
- Electronic Records
- Paint Brands
- Ear Notches/Marks
- Ultrasound (preg testing)
- Electronic ID Tags

EID's and Individual Animal Records





These make genetic selection easier

- We know they work
- First selection indices introduced 1952
- Similar graphs for other species

Producer viewpoints

- “When you’re tending to 5,000 to 8,000 sheep (or 5 to 8 “bands”) every year, having every ram, ewe and lamb microchipped saves ranch hands both time and labor while increasing information accuracy.” Evan Helle (AG Daily, 11/5/20)
- “Cull wasteful sheep”. First year using EID’s in commercial flock culled 170 lb fancy ewes that weaned ~65 lb lambs at 4 months. Second year, less grafting in the lambing shed because more of the ewes could care for twins. Targhee breeder, MT
- Reduced foot rot issues through genetic selection. Also, increased twinning rate (lambing percentage) and improved flock health. Emigh Livestock

Samples for Sheep Project

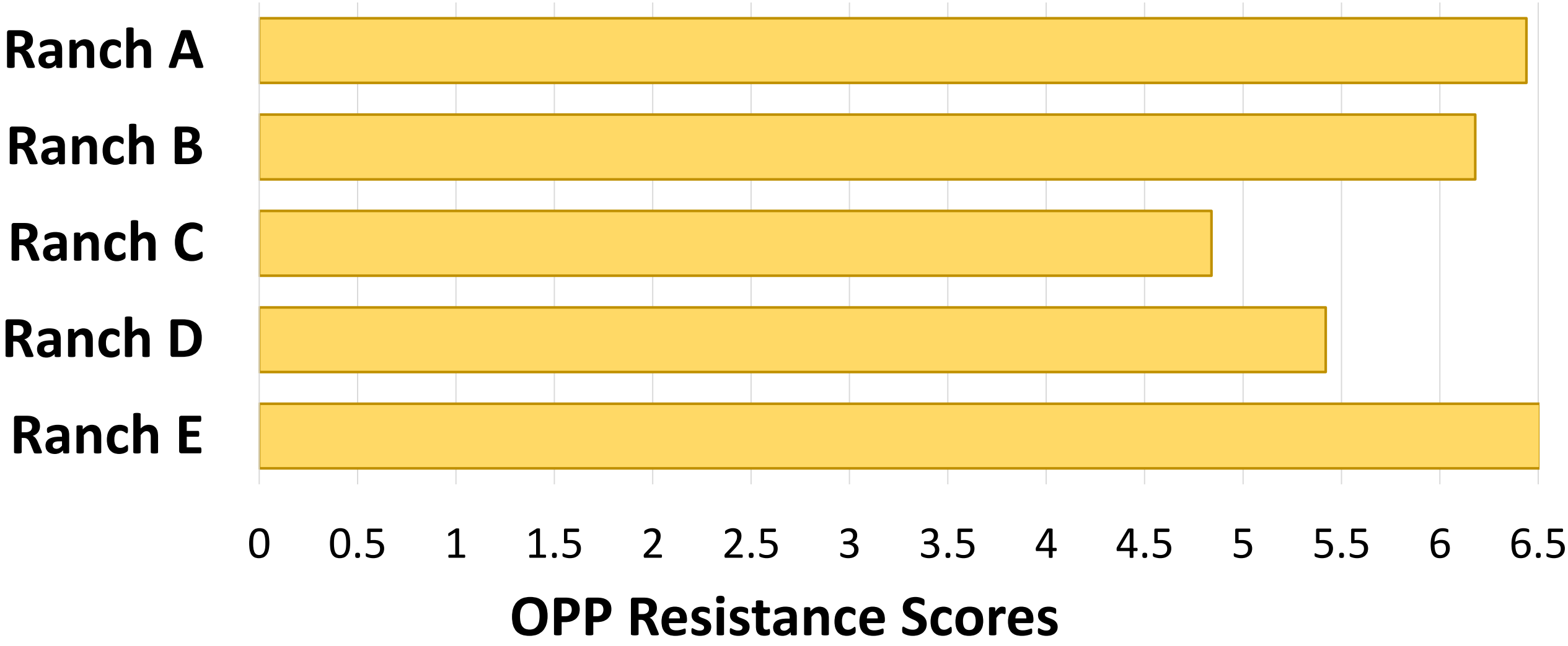
		RAMS	LAMBS			
			Males	Females	Parentage	Carcass
TOTAL COLLECTED	2963	305	1669	989	2658	**545**
Ranch A		62	662	7	606 (63)	209
Ranch B		37	423	406	796 (33)	315 (21)
Ranch C		6	36	44	80 (0)	0
Ranch D		12	331	310	623 (19 F)	0
Ranch E		11	217	222	149 (74)	0
TOTAL ANALYZED		128	1452	989	2254	524

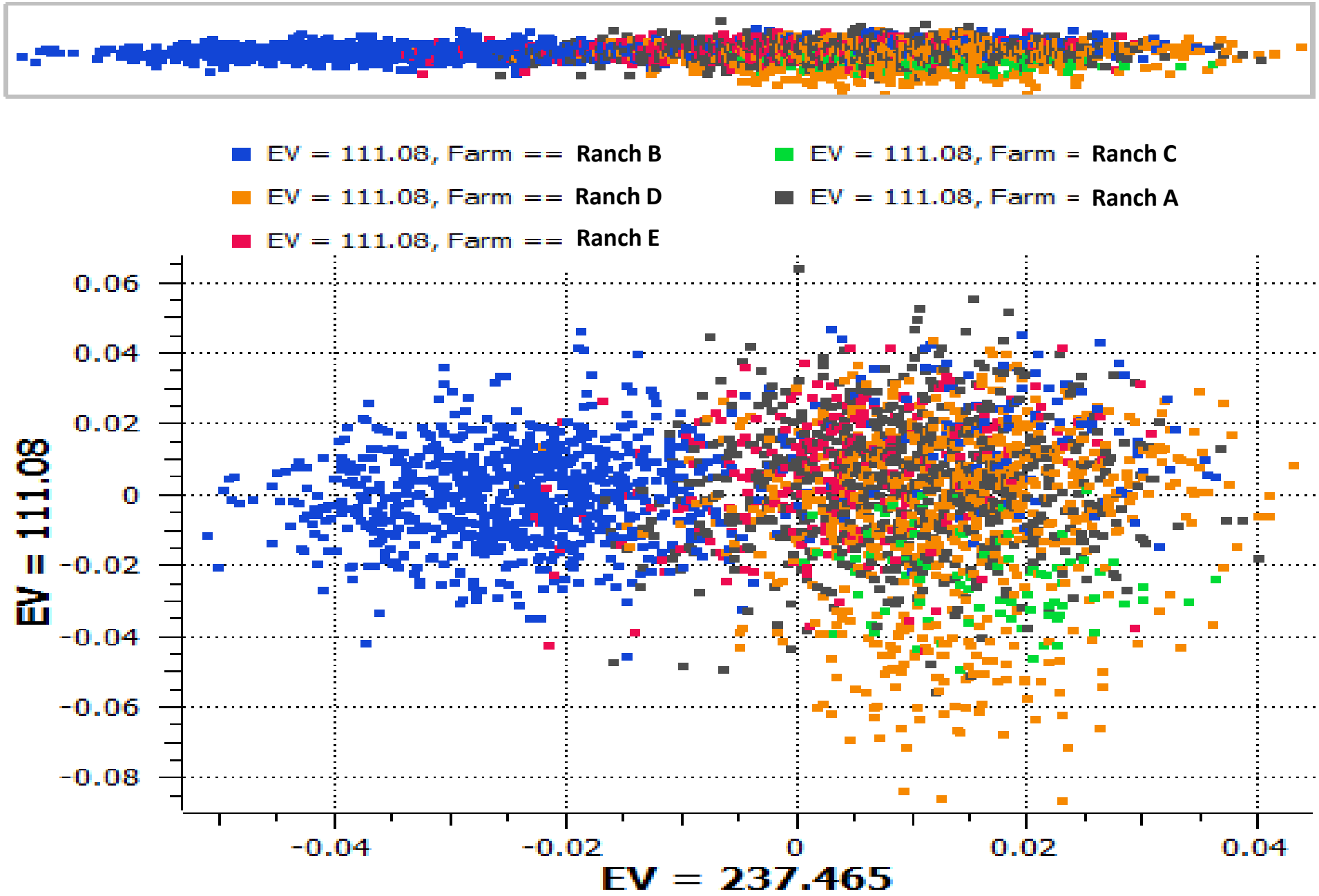
OPP Resistance:

Scored on a scale of 1- 10

- ✓ The HIGHER the score the LOWER the susceptibility
- ✓ The LOWER the score the HIGHER the susceptibility

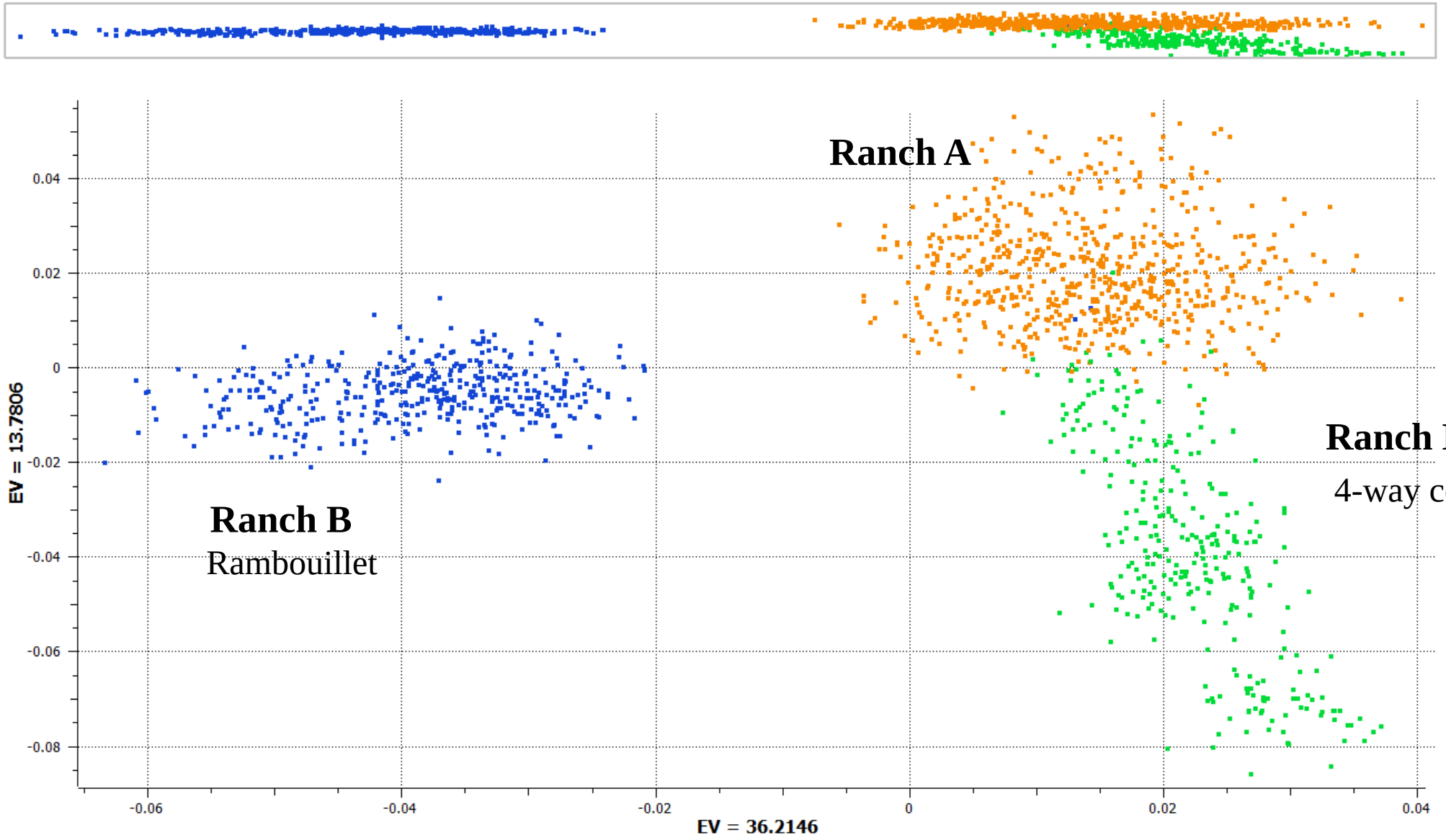
Average OPP Resistance Scores of All Lambs Submitted

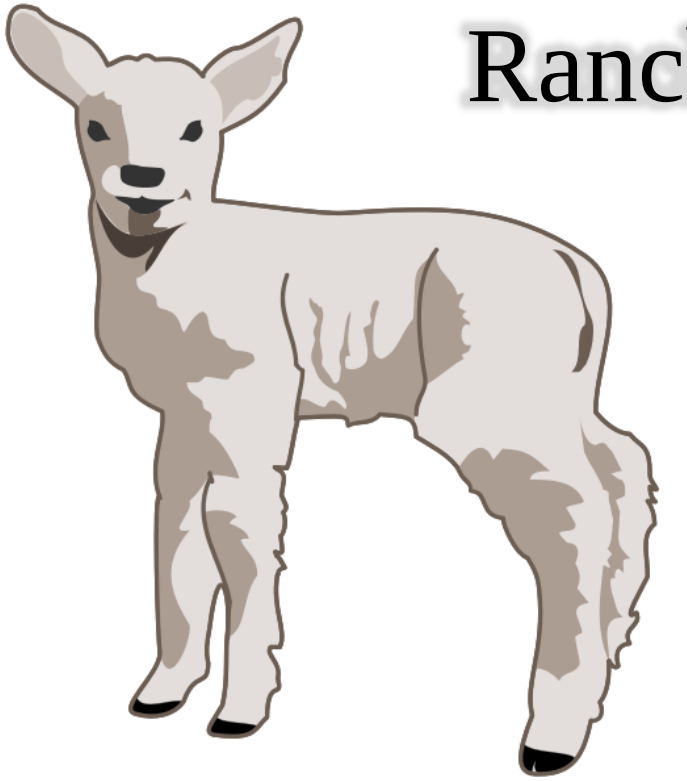




All Five Ranches

Flock Variation: Meat v.s. Wool breeds





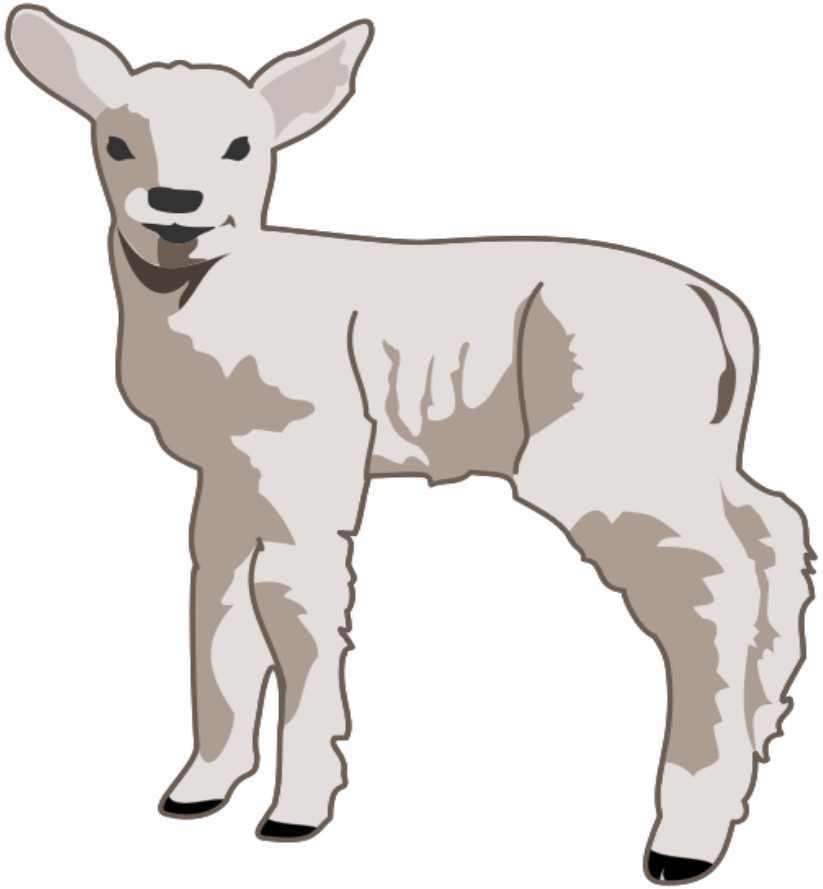
Ranch A

Tag Number	Sire	Fecundity
01622	320701	Positive GDF9
01615	320716	Positive GDF9
01617	320718	Positive GDF9
01623	321942	Positive GDF9
01625	SD5643	Positive GDF9
01609	321942	Positive GDF9

Miscellaneous Discussion Points

- ✓ Lambing Percentage is 1.31 lambs per ewe
- ✓ 83 potential Sires
- ✓ 662 Male and 7 Female lambs Submitted
- ✓ 606 Lambs analyzed parentage (63)
- ✓ 209 Carcasses analyzed

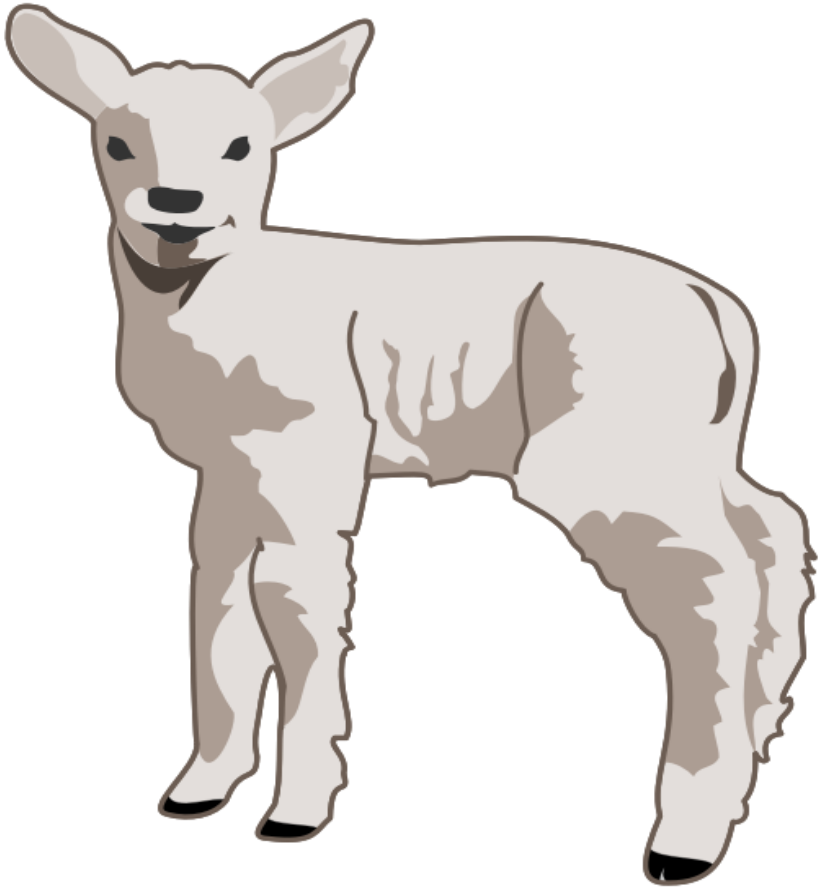
Ranch B



Miscellaneous Discussion Points

- ✓ 150 Potential Sires:
- ✓ 829 Lamb Submitted:
  - ✓ 423 Male & 406 Female Lambs
- ✓ 796 Lambs analyzed parentage (33 W/O Sires)

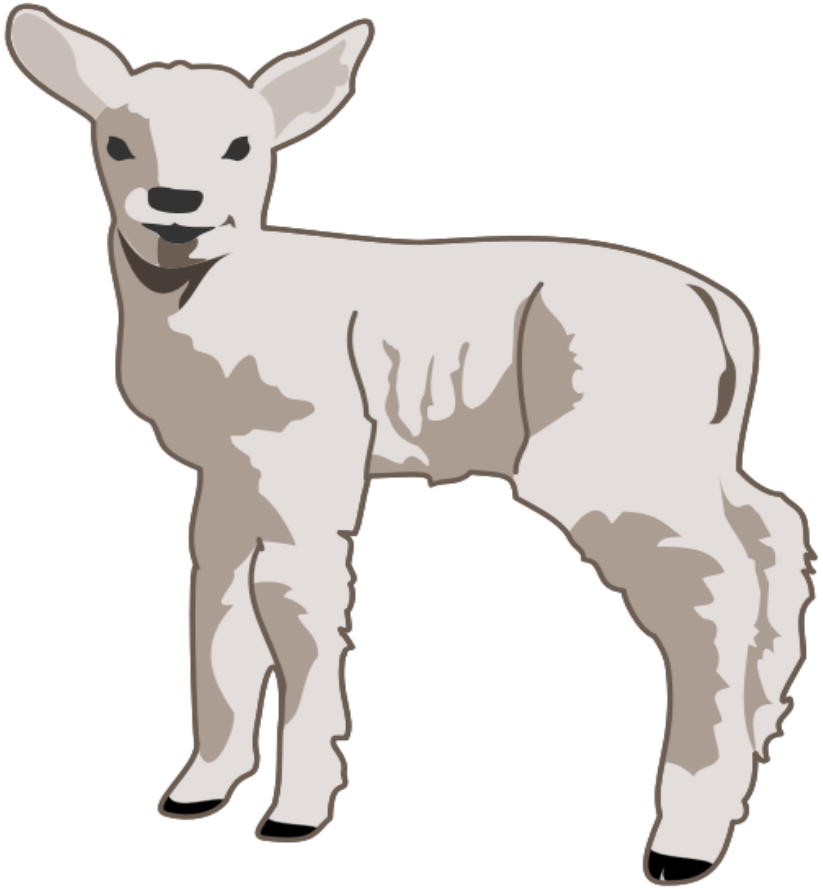
Ranch C



Miscellaneous Discussion Points

- ✓ 7 Potential Sires
- ✓ 36 Male, 44 Female Lambs, 1 Unknown Submitted
- ✓ 80 Lambs analyzed parentage (0)

Ranch D



Miscellaneous Discussion Points

- ✓ 40 Potential Sires
- ✓ 642 Lamb samples
  - ✓ 331 Male, 310 Female Lambs, 1 Unknown Submitted
- ✓ 623 Lambs analyzed parentage (19 samples retained in freezer)

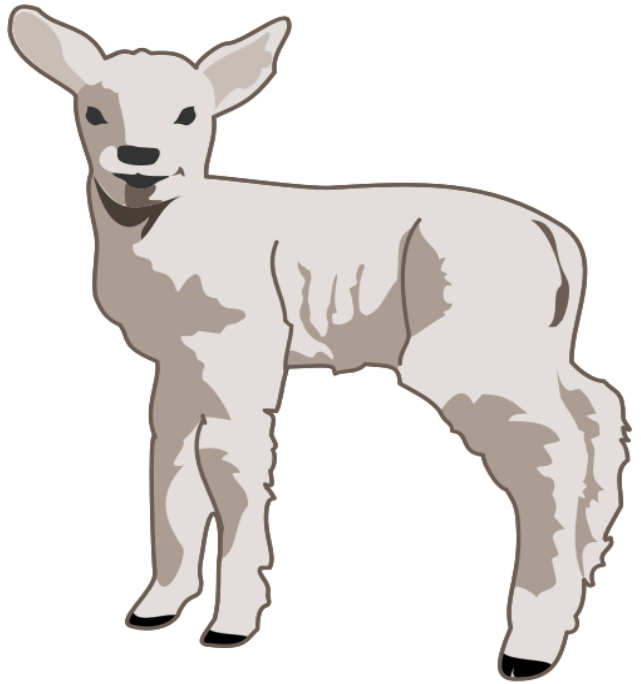
Flock54 Test Results– Ranch D

ID #	Group	Sire	OPP Score	Myostatin	Fecundity
025	Sire		4.5	Carrier	
8026	Sire		5.5	Carrier	
010	Sire		6	Carrier	
012	Sire		3.5	Double Allele	
159	Sire		4.5	Carrier	
ID 494	Male Lamb	21	4	Assoc w Muscular Hypertrophy	
ID 502	Male Lamb	21	4	Assoc w Muscular Hypertrophy	Positive GDF9
ID 6	Male Lamb	8026	5.5	Assoc w Muscular Hypertrophy	

ID #	Group	Sire	Myostatin	Fecundity
ID 116	Male Lamb	005	No Data	Positive GDF9
ID 150	Male Lamb	007	No Data	Positive GDF9
ID 157	Male Lamb	21	No Data	Positive GDF9
ID 168	Male Lamb	022	No Data	Positive GDF9
ID 172	Male Lamb	21	No Data	Positive GDF9
ID 192	Male Lamb	8089	No Data	Positive GDF9
ID 252	Male Lamb	21	No Data	Positive GDF9
ID 256	Male Lamb	21	No Data	Positive GDF9
ID 261	Male Lamb	8026	No Data	Positive GDF9
ID 300	Male Lamb	8026	No Data	Positive GDF9
ID 308	Male Lamb	008	No Data	Positive GDF9
ID 339	Male Lamb	008	No Data	Positive GDF9
ID 356	Male Lamb	8026	No Data	Positive GDF9
ID 376	Male Lamb	21	No Data	Positive GDF9
ID 382	Male Lamb	137	No Data	Positive GDF9
ID 383	Male Lamb	008	No Data	Positive GDF9
ID 401	Male Lamb	8026	No Data	Positive GDF9
ID 442	Male Lamb	21	No Data	Positive GDF9
ID 501	Male Lamb	023	No Data	Positive GDF9
ID 518	Male Lamb	8026	No Data	Positive GDF9
ID 54	Male Lamb	137	No Data	Positive GDF9
ID 575	Male Lamb	008	No Data	Positive GDF9
ID 604	Male Lamb	007	No Data	Positive GDF9
ID 609	Male Lamb	21	No Data	Positive GDF9
ID 627	Male Lamb	21	No Data	Positive GDF9
ID 636	Male Lamb	007	No Data	Positive GDF9
ID 639	Male Lamb	022	No Data	Positive GDF9
ID 502	Male Lamb	21	Assoc w Muscular Hypertrophy	Positive GDF9

Ranch E

Flock54 Test Results				
Sample ID	Animal ID	OPP Resistance	Scrapie	Fecundity
IM 135	316	8	RR	Positive2



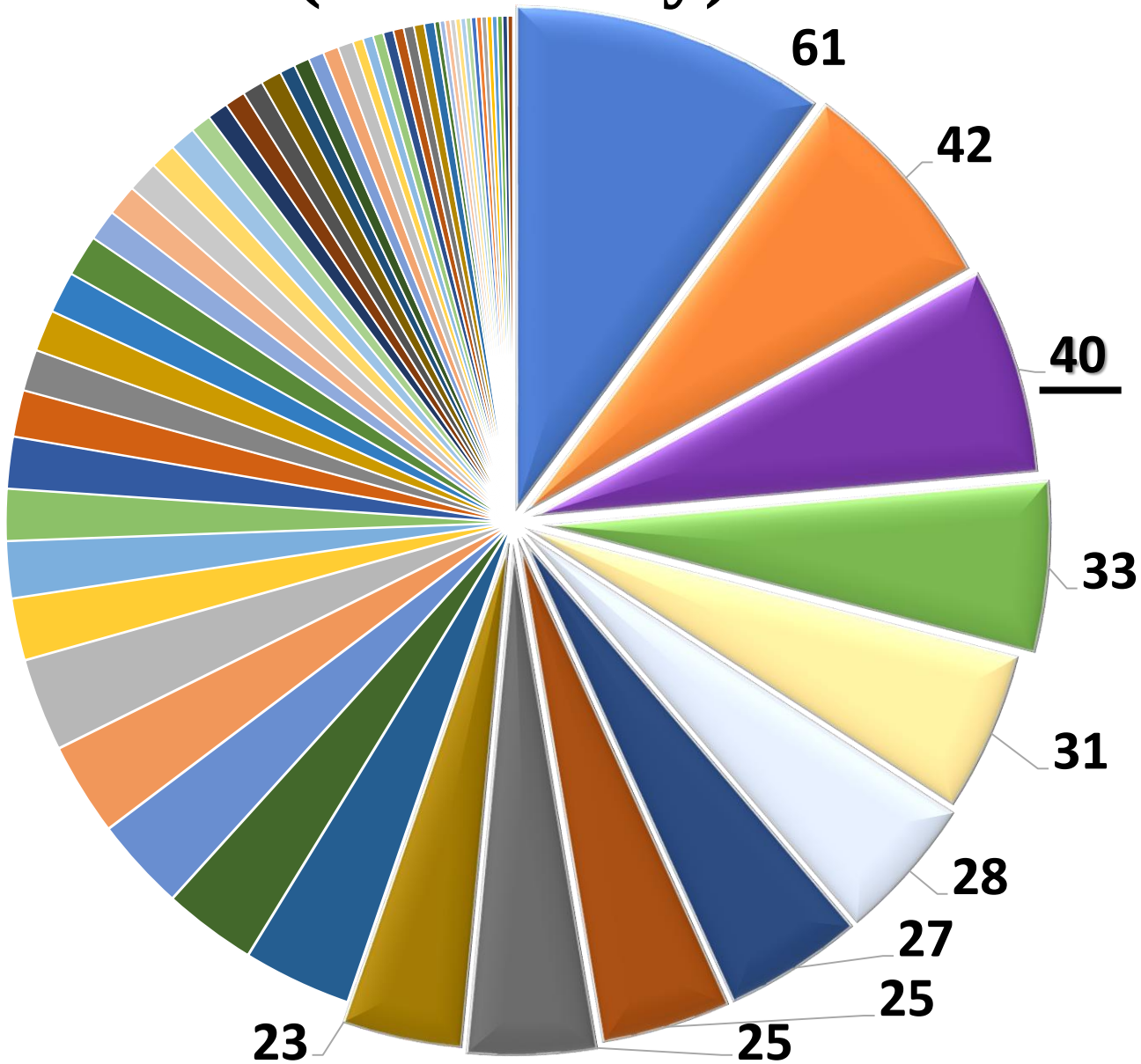
Miscellaneous Discussion Points

- ✓ 25 Potential Sires
- ✓ 439 Lambs Collected
  - ✓ 222 Ewe Lambs Submitted for Parentage
- ✓ 215 Lambs Returned in Flock 54 File:
- ✓ 149 Lambs analyzed parentage (74 W/O Sires)

Number of Lambs Called Per Sire – Ranch A (Male Only)

669 lambs submitted
606 (91%) matched to sires

83 Possible Sires
62 Rams with identified progeny

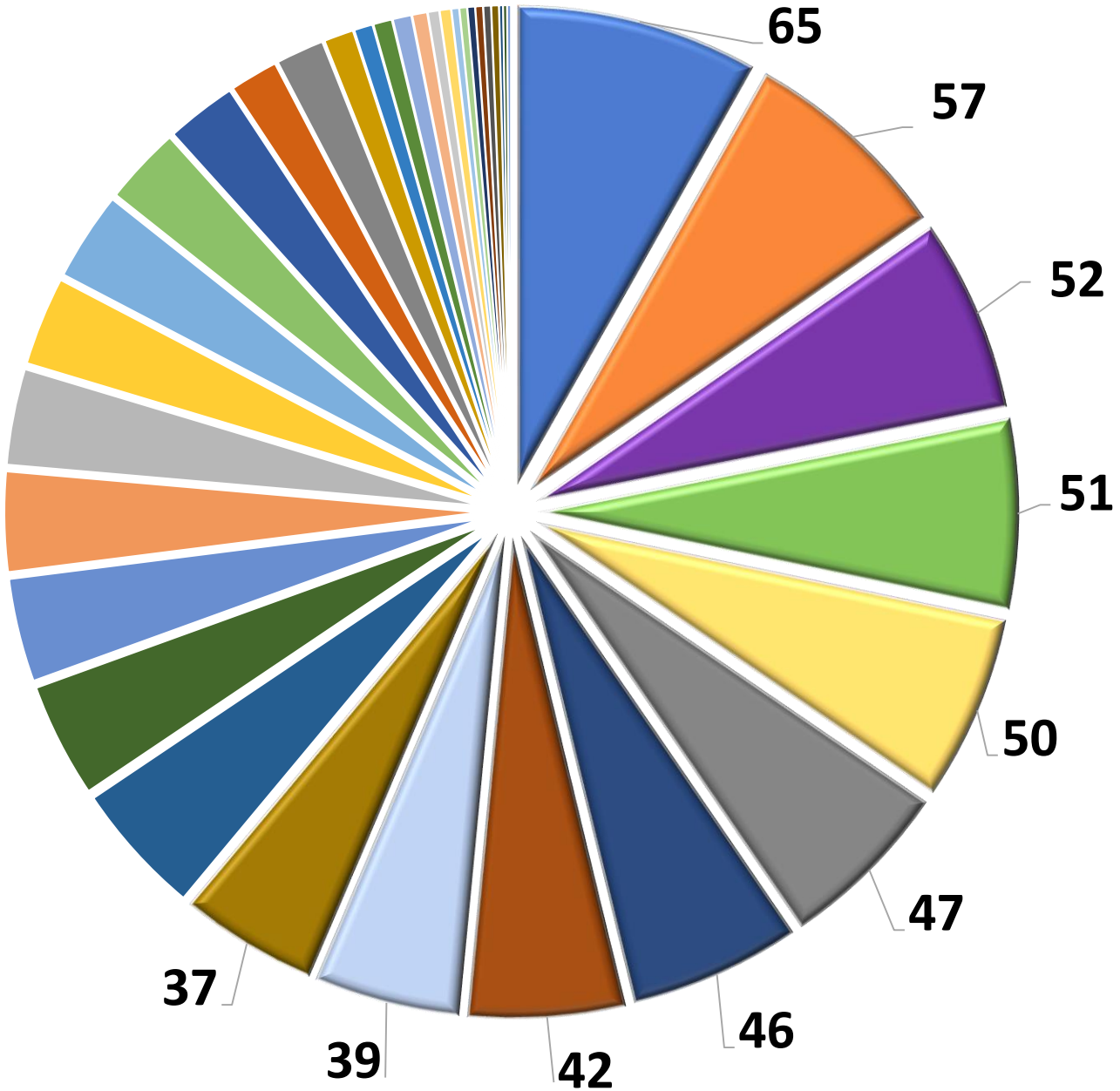


Top ten most prolific breeders sired 55% of lambs submitted

Ram to Ewe Ratio
1:10

Number of Lambs Called per Sire – Ranch B

829 lambs submitted
796 (96%) w/ identified sires

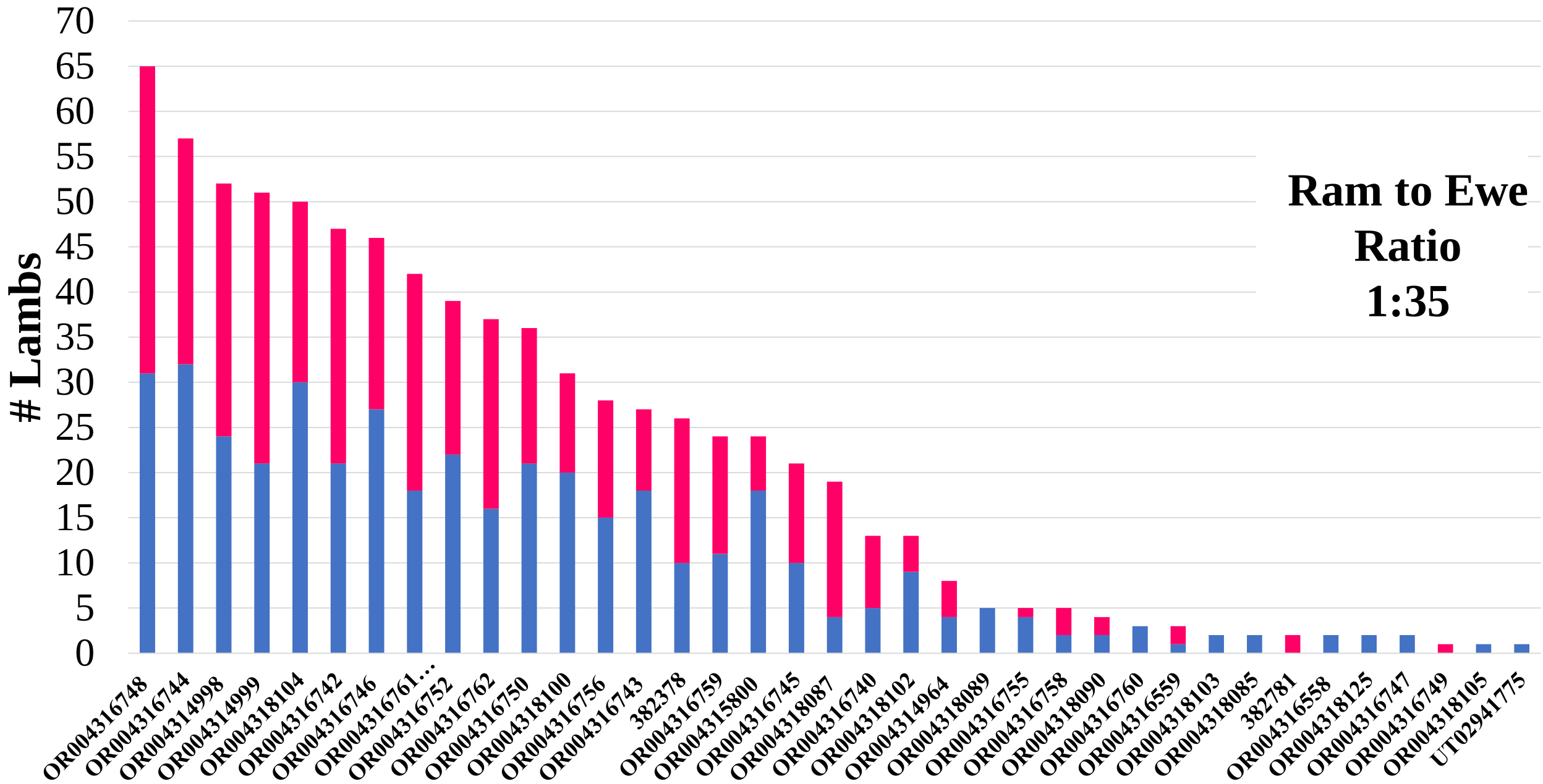


Top ten most prolific breeders sired 61% of lambs submitted

150 Possible Sires
37 Rams with identified progeny

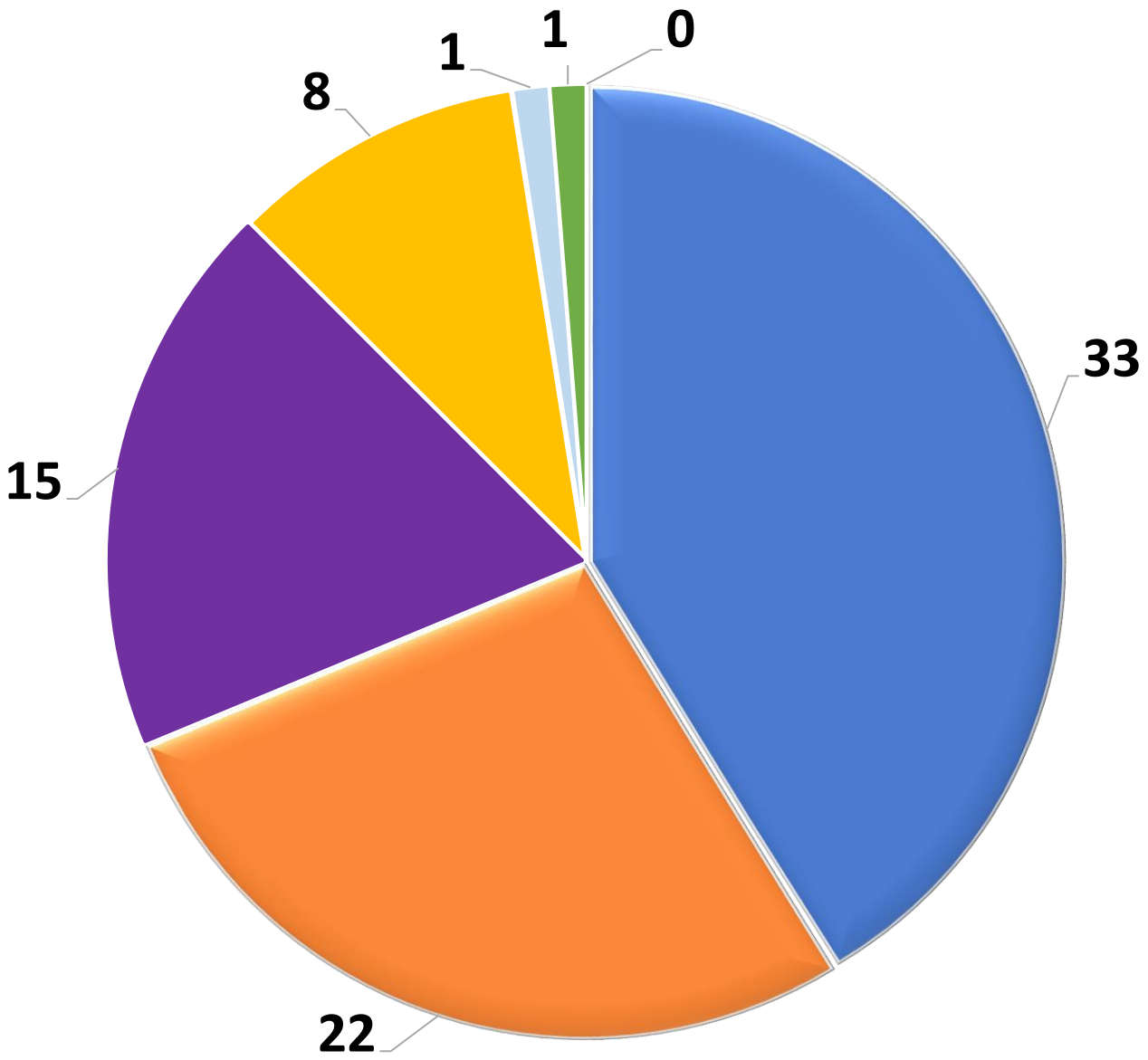
Ram to Ewe Ratio 1:35

Number of Progeny Called Per Sire – Ranch B



Number of Lambs Called Per Sire – Ranch C

80 Lambs submitted
80 (100%) w/identified sires



Top two most prolific breeders sired 69% of lambs submitted

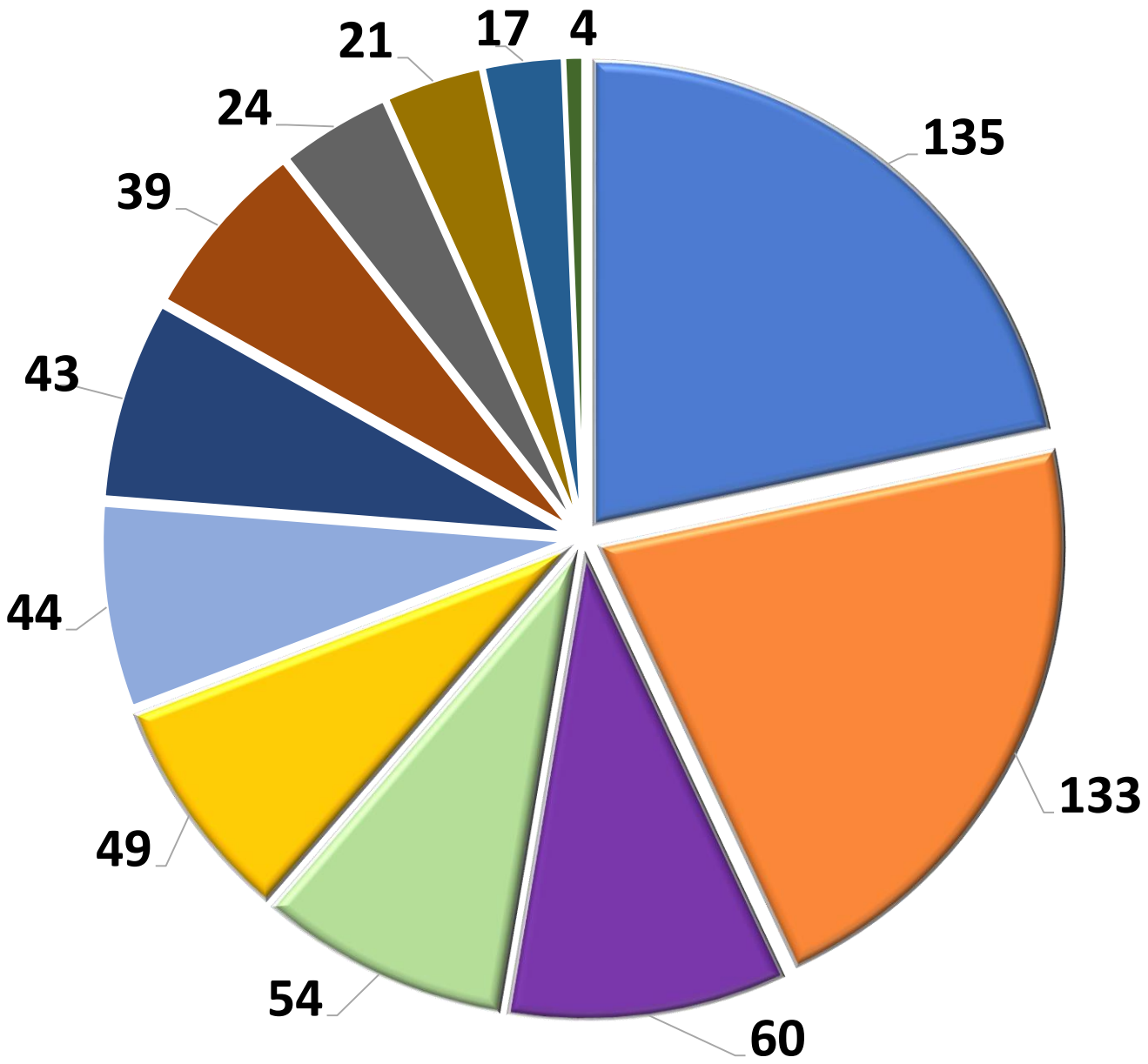
7 Possible Sires
6 Rams with identified progeny

Ram to Ewe Ratio
1:30-35

Number of Lambs Called Per Sire – Ranch D

642 lambs submitted
623 (97%) w/identified sires

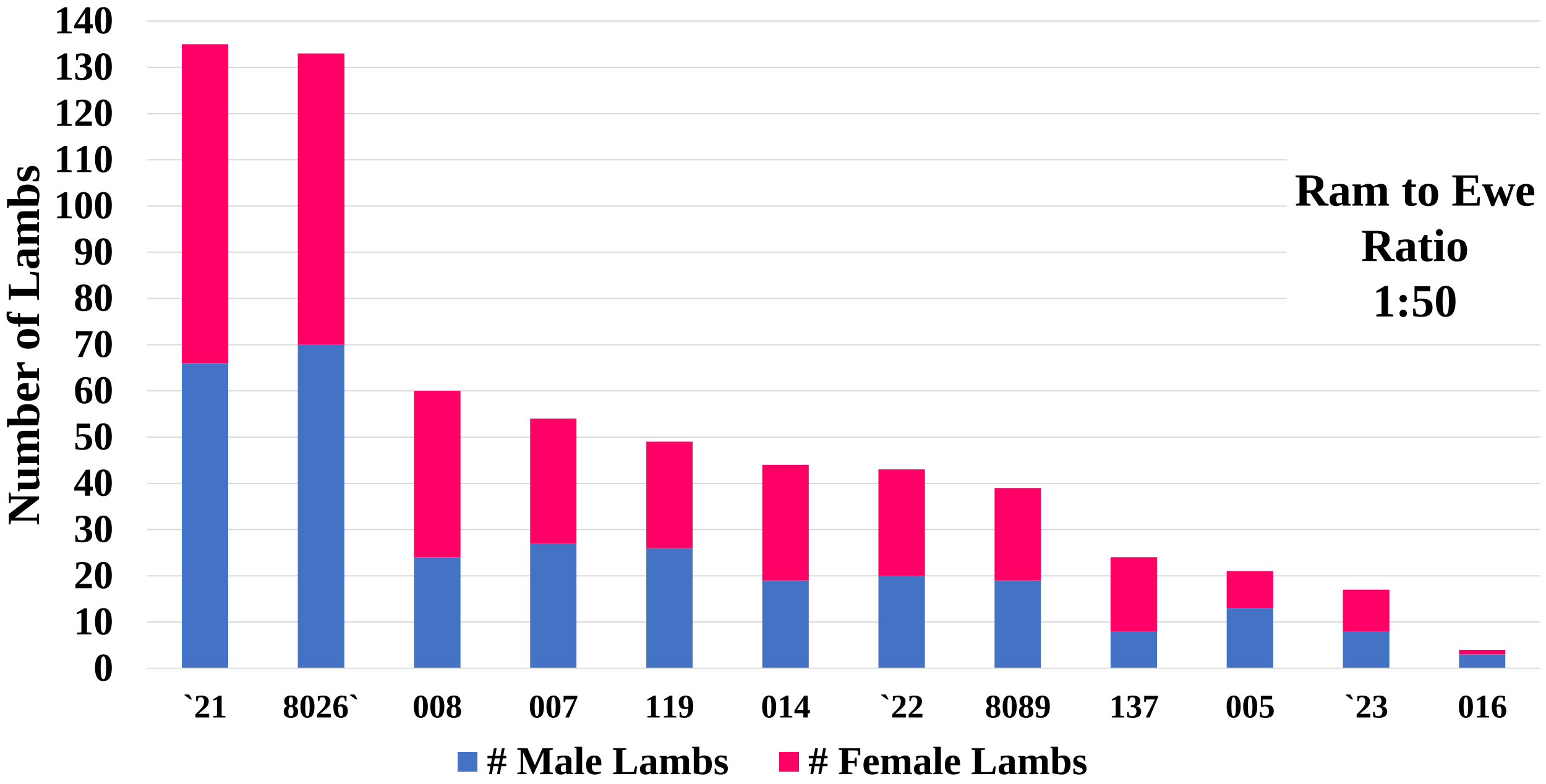
40 Potential Sires
12 Rams with identified progeny



Top five most prolific breeders sired 69% of lambs analyzed

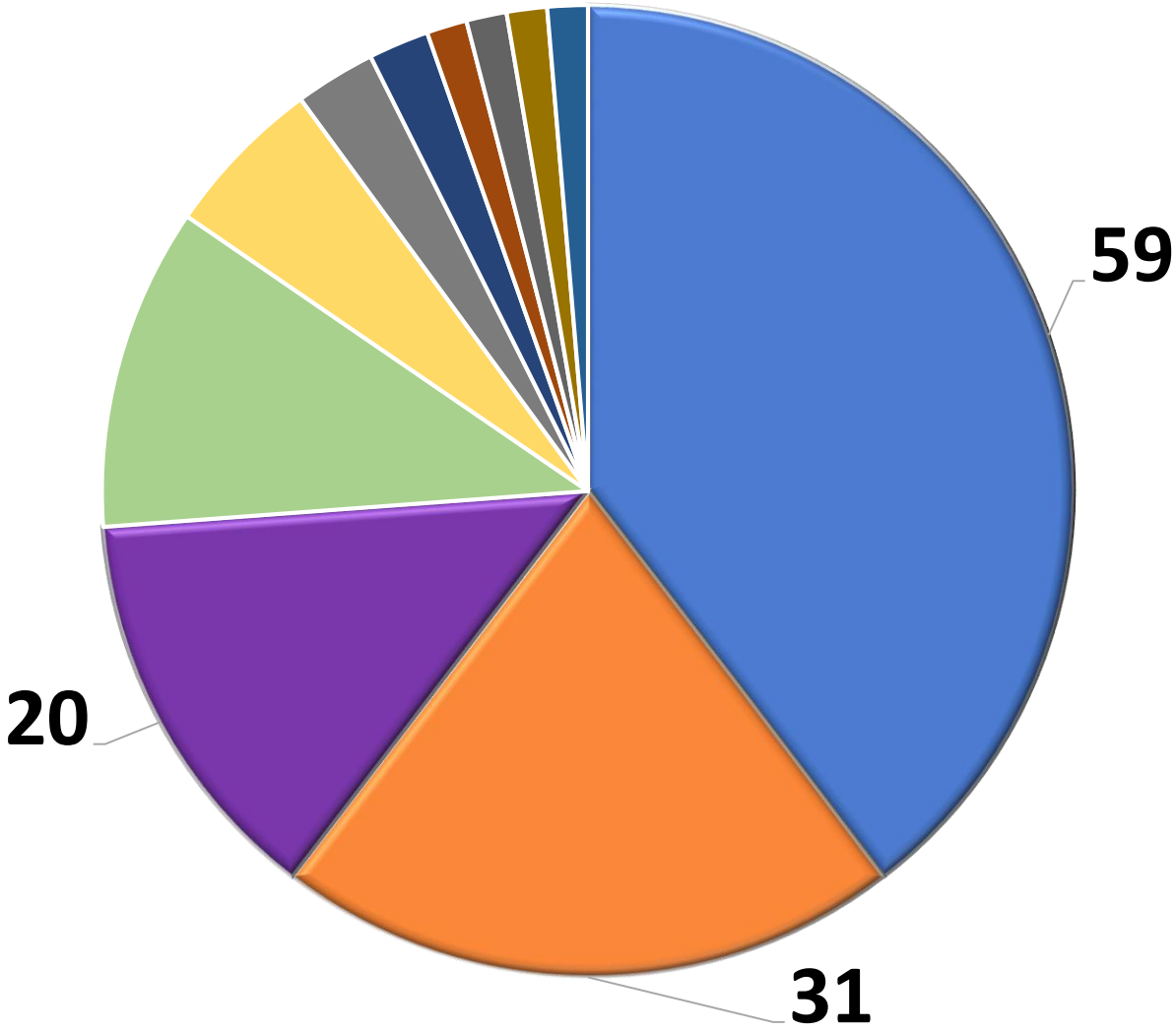
Ram to Ewe Ratio
1:50

Number of Progeny Called Per Sire – Ranch D



Number of Lambs Called Per Sire – Ranch E (Females Only)

222 ewe lambs submitted
149 (67%) w/identified sires

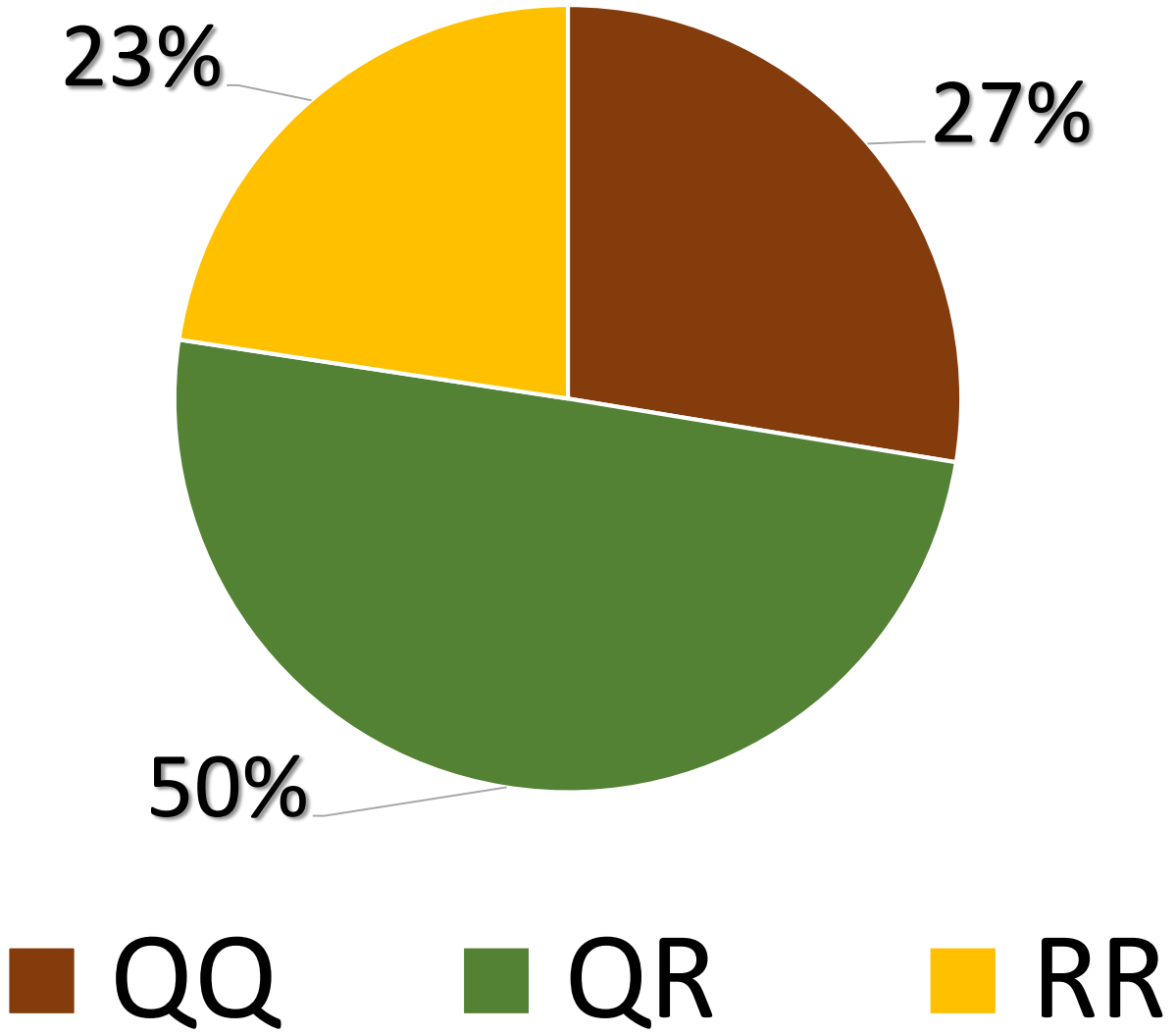


Top three most prolific breeders sired 74% of lambs analyzed

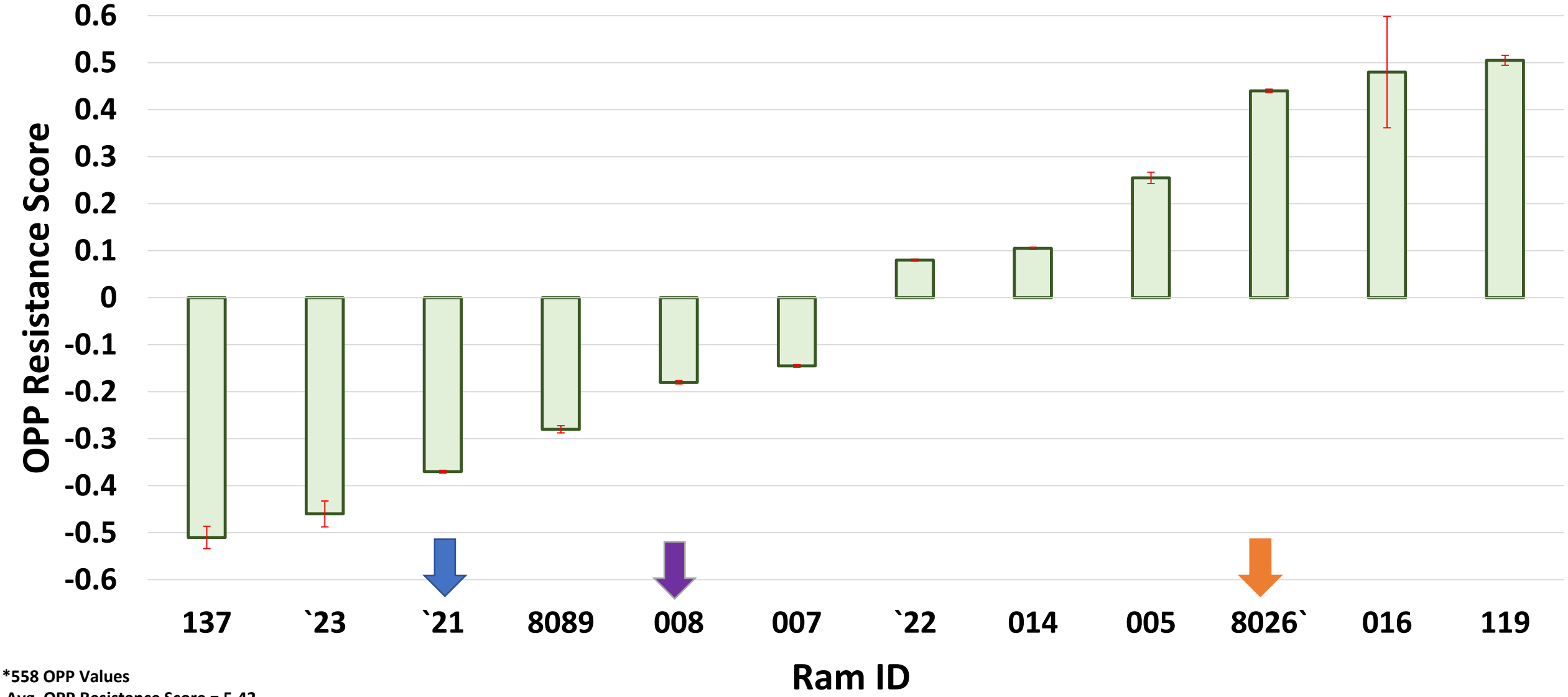
25 Possible Sires
11 Rams with identified progeny

Ram to Ewe Ratio
1:40

Scrapie Genotypes in Lambs Submitted – Ranch A



Difference in OPP Resistance among Sires` progeny – Ranch D



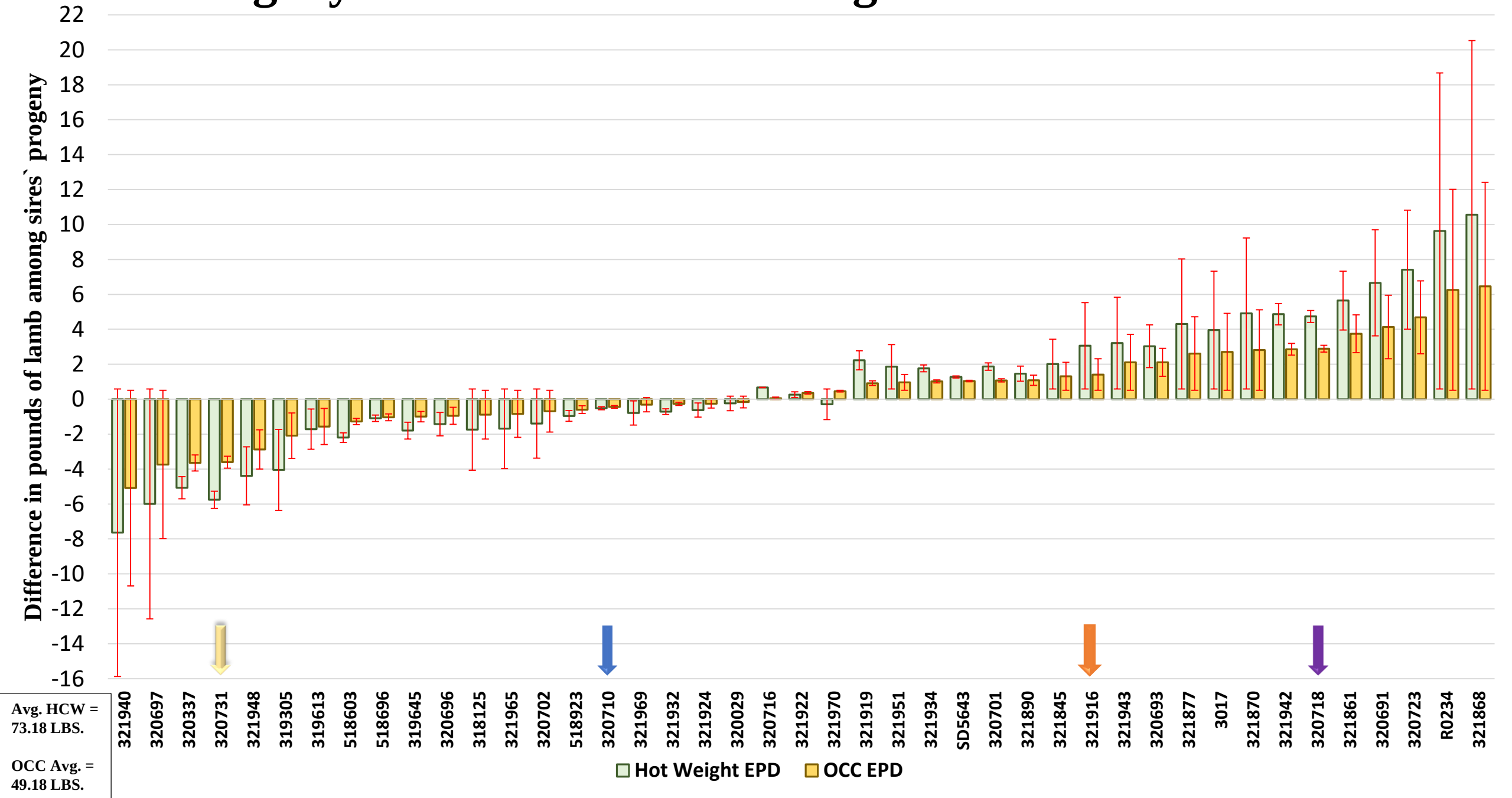
*558 OPP Values
Avg. OPP Resistance Score = 5.42

Carcass Measures

Ranch A: 209

Ranch B : 315 (21)

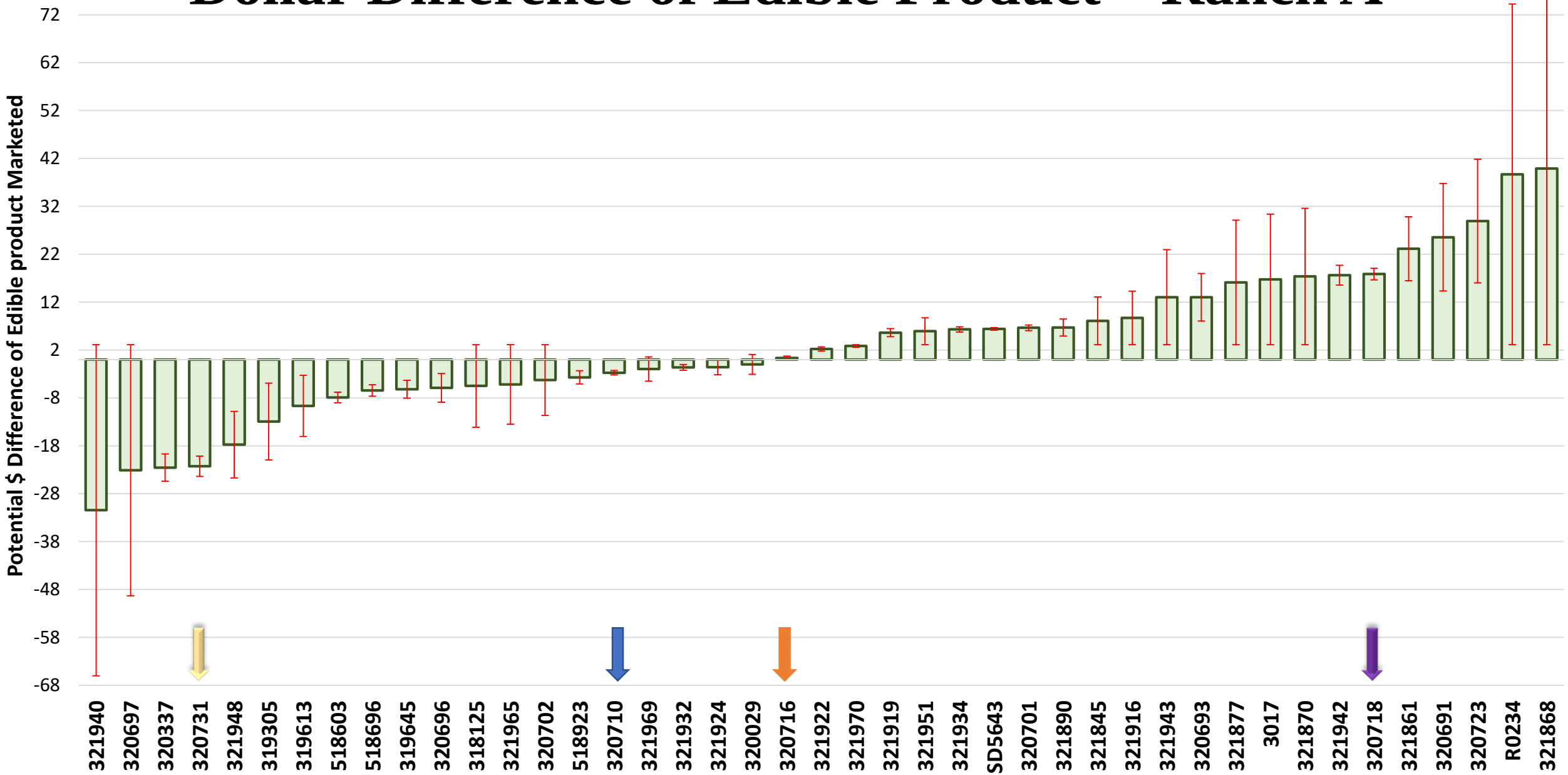
Progeny Differences in Hot Weight & OCC – Ranch A



Avg. HCW = 73.18 LBS.

OCC Avg. = 49.18 LBS.

Dollar Difference of Edible Product – Ranch A



*Based on Net Lamb Carcass Cutout Value, Wtd Avg, $/cwt. @ $607.43 (Week ending 12/3/21)
Price = + 49.1% change from last year (USDA Ag & Marketing Service, AMS)

Avg. = $/lb. 3.19

EID Cost Analysis

BEFORE EID'S

- Paper data sheets
- Three types of ear tags
- Hand enter data into Excel
- Tag loss rate ~ 3%
- Work lambs twice at weaning

AFTER EID'S

- Export data directly to Excel
- EID and Visual tag sold in tandem
- USDA Scrapie Eradication Program approved
- ~99% retention rate
- Reduce labor and cost
- Cost of reader

Genetic Selection

- Wanting to make change in your flock

- Know your starting point
  - Identify key production traits
  - Measure those traits

- Clearly define where you want to go
  - Track progress towards goals
  - Adapt as needed

Tracking Animal Performance

Focus on increasing pounds weaned/ewe (twinning)

% Lambs Weaned	90%	100%	110%	120%
Total costs	$525,000	$525,000	$525,000	$525,000
# Lambs Weaned	2,700	3,000	3,300	3,600
Avg lbs/lamb	105	105	105	105
Total lbs of lamb	283,500	315,000	346,500	378,000
$/pound	$1.52	$1.52	$1.52	$1.52
Lbs weaned/ewe	94.5	105	115.5	126
Gross Income	$430,920	$478,800	$526,680	$574,560
Net Income	-$94,080	-$46,200	**$1,680**	**$49,560**

Assumptions: 3,000 ewe base flock; labor cost/rates remain stable; $175 annual cost/ewe

Tracking Animal Performance

- Improved ability to:
  - Cull effectively
  - Increase flock efficiency
    - Increase pounds weaned per ewe
    - Reduce lamb grafting
    - Reduce $$ spent on animal health
- Individual Animal ID
  - Improves reliability of data
  - Facilitates animal disease traceability

What we learned…

- Observe differences between ranches
- Genetic testing in commercial flocks
- Scaling up EID use is a challenge
- We need an app for that, but…
- EID’s are well-suited to maternal flocks and seedstock flocks

References

- Weigel, K.A., P.M. VanRaden, H.D. Norman, and H. Grosu. 2017. A 100-year review: Methods and Impact of Genetic Selection in Dairy Cattle – From daughter-dam comparisons to deep learning algorithms. Journal of Dairy Science 100:10234-10250. https://doi.org/10.3168/jds.2017-12954
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THANK YOU!