The Brahman Project

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Origin of the Brahman Project

Objectives

Population Structure

Data and Tissue Sampling

Genetic and Genomic Evaluation

Culling, Mating, and Selection

Research and Expected Outcomes

Origin of the Brahman Project

Series of meetings at STARS in Brooksville at the end of 2009 and beginning of 2010

First Meeting: November 2009
Florida Producers
UF Faculty & Administrators
USDA-ARS Scientists & Administrators

Three Other Meetings: December 2009 to May 2010
USDA-ARS Scientists and UF Faculty
Texas A&M Faculty
NMSU, LSU, and USDA-MARC Scientists

First Meeting …

Brahman cattle widely used for crossbreeding in the Southern Region of the US

Brahman has excellent adaptability to tropical conditions and good growth and feed efficiency
Needed improvement in fertility and carcass and meat palatability

There was a need for a large scale research Brahman project involving producers and researchers
Target Traits: Reproduction, Growth, Feed Efficiency, and Carcass and Meat Palatability

The Other Three Meetings …

Technical Meetings

Objectives of the Brahman Project
Structure of the Population
Construction of the Brooksville Brahman Herd
Pedigree, Phenotypic, and Genotypic Data Collection
Tissue Sample Collection and Storage
Database Storage and Management
Genetic and Genomic Evaluation
Mating, Culling and Selection
Assessment of Genetic Change
Research Areas and Expected Outcomes

Origin of the Brahman Project

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Research and Expected Outcomes

Objectives

Develop a Brahman population with animals from multiple herds to conduct genetics and genomics evaluation and selection for reproduction, growth, feed efficiency, ultrasound, carcass and meat palatability traits

Construct a database with pedigree, genomic, and phenotypic data from all participating herds

Conduct genetic and genomic evaluation of animals for reproduction, growth, feed efficiency, ultrasound, and carcass and meat palatability traits using pedigree, genomic, and phenotypic information

Identify and disseminate genetics from animals with the best predicted genetic and genomic values for reproduction, growth, feed efficiency, and carcass and meat palatability traits

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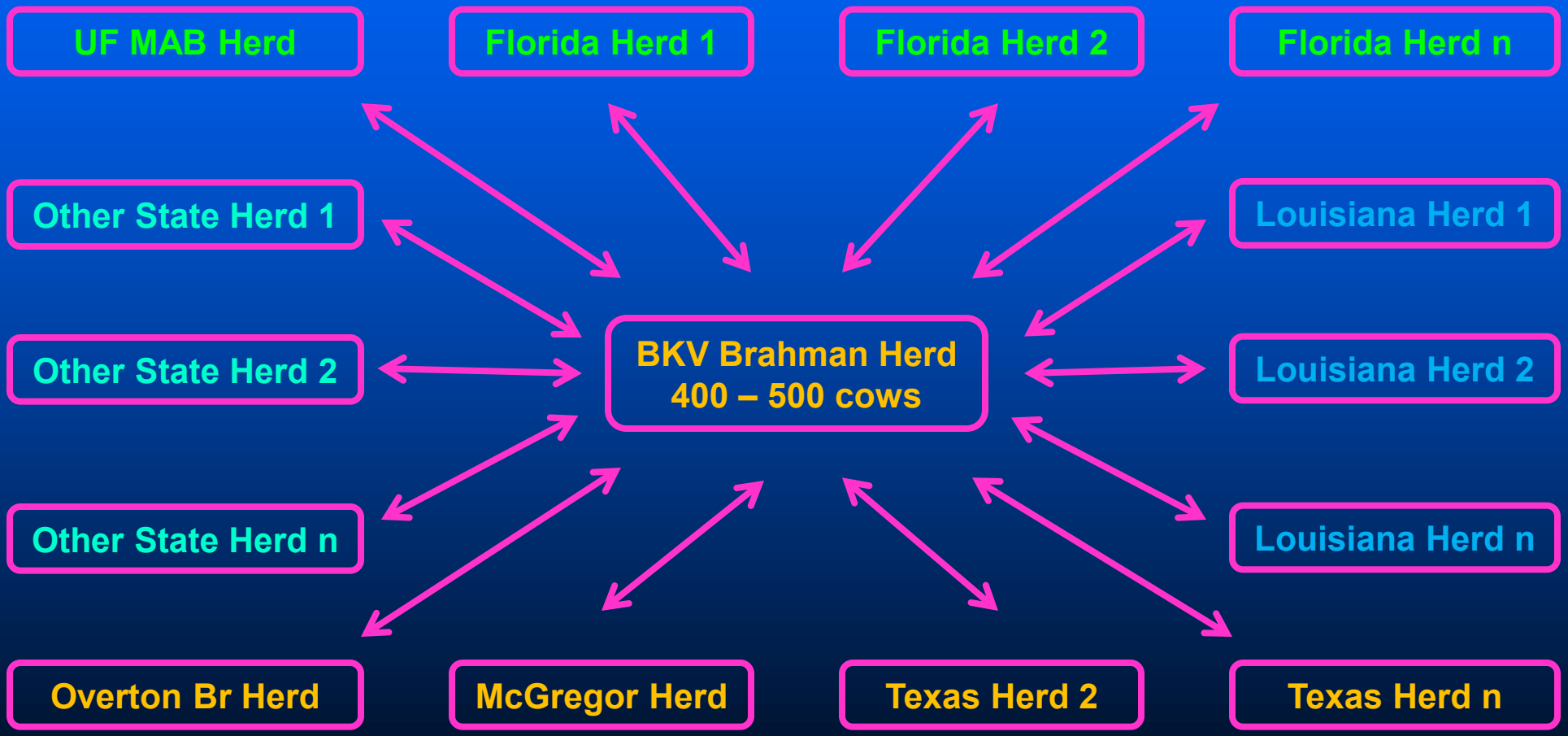
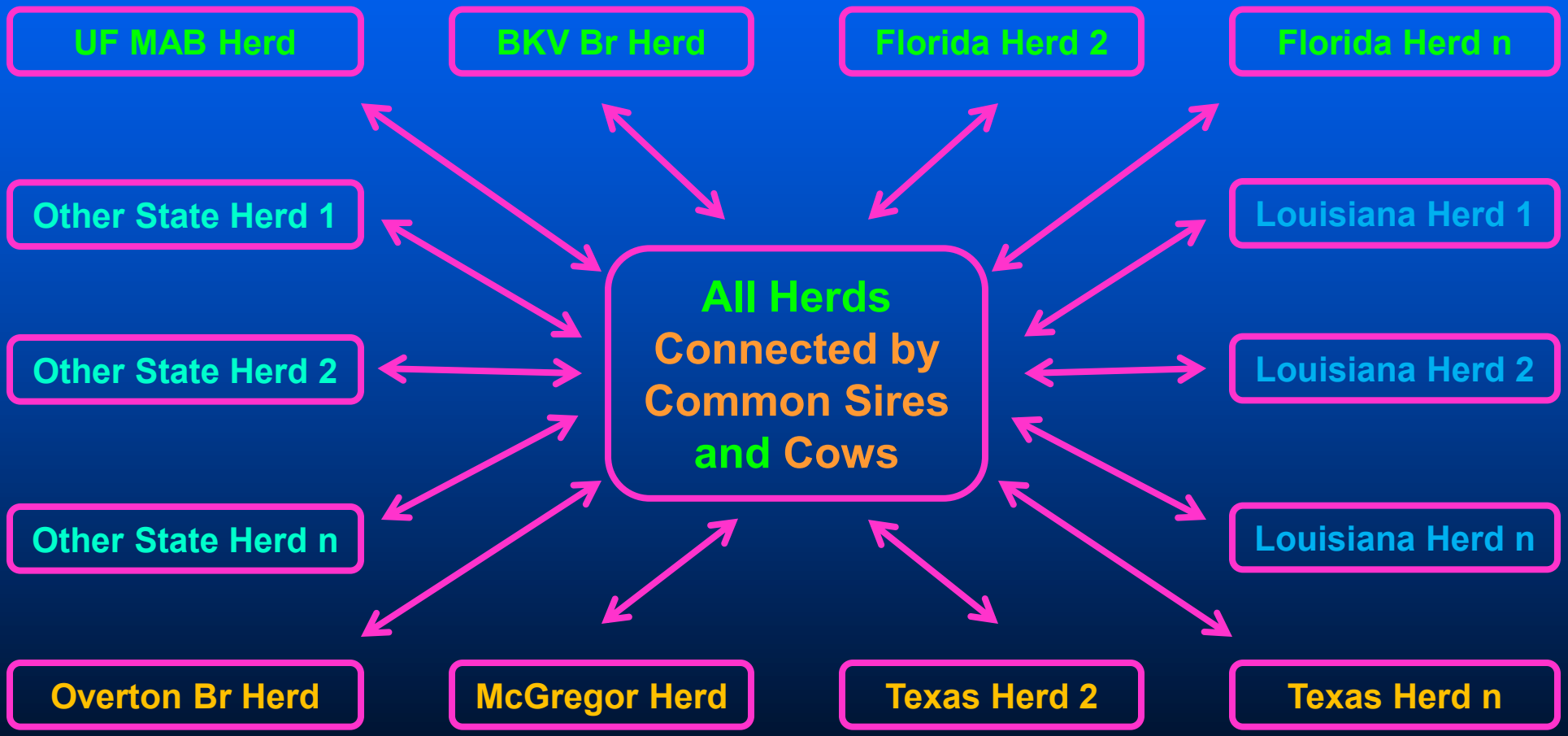
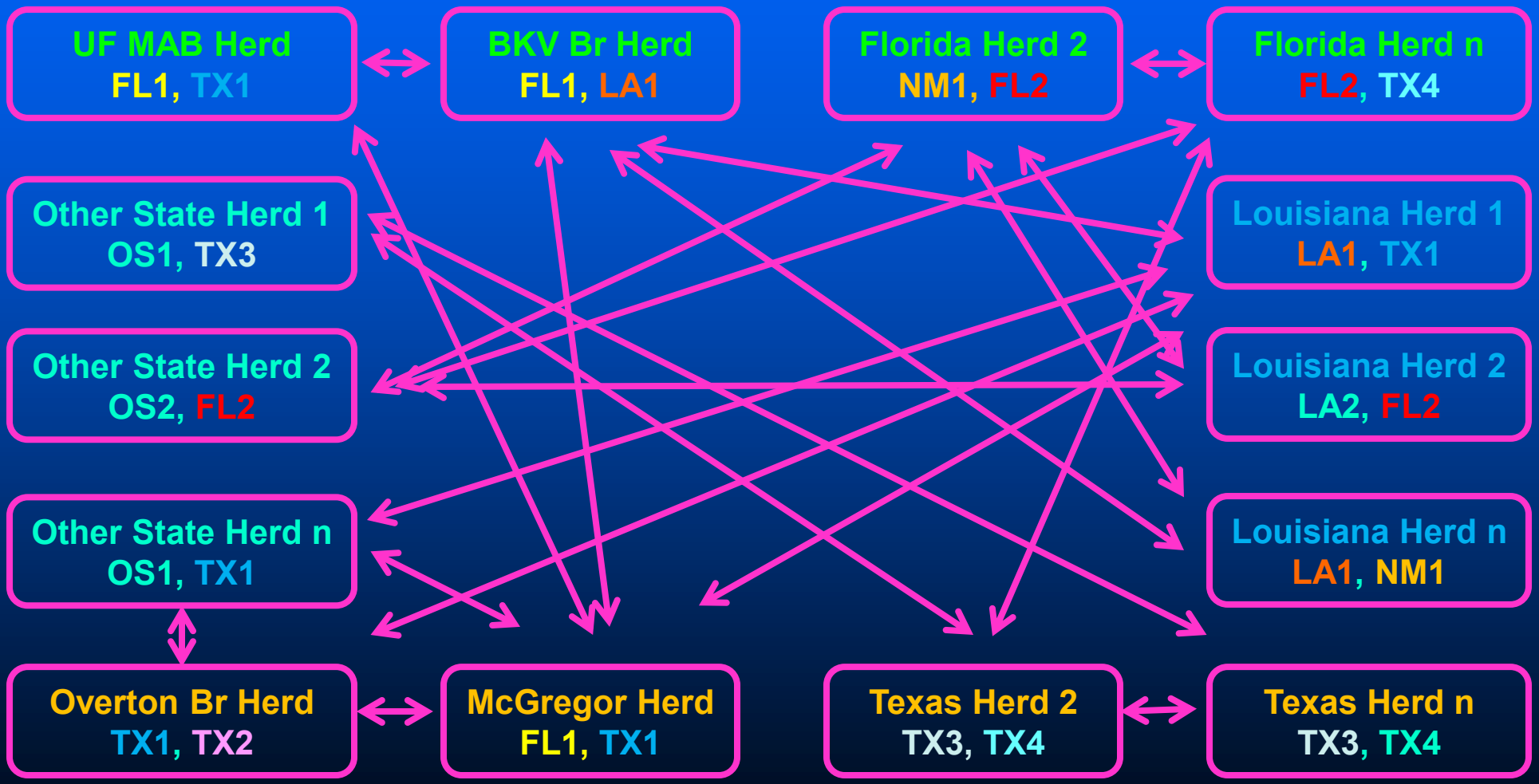
Initial Population Structure



Future Population Structure



Future Connectedness Among Herds



Sires Used in Brooksville for Embryo Transfer or In-Vitro Fertilization (2010 to 2013)

Year	Sire Reg #	Sire Name	Herd of Origin	State
2010	794506	REP SIR MANSO MANGUM 420	DOC PARTIN RANCH	FL
2010	306428	+BL LITTLE BOZO 1/8	BERCHMAN LAVERGNE	LA
2010	800995	JDH MR MANSO 236/3	J.D. HUDGINS-FORGASON DIV.	TX
2010	854694	MR TAES 6087	TEXAS A & M UNIVERSITY	TX
2010	863297	MR TAES 7145	TEXAS A & M UNIVERSITY	TX
2011	794506	REP SIR MANSO MANGUM 420	DOC PARTIN RANCH	FL
2011	804549	KCC SUTTON DUBO 135	KEMPFER CATTLE COMPANY	FL
2011	832506	KCC EMPEROR DUBO	KEMPFER CATTLE COMPANY	FL
2011	306428	+BL LITTLE BOZO 1/8	BERCHMAN LAVERGNE	LA
2011	877366	SCD DIDOR ESTO 623	D BAR RANCH	LA
2011	845544	NMSU 6X CLOVERDALE 5129	NEW MEXICO STATE UNIVERSITY	NM
2011	862754	NMSU GARRETT MANSO 7057	NEW MEXICO STATE UNIVERSITY	NM
2011	295806	JDH MULHIM EMP MANSO	J.D. HUDGINS-LOCKE DIV.	TX
2011	800995	JDH MR MANSO 236/3	J.D. HUDGINS-FORGASON DIV.	TX
2011	829894	MR TAES 3040	TEXAS A & M UNIVERSITY	TX
2011	851136	MSP SPECIAL RELOAD 945	PARTIN & PARTIN HEART BAR RANCH	TX
2011	863297	MR TAES 7145	TEXAS A & M UNIVERSITY	TX
2013	783104	REP IMPRA MANGUM 370	UF MULTIBREED HERD	FL
2013	804549	KCC SUTTON DUBO 135	KEMPFER CATTLE COMPANY	FL
2013	816797	REP WALTER MANSO	UF MULTIBREED HERD	FL
2013	778115	MR.SUNLAND 6X 874	NEW MEXICO STATE UNIVERSITY	NM
2013	845544	NMSU 6X CLOVERDALE 5129	NEW MEXICO STATE UNIVERSITY	NM
2013	862754	NMSU GARRETT MANSO 7057	NEW MEXICO STATE UNIVERSITY	NM
2013	871628	NMSU DUBO CHERRA 45/1	NEW MEXICO STATE UNIVERSITY	NM
2013	586630	EJL EMPER SUVILLE 176	DAVID HUSFELD-SANTERLAND RANCH LTD. CO	TX
2013	809856	MSP ESTO CHERRA 754	PARTIN & PARTIN HEART BAR RANCH	TX
2013	851136	MSP SPECIAL RELOAD 945	PARTIN & PARTIN HEART BAR RANCH	TX

Natural Service Sires Used in Brooksville from 2009 to 2012

Year	Sire Reg #	Sire Name	Herd of Origin	State
2009	857614	BB MR WEST BERCH 508	BARTHLE BROTHERS RANCH	FL
2009	842143	STARS 03-048	STARS	FL
2009	856461	TH BURMA BEN 182-04	TREASURE HAMMOCK RANCH	FL
2010	856461	TH BURMA BEN 182-04	TREASURE HAMMOCK RANCH	FL
2010	828050	JCC DAK Charley 109/1	DOUBLE C BAR RANCH	FL
2011	894378	STARS 09-212	STARS	FL
2011	863297	MR TAES 7145	TEXAS A & M UNIVERSITY	TX
2012	864628	KCC 272 OF 185-176	KEMPFER CATTLE COMPANY	FL
2012	863297	MR TAES 7145	TEXAS A & M UNIVERSITY	TX
2012	890628	MR. TAES 0107	TEXAS A & M UNIVERSITY	TX

[AI, ET, IVF] Sire Usage by State, Year, and Herd from 2010 to 2013

Years Used [AI,ET,IVF]	Sire Reg #	Name	Herd	State
2010, 2011	794506	REP SIR MANSO MANGUM 420	DOC PARTIN RANCH	FL
2011, 2013	804549	KCC SUTTON DUBO 135	KEMPFER CATTLE COMPANY	FL
2011	794506	REP SIR MANSO MANGUM 420	DOC PARTIN RANCH	FL
2011	832506	KCC EMPEROR DUBO	KEMPFER CATTLE COMPANY	FL
2013	783104	REP IMPRA MANGUM 370	UF MULTIBREED HERD	FL
2013	816797	REP WALTER MANSO	UF MULTIBREED HERD	FL
2010, 2011	306428	+BL LITTLE BOZO 1/8	BERCHMAN LAVERGNE	LA
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2011, 2013	845544	NMSU 6X CLOVERDALE 5129	NEW MEXICO STATE UNIVERSITY	NM
2011, 2013	862754	NMSU GARRETT MANSO 7057	NEW MEXICO STATE UNIVERSITY	NM
2013	778115	MR.SUNLAND 6X 874	NEW MEXICO STATE UNIVERSITY	NM
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2013	809856	MSP ESTO CHERRA 754	PARTIN & PARTIN HEART BAR RANCH	TX

[NS] Sire Usage by State, Year, and Herdfrom 2009 to 2012

Years Used [NS]	Sire Reg #	Name	Herd	State
2009, 2010	856461	TH BURMA BEN 182-04	TREASURE HAMMOCK RANCH	FL
2009	857614	BB MR WEST BERCH 508	BARTHLE BROTHERS RANCH	FL
2009	842143	STARS 03-048	STARS	FL
2010	828050	JCC DAK Charley 109/1	DOUBLE C BAR RANCH	FL
2011	894378	STARS 09-212	STARS	FL
2012	864628	KCC 272 OF 185-176	KEMPFER CATTLE COMPANY	FL
2011, 2012	863297	MR TAES 7145	TEXAS A & M UNIVERSITY	TX
2012	890628	MR. TAES 0107	TEXAS A & M UNIVERSITY	TX

Numbers of Brahman Females by Herd of Origin and Age

Herd of origin	Repro System	Cows	2-Year Olds	Yearlings	Calves	Total
Brooksville	NS	65	11	7	27	110
Texas AgriLife	NS	10				10
Barthle Bros Ranch	ET				4	4
Brooksville	ET			8	4	12
Doc Partin Ranch	ET			9	7	16
Kempfer Ranch	ET			2		2
Texas AgriLife	ET				12	12
Total		75	11	26	54	166

Number of Donor Brahman Cows Producing Heifers by Herd of Origin and Year of Mating[1]

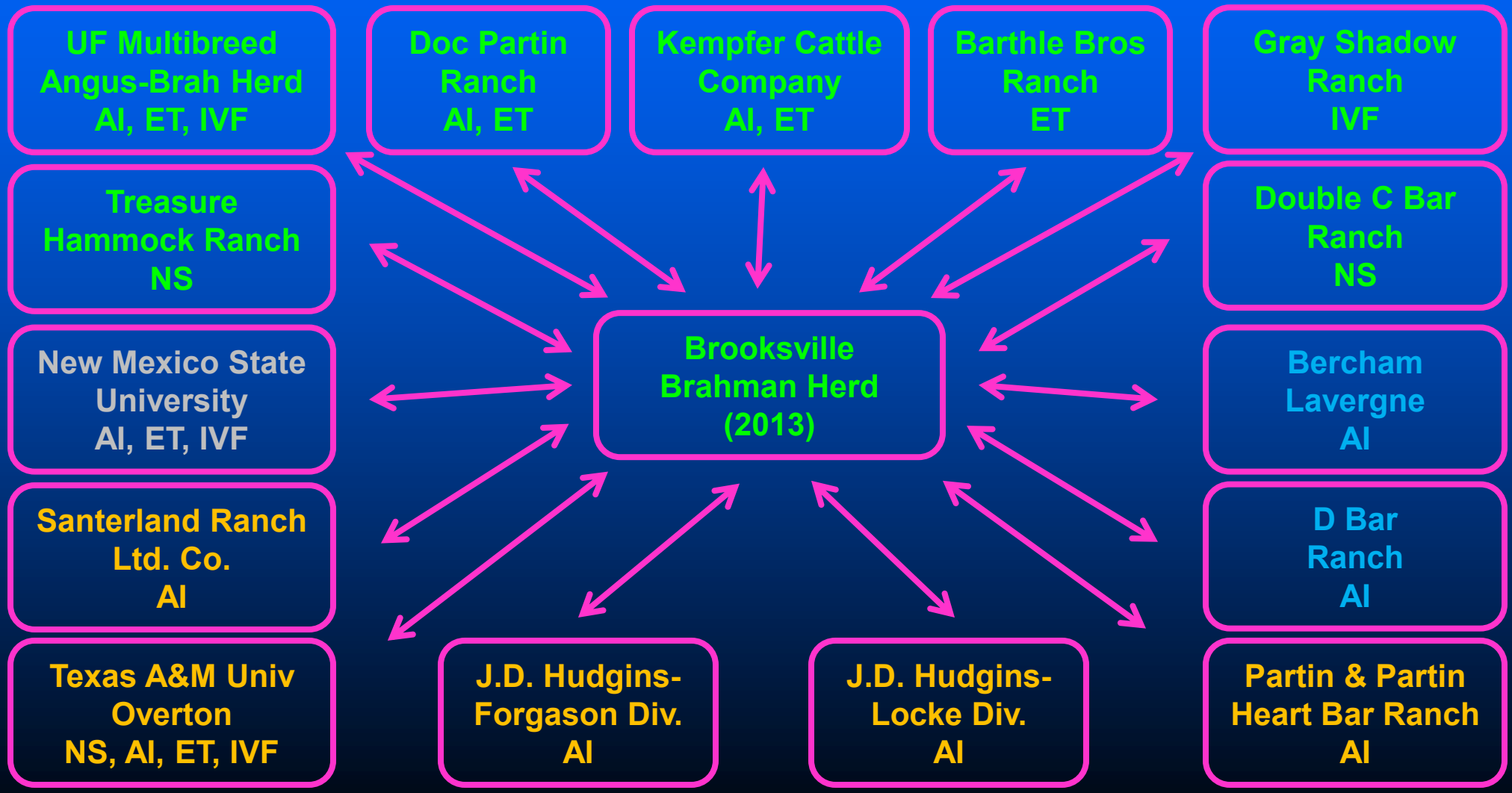
Herd of origin	2010	2011
Barthle Bros Ranch		3 (4)
Brooksville	3	2 (5)
Doc Partin Ranch	3	3 (4)
Kempfer Ranch	1	
Texas AgriLife		8 (9)
Gray Shadow Ranch		0 (3)
Total	7	16 (25)

[1]Total number of donor cows in parenthesis.

Natural Service Matings for 2012

	MR TAES 7145	MR TAES 0107	KCC 272 OF 185-176	Total
Heifers (Yearling)	0	26	0	26
Cows	38	12	36	86
Total	38	38	36	112

Connectedness Brooksville Herd and Cooperating Herds (2009-2013)

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Data Collection and Storage 1

Pedigree Data

Complete pedigree file with information on all animals (calves, sires, and dams) from all experimental and private herds in the population

Phenotypic Data 1

Reproduction: age at puberty, calving interval

Growth: calf weights at birth, pre-weaning, weaning, yearling, post-yearling; cow weights, condition scores

Data Collection and Storage 2

Phenotypic Data 2

Feed Efficiency: postweaning weights, feed intake, water intake, residual feed intake, feed conversion ratio

Temperament: pen score, exit velocity

Ultrasound: ribeye area, intramuscular fat, backfat

Phenotypic Data 3

Carcass: carcass weight, dressing percent, ribeye area, marbling, backfat thickness

Meat Palatability: shear force, tenderness, connective tissue, juiciness, flavor, off-flavor

Where and What Data?

Brooksville Brahman Herd
Multibreed Angus-Brahman Herd
Contributing Experiment Stations (TX, LA)
Private Herds

All Herds: phenotypes that are part of herd management (e.g., calving dates, calf and cow weights)

Some Herds (Funding Permitting): feed efficiency, carcass, and meat palatability traits

Realistic Objective
Collect as much data as feasible at each location

UF Feed Efficiency Facility

NFREC GrowSafe FE Facility, Marianna, FL
AdjPeriod: 21 d; Trial: 70 d
Pens: 24; Calves/pen: 14 - 16

Intake: Feed, Water (Real time)
Growth: Dates, weights, Hip Ht (2 wk)
Temperament: Chute Score, Exit Vel (2 wk)
Ultrasound: UREA, UIMF, UBF


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Tissue Collection and Storage

Sires
Semen (4 straws) or Blood (10cc)

Dams and Calves
Blood (10cc)

DNA from tissue samples would be maintained in a repository for long-term storage and retrieval
UF Interdisciplinary Center for Biotechnology (ICBR)
Other suitable site

Genomic Analysis of Tissue Samples

Provided that funding is available

DNA samples will be analyzed using available commercial genotyping chips
Illumina 50K, HD (770K), and LD (7K)
GeneSeek
UF ICBR

Genotypic data would be added to the pedigree and phenotypic data to conduct genetic and genomic evaluation of animals in the Brahman population

Illumina BovineSNP50 v2 BeadChip

Number of Markers	54,609
Samples per BeadChip	24
DNA Requirement	200ng
Assay	GoldgenGate
Instrument	iScan or HiScanSQ

http://www.illumina.com/products/bovine_snp50_whole-genome_genotyping_kits.ilmn

Illumina BovineSNPHD BeadChip

Number of Markers	777,962
Samples per BeadChip	8
DNA Requirement	200ng
Assay	Infinium HD
Instrument	iScan or HiScanSQ

http://www.illumina.com/products/bovinehd_whole-genome_genotyping_kits.ilmn

Illumina BovineLD BeadChip

Number of Markers	6,909
Samples per BeadChip	24
DNA Requirement	200ng at 50 ng/ul
Assay	Infinium HD Ultra
Instrument	iScan, HiScanSQ, or BeadArray Reader

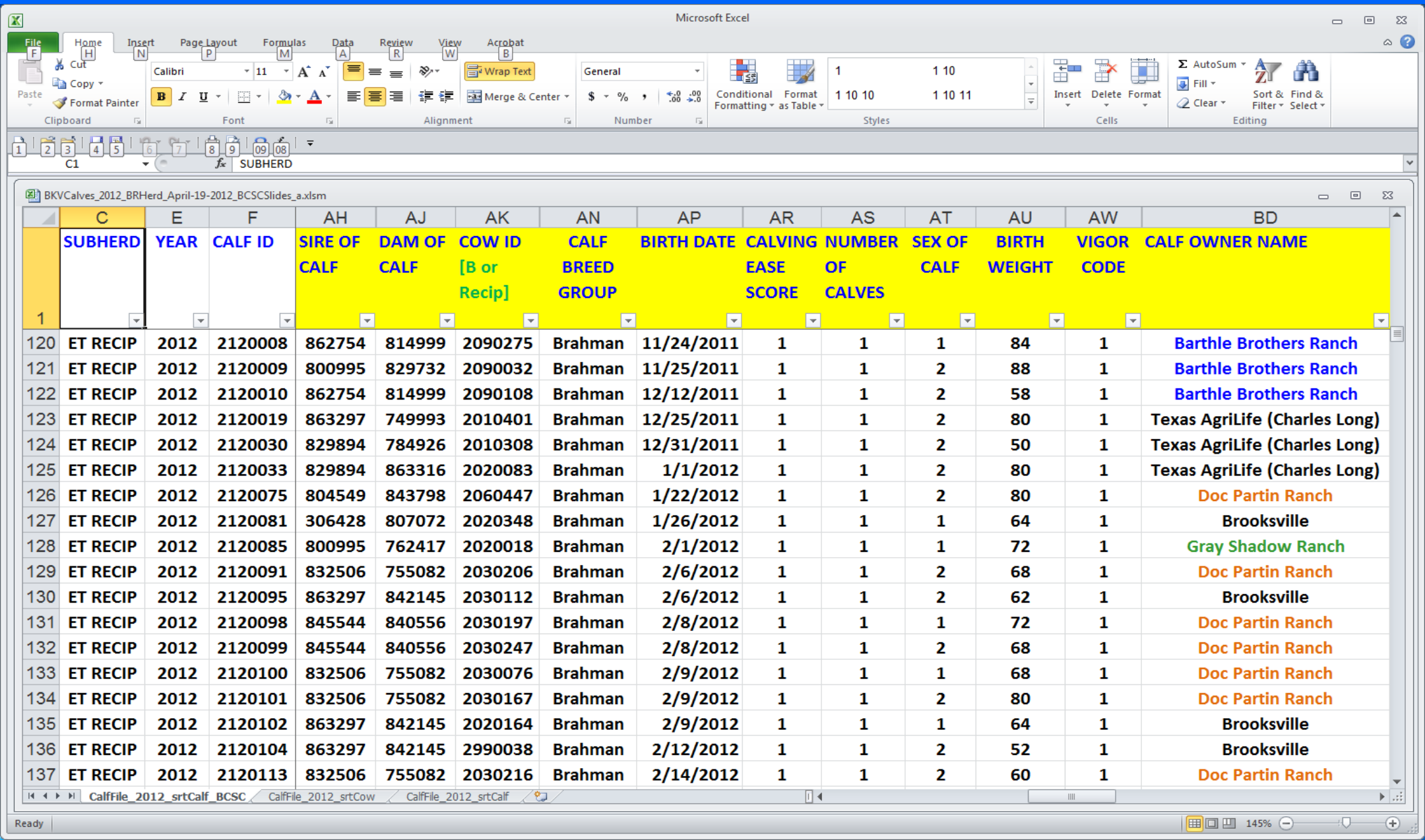
http://www.illumina.com/documents/products/product_information_sheets/product_info_bovineLD.pdf

Data Storage and Processing

Flexible Database Structure
Initially: Spreadsheet files (Excel)
Subsequently: Database program and dedicated computer programs for editing, storage, and retrieval

Later on …
Homepage: Producer could enter and manage data from individual herds
Computer Technician: Needed for programming, database entry and maintenance, and data analysis

Calf File 2012: ET Birth Data



Microsoft Excel

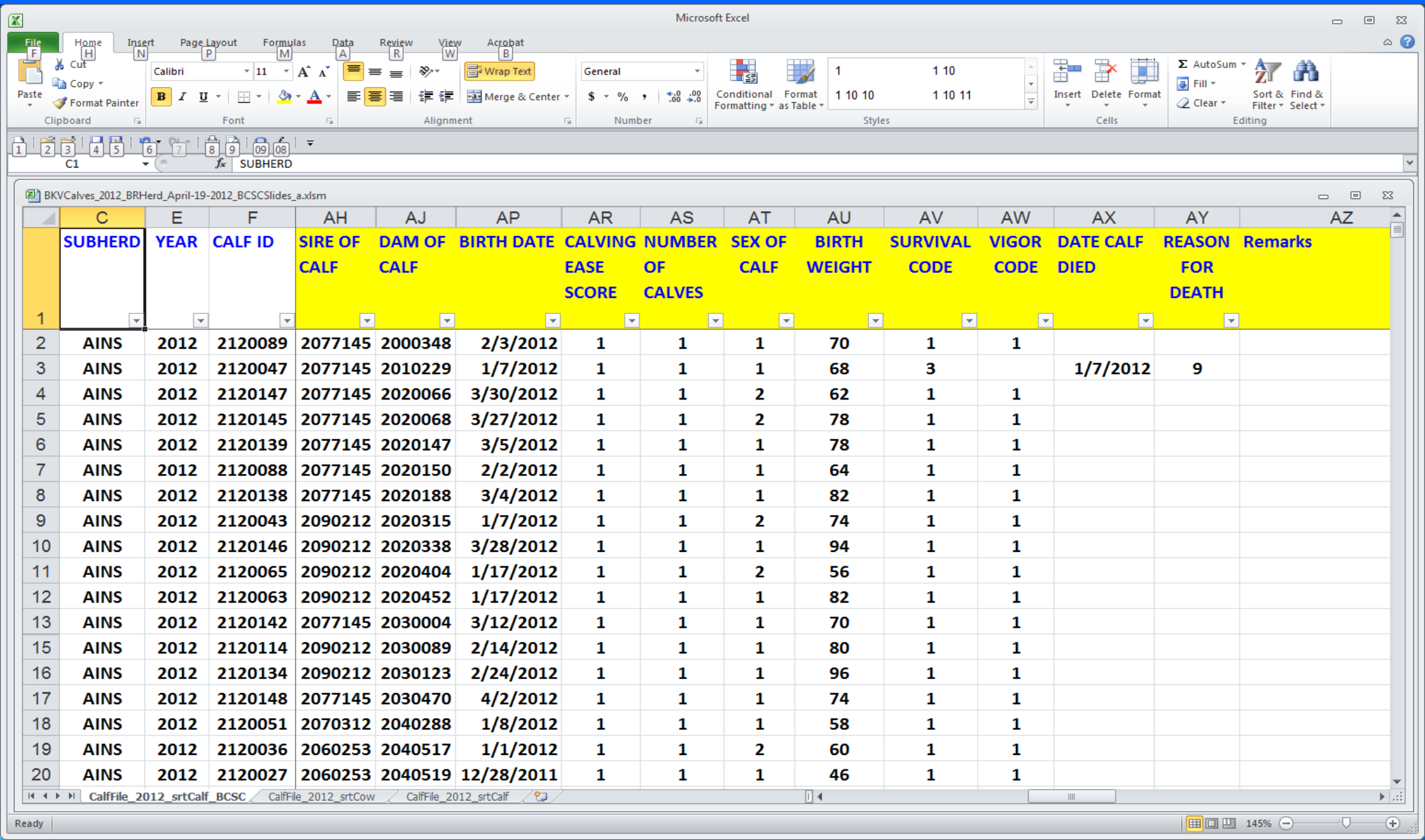
BKVCalves_2012_BRHerd_April-19-2012_BCSCSlides_a.xlsm

	C	E	F	AH	AJ	AK	AN	AP	AR	AS	AT	AU	AW	BD
1	SUBHERD	YEAR	CALF ID	SIRE OF CALF	DAM OF CALF	COW ID [B or Recip]	CALF BREED GROUP	BIRTH DATE	CALVING EASE SCORE	NUMBER OF CALVES	SEX OF CALF	BIRTH WEIGHT	VIGOR CODE	CALF OWNER NAME
120	ET RECIP	2012	2120008	862754	814999	2090275	Brahman	11/24/2011	1	1	1	84	1	Barthle Brothers Ranch
121	ET RECIP	2012	2120009	800995	829732	2090032	Brahman	11/25/2011	1	1	2	88	1	Barthle Brothers Ranch
122	ET RECIP	2012	2120010	862754	814999	2090108	Brahman	12/12/2011	1	1	2	58	1	Barthle Brothers Ranch
123	ET RECIP	2012	2120019	863297	749993	2010401	Brahman	12/25/2011	1	1	2	80	1	Texas AgriLife (Charles Long)
124	ET RECIP	2012	2120030	829894	784926	2010308	Brahman	12/31/2011	1	1	2	50	1	Texas AgriLife (Charles Long)
125	ET RECIP	2012	2120033	829894	863316	2020083	Brahman	1/1/2012	1	1	2	80	1	Texas AgriLife (Charles Long)
126	ET RECIP	2012	2120075	804549	843798	2060447	Brahman	1/22/2012	1	1	2	80	1	Doc Partin Ranch
127	ET RECIP	2012	2120081	306428	807072	2020348	Brahman	1/26/2012	1	1	1	64	1	Brooksville
128	ET RECIP	2012	2120085	800995	762417	2020018	Brahman	2/1/2012	1	1	1	72	1	Gray Shadow Ranch
129	ET RECIP	2012	2120091	832506	755082	2030206	Brahman	2/6/2012	1	1	2	68	1	Doc Partin Ranch
130	ET RECIP	2012	2120095	863297	842145	2030112	Brahman	2/6/2012	1	1	2	62	1	Brooksville
131	ET RECIP	2012	2120098	845544	840556	2030197	Brahman	2/8/2012	1	1	1	72	1	Doc Partin Ranch
132	ET RECIP	2012	2120099	845544	840556	2030247	Brahman	2/8/2012	1	1	2	68	1	Doc Partin Ranch
133	ET RECIP	2012	2120100	832506	755082	2030076	Brahman	2/9/2012	1	1	1	68	1	Doc Partin Ranch
134	ET RECIP	2012	2120101	832506	755082	2030167	Brahman	2/9/2012	1	1	2	80	1	Doc Partin Ranch
135	ET RECIP	2012	2120102	863297	842145	2020164	Brahman	2/9/2012	1	1	1	64	1	Brooksville
136	ET RECIP	2012	2120104	863297	842145	2990038	Brahman	2/12/2012	1	1	2	52	1	Brooksville
137	ET RECIP	2012	2120113	832506	755082	2030216	Brahman	2/14/2012	1	1	2	60	1	Doc Partin Ranch

CalfFile_2012_srtCalf_BCSC | CalfFile_2012_srtCow | CalfFile_2012_srtCalf

Ready

Calf File 2012: NS Birth Data



Microsoft Excel

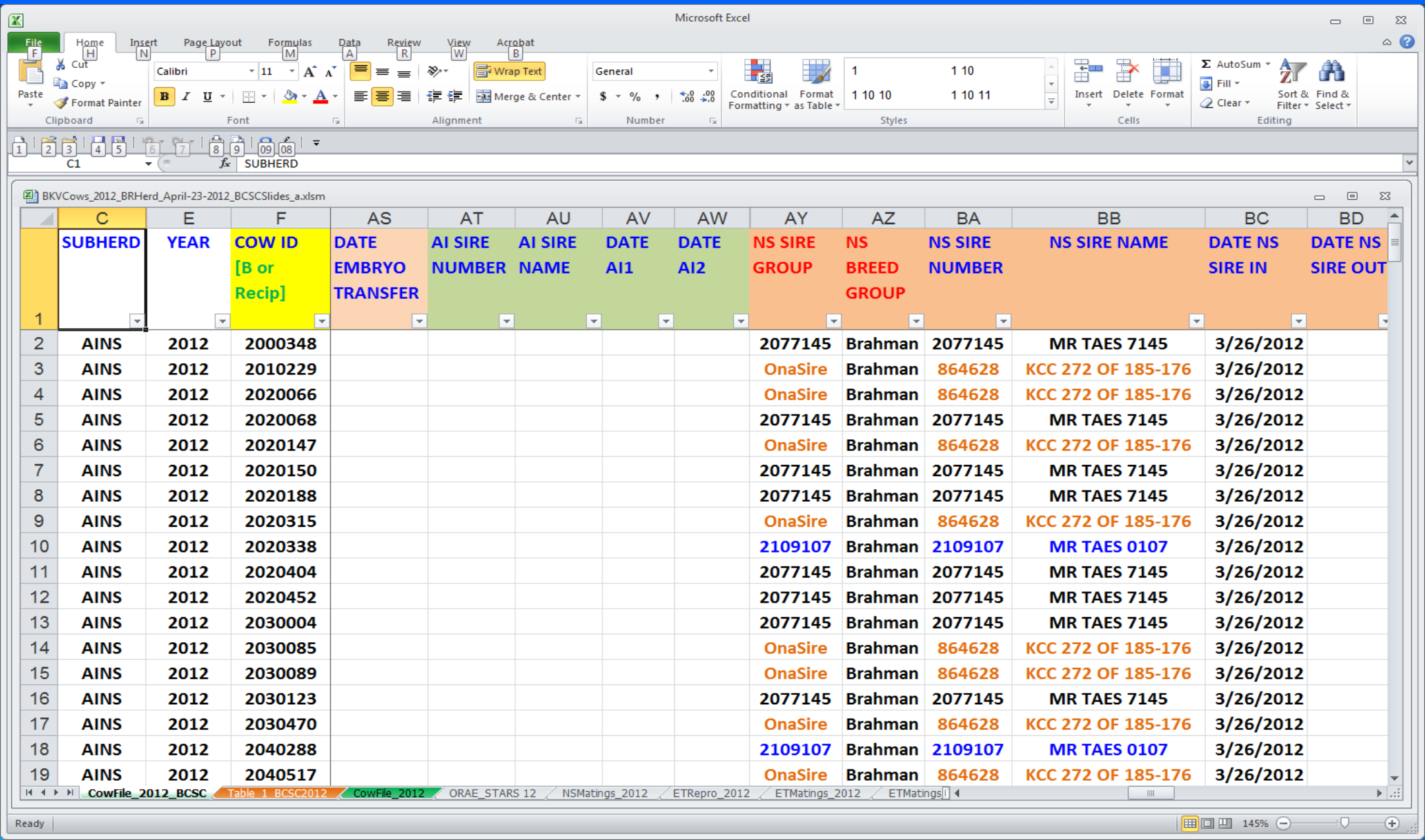
BKVCalves_2012_BRHerd_April-19-2012_BCSCSlides_a.xlsm

	C	E	F	AH	AJ	AP	AR	AS	AT	AU	AV	AW	AX	AY	AZ
1	SUBHERD	YEAR	CALF ID	SIRE OF CALF	DAM OF CALF	BIRTH DATE	CALVING EASE SCORE	NUMBER OF CALVES	SEX OF CALF	BIRTH WEIGHT	SURVIVAL CODE	VIGOR CODE	DATE CALF DIED	REASON FOR DEATH	Remarks
2	AINS	2012	2120089	2077145	2000348	2/3/2012	1	1	1	70	1	1			
3	AINS	2012	2120047	2077145	2010229	1/7/2012	1	1	1	68	3		1/7/2012	9	
4	AINS	2012	2120147	2077145	2020066	3/30/2012	1	1	2	62	1	1			
5	AINS	2012	2120145	2077145	2020068	3/27/2012	1	1	2	78	1	1			
6	AINS	2012	2120139	2077145	2020147	3/5/2012	1	1	1	78	1	1			
7	AINS	2012	2120088	2077145	2020150	2/2/2012	1	1	1	64	1	1			
8	AINS	2012	2120138	2077145	2020188	3/4/2012	1	1	1	82	1	1			
9	AINS	2012	2120043	2090212	2020315	1/7/2012	1	1	2	74	1	1			
10	AINS	2012	2120146	2090212	2020338	3/28/2012	1	1	1	94	1	1			
11	AINS	2012	2120065	2090212	2020404	1/17/2012	1	1	2	56	1	1			
12	AINS	2012	2120063	2090212	2020452	1/17/2012	1	1	1	82	1	1			
13	AINS	2012	2120142	2077145	2030004	3/12/2012	1	1	1	70	1	1			
15	AINS	2012	2120114	2090212	2030089	2/14/2012	1	1	1	80	1	1			
16	AINS	2012	2120134	2090212	2030123	2/24/2012	1	1	1	96	1	1			
17	AINS	2012	2120148	2077145	2030470	4/2/2012	1	1	1	74	1	1			
18	AINS	2012	2120051	2070312	2040288	1/8/2012	1	1	1	58	1	1			
19	AINS	2012	2120036	2060253	2040517	1/1/2012	1	1	2	60	1	1			
20	AINS	2012	2120027	2060253	2040519	12/28/2011	1	1	1	46	1	1			

CalfFile_2012_srtCalf_BCSC | CalfFile_2012_srtCow | CalfFile_2012_srtCalf

Ready

Cow File 2012: NS Mating Data



Microsoft Excel

BKVCows_2012_BRHerd_April-23-2012_BCSCSlides_a.xlsm

	C	E	F	AS	AT	AU	AV	AW	AY	AZ	BA	BB	BC	BD
1	SUBHERD	YEAR	COW ID [B or Recip]	DATE EMBRYO TRANSFER	AI SIRE NUMBER	AI SIRE NAME	DATE AI1	DATE AI2	NS SIRE GROUP	NS BREED GROUP	NS SIRE NUMBER	NS SIRE NAME	DATE NS SIRE IN	DATE NS SIRE OUT
2	AINS	2012	2000348						2077145	Brahman	2077145	MR TAES 7145	3/26/2012	
3	AINS	2012	2010229						OnaSire	Brahman	864628	KCC 272 OF 185-176	3/26/2012	
4	AINS	2012	2020066						OnaSire	Brahman	864628	KCC 272 OF 185-176	3/26/2012	
5	AINS	2012	2020068						2077145	Brahman	2077145	MR TAES 7145	3/26/2012	
6	AINS	2012	2020147						OnaSire	Brahman	864628	KCC 272 OF 185-176	3/26/2012	
7	AINS	2012	2020150						2077145	Brahman	2077145	MR TAES 7145	3/26/2012	
8	AINS	2012	2020188						2077145	Brahman	2077145	MR TAES 7145	3/26/2012	
9	AINS	2012	2020315						OnaSire	Brahman	864628	KCC 272 OF 185-176	3/26/2012	
10	AINS	2012	2020338						2109107	Brahman	2109107	MR TAES 0107	3/26/2012	
11	AINS	2012	2020404						2077145	Brahman	2077145	MR TAES 7145	3/26/2012	
12	AINS	2012	2020452						2077145	Brahman	2077145	MR TAES 7145	3/26/2012	
13	AINS	2012	2030004						2077145	Brahman	2077145	MR TAES 7145	3/26/2012	
14	AINS	2012	2030085						OnaSire	Brahman	864628	KCC 272 OF 185-176	3/26/2012	
15	AINS	2012	2030089						OnaSire	Brahman	864628	KCC 272 OF 185-176	3/26/2012	
16	AINS	2012	2030123						2077145	Brahman	2077145	MR TAES 7145	3/26/2012	
17	AINS	2012	2030470						OnaSire	Brahman	864628	KCC 272 OF 185-176	3/26/2012	
18	AINS	2012	2040288						2109107	Brahman	2109107	MR TAES 0107	3/26/2012	
19	AINS	2012	2040517						OnaSire	Brahman	864628	KCC 272 OF 185-176	3/26/2012	

CowFile_2012_BCSC | Table_1_BCSC2012 | CowFile_2012 | ORAE_STARS 12 | NSMatings_2012 | ETRepro_2012 | ETMatings_2012 | ETMatings

Ready

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Culling, Mating, and Selection

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Genetic and Genomic Evaluation

Data

Pedigree, Phenotypes, Genotypes

Models

Genomic-Polygenic: Pedigree, Phenotypes, and Genotypes

Polygenic: Pedigree and Phenotypes

Genomic: Phenotypes and Genotypes

Genomic-Polygenic Model
Multibreed

RFI, FCR, DFI, PWG
=
year-reprogroup-pen
+ age of dam + sex of calf + age calf
+ breed fraction calf + heterozygosity calf
+ additive animal polygenic
+ additive SNP genomic
+ residual

Genomic Model
Multibreed

RFI, FCR, DFI, PWG
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Polygenic Model
Multibreed

RFI, FCR, DFI, PWG

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+ age of dam + sex of calf + age calf

+ breed fraction calf + heterozygosity calf

+ additive animal polygenic

+ residual

Genomic-Polygenic Predictions
Multibreed

Prediction = Breed Solution + Genomic Prediction + Polygenic Prediction

EBV_{animal} = Prob (Alleles Other Breeds) *(Angus° - Brahman°)

+ Sum [(# "Alleles 2" at locus i) * ($_i$)], i = 1 to NSNP

+ $_{animal}$

Genomic Predictions
Multibreed

Prediction = Breed Solution + Genomic Prediction

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Polygenic Predictions
Multibreed

Prediction = Breed Solution + Polygenic Prediction

EBV_{animal} = Prob (Alleles Other Breeds) *(Angus° - Brahman°)

+ $_{animal}$

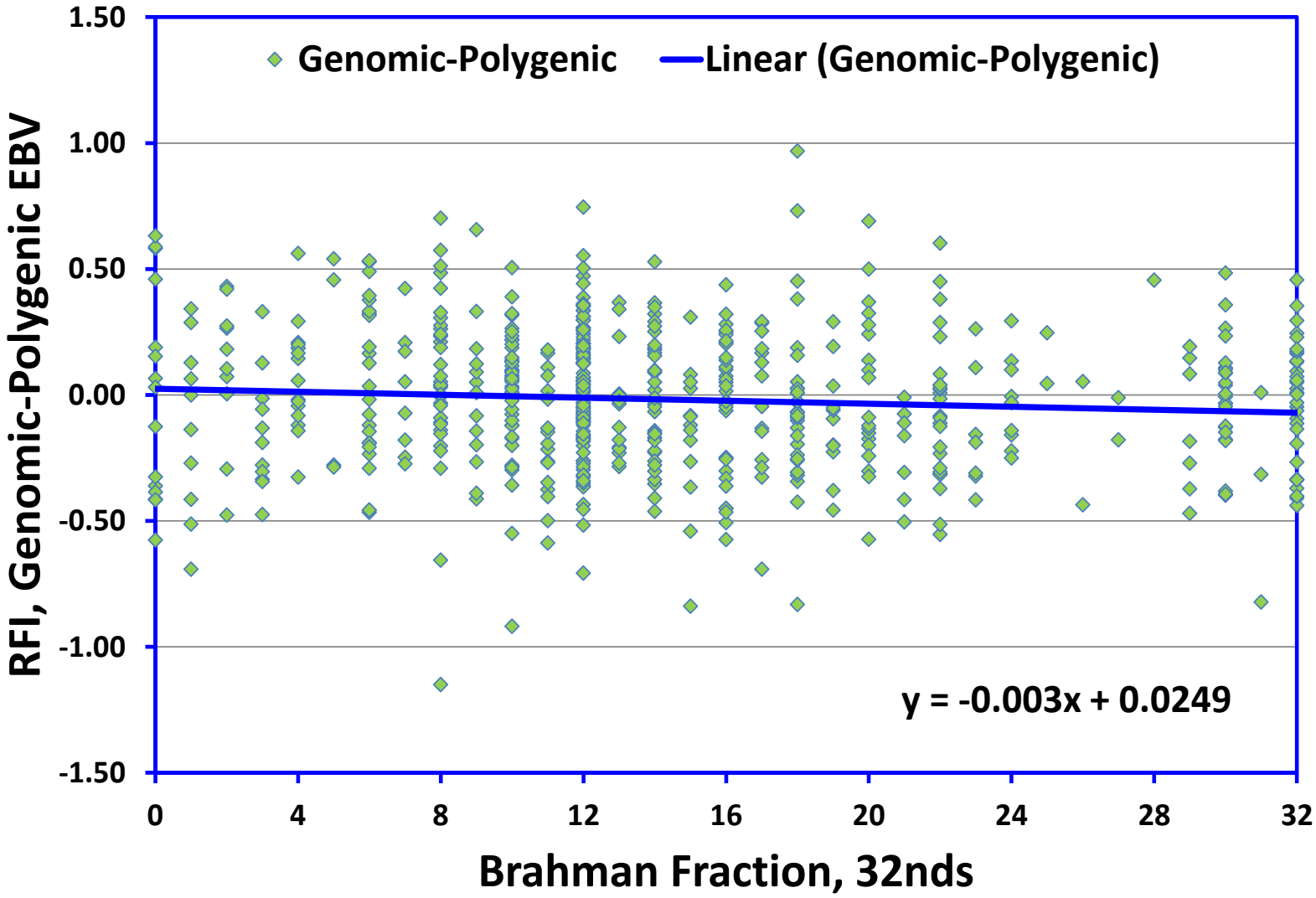
Number of calves by breed group of sire x breed group of dam combination

Breed group of dam	Breed group of sire						
	Angus	¾ A ¼ B	Brangus	½ A ½ B	¼ A ¾ B	Brahman	All
Angus	46	10	18	7	7	17	105
¾ A ¼ B	24	21	31	26	14	16	132
Brangus	4	10	60	9	10	7	100
½ A ½ B	30	27	21	26	22	20	146
¼ A ¾ B	13	17	11	9	11	4	65
Brahman	1	2	1	0	0	68	72
All	118	87	142	77	64	132	620

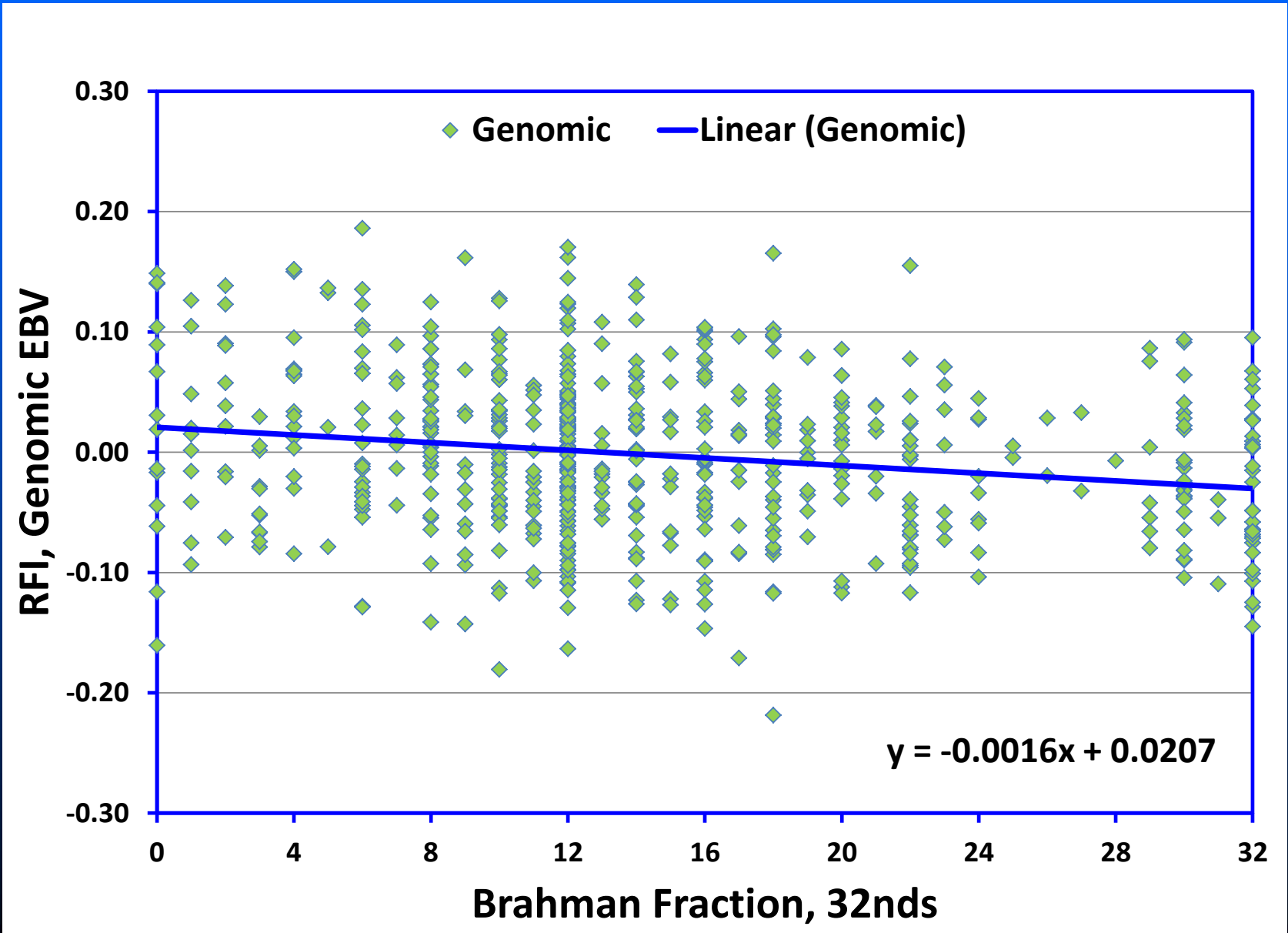
Additive Genetic and Genomic Variation for RFI, DFI, FCR and PWG

Trait	Parameter	AGVar	PhenVar	Heritability	AGOVar/AGVar
RFI	Mean	0.37	1.79	0.21	0.14
(kg/d)	SD	0.15	0.11	0.08	0.11
DFI	Mean	0.80	2.42	0.33	0.10
(kg/d)	SD	0.24	0.15	0.09	0.08
FCR	Mean	1.32	6.50	0.20	0.26
(kfd/kgd)	SD	0.56	0.40	0.08	0.17
PWG	Mean	89.74	240.97	0.37	0.16
(kg)	SD	25.85	15.09	0.10	0.11

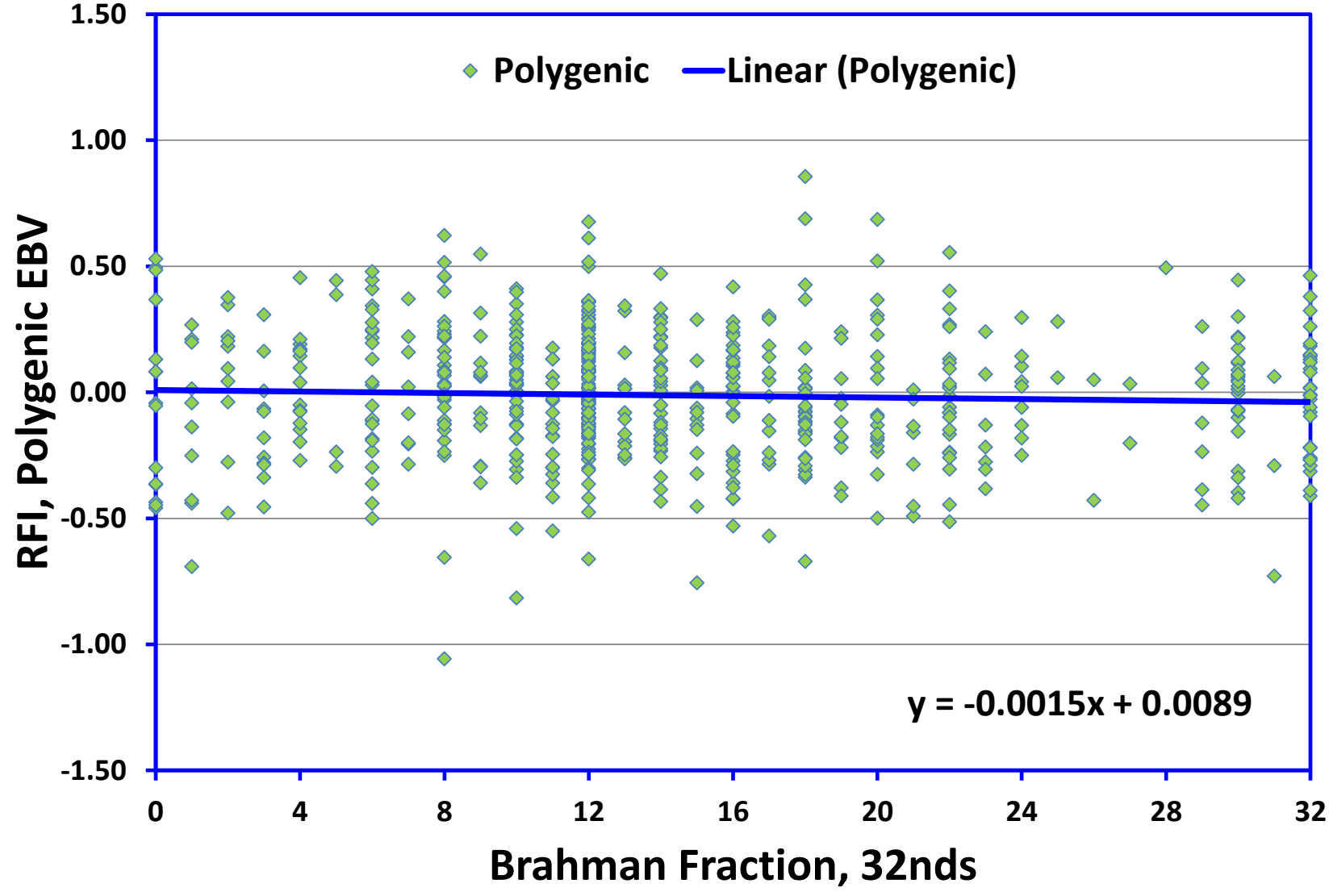
Genomic-Polygenic EBV for RFI



Genomic EBV for RFI



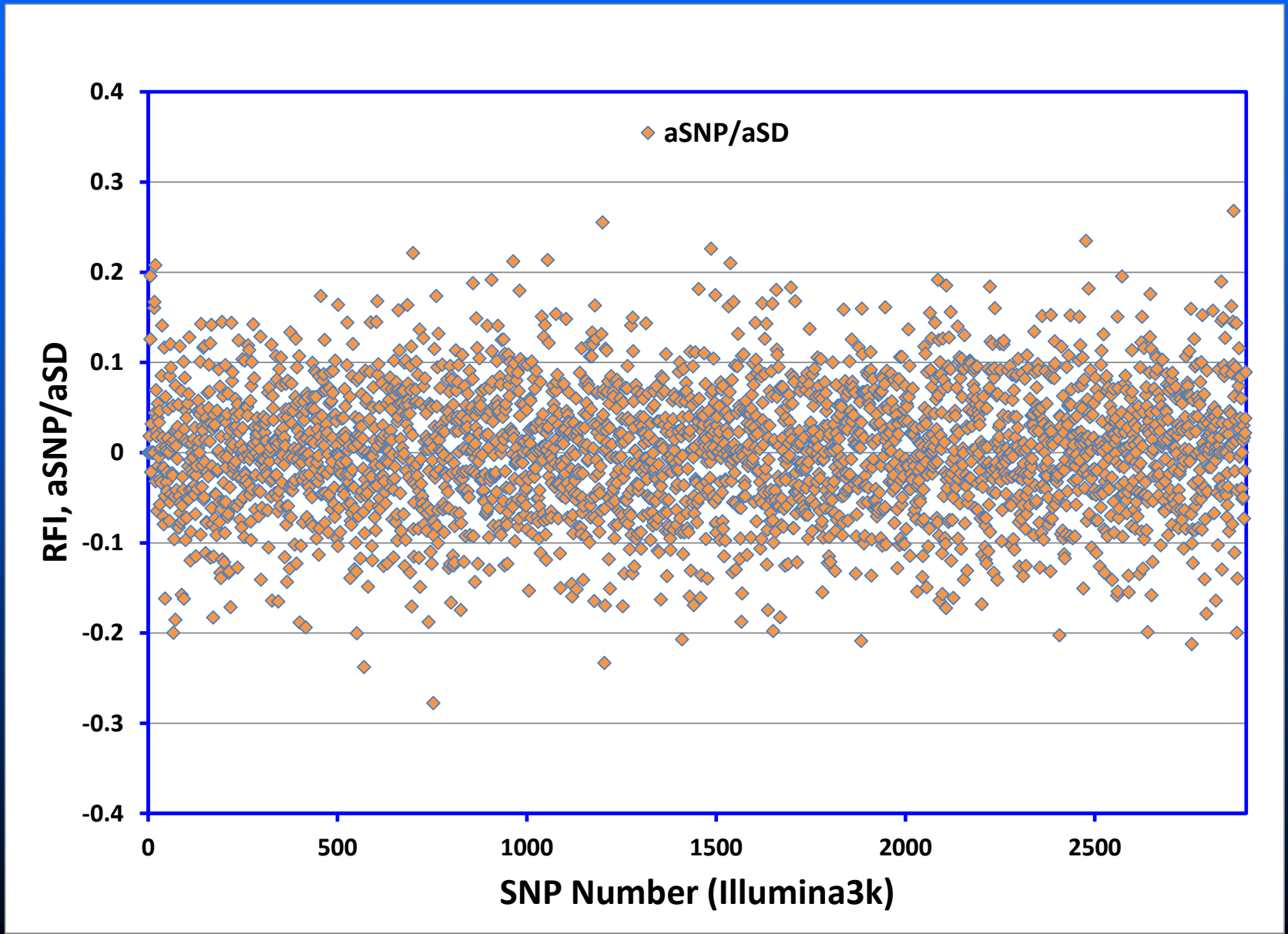
Polygenic EBV for RFI



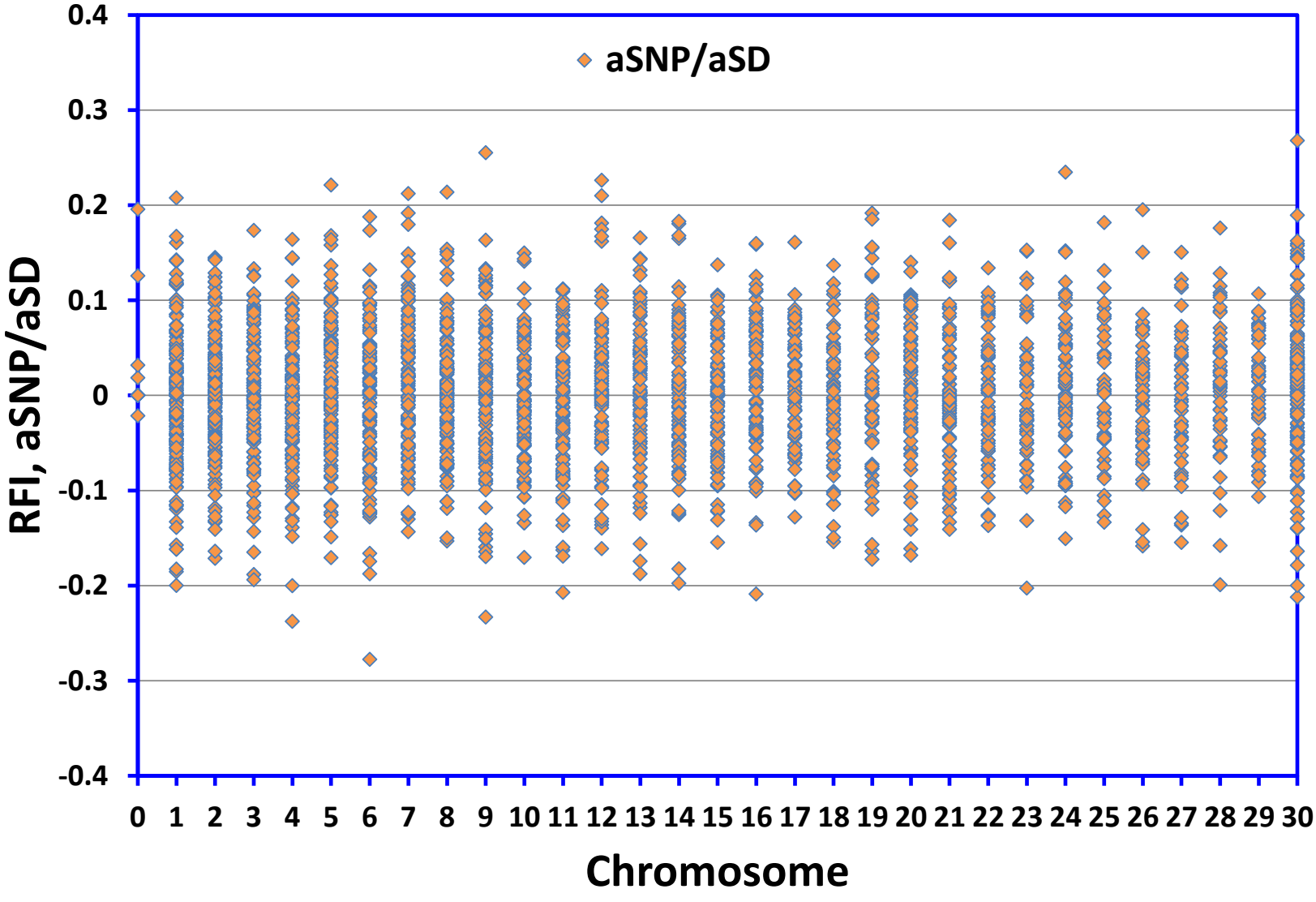
Rank correlations of animals evaluated for RFI, DFI, FCR, and PWG using genomic-polygenic, genomic, and polygenic models

	Trait			
Correlation	RFI	DFI	FCR	PWG
GP Model, G Model	0.65	0.62	0.66	0.74
GP Model, P Model	0.98	0.99	0.95	0.99
G Model, P Model	0.52	0.51	0.42	0.65

Predicted SNP Values for RFI Ordered by Location Across Chromosomes



Predicted SNP Values for RFI Ordered by Chromosome



Origin of the Brahman Project

Objectives

Population Structure

Data and Tissue Sampling

Genetic and Genomic Evaluation

Culling, Mating, and Selection

Research and Expected Outcomes

Culling, Mating, and Selection

Culling

Females culled due to health, reproduction, and production issues as in any commercial operation

Heifers: cull if not pregnant at 2 or 3 years of age (2 opportunities only)

Cows: cull if not pregnant or wean a calf in 2 consecutive years

Mating

Artificial Insemination: Synchronized, then AI once or twice

Embryo Transfer and In-Vitro Fertilization: Part of the AI system; Donor cows (3 or more consecutive calvings and good weaning weights)

Natural Service: After AI (ET, IVF) Brahman cows placed in groups of 35 to 50 with a Brahman cleanup bull for 60 days; Recipient cows placed with crossbred Angus-Brahman sires for 60 days

Future: Selection Indexes

Index 1

Primarily: Reproduction (fertility, age at puberty), Growth

Secondarily: Carcass (marbling) and Meat Palatability (tenderness)

Index 2

Primarily: Carcass and Meat Palatability, Growth

Secondarily: Reproduction (fertility, age at puberty)

Selection based on these indexes will effectively create 2 Selection Lines

Specification of indexes will require input from cooperators

2012 Brooksville Brahman Herd: Culling and Mating

Culling

Minimum culling of females due to health, reproduction, and production issues

Mating

Artificial Insemination: None (only ET Donor cows Synchr & AI)

Embryo Transfer and In-Vitro Fertilization: None

Natural Service: Brahman cows placed in groups of 35 to 50 with a Brahman sire for 60 days; Recipient cows placed with crossbred Angus-Brahman sires for 60 days

Origin of the Brahman Project

Objectives

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Research and Expected Outcomes

Research 1

Prediction models and procedures for genetic and genomic values and estimation of genetic and genomic parameters for reproduction, growth, feed efficiency, ultrasound, and carcass and meat palatability traits

Comparison of individual animals and groups of animals produced by AI, NS, ET, and IVF using phenotypic, genetic and genomic values

Comparison of individual animals and groups of animals from different geographical origin using phenotypic, genetic and genomic values

Research 2

Identification of groups of genes associated with reproduction, growth, feed efficiency, ultrasound, and carcass and meat palatability traits in Brahman and Brahman crossbred cattle

Identification of groups of genes affecting reproduction, growth, feed efficiency, ultrasound, and carcass and meat palatability traits in Brahman and Brahman crossbred cattle

Construction of single-breed and multibreed genomic models based on sets of genes associated with or affecting above mentioned traits

Expected Outcomes

Genetic and genomic evaluation of animals from all cooperating herds in the population for traits in common

Within-herd and across-herd ranking of animals by their genetic and genomic predicted values

Improvement of traits within herds and in the complete Brahman population by preferential use of males and females with superior EBV as parents of subsequent generations

Determination of genetic and genomic trends for males and females for traits in common and comparisons of Brahman cattle grouped by various criteria (e.g., location, selection lines)

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