

# Lessons learnt (so far) from the Beef Genomics Program

Japie van der Westhuizen, Johan de Jager, Bobbie van der Westhuizen, Colleagues at Stud Book & UP & Breeders.

SA Stud Book & Animal Improvement Association



CERTIFICATE  
OF QUALITY  
Exp. 04/2019

# Approach

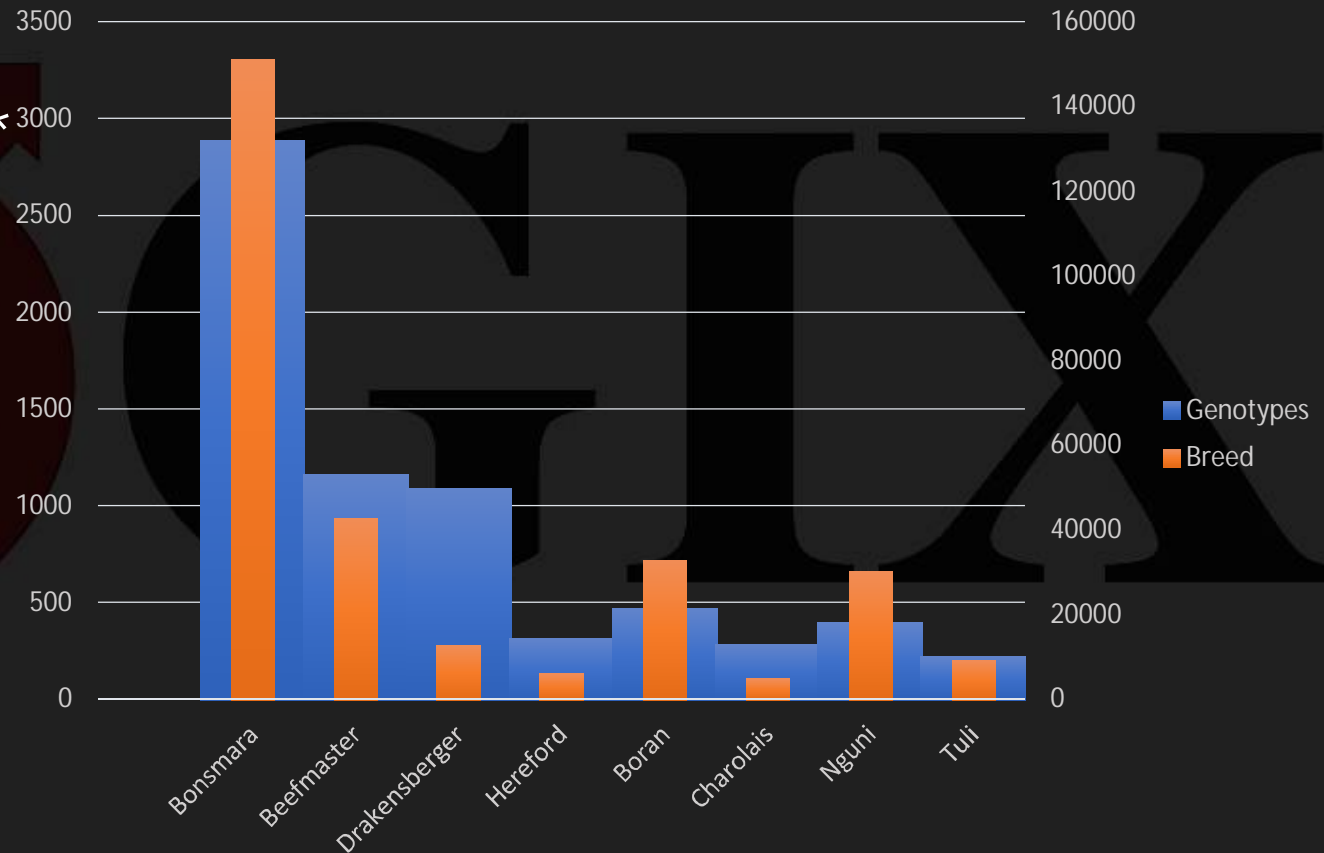
- Breeders' responsibility:
  - Keep proper records
  - Record traits of economic importance (may be breed specific) at own expense
  - Unbiased treatment of selection candidates
  - Apply sound selection & mating practices
  - Willingness to share data & biological material
  - Accept outcome, eg parentage discrepancies

# Approach

- SA Stud Book & Breeders' Societies:
  - Enabling environment
  - Internationally certified recording & calculations
  - Identification of appropriate candidates for genotyping based on population analyses (per breed)
  - Facilitating and record keeping – collection, collation and submission of biological samples
  - Quality assessment and follow-up of genomic profile results
  - Methodology and model development, testing and application

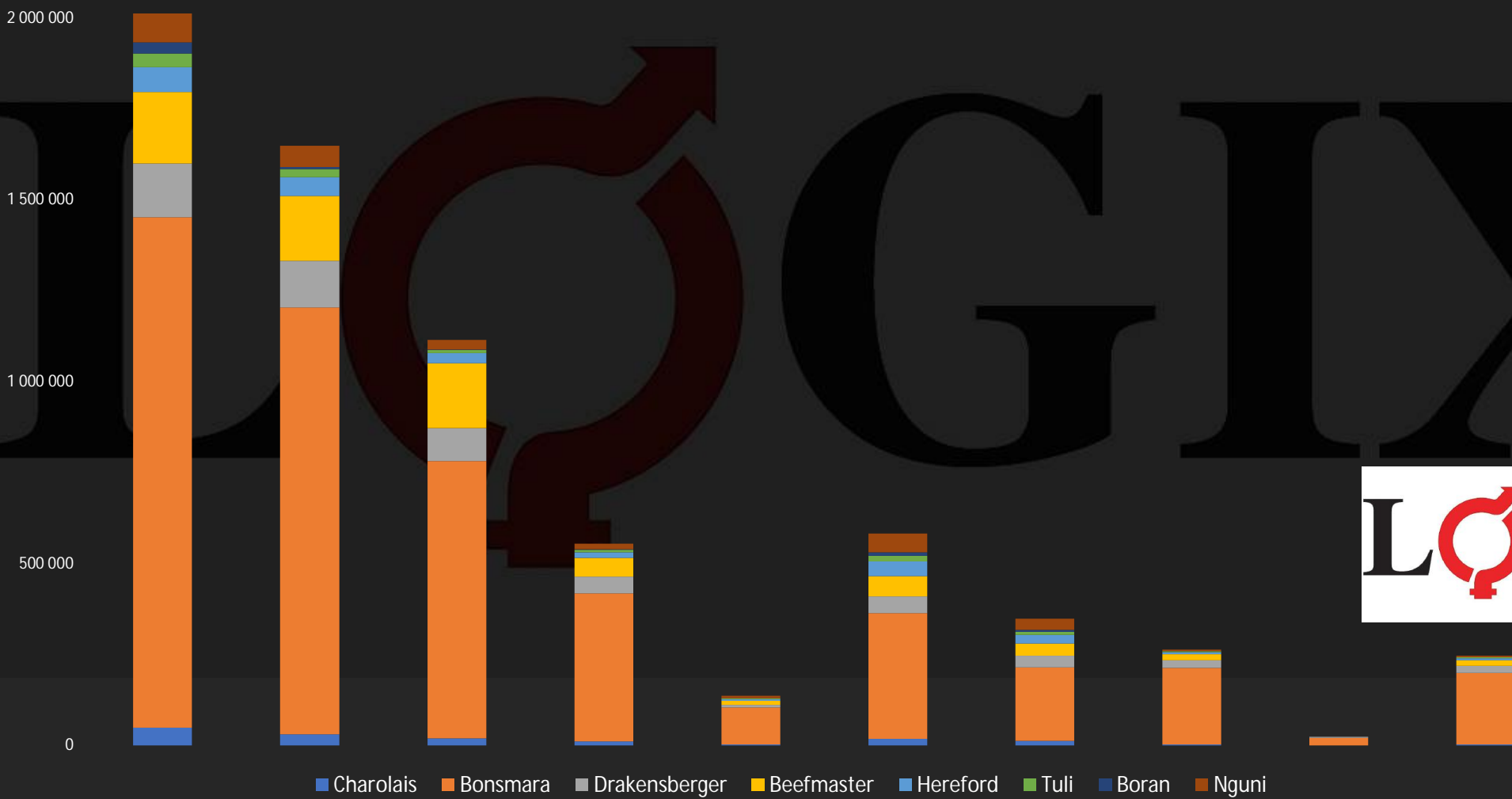
# Participation

- Bonsmara (SA & Nam)\*
- Beefmaster
- Drakensberger
- Boran
- Charolais
- Hereford\*
- Afrikaner<sup>1</sup>
- Nguni<sup>2</sup>
- Tuli<sup>2\*</sup>



# Phenotypic recordings: Genetic Evaluations (Oct 2017)

Birth Weight   Weaning Weight   12 Months   18 Months   Mature Weight   AFC   ICP   Gain   Intake   SC



## GEBV Focus on traits:

















- Female fertility
- Maternal traits
- Survival (herd life)
- Feed intake & growth efficiency
- Muscle & Fat through RTU
- Extension through research projects

# The “other” advantages

- Sorting out pedigrees
- Lines, relatedness, clustering

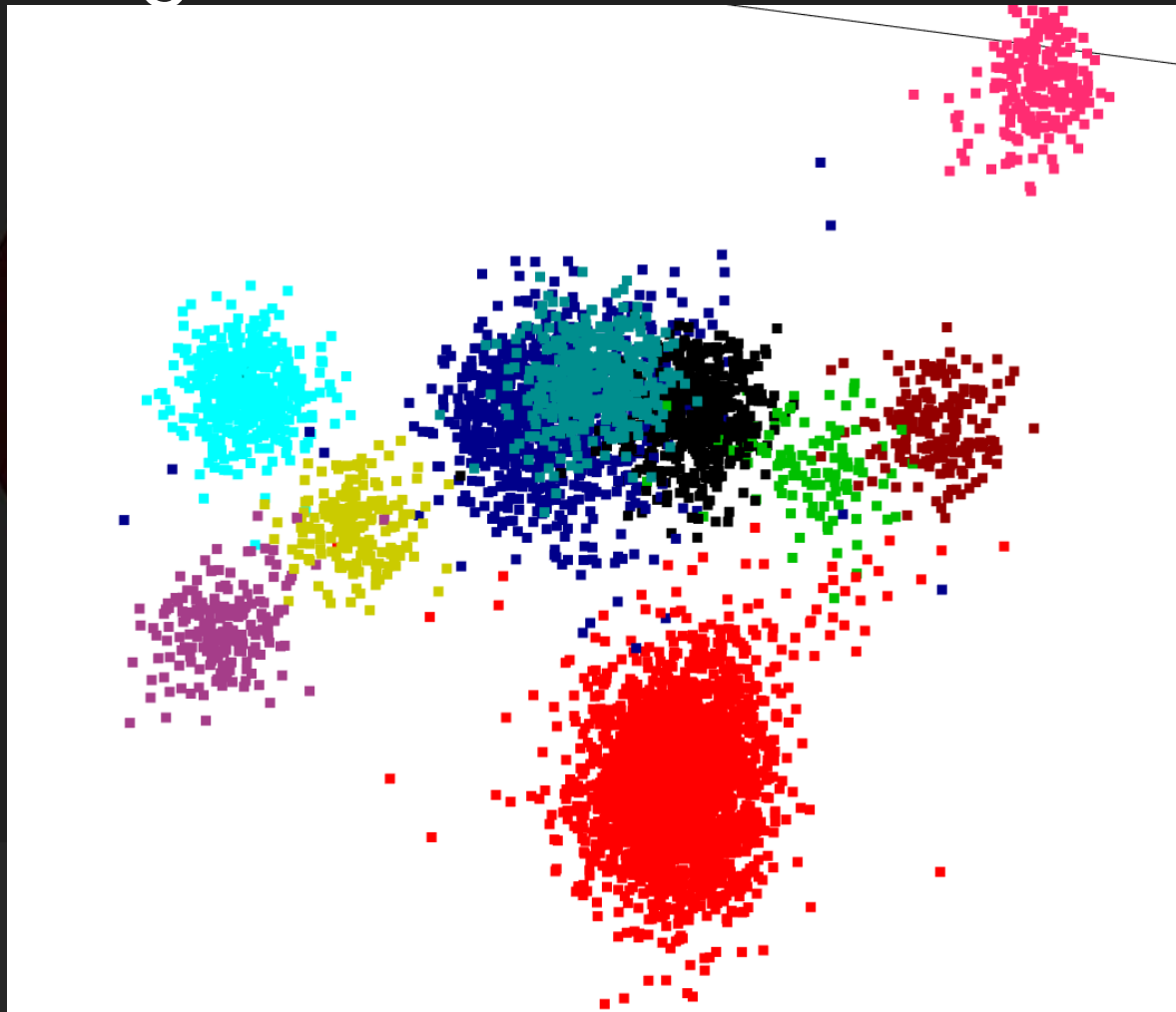
# Pedigrees

Animal ID	Sire ID	DAM ID	Sire Verifeid	Dam Verifeid
			no	N\T
			no	N\T
			no	N\T
			no	N\T
			no	no
			no	no
			no	no
			no	no
			yes	no
			yes	no
			yes	no
			N\T	no
			N\T	no
			yes	yes
			yes	yes
			yes	yes
			yes	yes
			yes	yes

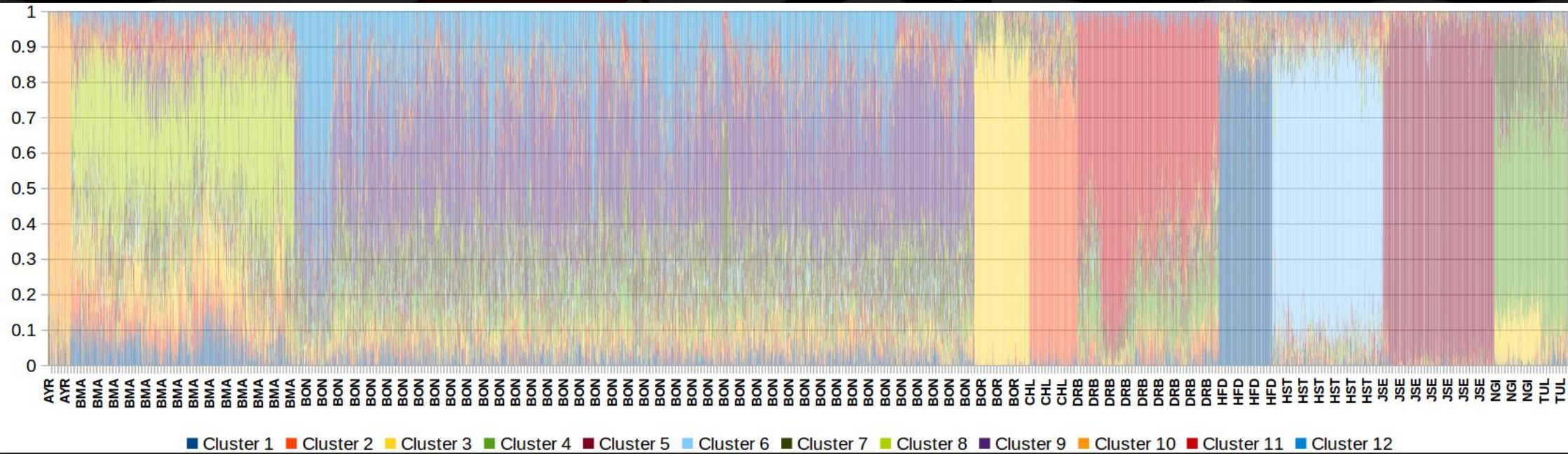
VJN 160037 84206119		 CRV 120175  VJN 100062
VJN 160040 84206143	1	 LAR 120217  VJN 130091
VJN 160041 84206150		 LAR 120026  VJN 090041
VJN 160042 84206168	1	 CRV 120217  VJN 120017
VJN 160043 84221316	1	 JRP 120007  VJN 130011
VJN 160044 84221324	2	 LAR 120026  LPS 080066
VJN 160045 84221332	2	 LMR 110054  CEW 080055
VJN 160046 84221340	3	 LMR 110054  CEW 120166



# Clustering & Relatedness



# Clustering & Relatedness



Main focus/effect

Indirect  
focus/effect

More precise

$$\Delta_{BV}/t =$$

$$\frac{r_{BV, \hat{BV}} i \sigma_{BV}}{L}$$

Any effect? / only  
herd sires

Major advantage?

Rg

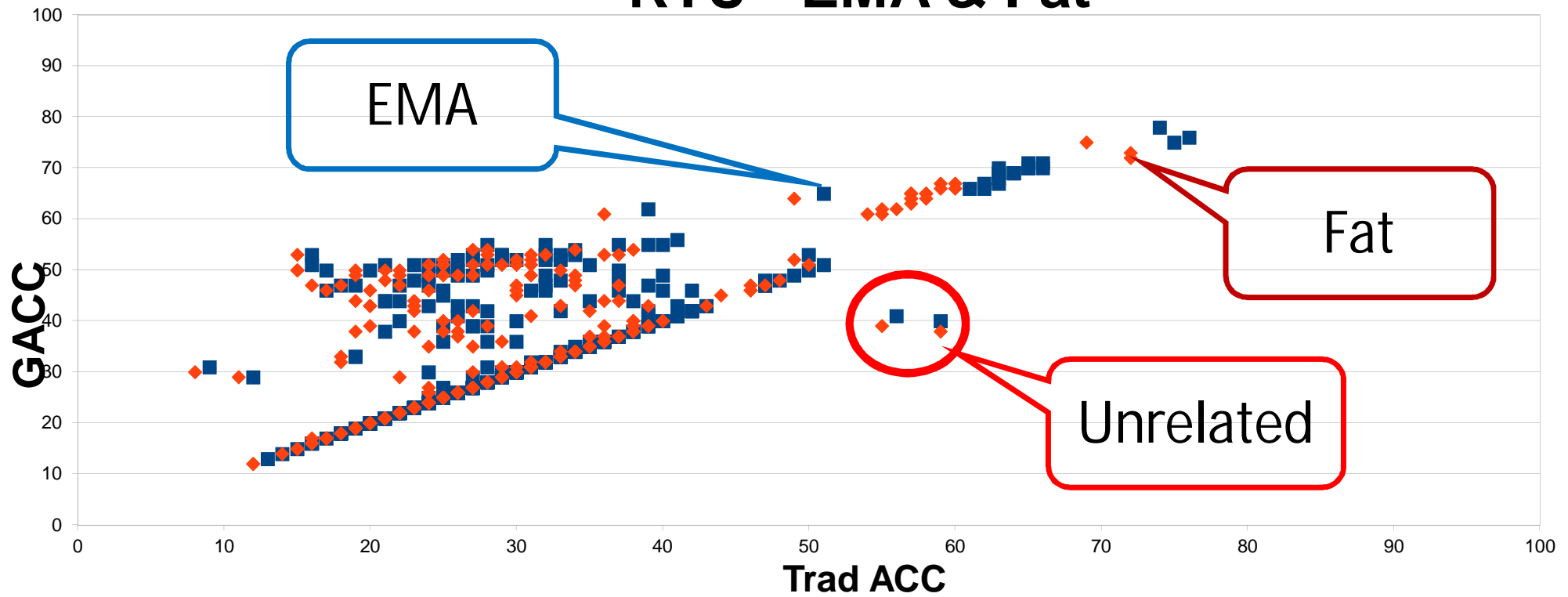
# Implementation and effect

Single Step implemented for Bonsmara & Beefmaster

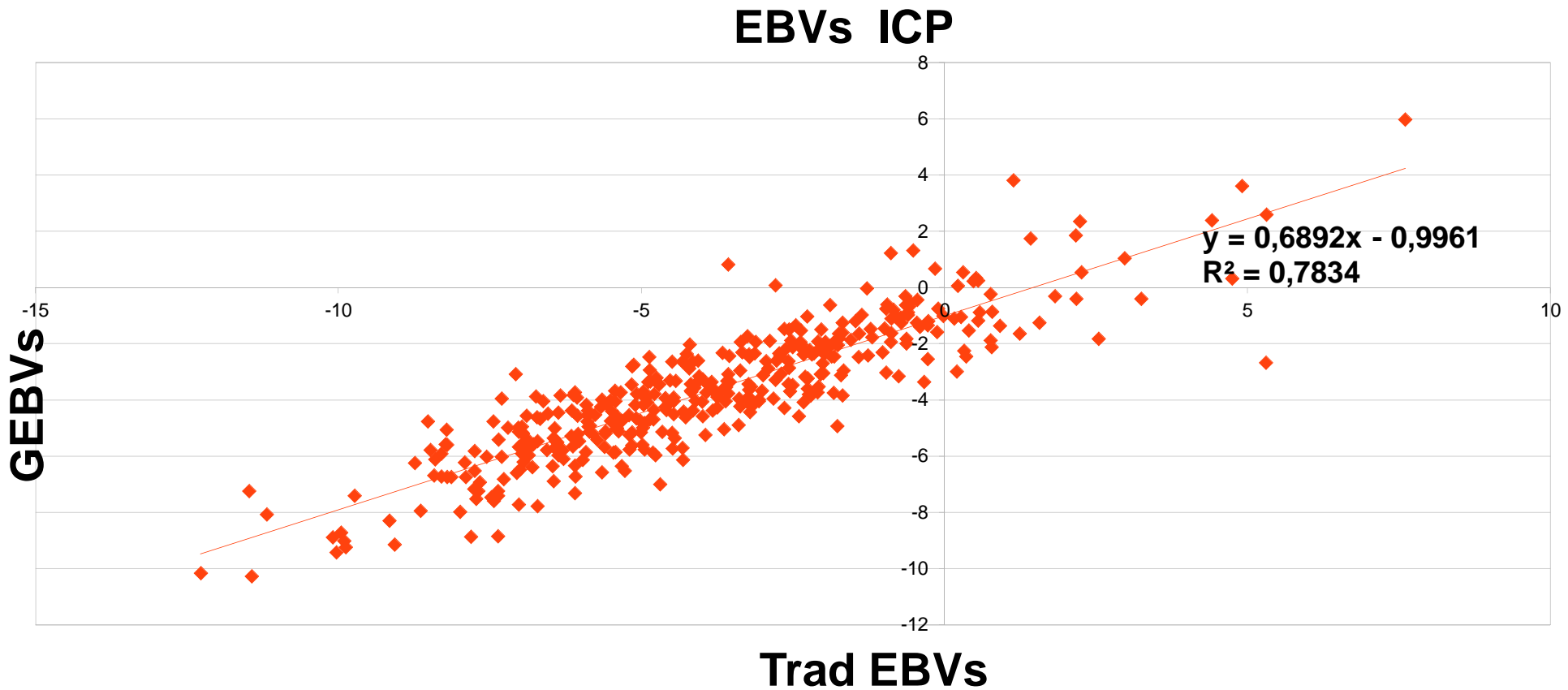
- Initially mostly “high impact” animals genotyped (as per plans for breeds)
- Imputing of less dense genotypes (also pre-BGP genotypes)
- Effect on EBVs (☞ GEBVs) for lower accuracy traits quantified
- Rules for parentage laid down
- Complete Bonsmara herd genotyped on IDB V3

# Changing prediction accuracy: RTU

## RTU - EMA & Fat



# Changes in prediction: Female fertility



# GEBVs 2 year old bull: GEBVs effect on not recorded traits

Breeding Values (EBVs)  
Publication Date: (2017-09-24)

Birth Weight:	1.51 (93%)	Birth Maternal:	-0.08 (63%)
Weaning Weight:	26.4 (91%)	Milk (WW Maternal):	6 (68%)
Yearling Weight:	38.8 (85%)	18-Month Weight:	47.4 (76%)
Post-Wean Weight:	42.9 (80%)	Mature Weight:	17 (60%)
Calf/Cow Ratio:	139 (73%)	Birth/Cow Weight Ratio:	0.08 (72%)
Age at First Calf:	-17 (60%)	Inter Calving Period:	-5.5 (52%)
Productive Herd Life:	34.7 (68%)	Scrotal Circumference:	26.5 (83%)
Average Daily Gain:	250 (77%)	Residual Gain:	0.046 (77%)
Feed Conversion Ratio:	-85 (52%)	Residual Feed Intake:	0.308 (52%)
Kleiber Ratio:	156.09 (77%)	Residual Feed Utilization:	-0.056 (64%)
Body Height:	23 (84%)	Body Length:	45 (82%)
Length/Height Ratio:	1.17 (83%)	RTU Fat Thickness:	0.5 (48%)
RTU Eye Muscle Area:	2.7 (49%)	Marbling:	0.28 (47%)

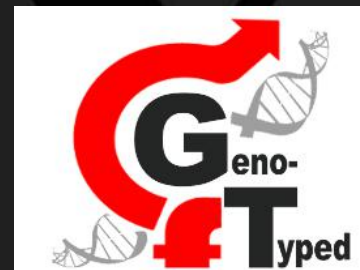
$h^2 = 0.23$

$h^2 = 0.10$

$h^2 = 0.17$

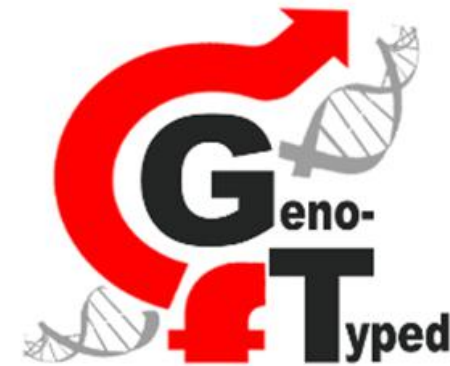
$h^2 = 0.28$

$h^2 = 0.24$

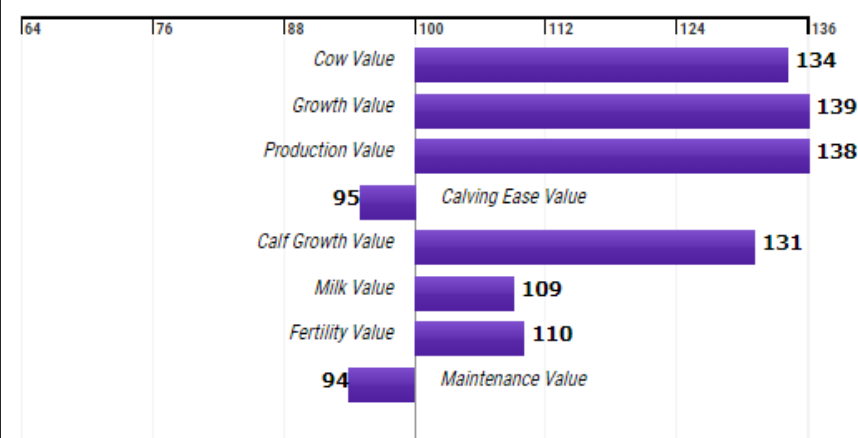




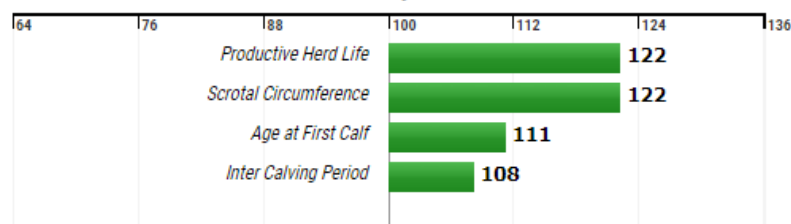
# GEBVs expressed as relative values



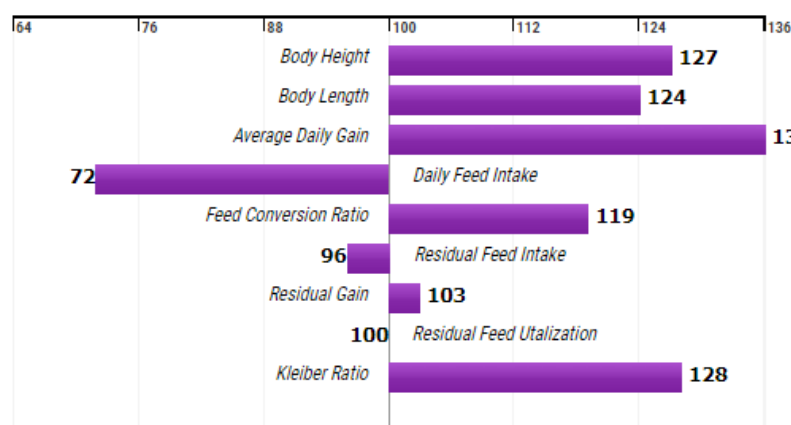
**Selection Values:**



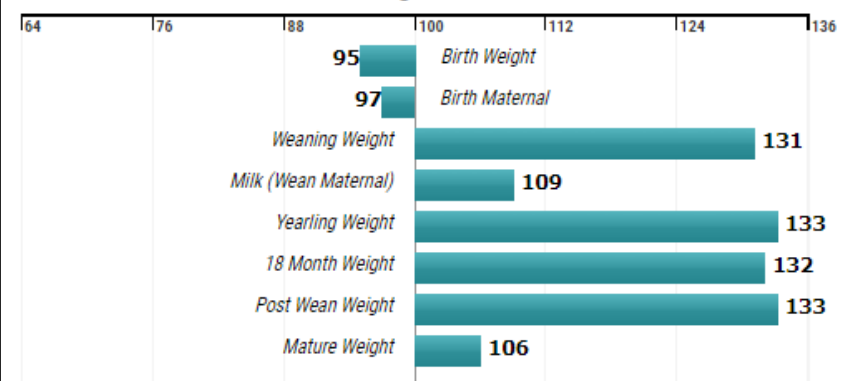
**Fertility Traits:**



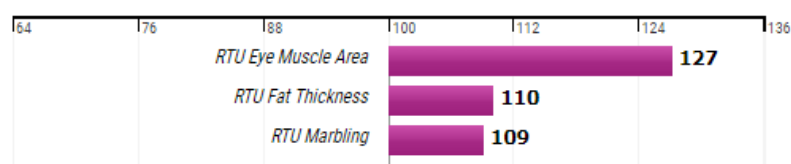
**Growth Test & Structural Traits:**



**Weight Traits:**



**Real Time Ultrasound Traits:**





## What now?

- More breeds GEBVs to be released
- Combining breeds seems possible
- Non-biased evaluations of carcass characteristics
- New breeds joining BGP<sup>2</sup>, if application successful
- Genotype exchange & inclusion in BLUP for (semen) imports

Thank you

QUESTIONS?

[SABeefBulls.com](http://SABeefBulls.com)

**Profit through Genetics**  
- at your service

LOGIX

