OVERVIEW

- Why Feed Efficiency?

- Numbers and Definitions

- GenTecSol Company Overview

- GenTecSol Data Acquisition

- Feed Efficiency Results and Implementation

- GenTecSol Challenges

Agriculture's Challenge to 2050:

Double food production on same or less land to feed and fuel 10 billion with less labour, adopt more efficient and sustainable production methods and adapt to climate change

- According to independent reports, the rangeland condition on 92% of all land in Namibia is below normal, while a staggering 64% of the total country has a vegetation cover of less than 20% of the normal. ("Letter from the NLU/NECFU to the Minister of Agriculture – 8. April 2019")
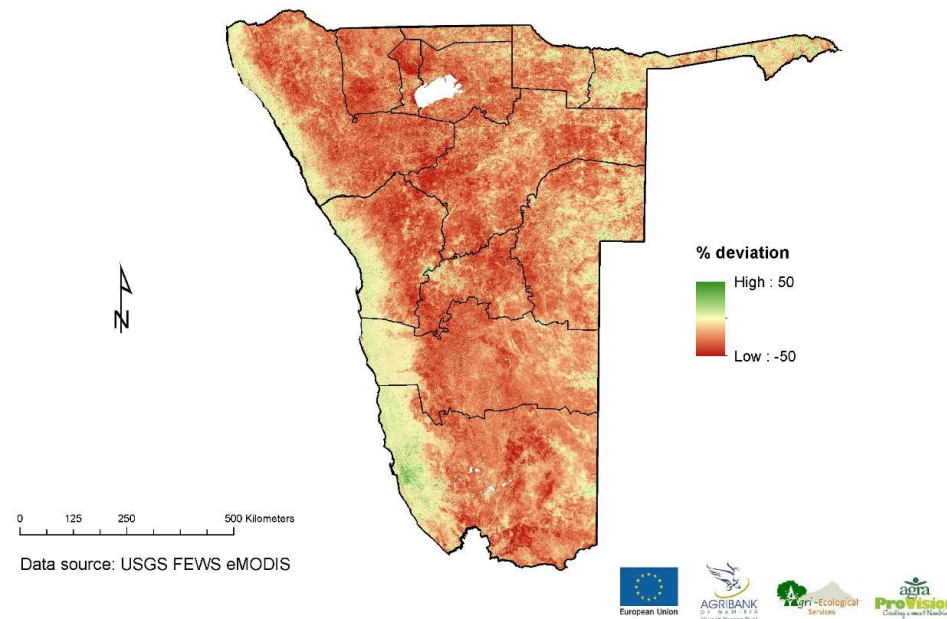
Deviation of the 21 to 31 May 2019 period's vegetation index (NDVI) from the long-term average (since 2002)

© **Namibia Rangelands**

CHARLES DARWIN IN HIS "ORIGIN OF SPECIES"

"IT IS NOT THE STRONGEST OF THE SPECIES THAT SURVIVES, NOT THE MOST INTELLIGENT...IT IS THE ONE THAT IS THE MOST ADAPTABLE TO CHANGE." - CHARLES DARWIN
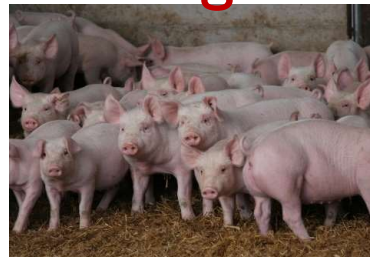
FEED CONVERSION – FEED TO GAIN

- On a feed:gain basis, beef cattle least efficient compared to other species

Poultry	Pigs	Beef
2 : 1	3.2 : 1	6 : 1

- Poultry 250% improvement in efficiency since 1957 using genetics and feed composition
- Beef – negligible improvement over last 30 years

RESIDUAL FEED INTAKE (RFI)

Residual Feed Intake (RFI) is:

- difference between an animal's <u>measured</u> feed intake and its expected feed requirements for maintenance and growth

- moderately heritable (26%-58%), selection will result in progeny that consume less feed for the same level of production

<u>Improved RFI cattle reduce:</u>
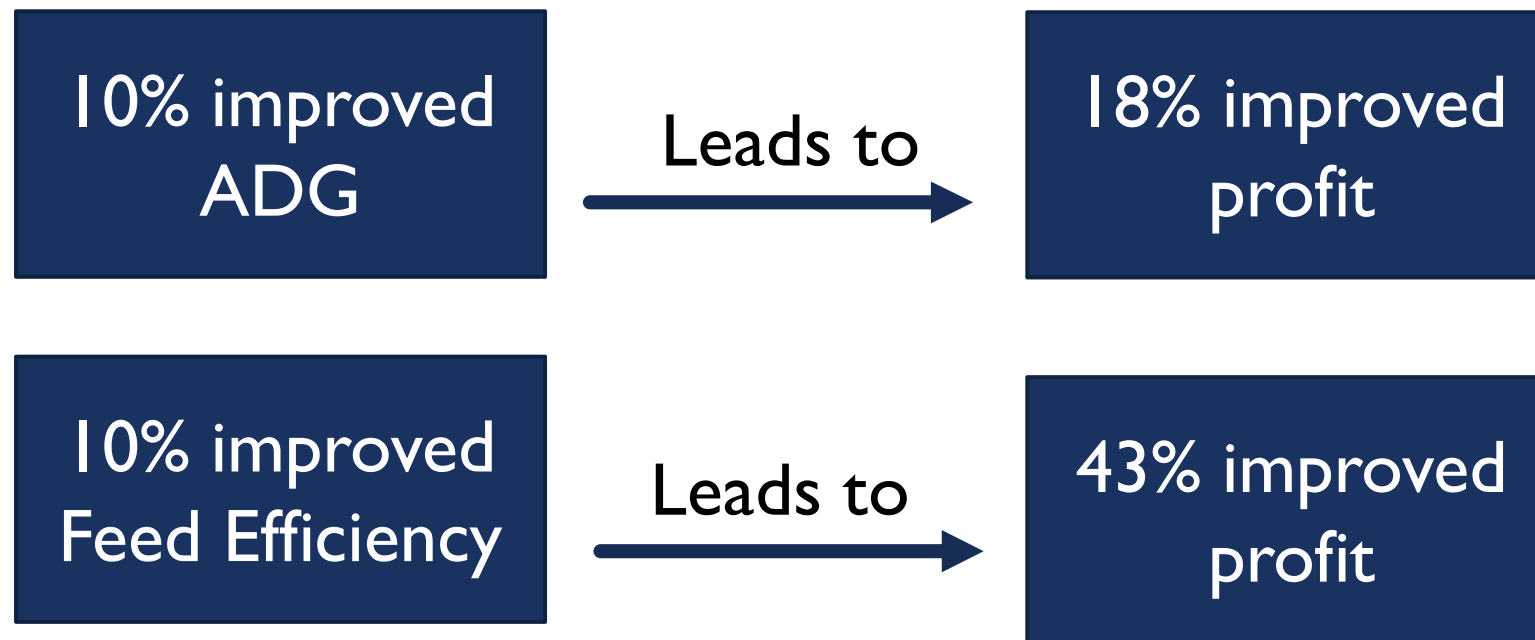
Feed reduction by 12%+

Methane by up to 30%

Manure by up to 17%

Agrifacts, 2006

PROFITABILITY OF FEED EFFICIENCY OF ANIMALS

Feed = 70% of all production costs

10% improved ADG	Leads to →	18% improved profit
10% improved Feed Efficiency	Leads to →	43% improved profit

Gibb; Fox et al., 2001

SOUTH DAKOTA - ON RANCH FEED EFFICIENCY TESTING

Eagle Pass Ranches – South Dakota

- *Started on farm testing in 2007*

- *Bulls in 2013 were 15% more efficient – F:G 4.3:1*

- *In 2013, every female bred that finished in the top half of her feed intake contemporary group as a yearling entered cow herd - all other females entered recipient herd*

Impact after 7 years selection:

- *~2 tons feed less each day*

- *U$100,000+ annual feed savings*

GenTecSol – Evaluating Feed Efficiency in Cattle

- Privately owned and run RFI-Test-Station

- Launch March 2016

- Located on the farm Okawatuta near Hochfeld, Namibia

- First RFI-Station in Africa

- RFI-Station manufactured and monitored by GrowSafe Systems Ltd (Calgary, Canada).

- Up to now 1002 young registered bulls tested from 14 different Namibian stud breeders
  - 789 Brahmans
  - 121 Simmentalers
  - 77 Simbras

FEED INTAKE MEASURMENT

- Animals RFID ear tagged

- RFID antenna in trough rim

- Trough on load cells – 10 gm accuracy

- Feed measured <u>each second</u>

- For GenTecSol 99% of all feed can be allocated to an animal

- Real-time data transmission to GrowSafe in Calgary, Canada

- Software automatically analyses data

RFI-TRIAL SETUP AND PROCEDURE

- Animals weight at the start, weekly and end of trial

- Information an animal registration ID, birth, breed and sex provided for RFI data analysis

- GenTecSol can test up to 96 animals per trial (8 troughs)

- Adaption period 21 days; Test period 70 days

- Internationally expected norm

- Cost per animal tested: N$6500 (2019)

- RFI is the true measurement of feed efficiency

- Old Feed Efficiency Tests (Phase C and Phase D) irrelevant
  - Inherently selected for larger animals, as metabolic requirements for maintenance and growth were neglected.

- When considering the Phase C Efficiency Test Procedure at GenTecSol:
  - Feed:Gain ratio of 3.71kg→11.66kg feed for 1kg animal weight gained
  - Across different breeds – more variation within breed than amongst breeds

- Target: Breed animals with Feed:Gain ration of <4:1

RFI RESULTS - EXAMPLE

- Raw data analysed by GrowSafe

- RFI Results received from GrowSafe for the group analysed:

  - ADG – Average Daily Gain (kg)

  - RFI – Residual Feed Intake (kg)

- Animals tested in Contemporary Groups – no comparison across test groups possible yet…..

- Estimated Breeding Value (EBV) for RFI

VID	ADG (Kg)	RFI (Kg)	RFIRank
15-0075OKB	1.66	0.49	18
15-0012OKB	1.10	-0.64	3
15-0014OKB	1.17	0.93	21
15-0171OKB	1.13	-0.65	2
15-0109OKB	1.49	0.24	14
15-0106OKB	1.47	-0.57	4
15-0181OKB	1.43	-0.85	1
15-0135OKB	1.24	0.54	20
15-0025OKB	1.66	0.51	19
15-0028OKB	1.63	-0.46	5
…	…	…	…
…	…	…	…
Average:	1.39	0.00	

RFI-Results GenTecSol March 2016

RFI – EBV (ESTIMATED BREEDING VALUE)

- RFI data accumulation in part of the Southern African Beef Genomic Project

- Raw data submitted to BREEPLAN (Australia – Performance recording evaluation system) for eventual genetic Estimated Breeding Value (EBV) calculation for RFI

- Analysis at ABRI (Armadale, Australia) of Data to determine if we now already can publish an EBV for RFI.

- Scientists estimate that 1500 RFI data required to publish EBVs

- Brahmans is leading this process. This will be incorporated in an International Brahman Genetic Evaluation run.

May 2019 Namibian Brahman BREEDPLAN EBVS																
	Gestation Length (days)	Birth Wt. (kg)	200 Day Wt (kg)	400 Day Wt (kg)	600 Day Wt (kg)	Mat Cow Wt (kg)	Milk (kg)	Scrotal Size (cm)	Days to Calving (days)	Carcase Wt (kg)	Eye Muscle Area (sq cm)	Rib Fat (mm)	Rump Fat (mm)	Retail Beef Yield (%)	IMF (%)	Docility
EBV	-	+0.9	+18	+28	+35	+33	+2	+1.5	-	+20	+1.0	+0.7	+0.9	0.0	-0.1	-
Acc	-	81%	71%	69%	69%	62%	41%	50%	-	56%	45%	54%	54%	46%	46%	-
Breed Avg. EBVs for 2017 Born Calves Click for Percentiles																
EBV	-0.8	+1.6	+16	+24	+31	+32	+3	+0.7	-0.4	+17	+0.3	+0.1	+0.1	+0.0	+0.0	+0.9

EBVs for Okabra 15-001 – June 2019

BGP – MEAT QUALITY ASSESSMENT

- Some bulls slaughtered at Meatco under the BGP programme to assess meat quality under the guidance of the meat laboratory at Irene, South Africa.

- Huge variations in meat tenderness were observed for all breeds, which would be another trait to focus on in future. <u>Especially with the focus on international niche markets</u>.
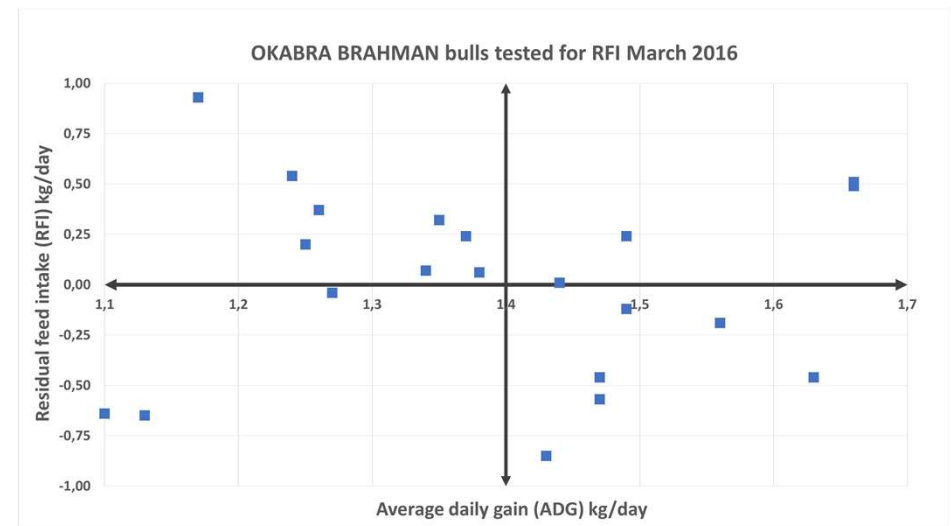
BREEDER ANIMAL SELECTION

- In absence of EBVs presently, breeders select there next stud sires based on GrowSafe feedback on analysis

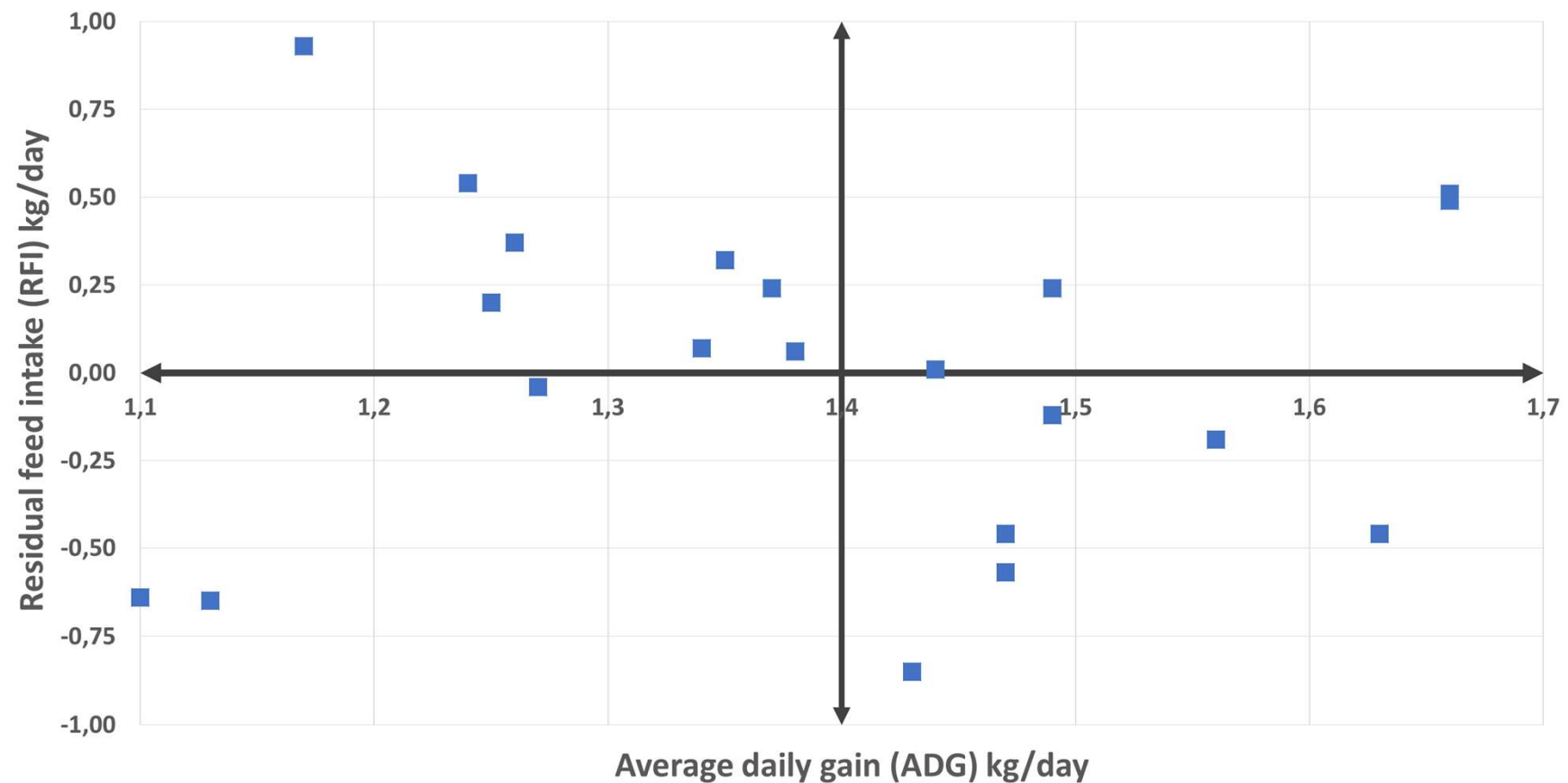- Comparison only valid for a contemporary group of animals

- Graph RFI vs ADG

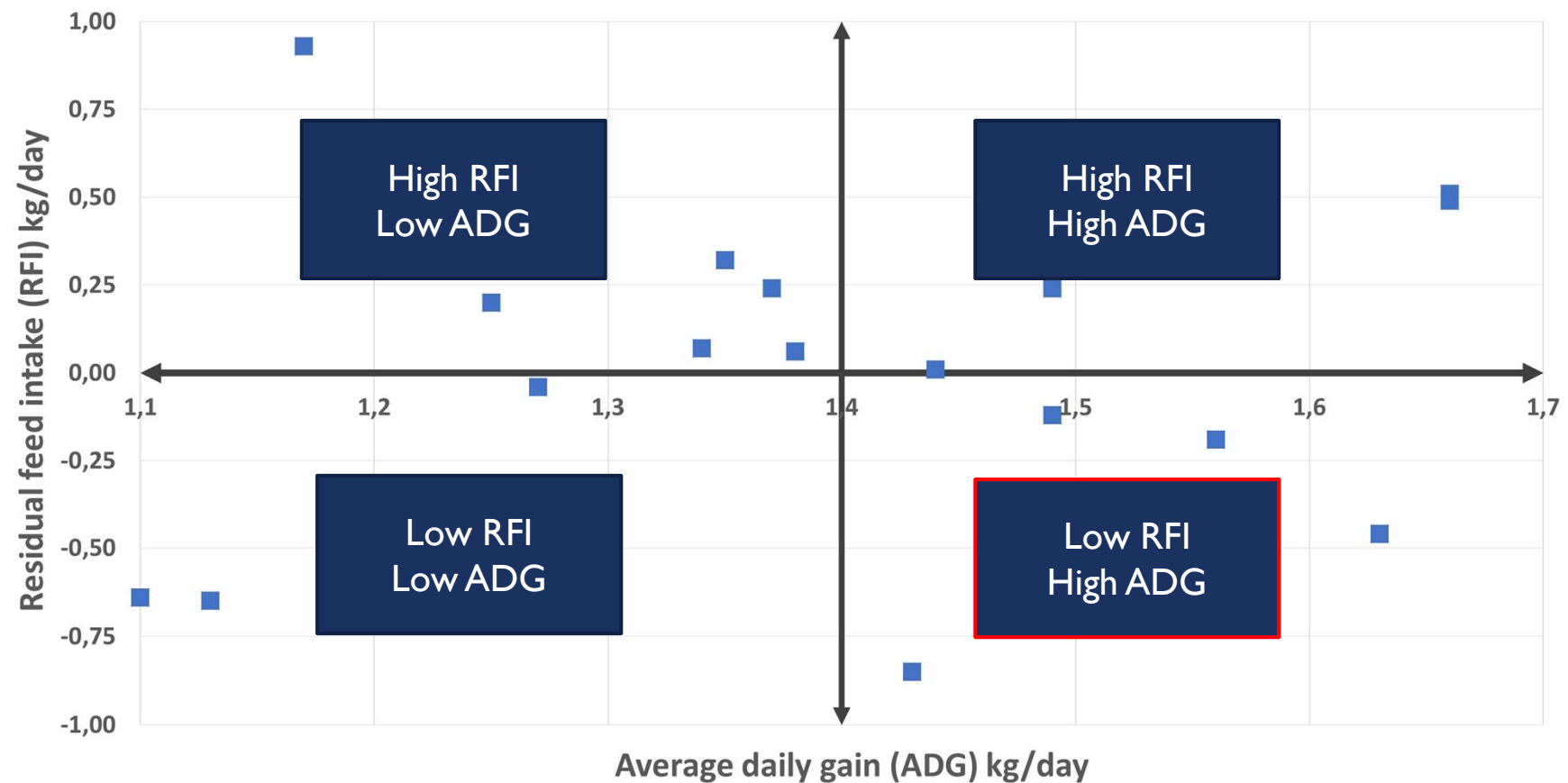| VID	ADG (Kg)	RFI (Kg)	RFIRank
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...	...	...	...
...	...	...	...
Average:	1.39	0.00	

OKABRA BRAHMAN bulls tested for RFI March 2016

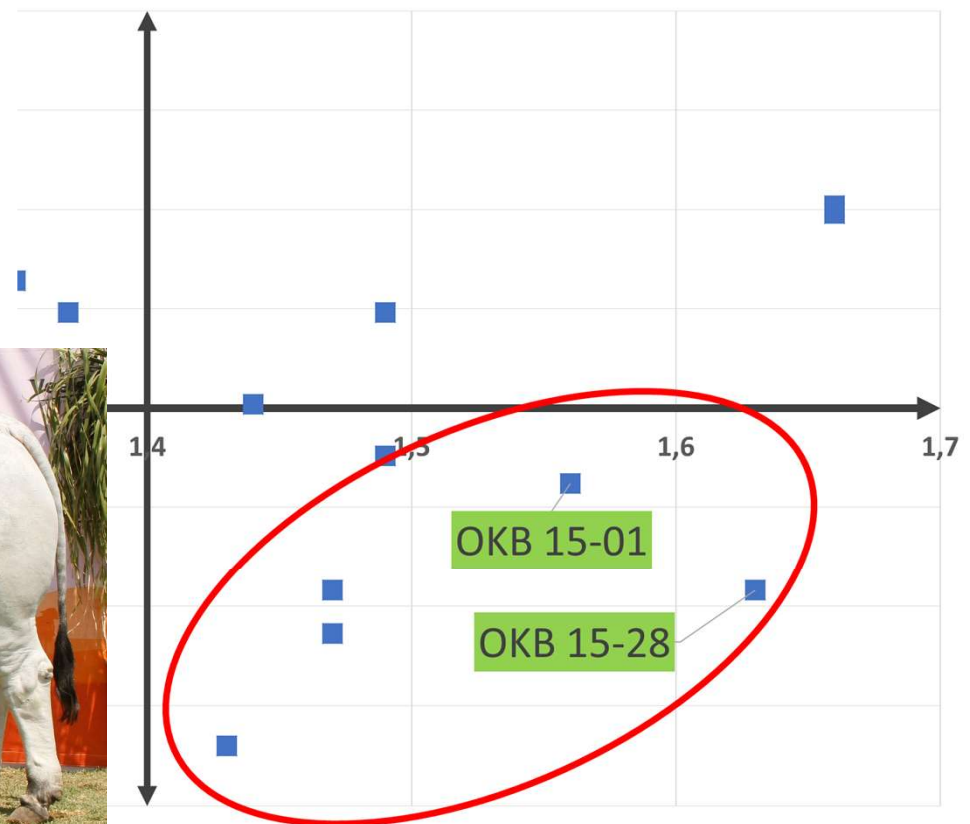OKABRA BRAHMAN bulls tested for RFI March 2016

OKABRA BRAHMAN bulls tested for RFI March 2016

BREEDER SELECTION OF STUD SIRES

bulls tested for RFI March 2016

OKB 15-01

OKB 15-28

Average daily gain (ADG) kg/day

Okabra Brahman bulls tested at GenTecSol in March 2018

OKB17-901 – Most Efficient in Group March 2018

RFI Rank 7
15-0022WB
F:G = 4.22:1
Wokuma Brahman

RFI Rank 17
15-0020WB
F:G = 6.11:1
Wokuma Brahman

FEEDLOT vs RANGLAND CONDITIONS

- Debate on RFI test conditions: Feedlot vs Rangeland conditions

- Dr. Paul Arthur (from the University of New South Wales at Armidale in Australia) is the internationally recognized expert on RFI having spent most of his research on this topic.

- High correlation between feedlot and rangeland conditions

- Animals efficiency in the feedlot is efficient on rangeland

% deviation
High : 50
Low : -50

0   125   250   500 Kilometers

Data source: USGS FEWS eMODIS
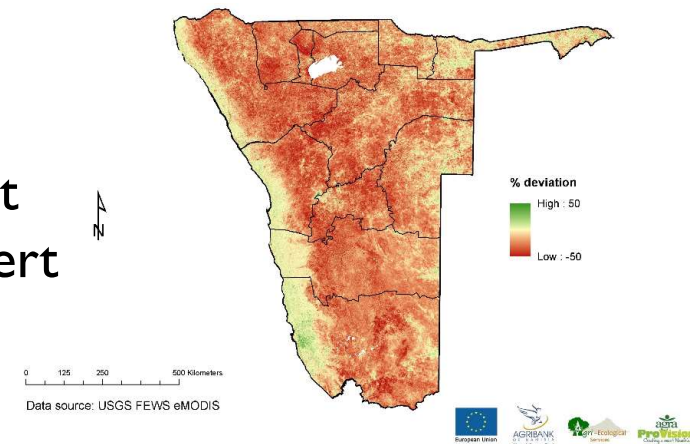
ADDITIONAL DATA ON ANIMAL BEHAVIOUR

- A lot of additional raw data available, that can be analysed → Not done at the moment

- Agressive vs Shy eater

- "Head down" and "In to Out" durations

- Force exerted on load cell
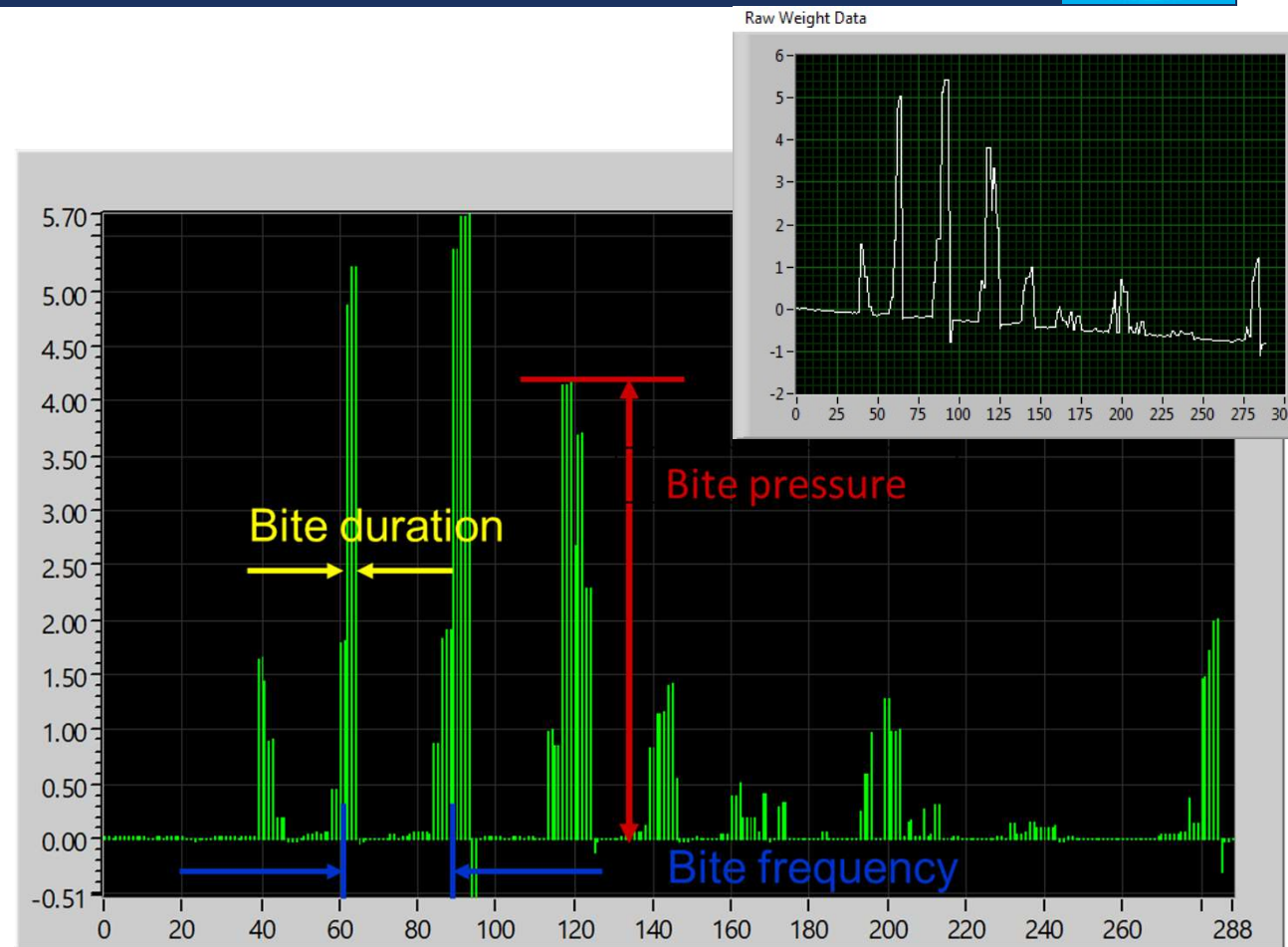
GenTecSol CHALLENGES

- Privately owned – no funding. Needs to be profitable.

- Number of animals per test

  - Cost N$6500/animal (covers running, maintenance and investment cost)

  - Investment in future. No immediate return or compensation

  - Namibia is a developing country

- Drought

- Feed supply

SUMMARY

- We are convinced that RFI is the next revolution in animal breeding

- RFI is the true measurement of feed efficiency

- The focus is on higher profitability of the livestock sector

- More efficient cattle have a direct simultaneous positive effect on the environment (methane)

- Estimated Breeding Value for RFI will be available soon

- Progressive breeders are already selecting on intermediate evaluation of data generated by GenTeSol

THANK YOU

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