



Regional Dairy Workshop - Why Dairy? Why Jersey?



How can we prove the Jersey offers the answers?

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Outline/key messages

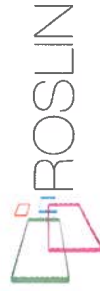
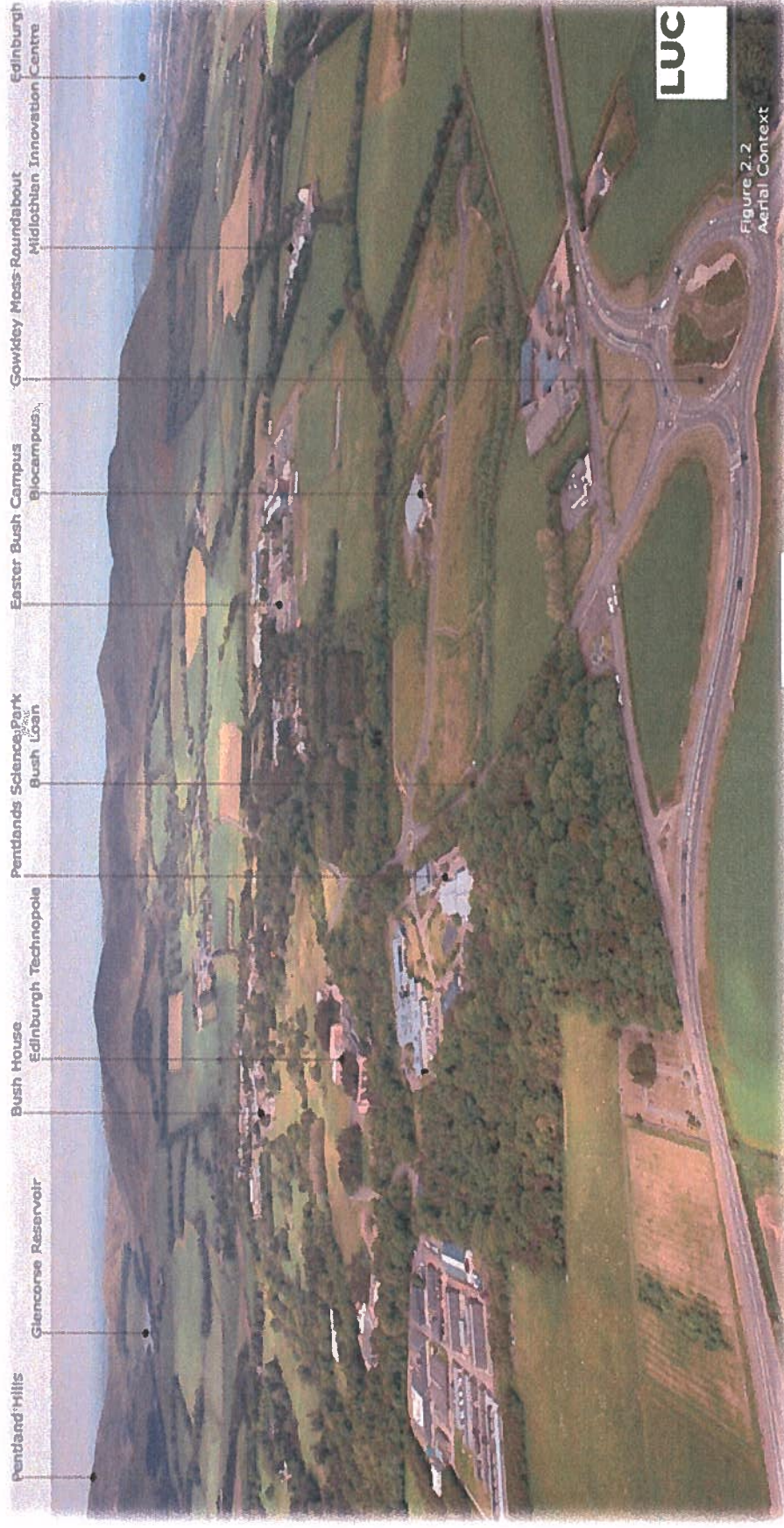
- i. General introduction to CTLGH and the need to develop and apply relevant tools and associated resources to drive livestock productivity and resilience
- ii. Possibilities of productivity and other gains realised through genomics
- iii. Some knowledge or previous work on jersey in Rwanda (**Professor Mizeck Chagunda**)



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Easter Bush is a major international animal research Hub

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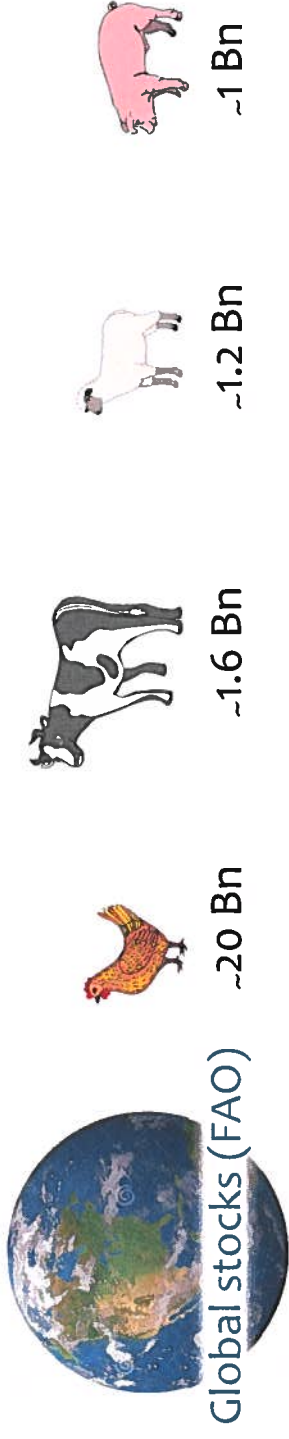
THE UNIVERSITY of EDINBURGH
The Royal (Dick) School
of Veterinary Studies





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Our Grand Challenges



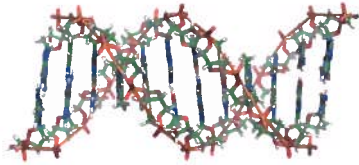
- Despite the vast scale of animal agriculture, production must grow by at least 50% by 2050 owing to population growth & rising demand
- Efficiency must increase owing to competition for scarce resources
- Animal diseases severely constrain productivity & welfare
- Zoonoses exert high societal & economic costs
- Antibiotic misuse has driven resistance & drug-resistant infections will kill an estimated 10M people/year by 2050
- Animal farming is a key route from hunger, malnutrition & poverty in LMICs
- History records the impact of genetic selection, vaccines & treatments



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Our capability & recent achievements

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- The revolution in inexpensive whole-genome sequencing allows us to map the architecture of production-relevant traits in fine detail (*Genomic Selection 2.0*)
- Ongoing industry-linked projects involve sequencing hundreds of thousands of chickens, pigs & cattle to link genotype with phenotypes
- Since adoption in 2013, Genus/PIC have increased genetic gain by 35% & GS2.0 permits co-selection of multiple traits
- Underpinned by theory, statistics & computational tools that are widely accessed by academia & industry
- Our basic research allows us to understand how variation exerts its effects





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“If you care about the poor, you should care about agriculture. And if you care about agriculture, you should care about livestock.”



Upstream genetics is such a powerful lever to get literally to hundreds of millions of animals and households.

Edinburgh, UK

29th July 2014 &
26th January 2018

BILL & MELINDA
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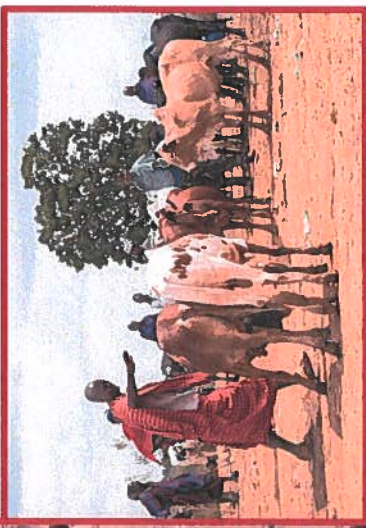
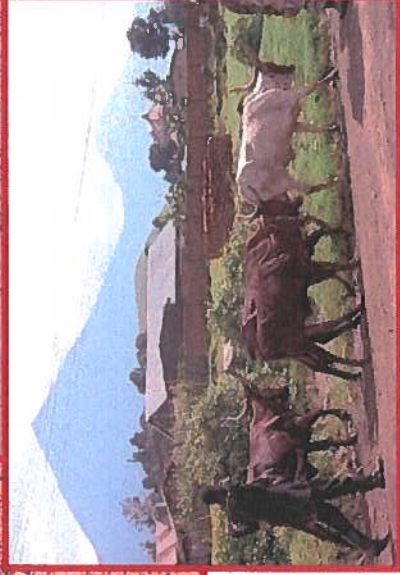
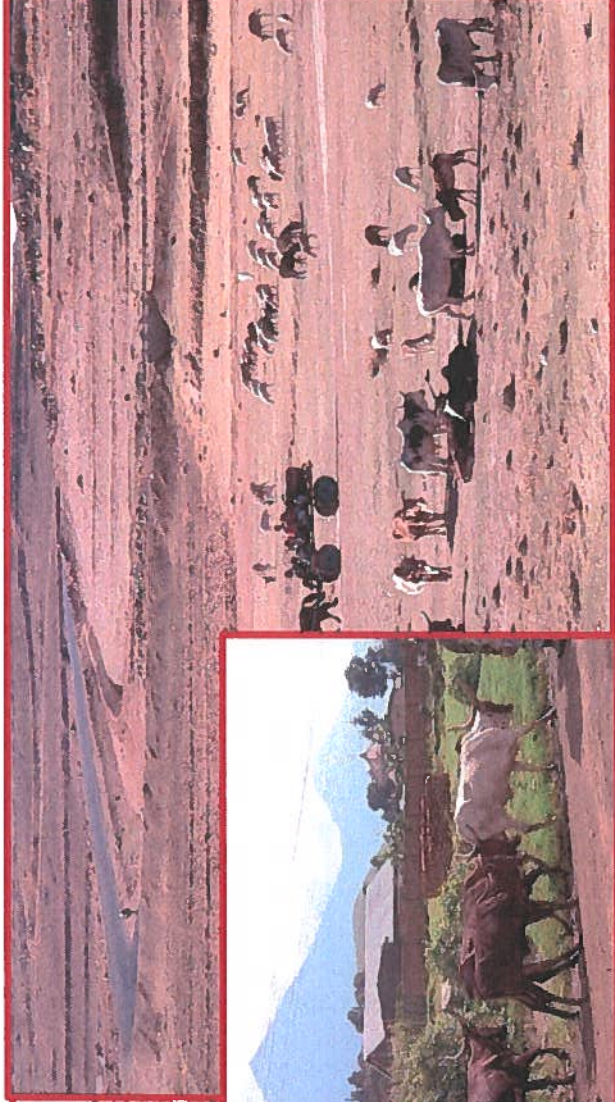
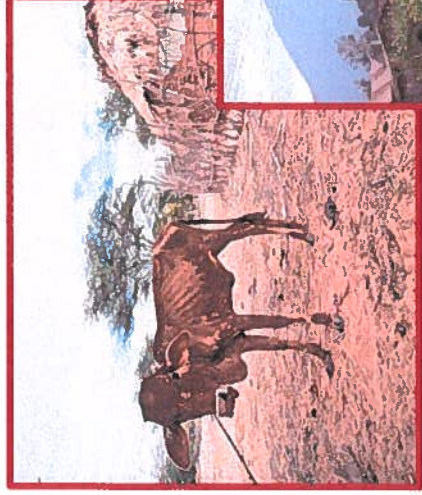


Improving tropical livestock development

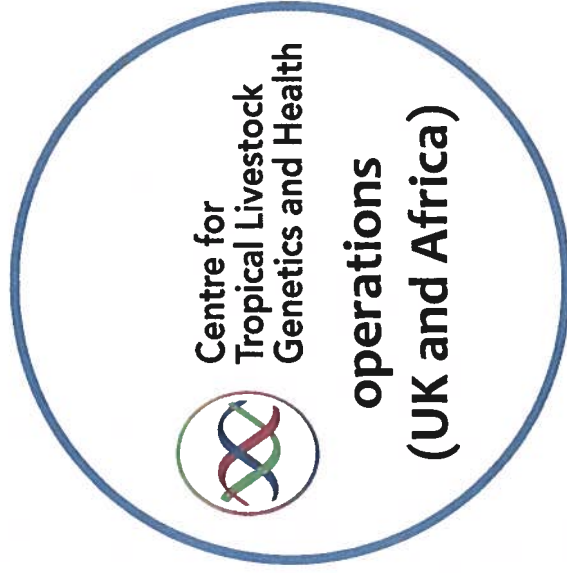
Animal health &
welfare

+ Feed/Nutrition + **Genetics** +

Others
Financing
Insurance
Markets
Gender & Youth



Genetic improvement provides a long term solution and can underpin other interventions (i.e animal health, nutrition and welfare) that tackle tropical livestock productivity and resilience challenges

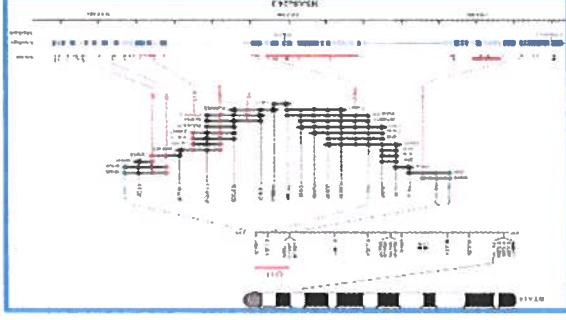
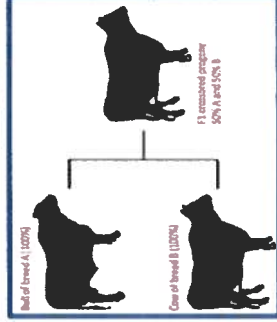
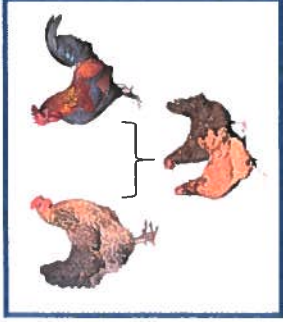
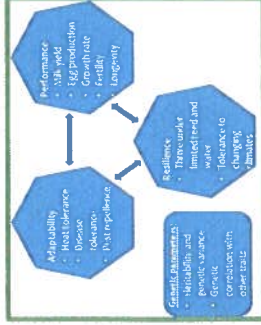
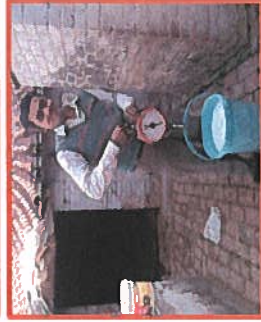


CTLGH = Partnership for R&D to support
tropical livestock genetic improvement



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Management information

- On-farm phenotype performance recording
- DNA/tissue sampling
- Data and biorepository

Matching breeds to ecology/environment

- Genetic profiling (host genome and microbiome)
- Definition and characterization of traits

Breeding information and decisions

- Breeding/Selection (exotic and locally adapted animals)
- Tools and Algorithms (breeding values)

Markers for selection

- Identification of putative QTLs, genes, SNPs with effects on key traits
- Fine-mapping, identification of putative causal alleles affecting each trait

Application and utilization of markers

- Focus on alleles impacting tropical adaptability and resilience
- Promotion of multiple favourable alleles through genome editing

Accelerated and sustained genetic gains

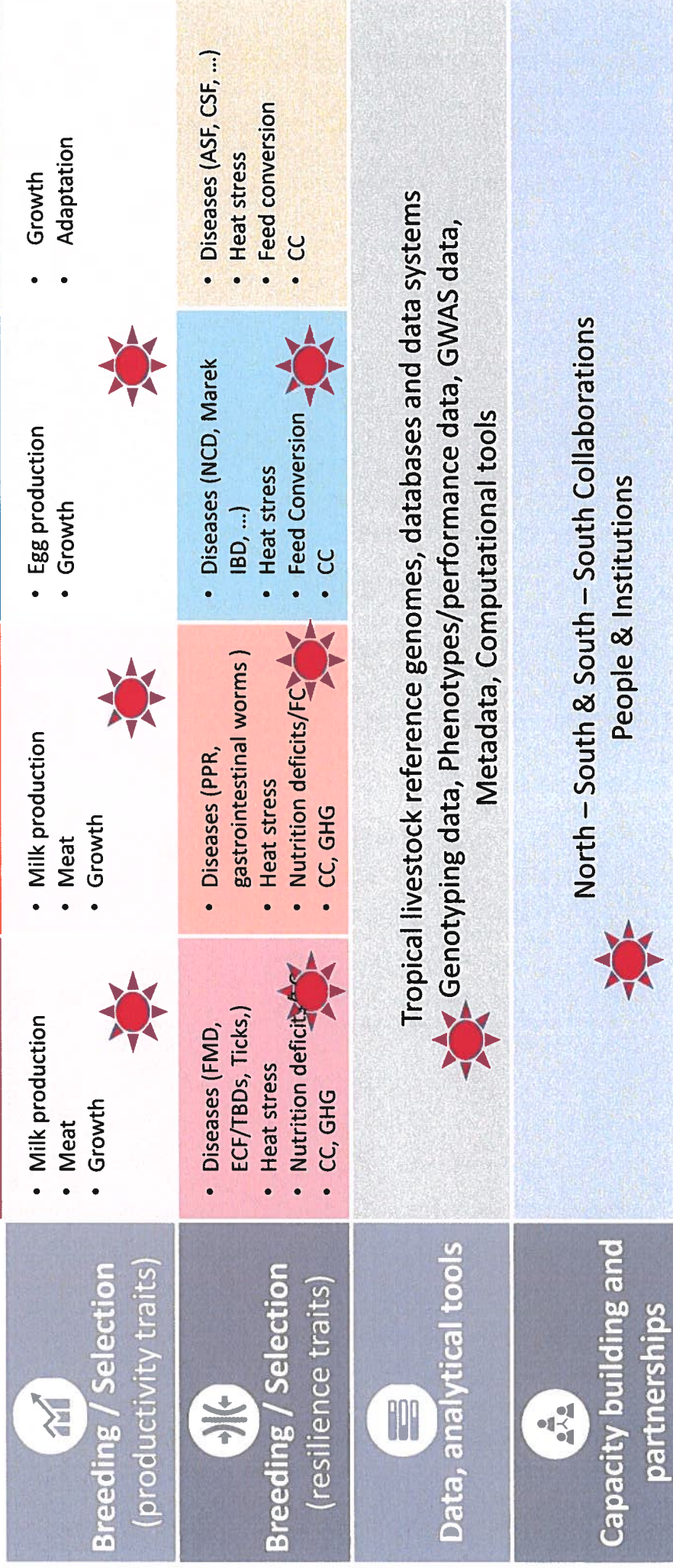
- Systems for selecting and introducing tropically-adapted parent stock back into the genetic gain and multiplication system



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Long term strategy

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What can genomics do (1)?

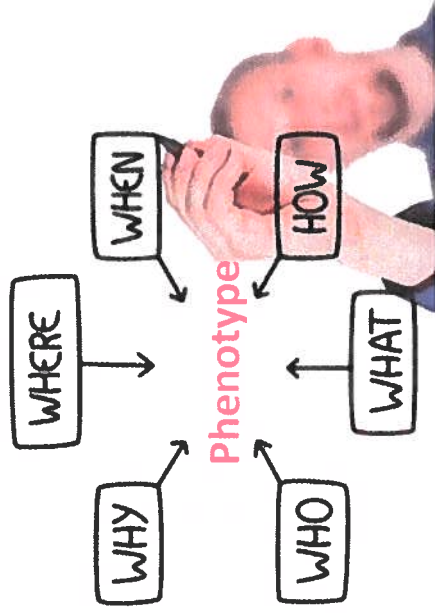
- Genomics looks at all genes and how they interact to influence growth and development of an organism
- Genomic testing can help predict future profitability potential; allows producers to optimize the profitability and yields of their herds by making different animal selection and strategic breeding decisions
- Allows producers to optimize the profitability and yields of their herds by making different animal selection and strategic breeding decisions
- **Some key decisions:**
 - Increase genetic gain
 - parentage verification
 - manage inbreeding
 - make confident mating decisions
 - identify the best replacement heifers

What can genomics do (2)?

- Enable genetic evaluations and use of genetic variation
- In turn this enables breeding programmes to disseminate genetics that add value
- Breeding goals and production systems
 - Definition of tropical adaptation and resilience
 - Diseases and pest
 - Nutritional challenges (feed variation during pregnancy
 - Genotype x Environment

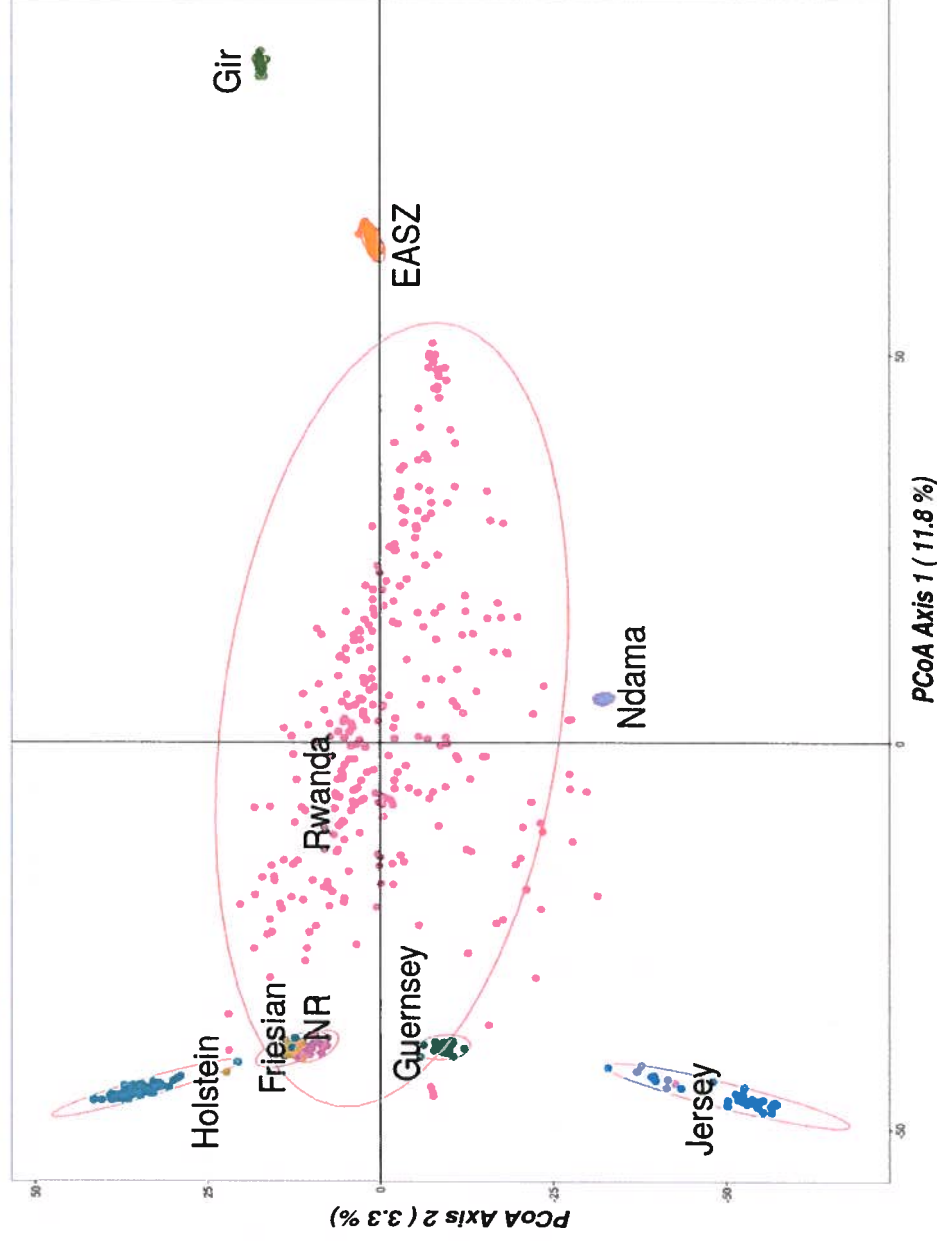
But phenotyping ... remains KING/CRITICAL

Phenotypes and metadata DATA DATA DATA DATA / Records



"If you cannot measure it,
you cannot improve it"

Genetic diversity in Rwanda: Using genomics (SNP data)



Conclusions

- Rwanda Girinka population is indeed comprised of crossbreeds
- Predominantly Zebu, Holstein Friesian (HF), some Jersey
- There was 46.2% agreement and 29.4% disagreement between the farmer-reported genotypes and the genetically determined genotypes.



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TACKLING **GLOBAL CHALLENGES** IN THE TROPICS THROUGH **GENETIC IMPROVEMENTS** IN LIVESTOCK

SUSTAINABLE DEVELOPMENT **GOALS**

ENHANCING LIVESTOCK ADAPTABILITY FOR MORE EQUITABLE LIVELIHOODS AND ECONOMIC GROWTH

1 **People**
2 **Zero Hunger**
5 **Gender Equality**

TROPICALLY ADAPTED AND MORE PRODUCTIVE LIVESTOCK FOR SUSTAINABLE AGRI-SYSTEMS AND ECOSYSTEMS

13 **Life Below Water**

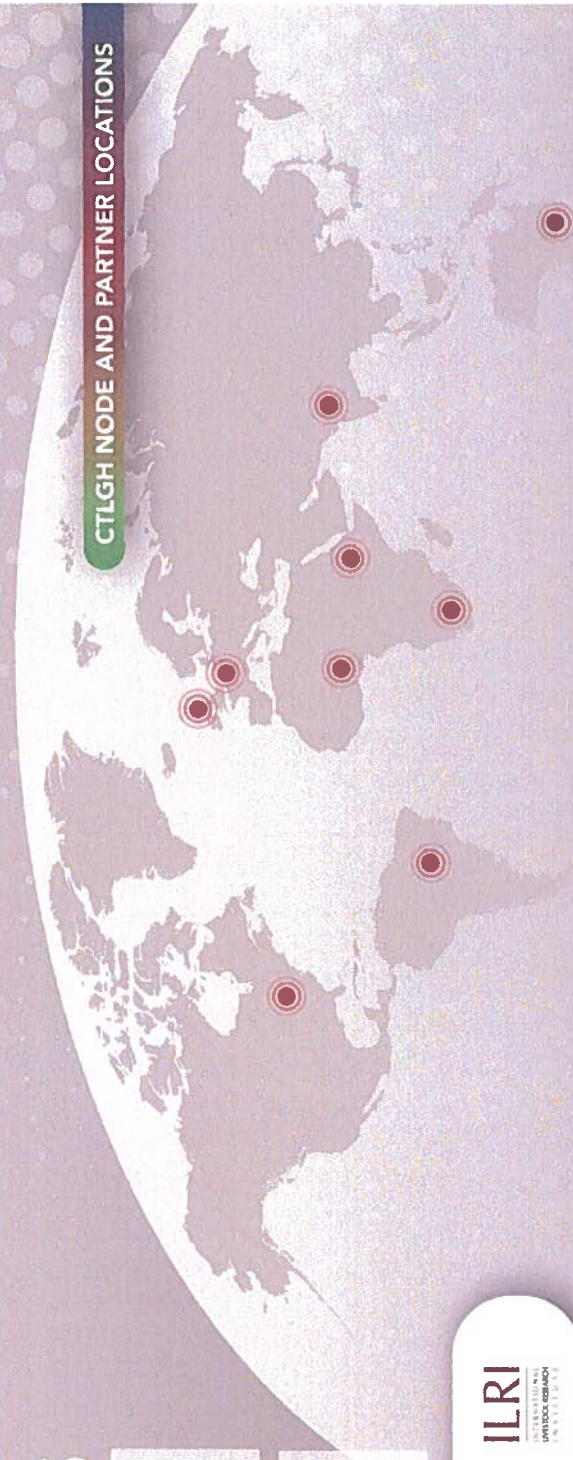
HARNESSING GENETIC POTENTIAL TO IMPROVE LIVESTOCK PRODUCTIVITY FOR BETTER HUMAN NUTRITION AND HEALTH

2 **Good Health and Well-being**
3 **Good Quality Education**

CATALYSING PARTNERSHIPS AND PROGRAMS FOR RESEARCH AND DEVELOPMENT

17 **Partnerships for Research and Development**

CTLGH NODE AND PARTNER LOCATIONS



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www.ctlgh.org

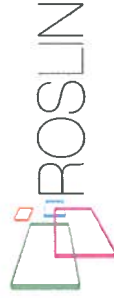
Innovative partnerships and engagements for sustainable livestock systems

Thank you



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