

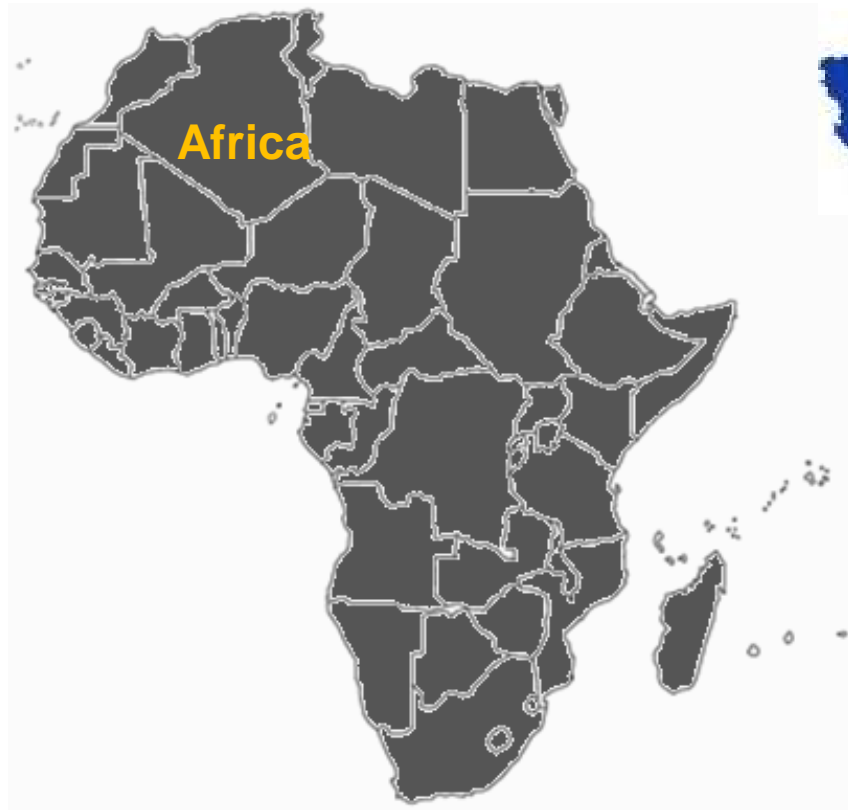
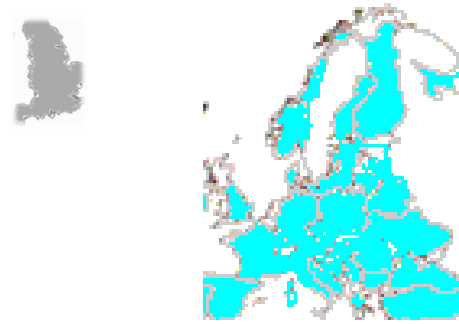
Some Opportunities for informed & better utilization of AnGRs: Some Examples

Okeyo A. Mwai

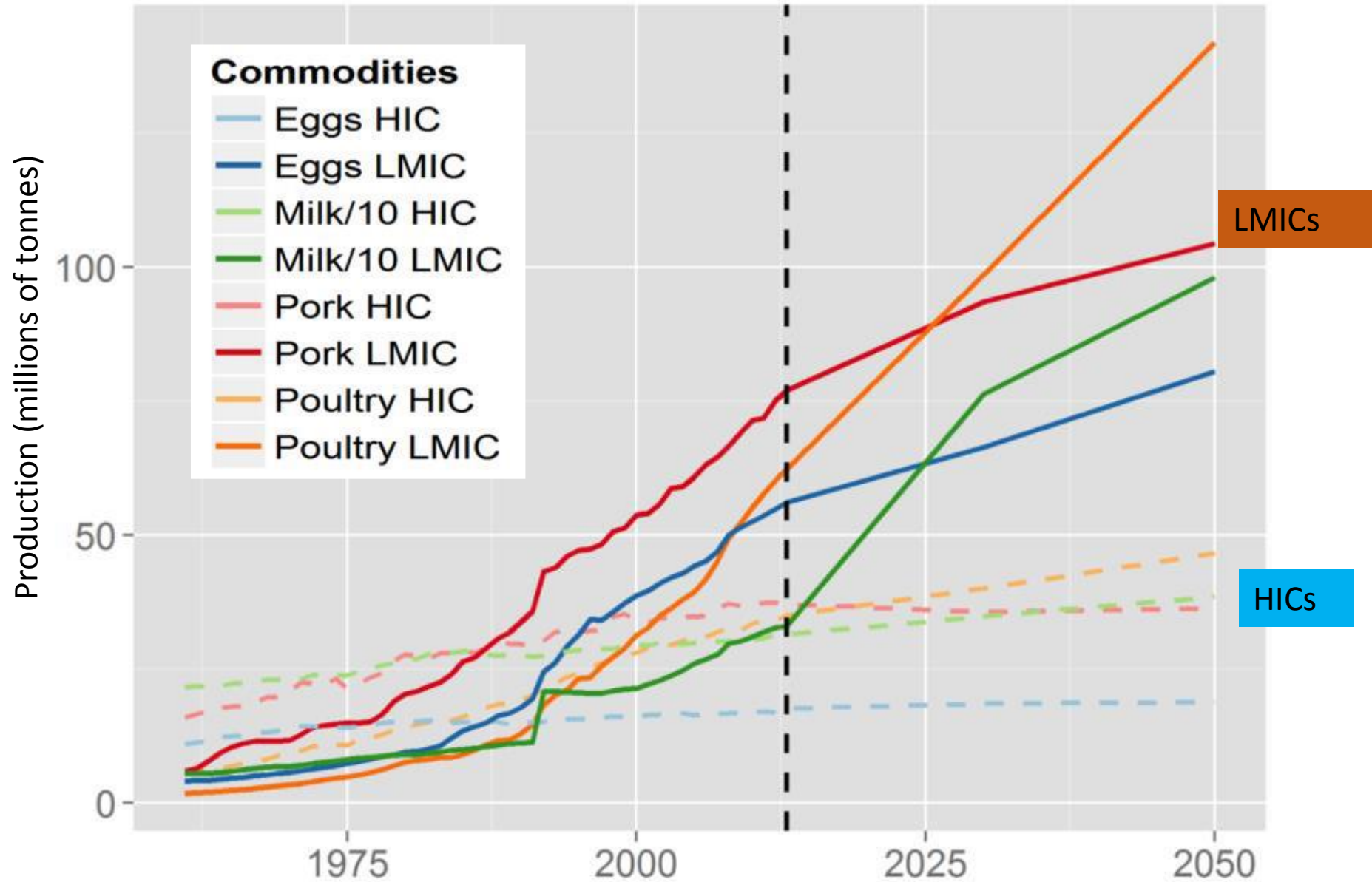
AU-IBAR's Training Workshop on Empowering Livestock Breeders Associations for Competitive & Sustainable Use of AnGRs, Harare, Zimbabwe, May-23-2017



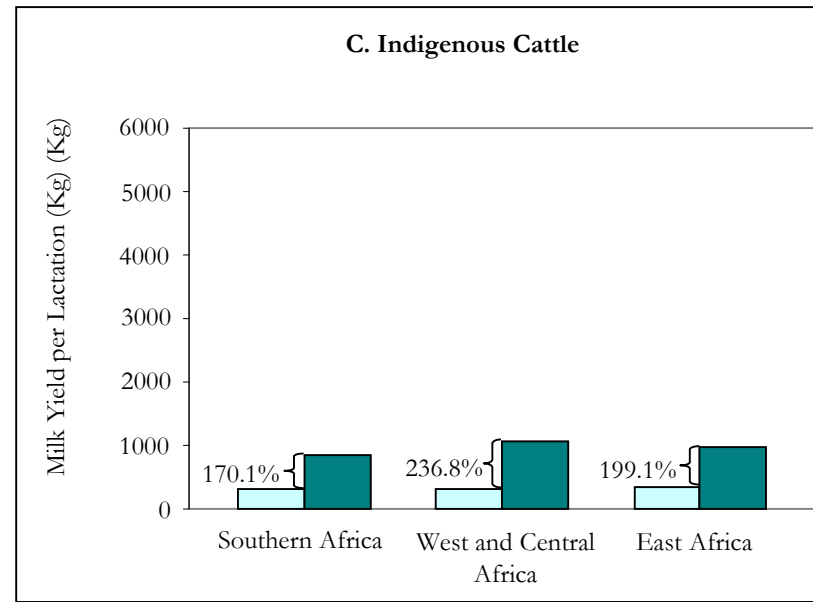
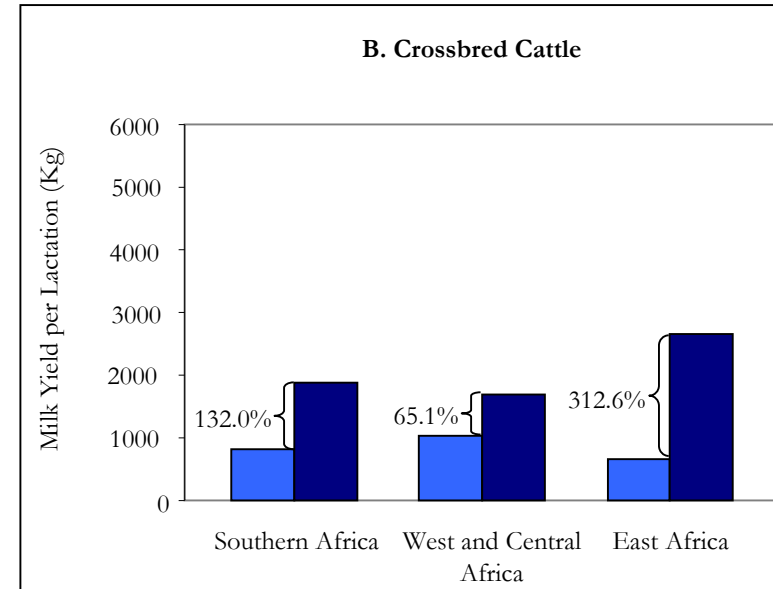
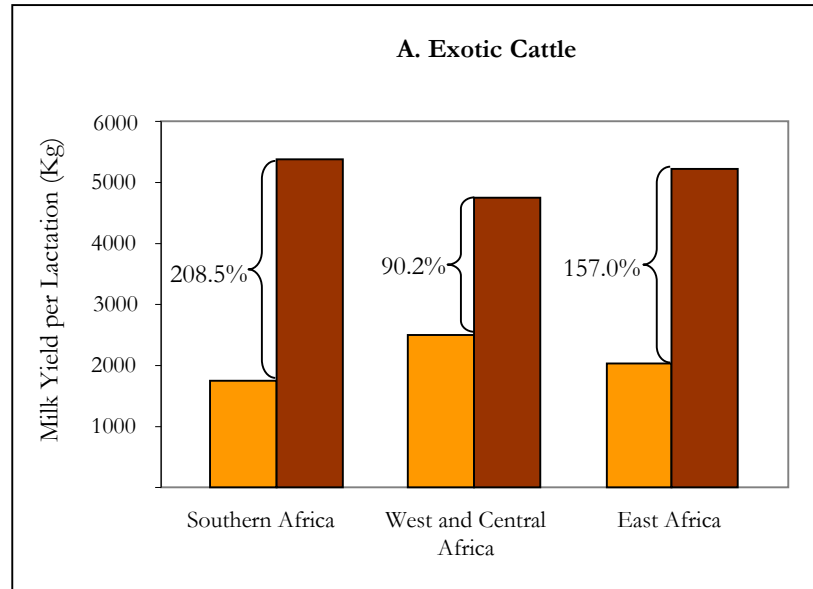
Africa is not small?



Production of animal products



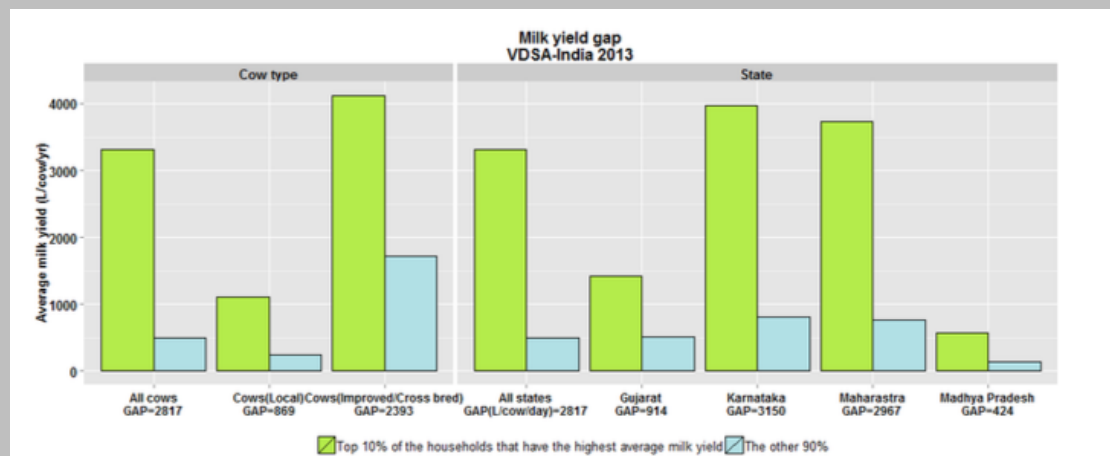
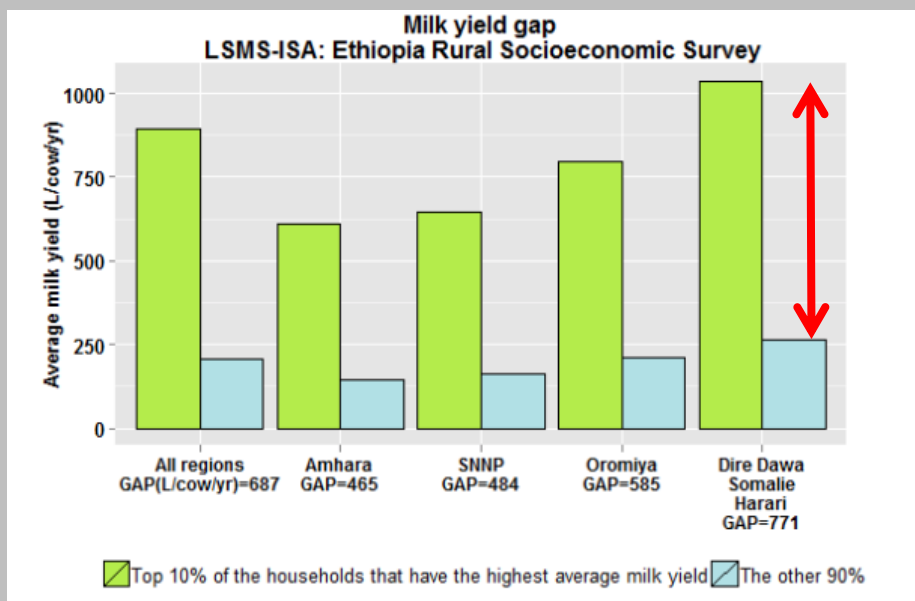
Huge Yield Gaps: Maximum (dark coloured) and minimum (light coloured) levels of milk production for different genotypes of cattle in Sub-Saharan Africa



Better strategies are required & biotechnology is key

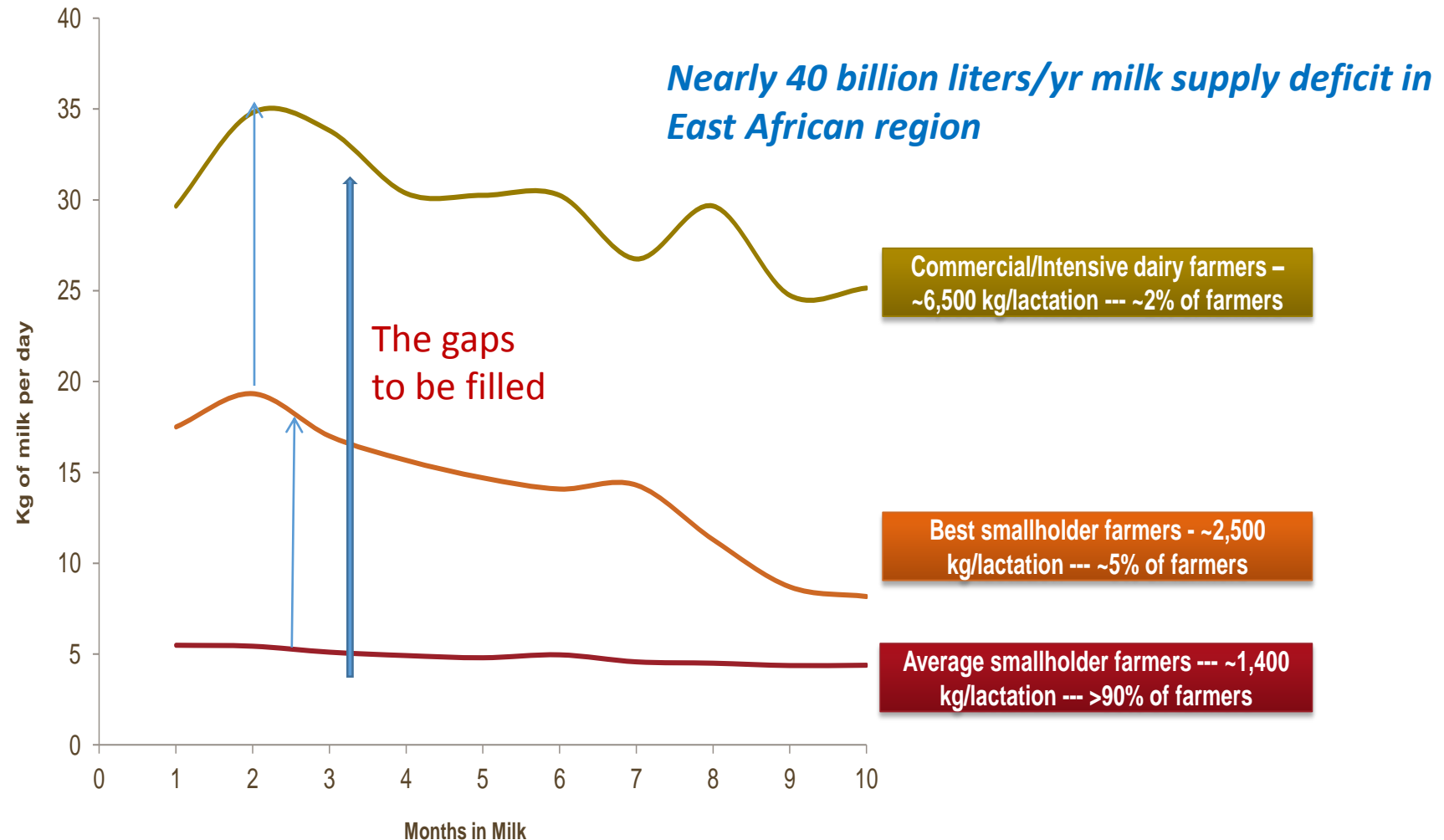
Huge opportunities for increased wealth creation, food & nutrition security

- The yield gap is self evident and huge cont..



Huge yield gaps-case of Kenya dairy cattle

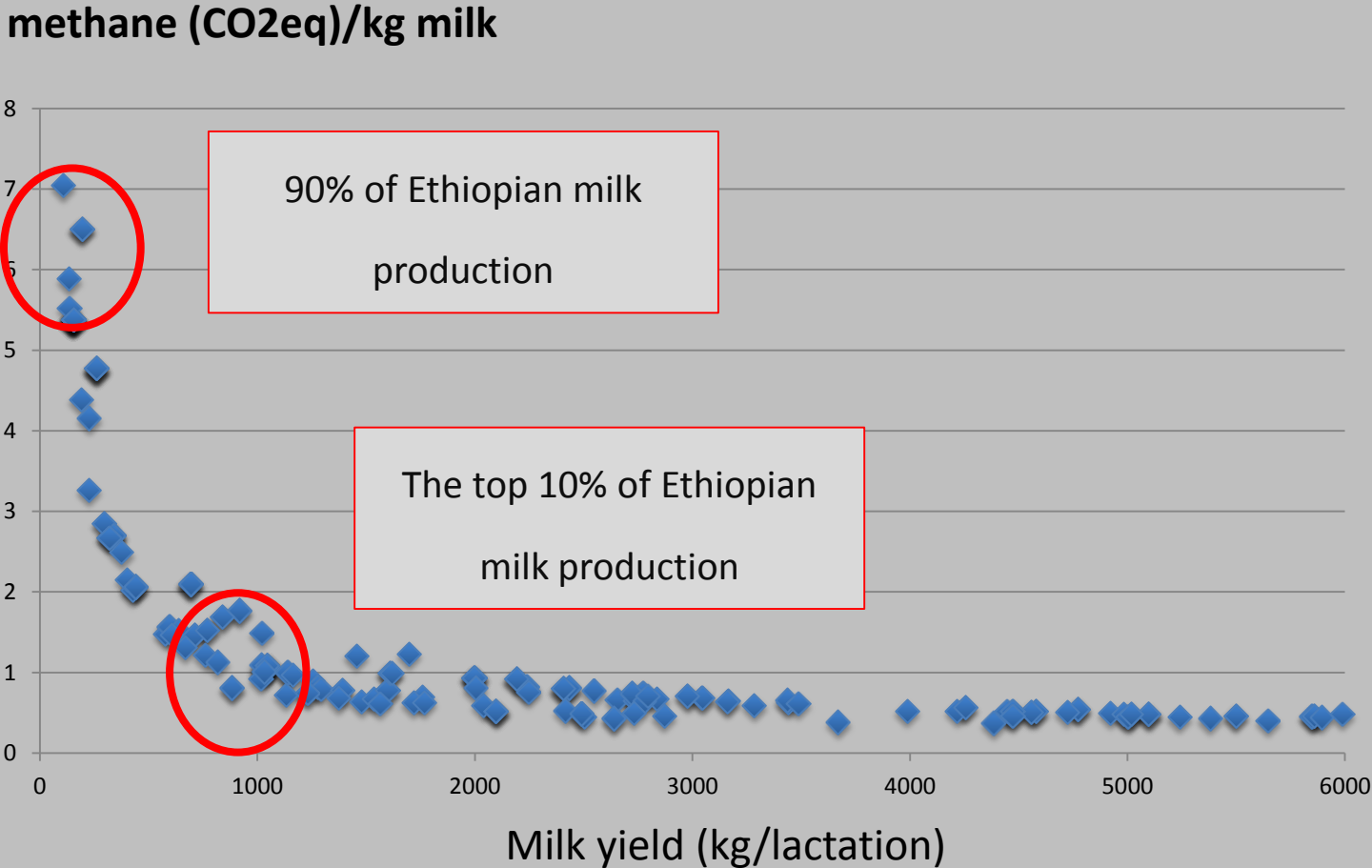
Figure 1: Realized lactation curves of improved (crossbred or higher) dairy cows achieved by different farmer types in Kenya



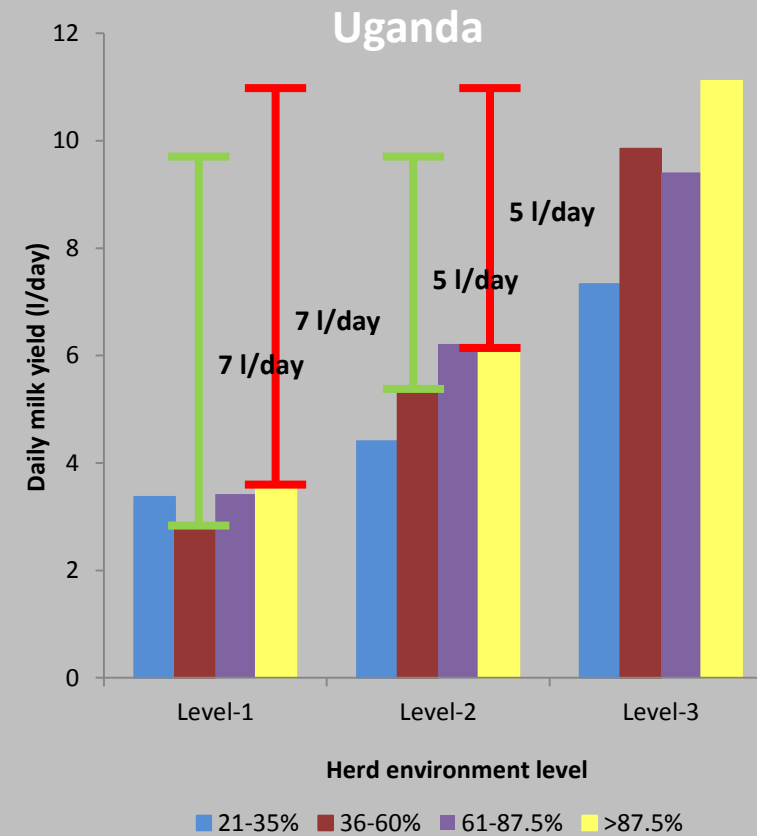
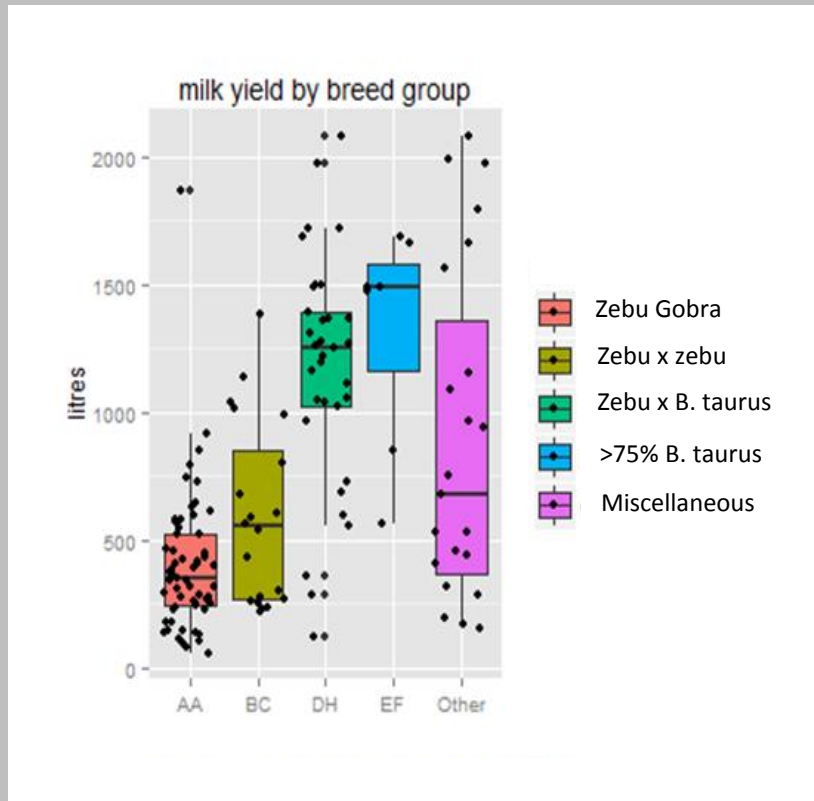
Source: Ojango et al., 2014

But large and less productive herds have far reaching environmental implications

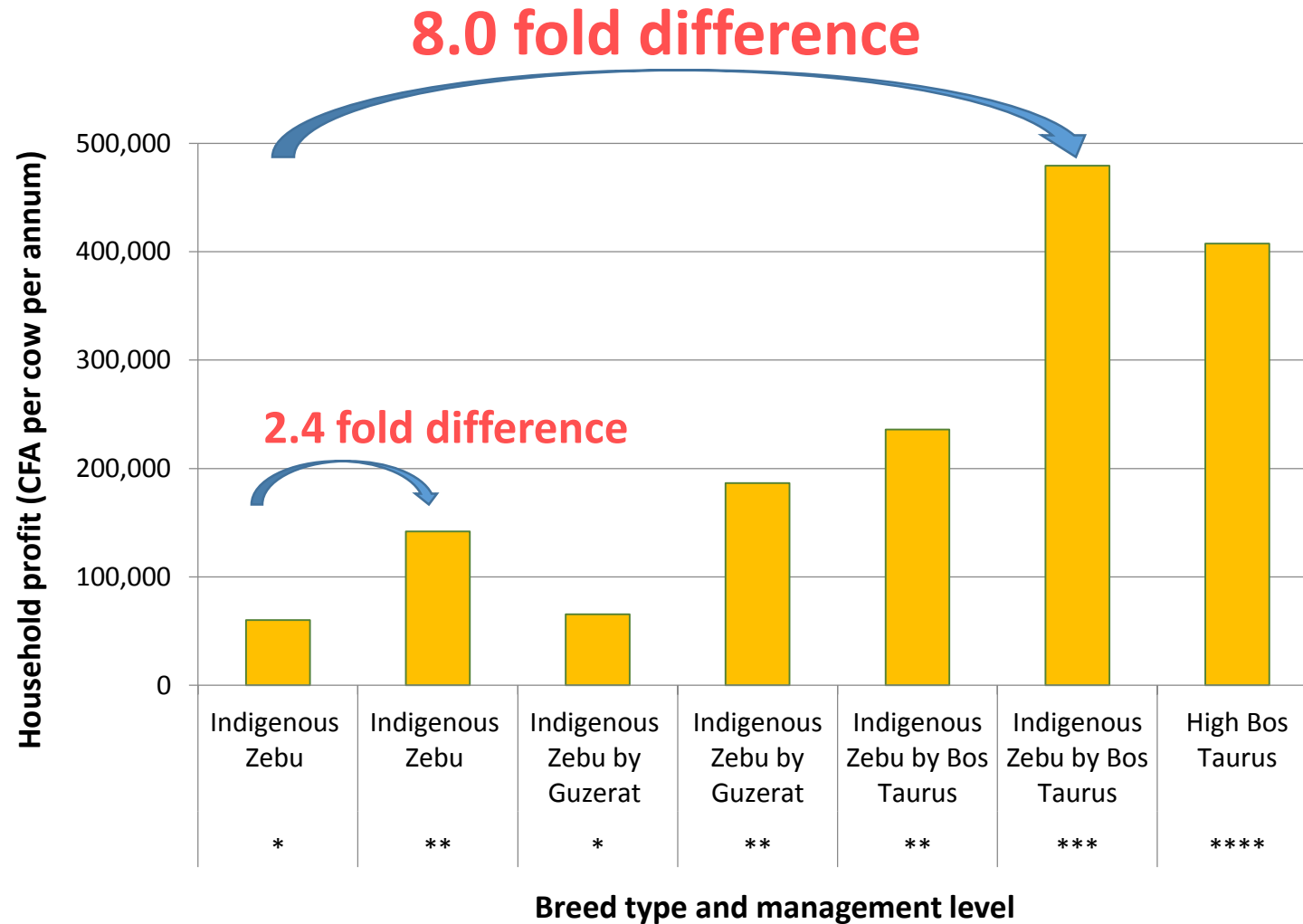
FAO 2013, Herrero et al 2013



- Genetics is important

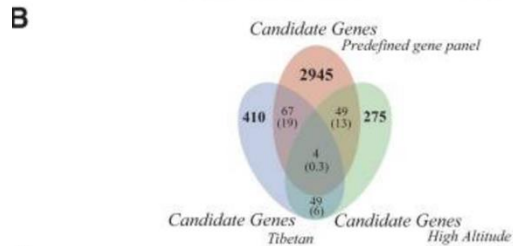
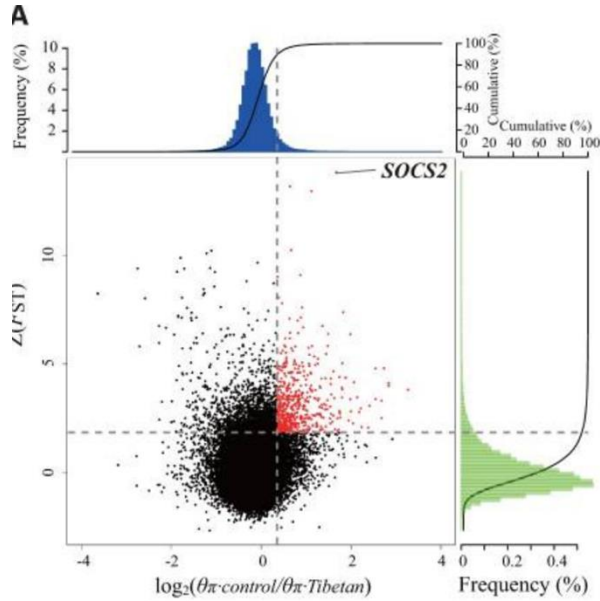


Improved management matters & more comprehensive analyses needed!

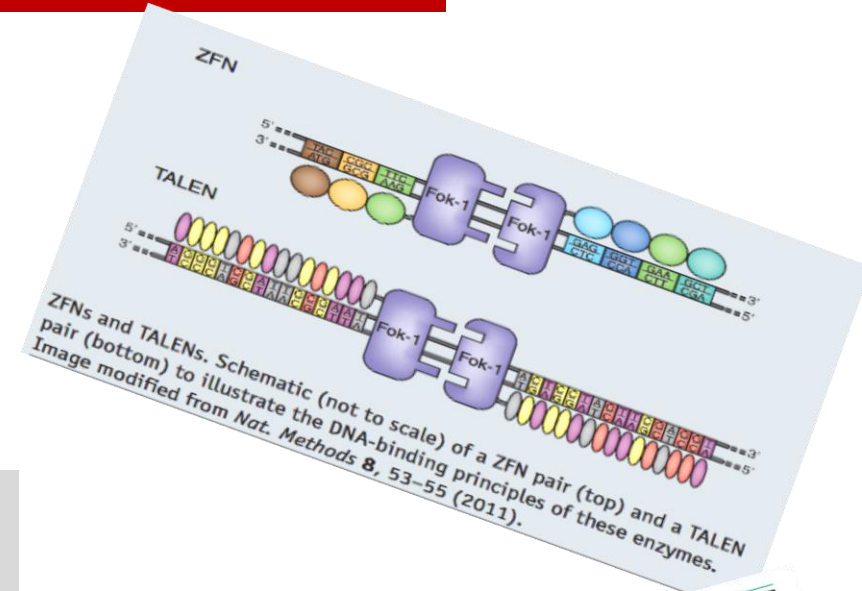


Herd size of 8 cows; non-transhumant

The power of new genomic tools



Yang J, Li WR, Lv FH, He SG, Tian SL, Peng WF, Sun YW, Zhao YX, Tu XL, Zhang M, Xie XL, Wang YT, Li JQ, Liu YG, Shen ZQ, Wang F, Liu GJ, Lu HF, Kantanen J, Han JL, Li MH, Liu MJ. (2016). Whole-genome sequencing of native sheep provides insights into rapid adaptations to extreme environments. *Molecular Biology and Evolution*, 33(10): 2576-



ZFN, TALEN, and CRISPR/Cas-based methods for genome engineering
 Thomas Gaj^{1,2,3}, Charles A. Gersbach^{4,5}, and Carlos F. Barbas III^{1,2,3}
¹The Skaggs Institute for Chemical Biology, The Scripps Research Institute, La Jolla, CA, USA
²Department of Molecular Biology, The Scripps Research Institute, La Jolla, CA, USA
³Department of Chemistry, The Scripps Research Institute, La Jolla, CA, USA
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⁵Institute for Genome Sciences and Policy, Duke University, Durham, NC, USA

Zinc-finger nucleases (ZFNs) and transcription activator-like effector nucleases (TALENs) comprise a powerful class of tools that are redefining the boundaries of biological research. These chimeric nucleases are combining strategies, and the potential for adverse mutagenic effects. Targeted gene knockdown by RNAi (see Glossary) has provided researchers with a rapid, inexpensive, and high-throughput alternative to homologous recombination.

A chance to skip a generation of technology

NextGen Phenotyping capacity:

- Remote sensing as proxy for phenotyping
- Use of Mid-Infra-red Spectroscopy as proxy for performance traits
- Ultra low cost sensors
- Farmer feedback systems
- GHG emission traits



Evidence for innate resistance to ECF



T. parva Tolerance

		Survived	Died	% Survived	Fisher's Exact p
Trial 1	Progeny of ZI3167	3	0	100	
	Control	0	9	0	0.0045
Trial 2	Progeny of ZI3167	4	6	40	
	Control	1	11	9	0.14
Trial 3	Progeny of ZI3167	12	3	80	
	Control	0	8	0	3.4×10^{-4}
Combined	Progeny of 3167	19	9	68	Combined p (Stouffer's method)
	Control	1	28	4	2.11×10^{-5}

Small is not always less efficient or less profitable

A

Location	Type of Kidding					Total
	Single	Twin	Triplet	Quadruplet	Sextuplet	
Western Highland	23	74	58	4	1	160
Forest	5	94	23	2	0	124
Total (%)	28 (9.9)	168 (59.1)	81 (28.5)	6 (2.1)	1 (0.4)	284

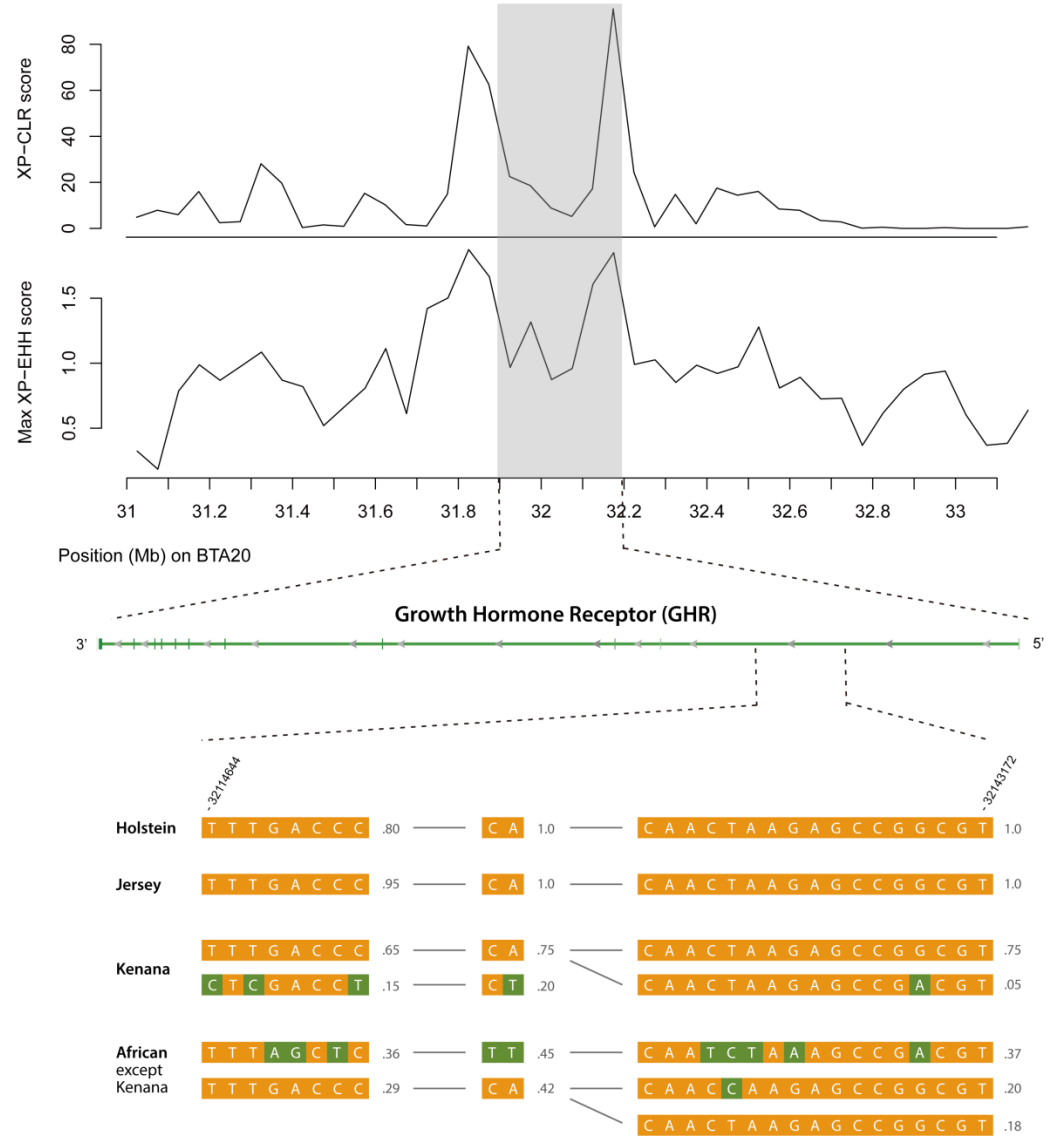


High Prolificacy can be profitable and **Green** (can reduce environmental impacts of goat production)

Prolificacy is expressed only in **does**, but efficient breeding requires use **bucks** with high potential.

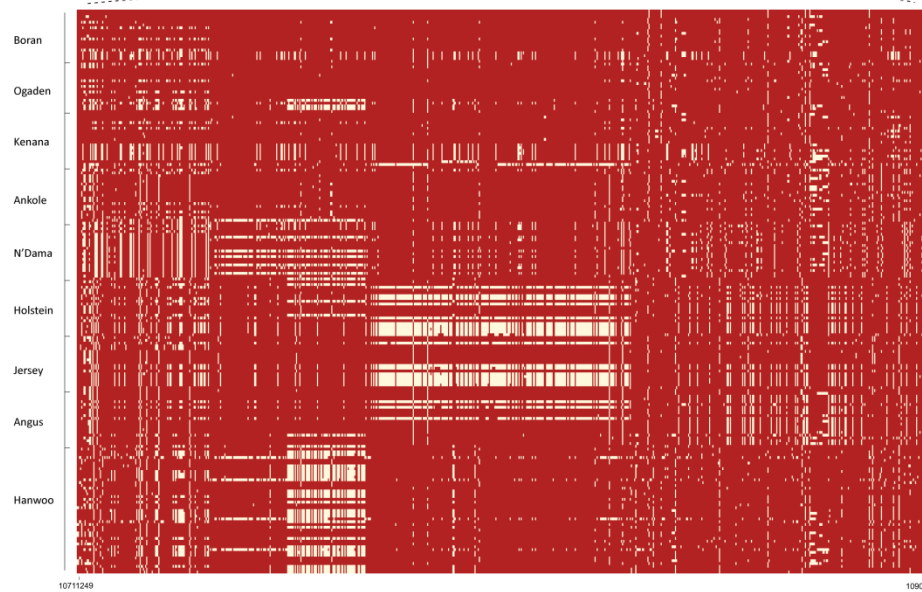
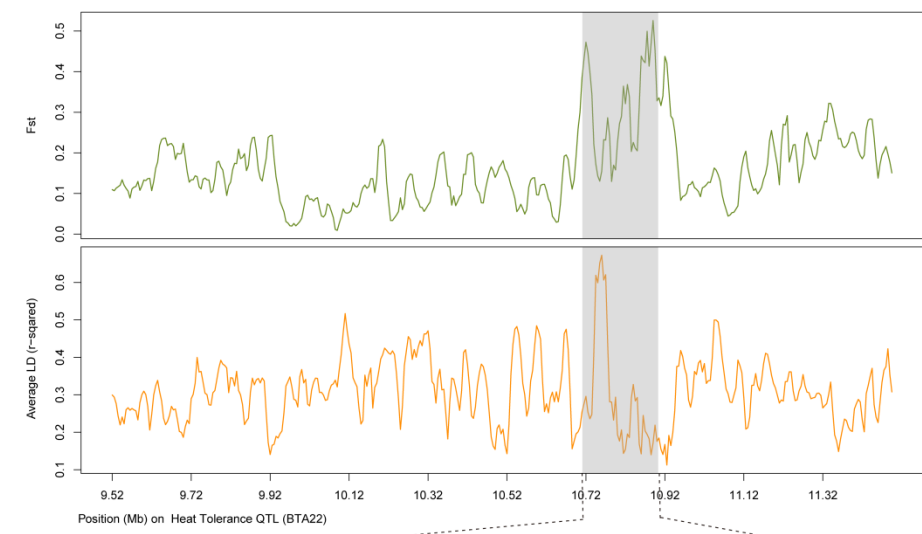
The genomic region responsible has been identified

Total kg marketed (US\$)/female/year!!

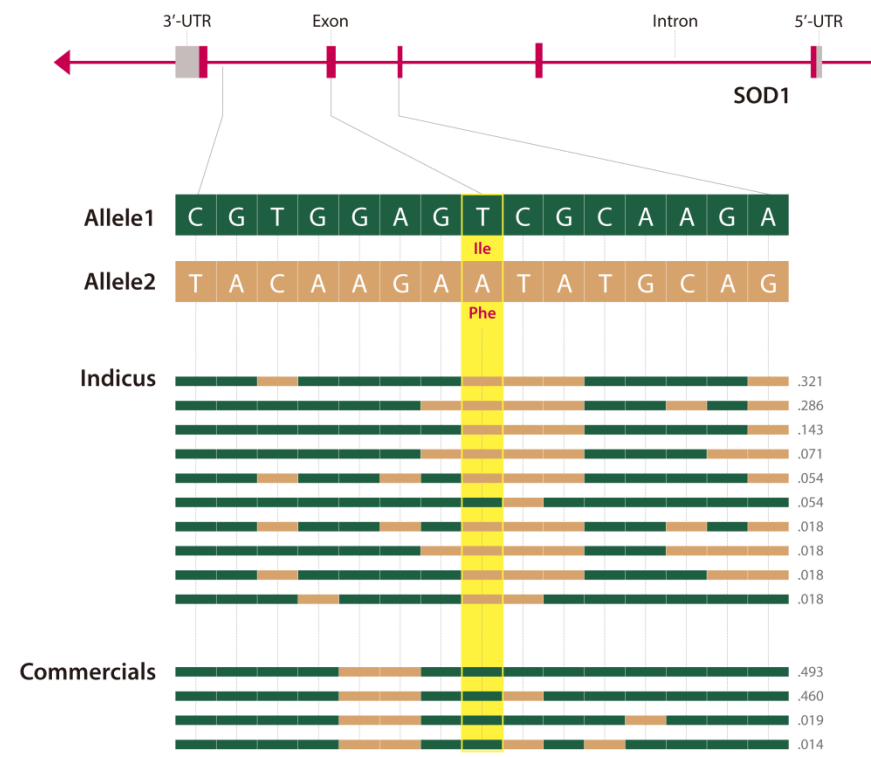


Selective sweep for milk production in Kenana cattle

A)

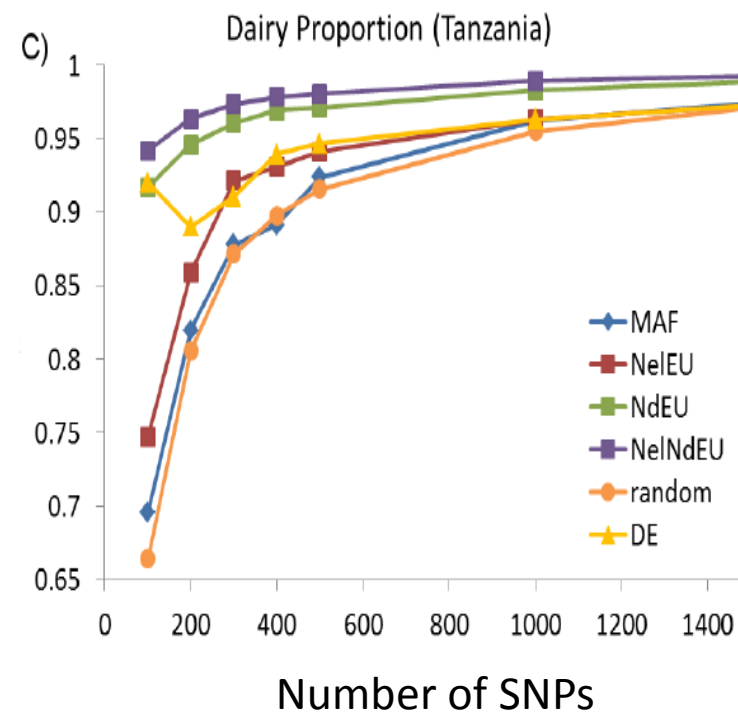
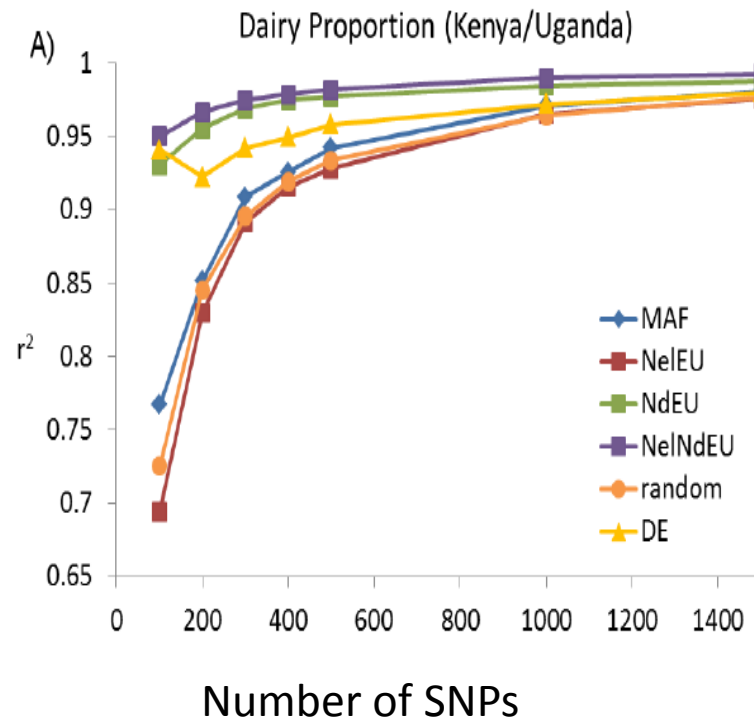


B)



Selective sweep for heat tolerance in African cattle

Smatter tools are now becoming available: A low density SNP array gives same level of usefulness as a 780,000 array for estimates of dairy breed proportion and parentage testing



A combined chip comprising 400 SNPs for both parentage and breed composition testing ready for field testing in from July, 2017.



Short communication: Genomic selection in a crossbred cattle population using data from the Dairy Genetics East Africa Project

A. Brown^{*}, J. Ojango[†], J. Gibson[‡], M. Coffey^{*}, M. Okeyo[†], R. Mrode^{*†}  

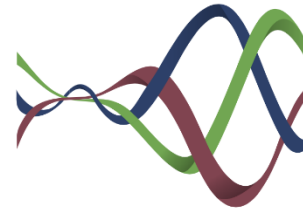
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Abstract

Due to the absence of accurate pedigree information, it has not been possible to implement genetic evaluations for crossbred cattle in African small-holder systems. Genomic selection techniques that do not rely on pedigree information could, therefore, be a useful alternative. The objective of this study was to examine the feasibility of using genomic selection techniques in a crossbred cattle population using data from Kenya provided by the Dairy Genetics East Africa Project. Genomic estimated breeding values for milk yield were estimated using 2 prediction methods, GBLUP and BayesC, and accuracies were calculated as the correlation between yield deviations and genomic breeding values included in the estimation process, mimicking the situation for young bulls. The accuracy of evaluation ranged from 0.28 to 0.41, depending on the validation population and prediction method used. No significant differences were found in accuracy between the 2 prediction methods. The results suggest that there is potential for implementing genomic selection for young bulls in crossbred small-holder cattle populations, and targeted genotyping and phenotyping should be pursued to facilitate this.



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ADGG
African Dairy Genetic Gains
More productive and profitable dairy cows

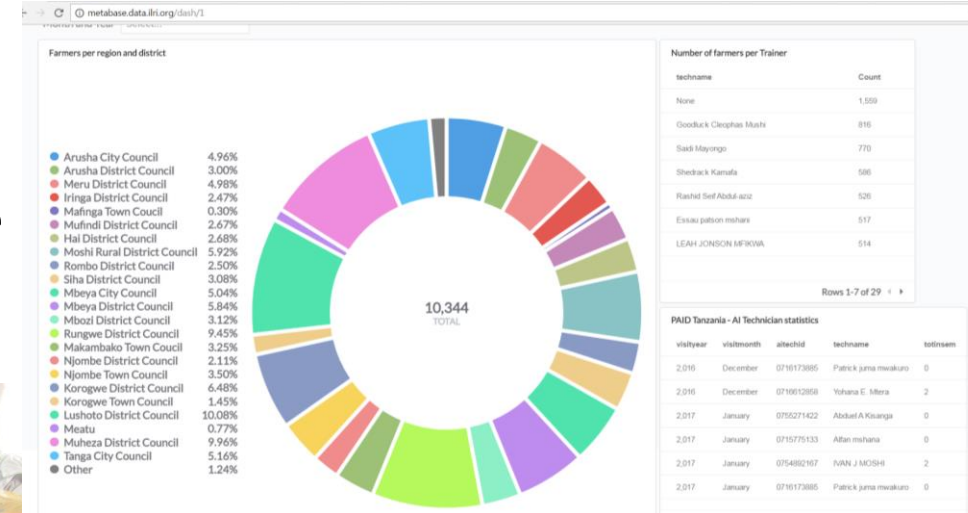


RESEARCH
PROGRAM ON
Livestock

Community-based breeding programs-select under prevailing environments



Pool flocks & record performance



Use the records, indigenous knowledge & genomics to select young rams for breeding

Ruthlessly get rid of unwanted males



Bonga sheep in Bonga, Ethiopia





Thank you



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Patron: Professor Peter C Doherty AC, FAA, FRS

Animal scientist, Nobel Prize Laureate for Physiology or Medicine—1996

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