Digital innovations to support extension, breeding and data capture in smallholder dairy systems

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Goal

Adapting Genomic and ICT technologies to transform dairy breeding in Smallholder production systems of middle and low-income countries of Africa and Asia.

Opportunities in smallholder dairy systems

- Smallholder farmers collectively contribute to >70% of the milk produced in middle and low-income countries
- Huge gaps exist in the production, supply & access to productive and adapted seedstock for smallholder systems.
- Contextualized information to enhance smallholder dairy enterprises is limited.
- Supportive public-private sector policies: institutions key value chain actors willing to support smallholder dairy producers
- ICT based information sharing tools are readily used across farming communities and can be adapted to provide targeted relevant information for smallholder dairy enterprises
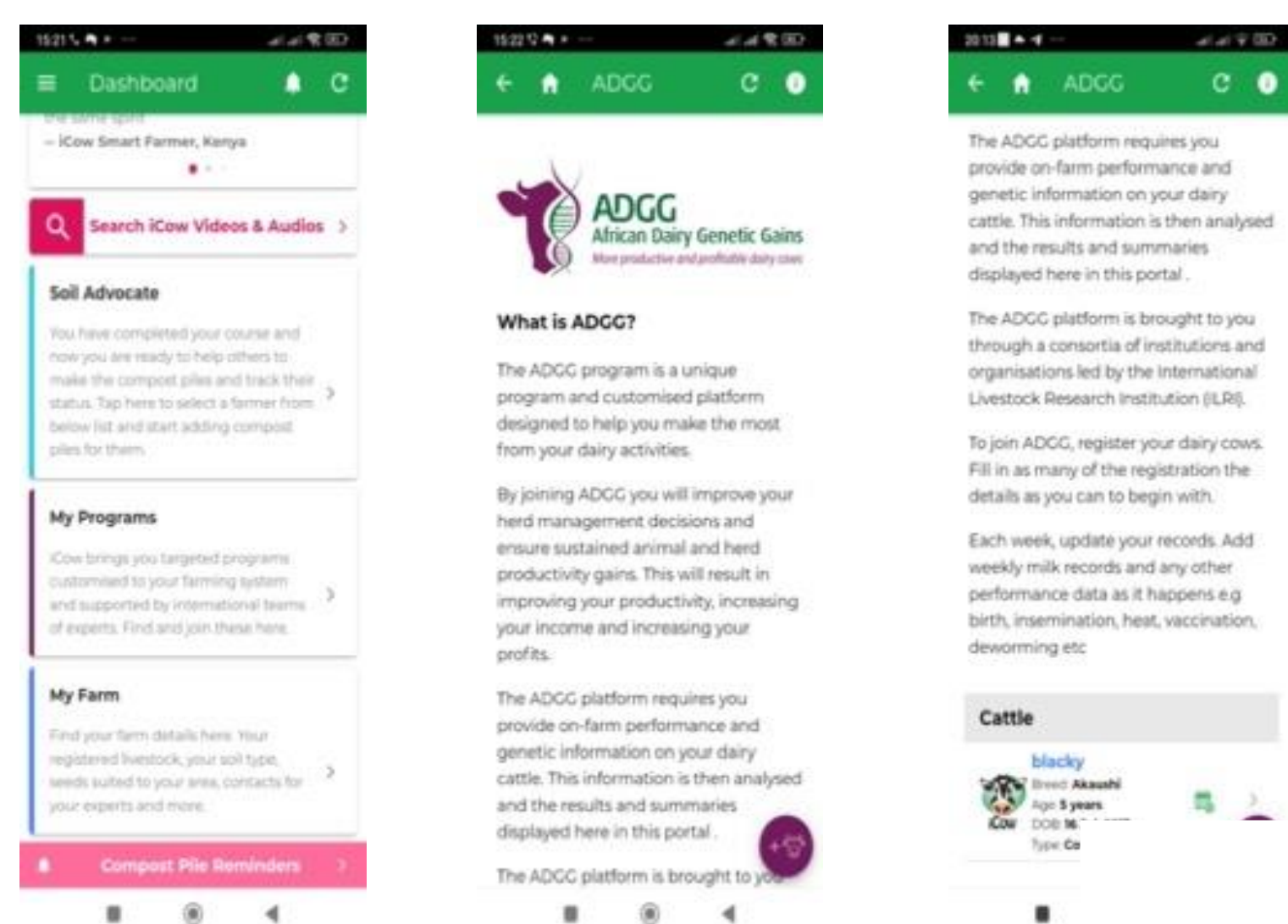
Genotyping

- > 10,000 animals sampled for Genotyping
- GeneSeek Genomic Profiler (GGP) Bovine 50K used for genotyping
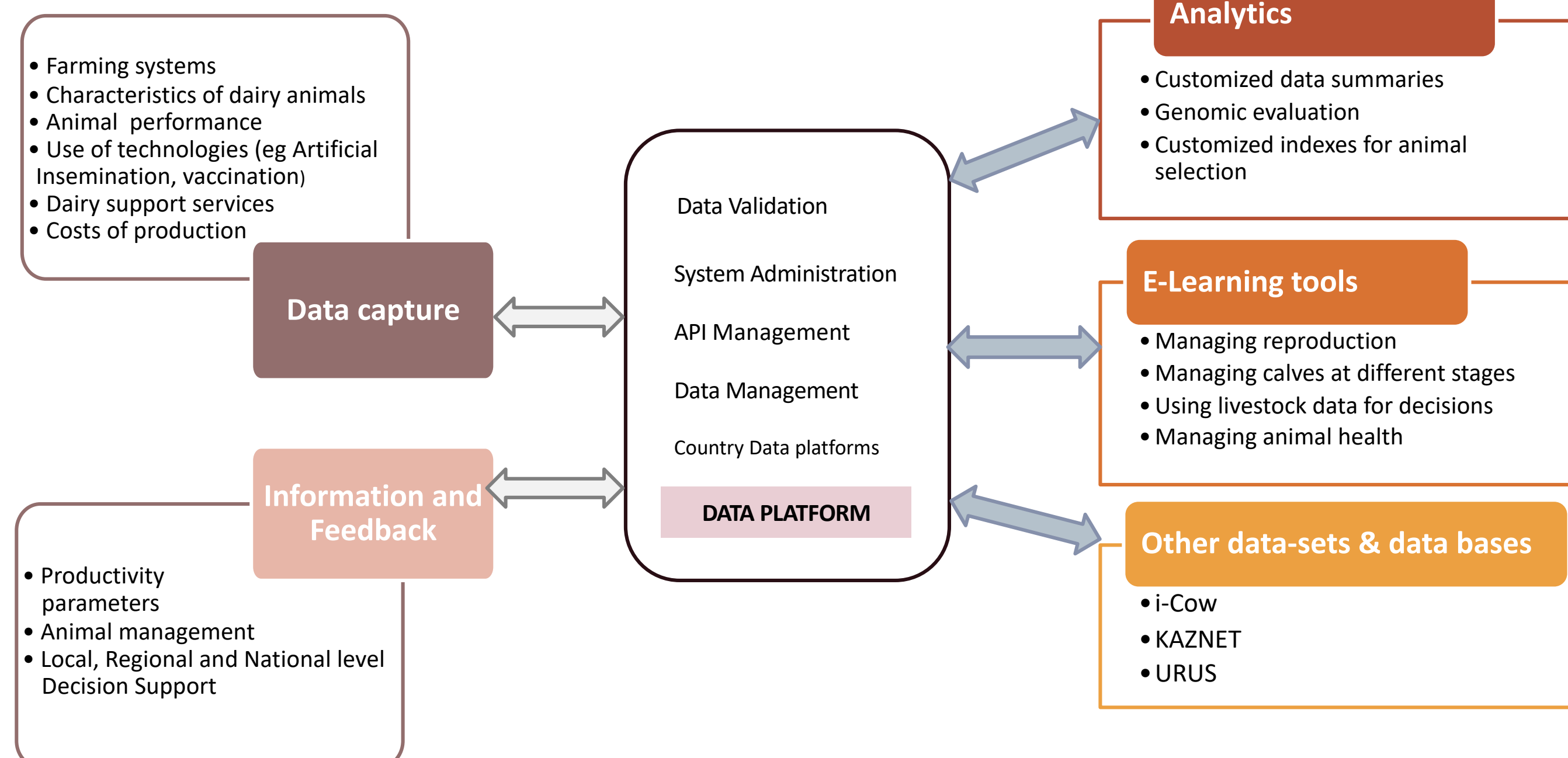- 40581 SNPs imputed to high density
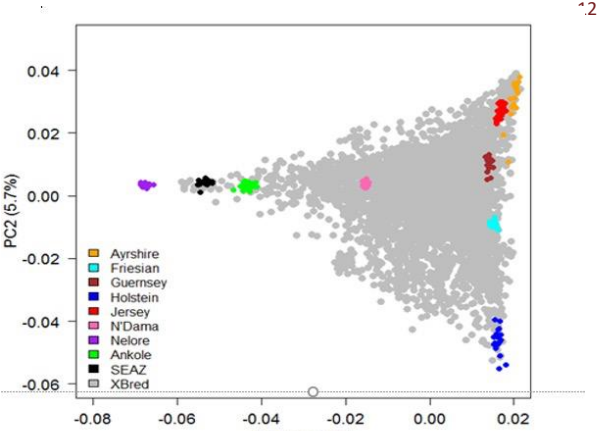
Index for selecting seed animals

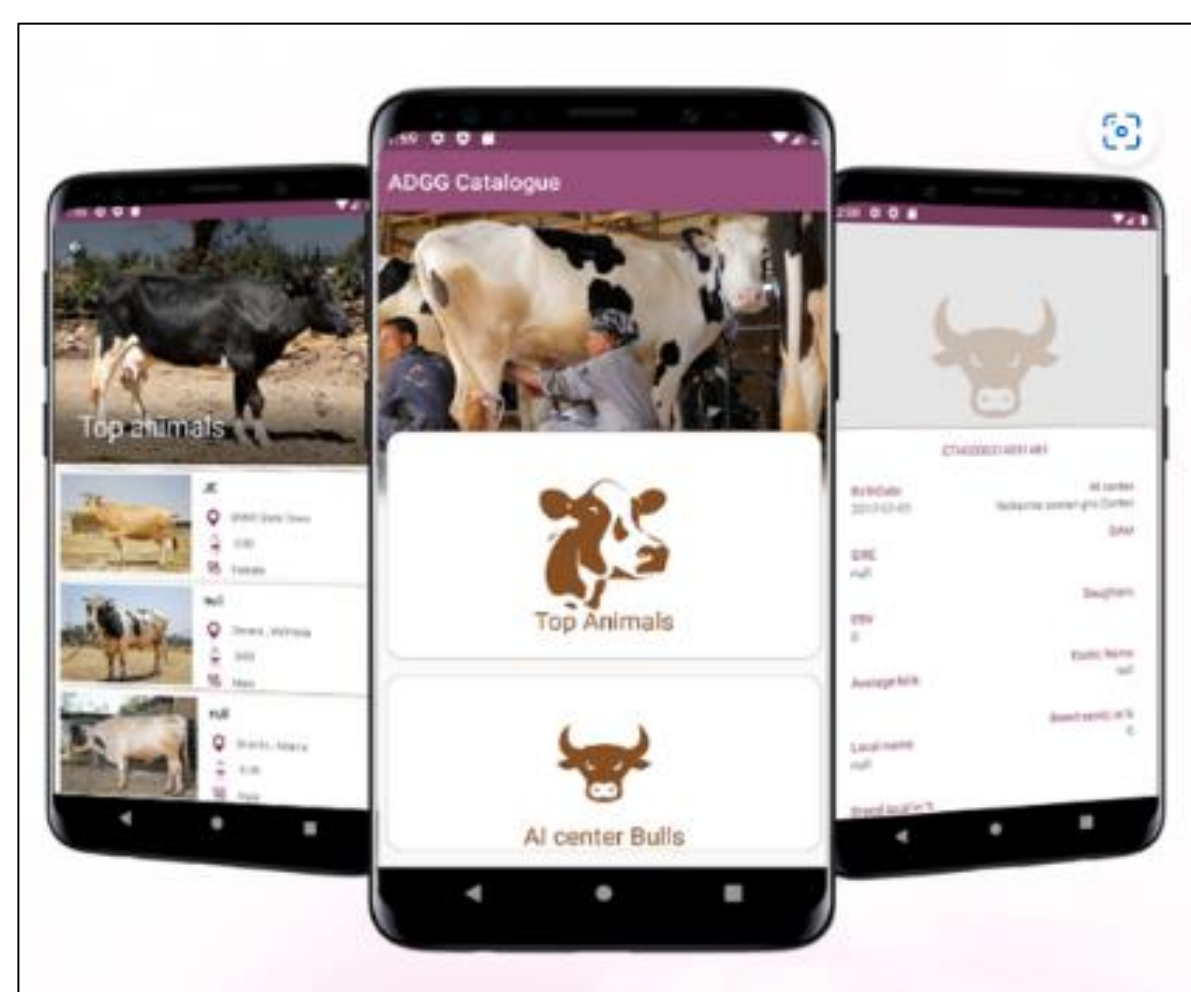- Index developed using results from genomic evaluation to improve milk production without increasing body weight
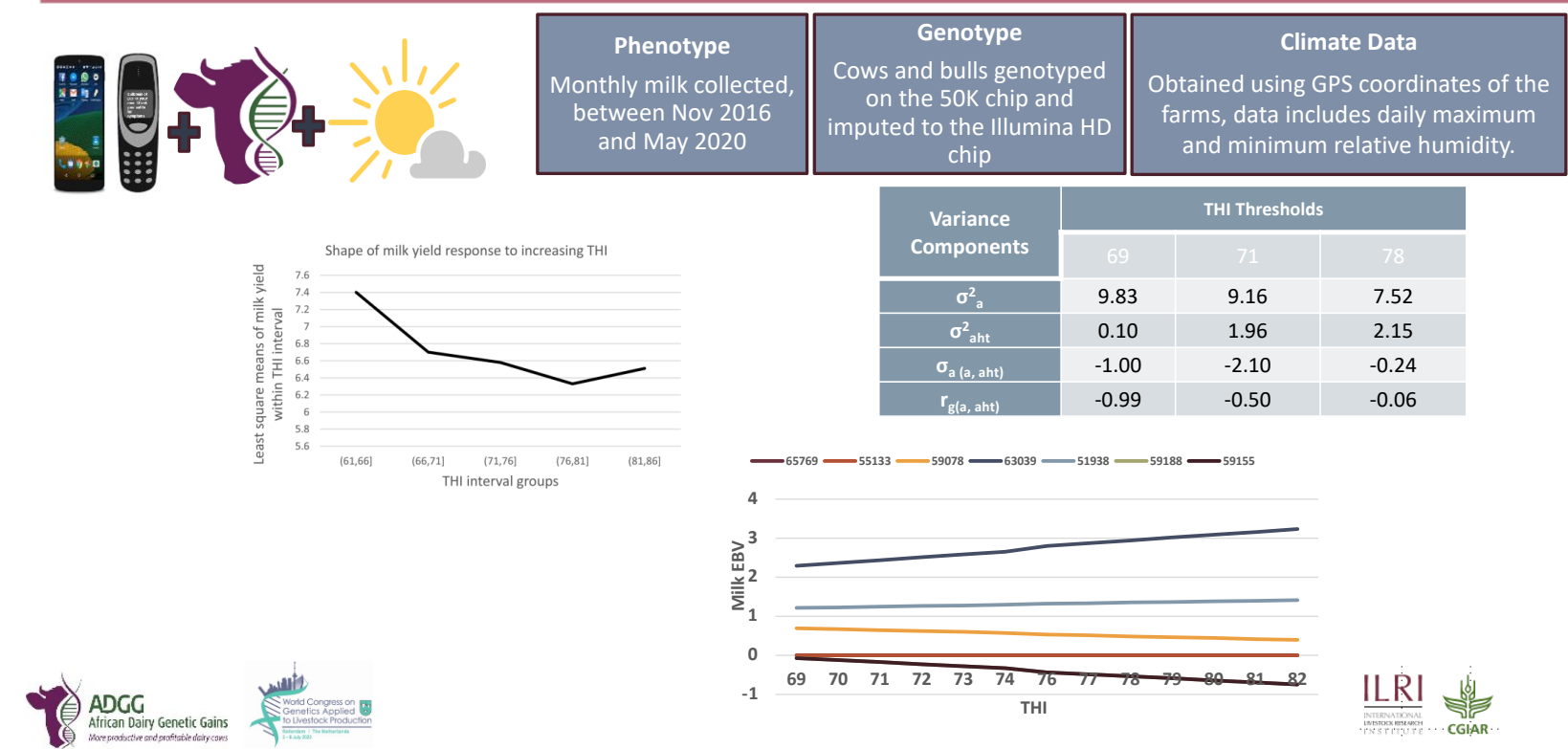
The AADGG-Data Platform

Data capture
- Farming systems
- Characteristics of dairy animals
- Animal performance
- Use of technologies (eg Artificial Insemination, vaccination)
- Dairy support services
- Costs of production

Information and Feedback
- Productivity parameters
- Animal management
- Local, Regional and National level Decision Support

DATA PLATFORM
- Data Validation
- System Administration
- API Management
- Data Management
- Country Data platforms

Analytics
- Customized data summaries
- Genomic evaluation
- Customized indexes for animal selection

E-Learning tools
- Managing reproduction
- Managing calves at different stages
- Using livestock data for decisions
- Managing animal health

Other data-sets & data bases
- i-Cow
- KAZNET
- URUS

https://portal.adgg.ilri.org/

Country	Animals registered
Tanzania	69,792
Kenya	232,482
Ethiopia	141,454
Nigeria	346
Zambia	82
Uganda	16,935

Genomic analysis of milk yield and heat tolerance for small holder dairy system of sub-Saharan Africa

	Phenotype	Genotype	Climate Data
	Monthly milk collected, between Nov 2016 and May 2020	Cows and bulls genotyped on the 50K chip and imputed to the Illumina HD chip	Obtained using GPS coordinates of the farms, data includes daily maximum and minimum relative humidity.

Variance Components	THI Thresholds		
	9.83	9.16	7.52
	0.10	1.96	2.15
	-1.00	-2.10	-0.24
	-0.99	-0.50	-0.06

Facilities and Enabling Conditions

- ❖ National Dairy Performance Recording Centers with a robust and agile database for herd and cow performance data collection
- ❖ Harmonized animal identification and registration
- ❖ Pipelines for continuous genetic evaluations to identify superior purebred and crossbred bulls
- ❖ Certification systems for dairy seedstock established
- ❖ Private-public partnerships options to sustainably resource recording, genetic evaluation and digital extension

National/regional Institutions/govts. Dairy Farmers & Farmer organizations