The African Animal Breeding Network (AABNet)
Towards transforming the African livestock development outlook

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ICAR-Interbull Meeting
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* Centre for Tropical Livestock Genetics and Health, The Roslin Institute, The University of Edinburgh, UK
% growth in demand for livestock products to 2030

Beef

Pork

Poultry

Milk

How to meet this demand by 2030?

Courtesy of ILRI

Increases not because of overconsumption!

OECD average 2018 = 69 kg/capita meat

SSA average 2018 = 10 kg/capita meat
Reduced environmental footprint

Improved performance rapidly reduces green house gas production intensity

1. Selection and breeding for more productive & lower CH4 producing ruminants
2. Vaccines to reduce CH4 production in the rumen
3. Anaerobic processes to capture biogas

90% of Ethiopian milk production

The top 10% of Ethiopian milk production

Methane (CO2eq)/kg milk

Milk yield (kg/lactation)

FAO 2013, Herrero et al 2013

Courtesy of ILRI
A real opportunity to initiate a system to support similar gain in Africa over time!

https://www.slideshare.net/jbcole/genetic-improvement-programs-for-us-dairy-cattle
Livestock contribute to the SDGs (at least directly to 8 of the 17 goals)
The challenge:  Limited success in animal breeding (genetic improvement) in Africa

Opportunities: A growing list of success stories on genetic gains in African livestock
Challenges facing smallholder dairy systems & the consequences

- Little or no systematic and sustainable breeding programs exist
- Limited access to the dairy genetics or breed types/choices that best suit the different production systems
- Inadequate access to various services and inputs, hence no sustained productivity gains
- Access to information or farmer education and training services lacking so can’t improve herd productivity and system profitability.

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

- Commercial/Intensive dairy farmers – ~6,500 kg/lactation --- ~2% of farmers
- Best smallholder farmers - ~2,500 kg/lactation --- ~5% of farmers
- Average smallholder farmers --- ~1,400 kg/lactation --- >90% of farmers
Opportunity 1: Innovative application of ICT & Genomic technologies

1. To establish National Dairy Performance Recording Centers (DPRCs) for herd and cow data collection, synthesis, genetic evaluation and timely farmer-feedbacks.

2. To develop & pilot an ICT platform (FFIP) to capture herd, cow level & other related data & link it to DPRCs (feeds back key related herd/cow summaries, dairy extension & market info. etc.).

3. To develop genomic chip for breed composition determination & related bull certification systems, esp. for crossbred bulls.
### Breeding value prediction pipelines developed

<table>
<thead>
<tr>
<th>Records</th>
<th>Ethiopia</th>
<th>Tanzania</th>
<th>Kenya</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of farms</td>
<td>72,095</td>
<td>34,732</td>
<td>26,766</td>
<td><strong>133,593</strong></td>
</tr>
<tr>
<td>No of cows</td>
<td>113,280</td>
<td>67,825</td>
<td>131,229</td>
<td><strong>312,334</strong></td>
</tr>
</tbody>
</table>

Opportunity 2: Community Based Breeding Programs provide an appropriate framework for sustainable breed development and conservation in Malawi

<table>
<thead>
<tr>
<th>CBBP Programs in Malawi</th>
<th>Support</th>
<th>Areas</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goats breed improvement</td>
<td>USDA ARC AGIN</td>
<td>North, Center, South</td>
<td>Within breed buck selection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Integrate science and community knowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Training to mitigate inbreeding</td>
</tr>
<tr>
<td>Beef commercialization</td>
<td>Nyama World, a private meat retail company</td>
<td>North</td>
<td>Crossbreeding Bonsmara with Malawi Zebu</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Smallholder beef commercialization</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nyama World as buyer of weaners</td>
</tr>
<tr>
<td>Smallholder chicken commercialization</td>
<td>InCIP, iLINova and FOM</td>
<td>Central Malawi</td>
<td>Local chicken development</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Promote business in village chickens</td>
</tr>
</tbody>
</table>

CBBP output from kids born after first selection

MSc Theses by Mussa (2019 and Kaunda (2020)

<table>
<thead>
<tr>
<th>Goats</th>
<th>Selected</th>
<th>Non-selected</th>
<th>Difference</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth weight, kg</td>
<td>2.5</td>
<td>2.4</td>
<td>0.10</td>
<td>4.17</td>
</tr>
<tr>
<td>2-month weight, kg</td>
<td>8.5</td>
<td>6.9</td>
<td>1.60</td>
<td>23.19</td>
</tr>
<tr>
<td>4-month weight, kg</td>
<td>13.4</td>
<td>11.7</td>
<td>1.70</td>
<td>14.53</td>
</tr>
<tr>
<td>Dressing %</td>
<td>45.26</td>
<td>39.36</td>
<td>5.90</td>
<td>14.99</td>
</tr>
</tbody>
</table>
Objective 1
Multi-country genetic evaluation

Objective 2
Professional development
(the African Animal breeding Academy, AABA)

Objective 3
Advocacy and awareness, business development
(livestock genetic improvement and circular bio-economy)

Objective 4
Collaboration, networking and partnerships
(A platform linking public sector, industry and academia)

Vision
resilient, sustainable, efficient and profitable livestock production systems
Across country genetic evaluation

<table>
<thead>
<tr>
<th>Genetic parameters</th>
<th>Kenya (s.e)</th>
<th>South Africa (s.e)</th>
<th>Joint (s.e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( h^2 ) of MY</td>
<td>0.13 (0.10)</td>
<td>0.18 (0.01)</td>
<td>0.21 (0.01)</td>
</tr>
<tr>
<td>( h^2 ) of CI</td>
<td>0.04 (0.06)</td>
<td>0.04 (0.01)</td>
<td>0.05 (0.007)</td>
</tr>
<tr>
<td>( h^2 ) of AFC</td>
<td>0.24 (0.03)</td>
<td>0.44 (0.05)</td>
<td>0.46 (0.01)</td>
</tr>
<tr>
<td>( R^2 ) of MY</td>
<td>0.13 (0.05)</td>
<td>0.40 (0.003)</td>
<td>0.43 (0.005)</td>
</tr>
<tr>
<td>Genetic correlation MY-AFC</td>
<td>-0.53 (0.24)</td>
<td>-0.12 (0.10)</td>
<td>-0.15 (0.09)</td>
</tr>
<tr>
<td>Genetic correlation MY-CI</td>
<td>0.79 (0.72)</td>
<td>0.60 (0.05)</td>
<td>0.58 (0.05)</td>
</tr>
</tbody>
</table>

\( n = 66,000 \) records

- Earlier study has shown that African countries would benefit from joint genetic evaluation
- Appropriate genetic evaluation models need to be developed and utilised
- More data and participation are required to bring impact to scale

Source: Opoola et al. 2018
The current state of play: building on a relevant foundation

**Survey:** Livestock data recording, genetic improvement infrastructure, human capacity and potential for multi-country collaborations of the African livestock sector

**Key observations for consideration:**
1. Very diverse livestock breeds reported in Africa (large and small ruminants, pigs, poultry and other avian species, horses, camel, non-conventional livestock … )
2. Human capacity, national animal identification and ranking systems in Africa
3. Available livestock data, ownerships and some genetic evaluation methods schemes
4. Prospect for across country livestock genetic evaluation

*Houaga I, Mrode R & others*
A growing network to deliver the AABNet objectives
Thank you

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