THE ROLE OF ANIMAL BREEDING AND GENETIC TECHNOLOGIES IN IMPROVING LIVESTOCK PRODUCTIVITY IN SOUTH AFRICA

Prof K A Nephawe (PhD, Pr.Sci.Nat.)
Research Professor / HoD
PRESENTATION OUTLINE

• BACKGROUND
• SIGNIFICANT CHALLENGES
• GOLDEN OPPORTUNITIES
• RESEARCH THEMES
• CONCLUSIONS
BACKGROUND

• The National Development Plan (NDP) of South Africa vision 2030 indicates that Agriculture has a central role to play in building a strong economy.

• Agriculture is central to an inclusive and integrated rural economy by creating jobs in agriculture, agro-processing and related sectors.

• The NDP strives for the increased investment in new agricultural technologies, research and the development of adaptation strategies for the protection of rural livelihoods and expansion of commercial agriculture.
BACKGROUND

• The importance of the livestock industry is evident from various perspective (Livestock Development Strategy for South Africa, 2007).
  – Livestock accounts for more than 40% of the total value of agricultural output.
  – Livestock farming occupies nearly 80% of the agricultural land.
  – From a food and income security point of view, animal agriculture is the primary income generator in the majority of rural areas.
SIGNIFICANT CHALLENGES

- 48 Million Consumers
  Per Capita Consumption of 13.72kg/year
  7 to 13% Agricultural GDP

- 13 000 to 48 000 tonnes imported

- 35 000 tonnes exported

- Poor Consumers (Cheap Cuts Market)

- Tanneries for Automotive Industries

- Meat Processors (495 Abattoirs)
  - 2 400 000 to 2 800 000 slaughters
  - 640 000 tonnes Produced

- Export
  - Local

- Hides
  - Developing Sector Markets
    - Butchers
    - Auctions
    - Speculators
    - Festivities

- Failure point: Very low market off-take

- Developed Sector
  - 50 000
  - High Income Producers
  - 2 250 Elite Breeders

- Failure point: Lack of support targeting individual change to fit into RSA beef chain

- 6 670 000 Beef Cattle

- Failure point: Limited flow of improved bulls due to people & capitals

- 5 500 000 Beef Cattle

- Failure point: Low feed productivity due to people & capitals

- Integrated Feedlots

- Feedlots
  - Where 70% of RSA cattle are finished before slaughter

- Affluent Consumers
  - Premium Markets

- Restaurants
  - Wholesalers
  - Retailers

- Export

- Local

- Hides

- Developing Sector Markets

- Butchers

- Auctions

- Speculators

- Festivities

- Failure point: Very low market off-take

- Developed Sector
  - Land Reform Farmers
  - 15 000

- Emerging Farmers
  - 27 000

- Communal Farmers
  - 3 000 000

- Failure point: Limited flow of improved bulls due to people & capitals

- 5 500 000 Beef Cattle

- Failure point: Low feed productivity due to people & capitals
## SIGNIFICANT CHALLENGES

<table>
<thead>
<tr>
<th>Production Traits</th>
<th>Smallholder/ Emerging Sector (%)</th>
<th>Commercial (%)</th>
<th>Stud or elite (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calving rate</td>
<td>40</td>
<td>65</td>
<td>85</td>
</tr>
<tr>
<td>Pre weaning mortality</td>
<td>50</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Post weaning mortality</td>
<td>15</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Market price</td>
<td>50</td>
<td>100</td>
<td>&gt;130</td>
</tr>
<tr>
<td>Beef Market off-take</td>
<td>5</td>
<td>85</td>
<td>100</td>
</tr>
<tr>
<td>Weaning weight (kg)</td>
<td>150kg</td>
<td>200kg</td>
<td>223kg</td>
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</table>
GOLDEN OPPORTUNITIES

• Majority of livestock in SA are still being reared under traditional systems.

• Majority of these livestock are under threat of extinction.

• Livestock kept under the prevailing smallholder conditions and traditional systems of production has a low level of productivity.

• Therefore, traditional systems of production alone cannot be the best solution.
GOLDEN OPPORTUNITIES

• The most important and reliable alternatives is the use of animal breeding technologies such as:

  • Artificial insemination (AI),
  • Embryo transfer (ET),
  • Breeding Schemes,
  • Gene-Based Technologies.
**GOLDEN OPPORTUNITIES**

• There is an enormous potential for the utilization of gene-based techniques in communal and emerging livestock sectors.
  – marker-assisted selection (MAS), gene-assisted selection (GAS) and genomic selection (GS).

• However, owing to factors related to cost, infrastructure, institutional and human capacity, its large scale practical implementation in SA will take some time.

• Necessary to build a strong local capacity in biotechnology, infrastructure and investment in institutional developments to lay the foundation for future practical application.
GOLDEN OPPORTUNITIES

• Much interest towards community or village-based breeding programs.
• So far, several such breeding programs have been launched in SA (FAnGR, ART & IDC) and the experiences are encouraging.
• Active involvement of communities from the definition of breeding goals and selection criteria to identification and implementation of most appropriate and acceptable strategy.
• Thus, it is a more potential breeding strategy, suitable to improve the genetic potential of indigenous livestock in low-input small-scale farmer’s herds.
# RESEARCH THEMES

<table>
<thead>
<tr>
<th>SPECIALISATION</th>
<th>AREA OF RESEARCH</th>
<th>STAKEHOLDERS / COLLABORATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Animal Breeding &amp; Genetics</strong></td>
<td>Beef Cattle Breeding (Production Efficiency, Indigenous genetic resources, Genetic markers)</td>
<td>ARC Provincial DAFF &amp; National DAFF</td>
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<td>Dairy Cattle breeding (Milk Production Traits)</td>
<td>ARC</td>
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<td>Sheep, Goats and Chicken Breeding (Molecular Characterisations, Conservation &amp; Sustainable Utilisation)</td>
<td>ARC Provincial DAFF &amp; National DAFF NRC (Egypt)</td>
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<td>Game (Hybridization)</td>
<td>National Zoological Gardens (NZG)</td>
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<tr>
<td><strong>Animal Reproduction and Physiology</strong></td>
<td>Reproductive technologies (Semen, Oocytes and embryo characterisation and quality studies from indigenous breeds)</td>
<td>ARC</td>
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<tr>
<td></td>
<td>In-vitro embryo production and cryopreservation</td>
<td>ARC</td>
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<td></td>
<td>Cryo-conservation, embryo transfer, artificial insemination</td>
<td>ARC</td>
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<tr>
<td><strong>Animal Nutrition</strong></td>
<td>Feed processing (Silage making; natural products)</td>
<td>ARC</td>
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<td>Probiotics</td>
<td>ARC</td>
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<td>Animal Health &amp; Indigenous knowledge Systems</td>
<td>Indigenous fodders – nutritive and anti-nutritive properties</td>
<td>ARC</td>
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<td></td>
<td>Probiotics/Anthelmintics</td>
<td>ARC</td>
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<td>Medicinal Plants</td>
<td>ARC Provincial DAFF &amp; National DAFF</td>
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<tr>
<td>Multidisciplinary Research</td>
<td>Poultry production</td>
<td>Industry</td>
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<td>ARC</td>
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<td></td>
<td>Pig Production</td>
<td>ARC &amp; Industry</td>
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<td></td>
<td>Feed safety / Mycotoxins and Bacterial contamination</td>
<td>University of North-West</td>
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<td>Small scale farming -management</td>
<td>ARC</td>
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<td></td>
<td>Climate intelligence agriculture (Mitigation of ghg emissions from extensive livestock production systems)</td>
<td>University of Pretoria ARC</td>
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<td>Climate smart forage nutritional modelling</td>
<td>ARC</td>
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<td>Biogas production</td>
<td>ARC</td>
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CONCLUSIONS

• Proper adoption of modern animal breeding biotechnology will have great potential to improve livestock productivity and food security in SA.
• In view of the impressive results achieved in developed countries, there are good prospects for adoption of similar technologies to improve the productive potential and efficiency of livestock in SA.
• The adoption of new technologies should be gradual and tailor-made.
• A multidisciplinary approach may be necessary.