Advances in breeding technologies:
an inclusive approach

Prof Norman Maiwashe

[1]ARC-Animal Production Institute, Private Bag X2, Irene, 0062
[2]University of the Free State, P.O. Box 339, Bloemfontein

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Presentation Outline

- Background
  - Beef industry outlook (2018 – 2024)
- Beef industry structure
- Breeding goals
- Genomics
- Concluding remarks

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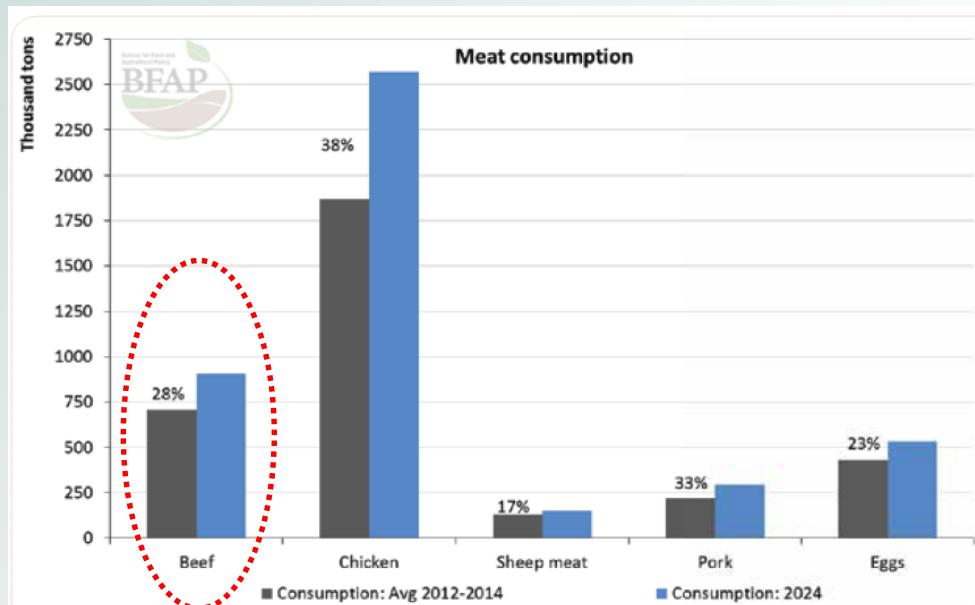Excellence in Research and Development

Beef Industry Outlook – *BFAP 2015 -2024*

- The demand for beef will increase resulting in increase in:
  – Beef consumption (**28%** increase by 2024)
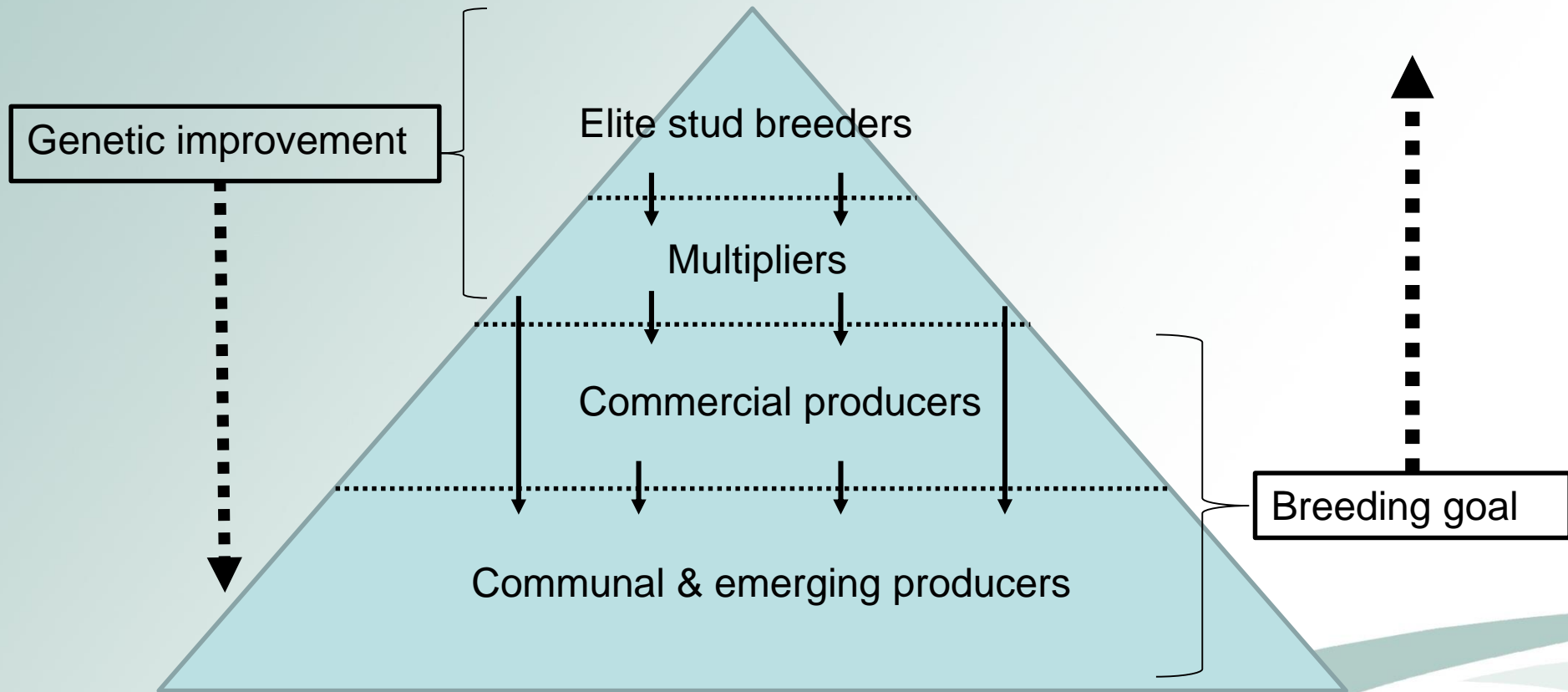 – Beef auction price (**R57/kg** by 2014) i.e. *annual increase of 5.7%*

There is a need for «**more beef production**» from the «**same or less**» resource base

Improved efficiency

- Number of cows
- Number of hectares
- Quantity of feed
- etc.

Meat consumption

Thousand tons

Beef	Chicken	Sheep meat	Pork	Eggs
28%	38%	17%	33%	23%

■ Consumption: Avg 2012-2014   ■ Consumption: 2024

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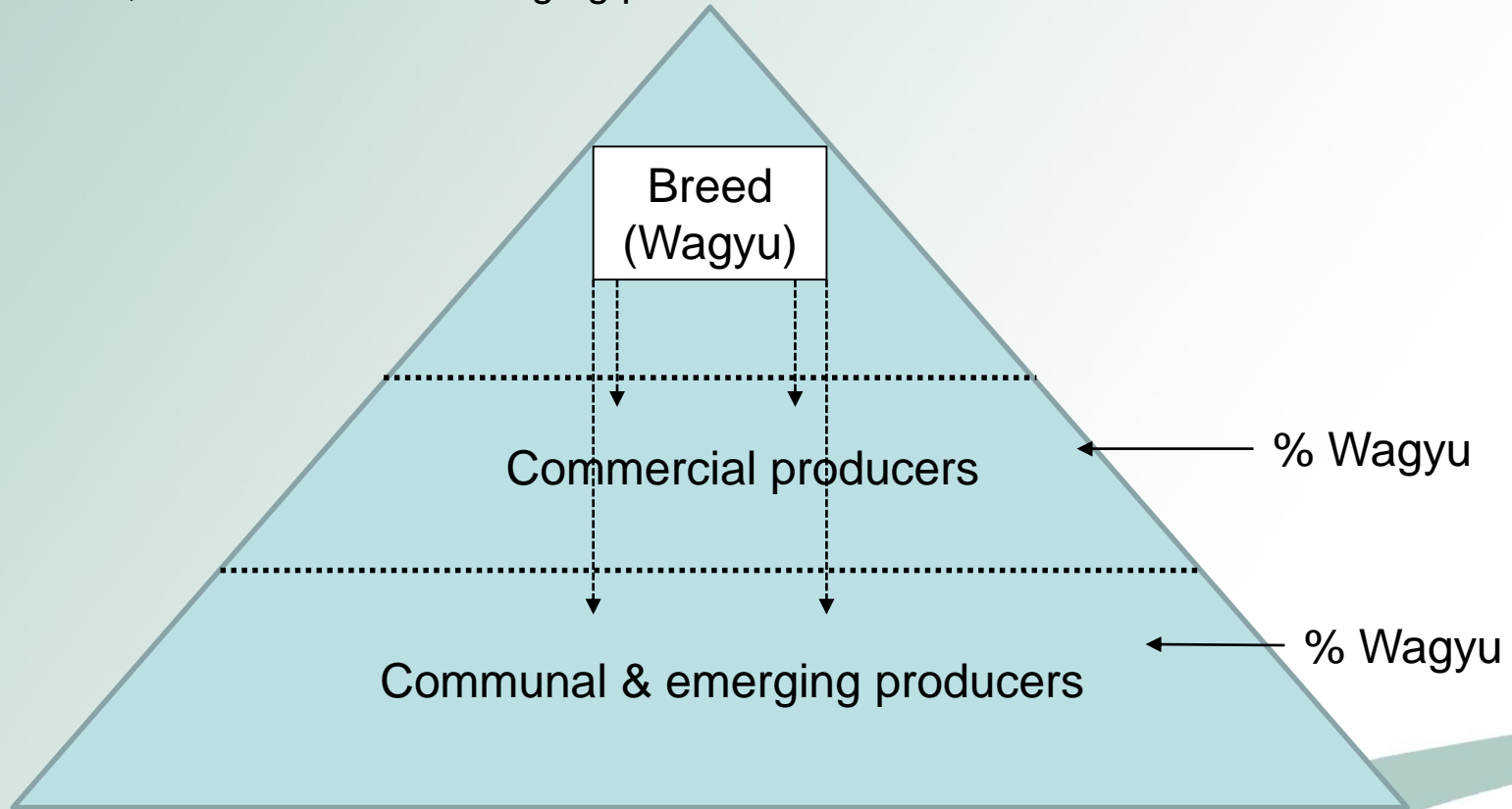*Excellence in Research and Development*

Beef Production Asset Base

Breed genetic impact on the national herd

Breed success depends on → compatibility of the **breeding goal** with the **needs** of the commercial, communal and emerging producers

Needs of commercial <small>*LARGE AND SMALL SCALE*</small> producers

- **Desirable «production» cow   (***cow → calf***)**

    – Produce a **«calf every year»** unassisted

    – Low **«feed requirements»**

    – **«Adapted»** to the production environment i.e. *management and natural environment*

- **Desirable product (***calf → beef***)**

    – Well **«adapted»** to the production environment

    – Produce more kg of **«high quality beef»** at the **«shortest time possible»** from **«low feed requirements»**

→ **Setting a breeding goal is important**

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Conventional genetic improvement

- Animal performance depends on:
  - genetics / DNA
  - environment / management

- Genetic evaluation and improvement relied on:
  - Measuring performance (performance testing)
  - Calculate genetic merit (Estimated Breeding Value – EBV) using performance records (*no technology was available to comprehensively read the DNA*)
  - Large number of performance records were required for effective genetic improvement particularly for «lowly heritable traits»

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Bovine Genome Sequencing

- Bovine genome was successfully sequenced in early 2000s

- A large number of DNA markers called SNPs were discovered throughout the genome

- SNPs allow us to discern differences among animals at DNA level

SNP chip – genome reader

New genetic improvement paradigm

- Genetic evaluation and improvement paradigm:
  1. Establish a reference population (>1 000 animals)
     - Animals with performance records and genotyped using SNP chip (genome reader)
  2. Estimate genetic merit (GEBV) using performance and genomic profile

- GEBVs are more accurate particularly for young animals with little or no performance records compared to conventional genetic evaluation

- Implication:
  - Selection can be done earlier in life → reducing selection cycle and increasing the rate of genetic improvement
  - Reduction in the cost of performance recording compared to conventional genetic improvement

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Is genomic selection possible in SA?

- A National Beef Genomic Project was initiated in 2015 through a partnership between industry and government (including Namibian beef cattle breeds) aimed at:
  - Setting up reference population for different cattle breeds
    - Collecting performance records on traits of economic importance
    - Genotyping animals using SNP chip technology
  - Conducting research in order to build research capacity of genomics nationally

- To date, ~ 3000 animals were genotyped and ~40 animals were sequenced

- The first genomic evaluation in beef cattle was implemented in 2017

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More benefits of genomic selection

- Parentage verification
  - Genomic profiles from SNP chip could be used for both parentage verification and genomic selection

- Performance data on commercial animals could be used for genomic selection
  - Carcass data on slaughter progeny of stud bulls

- Identification of genetic defects

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Genomics and Beef Industry Structure

Enhance cooperation between stud breeders and commercial producers
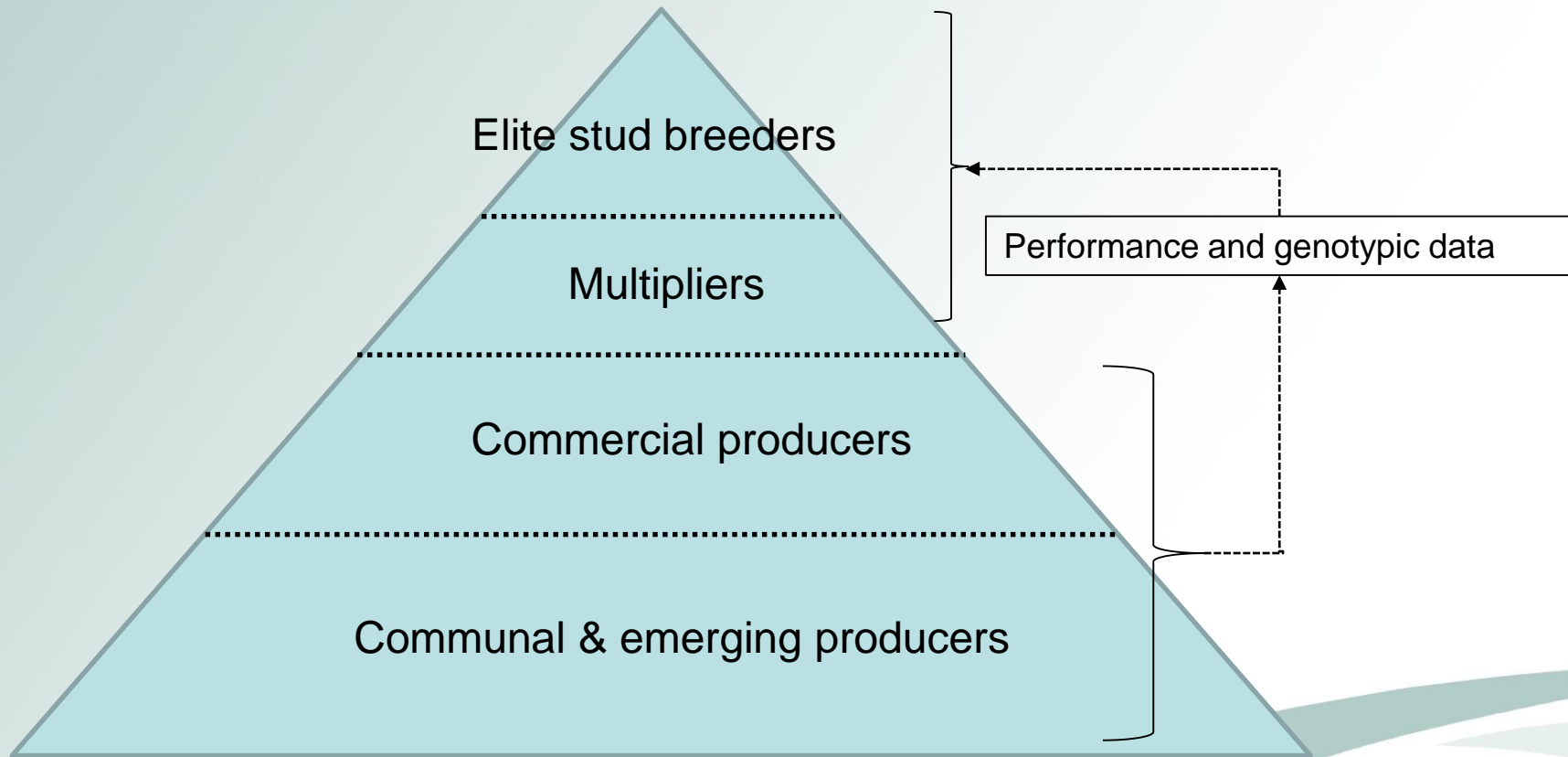
Summary

- New breeding technologies (genomics) provides an opportunity to enhance efficiency of production

- Development of breeding objectives is more important in genomic era since in advent mistakes might take longer to fix

- Recording of performance data is key to implementation of genomic selection

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Thanks for Your Attention

Email: norman@arc.agric.za

Website: http://www.arc.agric.za

Tel: (012) 672 9028

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