The role of pedigree recording in sustainable animal agriculture with special focus on indigenous breeds

Charl Hunlun & Keith Ramsay*

SA Stud Book and Animal Improvement Association, Bloemfontein, South Africa
*Department of Agriculture, Forestry and Fisheries, Pretoria, South Africa
Ankole
Ankole
Hugenoot
Hugenoot
Boran
Boran
Boer Goat
Savannah Goat
Savannah Goat
Indigenous Veld Goat
Indigenous Veld Goat
Dohne Merino
Dohne Merino
Dorper
Dorper
Bapedi Sheep
Bapedi Sheep
Zulu Sheep
Some threats to animal agriculture –

- Pressure on land use
- Global warming
Some threats to animal agriculture –

- Pressure on land use
- Global warming
Some threats to animal agriculture –

- Pressure on land use
- Global warming
The challenge –

- Improve specific adaptation of animals
- Improve rate / level of production and efficiency

Indigenous breeds will play a vital role in future animal agriculture
The challenge –

- Improve specific adaptation of animals
- Improve rate / level of production and efficiency

Indigenous breeds will play a vital role in future animal agriculture
The challenge –

- Improve specific adaptation of animals
- Improve rate / level of production and efficiency

Indigenous breeds will play a vital role in future animal agriculture
Animal agriculture in Southern Africa

- Dualistic in nature
  - Commercial production
    - Commercial producers
    - Seedstock producers
  - Highly dependant on all aspects of animal recording & improvement
  - Users pay for all services

- Informal livestock keeping
  - Virtually no animal identification and recording / formal animal improvement
  - Resource poor owners
Animal agriculture in Southern Africa

- Dualistic in nature
  - Commercial production
    - Commercial producers
    - Seedstock producers
  Highly dependant on all aspects of animal recording & improvement
  Users pay for all services

- Informal livestock keeping
  Virtually no animal identification and recording / formal animal improvement
  Resource poor owners
Animal agriculture in Southern Africa

- Dualistic in nature
  - Commercial production
    - Commercial producers
    - Seedstock producers
  Highly dependant on all aspects of animal recording & improvement
  Users pay for all services

- Informal livestock keeping
  Virtually no animal identification and recording / formal animal improvement
  Resource poor owners
Animal agriculture in Southern Africa

Dilemma –
- Rich heritage in indigenous animal resources
  - Special qualities
  - Need to be utilised
- Usefulness of indigenous breeds are threatened because of low levels of basic animal recording
  - Government and industry interventions are needed
Animal agriculture in Southern Africa

Dilemma –

- Rich heritage in indigenous animal resources
  - Special qualities
  - Need to be utilised
- Usefulness of indigenous breeds are threatened because of low levels of basic animal recording
  - Government and industry interventions are needed
Animal agriculture in Southern Africa

Dilemma –

- Rich heritage in indigenous animal resources
  - Special qualities
  - Need to be utilised
- Usefulness of indigenous breeds are threatened because of low levels of basic animal recording
  - Government and industry interventions are needed
The use of pedigree- and ownership information

Example: Four South African indigenous beef cattle breeds

- Afrikaner (AFR)
  - Started recording 1907
  - Breeders’ society formed 1912
  - Once the most numerous cattle breed in South Africa
The use of pedigree- and ownership information

Example: Four South African indigenous beef cattle breeds

- Bonsmara (BON)
  - Started recording 1940’s
  - Breeders’ society formed 1968
  
Currently the most numerous cattle breed in South Africa
The use of pedigree- and ownership information

*Example:* Four South African indigenous beef cattle breeds

- Drakensberger (DRB)
- Started recording 1947
- Breeders’ society formed 1947
The use of pedigree- and ownership information

Example: Four South African indigenous beef cattle breeds

- Nguni (NGI)
  - Started recording 1950’s
  - Breeders’ society formed 1986
The use of pedigree- and ownership information
Census statistics –

Census statistics, as in July 2008.

<table>
<thead>
<tr>
<th>Breed</th>
<th>Registered herds</th>
<th>Perf. Rec. herds</th>
<th>Registered animals</th>
<th>Perf. Rec. animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFR</td>
<td>74</td>
<td>52</td>
<td>11 885</td>
<td>10 505</td>
</tr>
<tr>
<td>BON</td>
<td>350</td>
<td>332</td>
<td>99 642</td>
<td>97 235</td>
</tr>
<tr>
<td>DRB</td>
<td>73</td>
<td>71</td>
<td>13 538</td>
<td>13 355</td>
</tr>
<tr>
<td>NGI</td>
<td>441</td>
<td>95</td>
<td>53 265</td>
<td>19 307</td>
</tr>
</tbody>
</table>
The use of pedigree- and ownership information

Average performance –

Average performance, as in 2007/2008.

<table>
<thead>
<tr>
<th>Breed</th>
<th>Birth weight (kg)</th>
<th>Weaning weight (kg)</th>
<th>Cow weight @ weaning (kg)</th>
<th>Weaning weight ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFR</td>
<td>31.3</td>
<td>195</td>
<td>478</td>
<td>43.2</td>
</tr>
<tr>
<td>BON</td>
<td>35.3</td>
<td>218</td>
<td>508</td>
<td>44.1</td>
</tr>
<tr>
<td>DRB</td>
<td>34.6</td>
<td>204</td>
<td>499</td>
<td>43.3</td>
</tr>
<tr>
<td>NGI</td>
<td>25.1</td>
<td>158</td>
<td>366</td>
<td>44.9</td>
</tr>
</tbody>
</table>
The use of pedigree- and ownership information
Analysis of breeding structure -

- Based on pedigree & ownership data
- Functional stratification of breed
  - Breeders
  - Multipliers
- Population statistics

Animals born 1 July 2006 to 30 June 2008
The use of pedigree- and ownership information
Analysis of breeding structure –

- Based on pedigree & ownership data
- Functional stratification of breed
  - Breeders
  - Multipliers
- Population statistics
  Animals born 1 July 2006 to 30 June 2008
The use of pedigree- and ownership information
Analysis of breeding structure –

- Based on pedigree & ownership data
- Functional stratification of breed
  - Breeders
  - Multipliers
- Population statistics

Animals born 1 July 2006 tot 30 June 2008
The use of pedigree- and ownership information
Analysis of breeding structure –

- Based on pedigree & ownership data
- Functional stratification of breed
  - Breeders
  - Multipliers
- Population statistics
Animals born 1 July 2006 to 30 June 2008
The use of pedigree- and ownership information
Analysis of breeding structure –

Stratification

| Breed | Breeders | | | | | Multipliers | | | |
|-------|----------|---|---|---|---|---|---|---|
|       |          | Herds | Animals | Herds | Animals | | | |
| AFR   | 51.9     | 69.3  | 48.1    | 30.7  | | | | |
| BON   | 49.2     | 64.9  | 50.8    | 35.1  | | | | |
| DRB   | 50.0     | 66.0  | 50.0    | 34.0  | | | | |
| NGI   | 51.7     | 77.1  | 48.3    | 22.9  | | | | |
The use of pedigree- and ownership information
Analysis of breeding structure –

Number of animals, herds and average number of births.

<table>
<thead>
<tr>
<th>Breed</th>
<th>Number of animals born</th>
<th>Number of herds</th>
<th>Average births / year</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFR</td>
<td>4 999</td>
<td>52</td>
<td>48.07</td>
</tr>
<tr>
<td>BON</td>
<td>49 688</td>
<td>250</td>
<td>99.38</td>
</tr>
<tr>
<td>DRB</td>
<td>7 232</td>
<td>64</td>
<td>56.50</td>
</tr>
<tr>
<td>NGI</td>
<td>26 447</td>
<td>259</td>
<td>51.06</td>
</tr>
</tbody>
</table>
**The use of pedigree- and ownership information**

**Analysis of breeding structure –**

Number of animals, herds and average number of births.

<table>
<thead>
<tr>
<th>Breed</th>
<th>Number of animals born</th>
<th>Number of herds</th>
<th>Average births / year</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFR</td>
<td>4 999</td>
<td>52</td>
<td>48.07</td>
</tr>
<tr>
<td>BON</td>
<td>49 688</td>
<td>250</td>
<td>99.38</td>
</tr>
<tr>
<td>DRB</td>
<td>7 232</td>
<td>64</td>
<td>56.50</td>
</tr>
<tr>
<td>NGI</td>
<td>26 447</td>
<td>259</td>
<td>51.06</td>
</tr>
</tbody>
</table>
The use of pedigree- and ownership information
Analysis of breeding structure –

Number of animals, herds and average number of births.

<table>
<thead>
<tr>
<th>Breed</th>
<th>Number of animals born</th>
<th>Number of herds</th>
<th>Average births / year</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFR</td>
<td>4 999</td>
<td>52</td>
<td>48.07</td>
</tr>
<tr>
<td>BON</td>
<td>49 688</td>
<td>250</td>
<td>99.38</td>
</tr>
<tr>
<td>DRB</td>
<td>7 232</td>
<td>64</td>
<td>56.50</td>
</tr>
<tr>
<td>NGI</td>
<td>26 447</td>
<td>259</td>
<td>51.06</td>
</tr>
</tbody>
</table>
The use of pedigree- and ownership information
Analysis of breeding structure –

Effective number of herds supplying male ancestors.

<table>
<thead>
<tr>
<th>Breed</th>
<th>$H_s$</th>
<th>$H_{ss}$</th>
<th>$H_{sss}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFR</td>
<td>16.64</td>
<td>11.14</td>
<td>15.04</td>
</tr>
<tr>
<td>BON</td>
<td>52.63</td>
<td>22.37</td>
<td>20.12</td>
</tr>
<tr>
<td>DRB</td>
<td>14.95</td>
<td>13.83</td>
<td>14.43</td>
</tr>
<tr>
<td>NGI</td>
<td>42.19</td>
<td>42.37</td>
<td>49.02</td>
</tr>
</tbody>
</table>
The use of pedigree- and ownership information
Analysis of breeding structure –

Effective number of herds supplying male ancestors.

<table>
<thead>
<tr>
<th>Breed</th>
<th>$H_s$</th>
<th>$H_{ss}$</th>
<th>$H_{sss}$</th>
<th>$H_s/1000$</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFR</td>
<td>16.64</td>
<td>11.14</td>
<td>15.04</td>
<td>3.33</td>
</tr>
<tr>
<td>BON</td>
<td>52.63</td>
<td>22.37</td>
<td>20.12</td>
<td>1.06</td>
</tr>
<tr>
<td>DRB</td>
<td>14.95</td>
<td>13.83</td>
<td>14.43</td>
<td>2.07</td>
</tr>
<tr>
<td>NGI</td>
<td>42.19</td>
<td>42.37</td>
<td>49.02</td>
<td>1.60</td>
</tr>
</tbody>
</table>
The use of pedigree- and ownership information
Analysis of breeding structure –

Average completeness of pedigree information in the parental generation.

<table>
<thead>
<tr>
<th>Breed</th>
<th>Average completeness of pedigrees (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFR</td>
<td>99.95</td>
</tr>
<tr>
<td>BON</td>
<td>98.23</td>
</tr>
<tr>
<td>DRB</td>
<td>97.44</td>
</tr>
<tr>
<td>NGI</td>
<td>89.12</td>
</tr>
</tbody>
</table>
Conclusive remarks

- Modern techniques of animal- and performance recording are vital for effective genetic change in populations.
- These techniques cannot be used if animals are not identified, parentage recorded, and ownership recorded.
Conclusive remarks

- Modern techniques of animal- and performance recording are vital for effective genetic change in populations
- These techniques cannot be used if animals are not –
  - identified
  - parentage recorded
  - ownership recorded
Conclusive remarks

- Modern techniques of animal- and performance recording are vital for effective genetic change in populations
- These techniques cannot be used if animals are not -
  - identified
  - parentage recorded
  - ownership recorded