RESEARCH AND DEVELOPMENT IN LIVESTOCK NUTRITION/FODDER - NEW TRENDS

PRESENTED AT THE
Extensive Livestock Expo: Mifugo ni Mali
Nairobi, November 4-6th 2015
D. M. Mwangi, D, Njarui, E. Kirwa,
B. Korir
Livestock and ASAL Areas

- Arid and semi-arid zones cover 80% of the land mass
- Over 60% of the livestock and 80% of wildlife
- Low rainfall and long dry season
- Characterized by frequent droughts
- Hence low livestock productivity due to poor quality and quantity of feed
- Lack of water for both human and livestock
Causes of feed scarcity

- Short growing seasons – rapid decline of quality and long periods of no growth
- Over grazing and degradation of pasture land
- Curtailed movement of animals (security, water)
Research needs (Arid and semi-arid areas)

- higher yielding and high quality pasture grasses
- Develop systems that allow longer growth periods
- Address climate change
- Crop-livestock integration
  - Maize for food and feed (in semi-arids)
  - Fodder Maize
  - Push-pull production system
- Feed conservation
Range grass improvement

- Over 90% of the major cultivated grasses have their centre of diversity in Africa.
- Many have been improved elsewhere and a major component of livestock production in other parts of the world.
  - Brazil have about 100 million ha of Bracharia.
Grass improvement

- Collect, characterize, select and crossbreed to improve quality and yield
  - *Bracharia spp.*, (apomictic)
  - *Cenchrus ciliaris* (apomictic)
  - *Panniculum spp* (apomictic)
  - *Chloris gayana* (Rhodes grass)
Climate smart Bracharia

To increase feed availability in action areas by use of climate-smart *Brachiaria* grasses for increased animal productivity and for generation of extra income to smallholder farmers by 2015.
Why Brachiaria

- Predominantly an African genus comprising about 100 species.
- Major feed for beef industry in South America (over 10 million ha in Brazil)
- High biomass (30t/ha) especially where rainfall exceeds 1000 mm/year
- Wide adaptation – infertile acid soils and low rainfall
- Enhance N use efficiency (BNI),
- Can contribute to carbon accumulation and reduce emission of N\textsubscript{2}O.

Picture Courtesy: Rao, 2015
Climate smart Bracharia (BecA and Grasslanz/Akresearch)

- Test the role of endophytes in improving adaptation of Bracharia grasses to drought stress
- Test the impact of endophytes on biological nitrification inhibition (BNI) and nitrous oxide ($N_2O$) emission from Bracharia grasses
- Quantify the benefits of endophyte infection on forage yield and forage quality of Bracharia grasses during drought stress under field conditions
What are fungal endophytes

Fungal endophyte + Grass Plant

Endo = within - Phyte = plant
Endophytes in Brachiaria leaves

Opportunity for improved pest resistance and productivity

Projections of endophyte hyphae in leaf tissue

Courtesy John Caradus, 2013
Mitigation to climate change (carbon sequestration) *CIAT/BecA*.

- Establish shoot and root growth

- Quantify the contribution of Brachiaria grasses to accumulation of soil carbon

- Quantify the contribution of Brachiaria grasses to inhibit nitrification in soil and reduce nitrous oxide emissions from soil
Contribution of Brachiaria to reduction of GHG
Contribution of Brachiaria to soil carbon accumulation

Brachiaria have abundant root system

Courtesy: Rao, 2013
Brachiaria Experiment
Dry matter yield of Brachiaria grasses across three sites at 16 week after seedling emergence
Participatory selection

Coastal lowland

Semi-arid

Farmers scoring for different grasses
3.5 To determine the role of Brachiaria grasses in smallholder systems in increasing milk and meat production

Harvesting Brachiaria grass for feeding dairy cattle
Seed Production
Germplasm for 12 ecotypes of *C. ciliaris* and 9 for *E. superba* were collected from the wild in Kilifi, Taita Taveta, Makueni and Kajiado counties.

The 21 accessions established at Kiboko and characterized (morphological and genetic) is ongoing.

Cluster analysis for *C. ciliaris* ecotypes resulted in two major groups for flowering time (Early and late) and plant size (robust and small types).

Multi-locational studies on herbage and seed yield done at KALRO Kiboko, Buchuma and Mtwapa indicated variation among the ecotypes.
Variation in C. ciliaris ecotypes

Purplish stems of TVT1 at wk. 4

MGD1

KLF1 seeds

Variation in C. ciliaris ecotypes

KBK2

MGD3
Chloris gayana improvement

- Rhodes grass varieties released in Kenya – Boma, Pokot, Mbarara
- New material high yielding and drought tolerant (NPT)
Production systems

- Push-pull (maize and Desmodium)
- Irrigated pasture (Clitoria in Sudan)
- Integration of food and feed
Push Pull system
Large scale Commercial Production

- Pivot irrigation
- High value crop
- Conserved and marketed
- 5 New Lucerne varieties
Holistic grazing management

- Bunched grazing
- Frequent movement
- Testing the system and adapting it
Planting methods

- Establishment most difficult part in ASAL areas
- Establishment structure
  - Half moons
  - Zai-pits
  - Tumbukiza pits
Supplementation

- Protein content low
- Digestibility low
- Fibre high
- Need NRF
- Complete Ration (blocks)
Improving Quality (legumes)

- Include Nitrogen rich forages
Supplementation

1. Chemical composition of Bracharia, cassava leaves, Dry Range grass and Azolla

<table>
<thead>
<tr>
<th>Feed</th>
<th>%CP</th>
<th>Ash</th>
<th>ADL</th>
<th>NDF</th>
<th>ADF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range grass</td>
<td>5.54</td>
<td>17.86</td>
<td>17.7</td>
<td>58.29</td>
<td>33.92</td>
</tr>
<tr>
<td>CLM</td>
<td>25.85</td>
<td>10.42</td>
<td>13.23</td>
<td>40.39</td>
<td>29.03</td>
</tr>
<tr>
<td>Azolla</td>
<td>26.28</td>
<td>19.91</td>
<td>7.91</td>
<td>49.94</td>
<td>39.89</td>
</tr>
<tr>
<td>Bracharia</td>
<td>14.10</td>
<td>13.09</td>
<td>5.23</td>
<td>58.3</td>
<td>30.07</td>
</tr>
</tbody>
</table>
Conclusions

- Adoption still very low
- Commercial orientation lacking