Options for increasing livestock water productivity in the Nile basin


Nile Basin Development Forum
Khartoum, Sudan, 17-19 November 2008
(A CPWF PN37 output)
Livestock are major water users in the Nile Basin.

Opportunities exist to use water more:

- Effectively, productively, profitably & sustainably
- By integrating water and livestock
- In investment, development & management
Partners

Agricultural Economics and Policy Research Center (Sudan)
Animal Resources Research Corporation, (Sudan)
Care-Ethiopia
Ethiopian Institute for Agricultural Research
International Livestock Research Institute (ILRI)
International Water Management Institute (IWMI)
Makerere University (Uganda)
Outline

Importance of livestock in the Nile.
Livestock water productivity framework.
What are the implications for the Nile?
What next?
## Distribution of Nile livestock systems

<table>
<thead>
<tr>
<th>Country</th>
<th>Land area in basin (1000 km²)</th>
<th>Livestock systems (% land area in basin)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Grazing</td>
</tr>
<tr>
<td>Sudan</td>
<td>1,933</td>
<td>75</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>362</td>
<td>23</td>
</tr>
<tr>
<td>Egypt</td>
<td>286</td>
<td>87</td>
</tr>
<tr>
<td>Uganda</td>
<td>204</td>
<td>19</td>
</tr>
<tr>
<td>Tanzania</td>
<td>86</td>
<td>11</td>
</tr>
<tr>
<td>Kenya</td>
<td>47</td>
<td>13</td>
</tr>
<tr>
<td>Eritrea</td>
<td>25</td>
<td>27</td>
</tr>
<tr>
<td>Other 3</td>
<td>51</td>
<td>6</td>
</tr>
<tr>
<td>Basin total</td>
<td>2,993</td>
<td>61</td>
</tr>
</tbody>
</table>
### Distribution of Nile livestock & people

<table>
<thead>
<tr>
<th>Country</th>
<th>Cattle</th>
<th>Sheep</th>
<th>Goats</th>
<th>Total</th>
<th>People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sudan***</td>
<td>34</td>
<td>32</td>
<td>26</td>
<td>92</td>
<td>27</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>14</td>
<td>5</td>
<td>4</td>
<td>23</td>
<td>25</td>
</tr>
<tr>
<td>Egypt</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>8</td>
<td>62</td>
</tr>
<tr>
<td>Uganda</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>9</td>
<td>23</td>
</tr>
<tr>
<td>Tanzania</td>
<td>6</td>
<td>1</td>
<td>3</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Kenya</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Eritrea</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Other 3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td><strong>Basin total</strong></td>
<td><strong>67</strong></td>
<td><strong>47</strong></td>
<td><strong>41</strong></td>
<td><strong>155</strong></td>
<td><strong>170</strong></td>
</tr>
</tbody>
</table>

**Based on data synthesis – basin census needed***
Nile Livestock: Important water users

- Livestock outnumber people.
- 50% of rainfall lost in grazing lands.
- Animal feed > human food demand
- Water for feed > water for food.
- Current management degrades land & H₂O.
  - 50% of grazing lands.
  - Most rural domestic water contaminated.
- Mixed temperate mixed crop-livestock systems - hot spots for action.
What is livestock water productivity
(An entry point for INRM, IWRM & IRBM)

\[
\text{LWP} = \frac{\sum(\text{Net beneficial outputs})}{\sum(\text{Depleted water})}
\]

**Benefits:** Meat, milk, hides, traction power, manure, eggs, whole animal sales, drought security, wealth savings, etc.

**Depleted water:** Transpiration, evaporation, discharge & contamination.

**Units:** US$/m³ but alternatives exist.

(Only a few species considered so far)
Livestock water productivity challenge

More:
- Benefits
- Transpiration
- Recharge

Less:
- Runoff
- Evaporation
- Contamination

Grain Residues By-products Fodder Pasture

Runoff Discharge Evaporation Contamination

Meat, milk, hides, traction, manure, etc.

Surface in-flow

Rain

Ground water

Infiltration
Four LWP improving strategies: Feed sourcing

1. Select low water cost feeds

- Grain
- Residues
- By-products
- Fodder
- Pasture

Other losses:
- Runoff
- Discharge
- Evaporation
- Contamination

Infiltration

Ground water

Meat, milk, hides, traction, manure, etc.
Select low water cost feeds

- Crop residues
- Crop by-products
- Succulents in dry lands unsuited for crops

Pastoral Sudan

Crop residues (Teff)

Molasses from sugar cane (Sudan)
Four LWP improving strategies: Animal Production

1. Select low water cost feed
2. Enhance animal production

- Grain
- Residues
- By-products
- Fodder
- Pasture
- Imported feed
- Runoff
- Discharge
- Evaporation
- Contamination

- Meat, milk, hides, traction, manure, etc.
Four LWP improving strategies: Animal Production

1. Select low water cost feed

Genetics
Nutrition
Vet health
Husbandry
Marketing

Meat, milk, hides, traction, manure, etc.
Enhance animal production
(Reduce stress, mortality & morbidity)

- Select drought hardy animals
- Promote marketing of dairy products
- Adopt zero grazing and watering
Four LWP improving strategies: Conserve water

1. Select low water cost feed
2. Enhance animal production
3. Conserve water

- Grain Residues By-products Fodder Pasture Imported feed
- Runoff Discharge Evaporation Contamination
- Meat, milk, hides, traction, manure, etc.
Four LWP improving strategies: Conserve water

1. Select low water cost feed

2. Enhance animal production

3. Manage
   - soil
   - vegetation
   - green water
   - watering
   - waste

Other losses
- Transpiration
- Runoff
- Discharge
- Evaporation
- Contamination
- Grain
- Residues
- By-products
- Fodder
- Pasture
- Imported feed

Meat, milk, hides, traction, manure, etc.
Conserve water
(Vegetation and drinking management)

- Limit animal access to open water and riparian habitats; use drinking troughs.
- Rehabilitate & maintain rangelands; limit animal numbers & re-establish pasture
Conserve water & soil

<table>
<thead>
<tr>
<th>Land-use in Ethiopia</th>
<th>Area (%)</th>
<th>Estimated soil loss</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>% national loss</td>
</tr>
<tr>
<td>Mixed crop-livestock systems</td>
<td>13</td>
<td>45</td>
</tr>
<tr>
<td>Grazing</td>
<td>51</td>
<td>21</td>
</tr>
</tbody>
</table>

Source: Hurni (1987)

Highland priorities

- Conservation agriculture
- Manure management
- Grazing management
Four LWP improving strategies: Watering sites

1. Select low water cost feed
2. Enhance animal production
3. Conserve water
4. Strategic Livestock watering

Other losses: Transpiration
- Grain
- Residues
- By-products
- Fodder
- Pasture
- Imported feed

Other losses: Evaporation
- Runoff
- Discharge
- Contamination

Infiltration
Ground water

Meat, milk, hides, traction, manure, etc.
Balance feed & water distribution to increase LWP

- Low LWP near water points
  - Overgrazing
  - Rain produces little feed.

- Low LWP far from watering points
  - Drinking water constraints prevent grazing

Solution
- Limit grazing near watering points.
- Develop new watering points where surplus feed exists.
- **Difficult but needed!**
Implications for the Nile

- Half of rainfall lost as ET in grazing lands
  - Manage ET for more benefits
  - Shift E to T

- More depleted in mixed crop-livestock

- Potential to reduce water use by 50% to 90%.

- 4 helpful strategies (policy & practice)
  - Feed sources.
  - Adopt existing animal science tools.
  - Animal management to conserve water.
  - Feed-water-animal balance.
Implications for the Nile

- Integrate crop-livestock-water development for improved production, livelihoods and sustainability.

- Identify areas to promote and reduce livestock production
  - Taking into account trade-offs with other water users.
What next?

- Build on agreement between NBI & CGIAR.
- Strengthen collaboration between livestock subsector, NBI & member states.
- Improve coverage and quality of livestock & vegetation data sets for the Nile Basin.
- Collaborate in policy development that ensures livestock contribute to poverty reduction, benefit sharing and sustainability.
- Identify and encourage local level livestock-water management intervention options.
Key messages

Livestock are major water users in the Nile Basin.

Opportunities exist to use water more:

• Effectively, productively, profitably & sustainably
• By integrating water and livestock
• In investment, development & management
THANK YOU!

CGIAR Challenge Program on WATER & FOOD