ILRI Livestock projects - FA 1

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Global Agenda of Action. The Agenda, Focus Area 1
Meeting: 19-20 Sept. 2013. Rome, Italy
ILRI

- a member of the CGIAR Consortium which conducts food and environmental research
  - to help alleviate poverty and increase food security,
  - while protecting the natural resource base.

- 700 staff
- 130 scientists and researchers
- 30+ scientific disciplines
- 70% research in SSA
- Two large campuses (Kenya, Ethiopia)
- Budget: USD 60 million
- ILRI works with a range of partners.
- offices: Kampala, Uganda; Harare, Zimbabwe

ILRI vision A world made better for poor people in developing countries by improving agricultural systems in which livestock are important.
1. Institutional approach – Value chain approach

2. Focus: smallholder production systems

3. Research programs/projects – FA1

1. Michael Blummel: Detailed project presentation
Traditional approach: piecemeal

Value chain approach

...in Country A

...in Country B

...in Country C

...in Country D
Value chain approach

A value chain is the set of actors, transactions, information flows, and institutions that enable value to be delivered to the customer (Baker, 2007)
Value chain analysis approach

- Address the whole value chain

Source: Adapted from Tom Randolph (2012)
Small holder dairy project: Kenya (smallholderdairy.org)

- Collaborative research and development project (1997-2004): funded by DFID
- Partnerships: ILRI, Government, KARI; key objective: increase efficiency

1. **Initial focus: increasing productivity at farm level**
   - better feeding strategies
   - access for forage

2. **Marketing: key constraint was at the marketing level**
   - Highly concentrated: little competition & interest (dairy board) to limit no. of players
   - Small holder farmers kept out market: licensing
   - Key issue: raw milk perceived as risky; small traders of raw milk kept out key markets
   - Research by ILRI: showed that risk levels were exaggerated

3. **Policy engagement**
   - Information dissemination
   - Engagement of civil society, government and advocacy group
   - Policy briefs, strategies and dialogue

**Impact**

- Policy change: market liberalization
- Training and certification: milk testing, quality control and maintenance
- Increase in quantity of milk supplied
Smallholder production systems

• Size and nature of transaction costs in the value chain influence efficiency

• Key constraints to efficiency improvement include access to capital and inputs

• Value chain analysis: allows for a system approach and looks at efficiency holistically

• Moving beyond pictures & maps: quantifying VC performance
Livestock and fish CGIAR Research program

Coverage
Uganda (pig), Ethiopia (sheep & goats), Tanzania (dairy), Vietnam (pig), India (dairy), Nicaragua (dairy), Mali (sheep and goats) and Egypt (fish)

Data & results
- Uganda pig: VCA & implementing detailed benchmarking survey
- Tanzania dairy: value chain analysis and baseline data
- Ethiopia: VCA & implementing detailed benchmarking survey

Efficiency and FA1 link
- Assess productivity, feed, animal health and economic efficiency
- Data covers most of the indicators discussed by FA1
- Technological interventions: feed, animal disease, breed/genetics levels, and marketing innovations
- Need: tools to assess environmental chain performance
Smallholder livestock competitiveness project- Botswana

- Identify factors affecting productivity
- Assess competitiveness including technical, cost and economic efficiency

Coverage & livestock commodity

- Botswana (potentially Namibia in the future)
- Cattle and small stock (goats and sheep)

Data and results

- Value chain analysis assessment
- Detailed producer level household farm level data: July –Aug. 2013
- Results on efficiency available early next year

Efficiency and FA1 link

- Assess productivity, feed and economic efficiency
- Data covers most of the indicators covered by FA1
- Need: tools to assess environmental chain performance
Livestock systems and the environment

- Analyze interactions among livestock and plant systems and the environment (at global and local scale).

**Approach**
- Combines empirical and modeling approaches
- Econometric methods to estimate livestock feed-yield relationship
- Models: GLOBIUM (PE model) and ruminants model (diet)

**Data and results**
- Source: FAO-stats country level animal stocks and commodity: used minimum herd dynamics and animal nutrition modeling techniques to disaggregate data

**Efficiency and FA1 link**
- Models impacts of change in diet on yield, manure, GHG emissions, land use change, soil fertility
Thank you
Efficiency methods and approaches

**Technical level: Animal feed**

*Production*
- Test eco-efficient technologies: (e.g. forage into mixed systems)
- Reduction in level of land degradation

Utilization level – feed resource conversion
- Test different technologies: chopping, fortification and densification
- Measure intake differences
- Quantify conversion efficiency at animal level
- Quantify changes in yield levels
- Maintenance energy – convert to no. of days that feed can support the animal

**Examples: East African Dairy Development**

- Efficiency from chopping crop residues; calves status diet
- Dry season feed supplementation in pastoral systems (Uganda)
- Intergrading forages into mixed systems (Rwanda, Uganda & Kenya)
- Feed gap at site level: estimate target/optimum requirement at site level accounting for seasonality

**Lessons**

- When farmers see the benefits, they adopt selective feeding strategies – potential entry point to reduce animal numbers in the long term
- Make technologies user-friendly: should be less demanding in knowledge requirement
- Extensive system more challenging than intensive systems: costs and land tenure systems
Approach: Solution-driven R4D to achieve impact

#3: Focus on 9 target value chains
International Livestock Research Institute (ILRI)
Livestock and Fish Program
Outline of Presentation

- New departures for interventions into livestock production

- Primary objectives: increase availability of affordable AFS and improve livelihoods of small holder producers

- Feed resourcing at the interface of positive and negative effect from livestock

- Key variables/key problem for linking livestock productivity and natural resource use efficiency in ILRI Value Chains
Delivering the Livestock and Fish Program

**Structure: Six integrated components**

5 **Targeting**: Foresight, prioritization, environmental impacts

- Technology development:
  - 1 Health
  - 2 Genetics
  - 3 Feeds

6 **Cross-cutting**: gender, impact, M&E, comms, capacity building

4 Value chain development

Commodity X in Country Y
Water: where does it go?
## Water for milk and fodder

<table>
<thead>
<tr>
<th>Region</th>
<th>Water Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gujerat</td>
<td>3 400 l of water per kg of milk</td>
</tr>
<tr>
<td></td>
<td>10 000 l of water for fodder/animal/day</td>
</tr>
<tr>
<td>Gobal</td>
<td>900 l of water per kg of milk</td>
</tr>
</tbody>
</table>

Predicting water requirement for milk production by feed-H₂O estimates?

<table>
<thead>
<tr>
<th></th>
<th>S. Gujarat</th>
<th>W. Gujarat</th>
<th>N. Gujarat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>32.3</td>
<td>45.8</td>
<td>126.8</td>
</tr>
<tr>
<td>Green maize</td>
<td>43.5</td>
<td>21.7</td>
<td>131.5</td>
</tr>
<tr>
<td>Wheat straw</td>
<td>17.4</td>
<td>8.6</td>
<td>52.4</td>
</tr>
<tr>
<td>Millet stover</td>
<td>20.9</td>
<td>18.1</td>
<td>61.5</td>
</tr>
<tr>
<td>Rice straw</td>
<td>29.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundnut haulm</td>
<td></td>
<td></td>
<td>8.8</td>
</tr>
<tr>
<td>Mean H₂O / liter of milk</td>
<td>2 557</td>
<td>1 810</td>
<td>3 775</td>
</tr>
</tbody>
</table>

Blummel et al., 2009 calculated from data of Singh et al., 2004
Feed allocation, methane production and natural resource utilization

### India: Livestock and milk in 2005-06

<table>
<thead>
<tr>
<th></th>
<th>Milch animals</th>
<th>Total animals</th>
<th>Milk yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$x 10^3$</td>
<td></td>
<td>kg/d</td>
</tr>
<tr>
<td>Cross Bred</td>
<td>8 216</td>
<td>28 391</td>
<td>6.44</td>
</tr>
<tr>
<td>Local</td>
<td>28 370</td>
<td>155 805</td>
<td>1.97</td>
</tr>
<tr>
<td>Buffalo</td>
<td>33 137</td>
<td>101 253</td>
<td>4.40</td>
</tr>
</tbody>
</table>

Overall herd mean 3.61 l/d
Feed energy needs of milch animals in dependence of average daily milk yields

<table>
<thead>
<tr>
<th>Milk (kg/d)</th>
<th>Maintenance</th>
<th>Production</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.61 (05/06)</td>
<td>1247.6</td>
<td>573.9</td>
<td>1821.5</td>
</tr>
<tr>
<td>6 (Scenario 1)</td>
<td>749.9</td>
<td>573.9</td>
<td>1323.8</td>
</tr>
<tr>
<td>9 (Scenario 2)</td>
<td>499.9</td>
<td>573.9</td>
<td>1073.8</td>
</tr>
<tr>
<td>12 (Scenario 3)</td>
<td>374.9</td>
<td>573.9</td>
<td>948.8</td>
</tr>
<tr>
<td>15 (Scenario 4)</td>
<td>299.9</td>
<td>573.9</td>
<td>873.9</td>
</tr>
</tbody>
</table>
It seems obvious but....

Assume:

Farmer A: 5 cattle each giving 2 liter milk day

Farmer B: 1 cattle giving 10 liters milk per day

Which farmer needs more feed and why?
Effect of increasing average daily milk yields on overall methane emissions from dairy in India

![Graph showing the relationship between daily milk yield and methane production. The graph indicates a decrease in methane production as daily milk yield increases. The current herd average milk yield is 3.61 liters per day.](image-url)

Blummel et al 2009
Livestock revolution: Impact on energy and feed requirements

<table>
<thead>
<tr>
<th></th>
<th>(2005-06)</th>
<th>2020</th>
<th>2020 (fixed LP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk (million tons)</td>
<td>91.8</td>
<td>172</td>
<td>172</td>
</tr>
<tr>
<td>yield/day (kg)</td>
<td>3.6</td>
<td>5.24</td>
<td>6.76</td>
</tr>
<tr>
<td>Numbers (000)</td>
<td>69759</td>
<td>89920*</td>
<td>69759</td>
</tr>
</tbody>
</table>

Metabolizable energy requirements (MJ x 10⁹)

<table>
<thead>
<tr>
<th></th>
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<th>2020</th>
<th>2020 (fixed LP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance</td>
<td>1247.64</td>
<td>1608.22</td>
<td>1247.6</td>
</tr>
<tr>
<td>Production</td>
<td>573.94</td>
<td>1075.00</td>
<td>1075.00</td>
</tr>
<tr>
<td>total</td>
<td>1821.58</td>
<td>2683.22</td>
<td>2326.66</td>
</tr>
</tbody>
</table>

Feed Req. (m tons) | 247.50 | 364.57 | 315.6 |

* Calculated based on Component Annual Growth Rate (CAGR)
BAIF success with cross bred cow performance in rural WM 1997-2001

<table>
<thead>
<tr>
<th>Land use</th>
<th>Milk (kg/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigated areas</td>
<td>8.5</td>
</tr>
<tr>
<td>Non-irrigated areas</td>
<td>7.7</td>
</tr>
</tbody>
</table>

Data from Ghokale et al 2007 calculated for 365 day lactations
Feed block manufacturing: supplementation, densification

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>%</th>
</tr>
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<tbody>
<tr>
<td>Sorghum stover</td>
<td>50</td>
</tr>
<tr>
<td>Bran/husks/hulls</td>
<td>18</td>
</tr>
<tr>
<td>Oilcakes</td>
<td>18</td>
</tr>
<tr>
<td>Molasses</td>
<td>8</td>
</tr>
<tr>
<td>Grains</td>
<td>4</td>
</tr>
<tr>
<td>Minerals, vitamins, urea</td>
<td>2</td>
</tr>
</tbody>
</table>

Courtesy: Miracle Fodder and Feeds PVT LTD
Comparisons of premium and low cost sorghum stover based complete feed blocks in dairy buffalo

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<thead>
<tr>
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<th>Block Premium</th>
<th>Block Low Cost</th>
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</thead>
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<tr>
<td>CP</td>
<td>17.2 %</td>
<td>17.1 %</td>
</tr>
<tr>
<td>ME (MJ/kg)</td>
<td>8.46 MJ/kg</td>
<td>7.37 MJ/kg</td>
</tr>
<tr>
<td>DMI</td>
<td>19.7 kg/d</td>
<td>18.0 kg/d</td>
</tr>
<tr>
<td>DMI per kg LW</td>
<td>3.6 %</td>
<td>3.3 %</td>
</tr>
<tr>
<td>Milk Potential</td>
<td>16.6 kg/d</td>
<td>11.8 kg/d</td>
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Anandan et al. (2009a)
Comparisons of premium and low cost sorghum stover based complete feed block in dairy buffalo

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<td><strong>Stover dig</strong></td>
<td>47%</td>
<td>52%</td>
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Anandan et al. (2009a)
Key problems

- Opportunistic management for example considerable variations in quantity and quality of feed from day to day and season to season (investment priority?)

- Frequent drastic disagreements between estimations of feed quantity and quality as obtained from farmers' questionnaires and surveys and triangulation results based on number of animals and their productivity
Thank you for your attention!
Past research has focused specific aspects of given value chains, commodities and country.

Traditional approach to increasing livestock productivity was piecemeal.
A value chain approach: a set of actors, transactions, information flows, and institutions that enable value to be delivered to the customer (Baker 2007)
Approach: Solution-driven R4D to achieve impact

#1: Addressing the whole value chain

R4D integrated to transform selected value chains in targeted commodities and countries.

Value chain development team + research partners

Strategic CRP 3.7 Cross-cutting Platforms
- Technology Generation
- Market Innovation
- Targeting & Impact

Major intervention with development partners

INTERVENTIONS TO SCALE OUT REGIONALLY

GLOBAL RESEARCH PUBLIC GOODS