Crossbreeding dairy cattle

Technology introduction and impacts on tropical smallholder production systems

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# supported by BOKU Doc-Grant
why crossbreeding in the tropics?

• dairy production = livelihood resource-poor (Mekonnen et al., 2009)
• population growth (FAO, 2009)
• changing consumption patterns (FAO, 2009)
why crossbreeding in the tropics?

- local breeds productivity = major constraint

<table>
<thead>
<tr>
<th>Breed group</th>
<th>No. breeds</th>
<th>Age 1st calving (mo)</th>
<th>Milk yield (kg)</th>
<th>Days in milk</th>
<th>Calving interval (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native</td>
<td>15</td>
<td>43.1</td>
<td>894</td>
<td>244</td>
<td>444</td>
</tr>
<tr>
<td>Two-breed cross</td>
<td>57</td>
<td>33.8</td>
<td>1903</td>
<td>316</td>
<td>437</td>
</tr>
<tr>
<td>3/4 cross</td>
<td>26</td>
<td>44.5</td>
<td>2072</td>
<td>288</td>
<td>454</td>
</tr>
<tr>
<td>European</td>
<td>7</td>
<td>36.5</td>
<td>2426</td>
<td>312</td>
<td>460</td>
</tr>
<tr>
<td>Two-breed cross</td>
<td>21</td>
<td>34.3</td>
<td>2108</td>
<td>285</td>
<td>415</td>
</tr>
</tbody>
</table>

McDowell 1985

- indigenous x exotic dairy breeds:
  - desirable traits → local breeds (e.g. Willham, 1970)
advantages crossbreds

+ ‘ income
+ employment
+ ‘ household nutrition (e.g. Nicholson et al., 1999)
+ integration agro-industry (e.g. Holloway et al., 2001)
+ ‘ lifetime production (e.g. Singh, 2005)
+ ‘ productivity/animal (e.g. Samdup et al., 2010)
+ income opportunities (women) (e.g. Tiplida and Kristjanson, 2008)
+ livelihood improvement (e.g. Peacock et al., 2011)
disadvantages crossbreds

- “ endemic disease and climatic tolerance (e.g. Wilson, 2009)
- ‘ feed demand (e.g. Tassew and Seifu, 2009)
- management (e.g. Wilson, 2009)
- ‘ animal health care (e.g. de Haan, 1995)
- ‘ workload (women) (e.g. Tiplida and Kristjanson, 2008)
- high initial investment (e.g. Holloway et al., 2001)
- threat local AnGR (e.g. Wollny et al., 2002)
crossbreeding = sustainable improvement?

• crossbreeding encouraged (governments, NGOs)
• slow up-take rate
  ➢ few programs successful (de Haan, 1995),
  ➢ widely used but often unsustainable (Kosgey et al., 2006)
• situation after introduction on smallholder farms?

knowledge gap about adaptation of crossbreeding at farm level
Our research wanted to identify...

crossbreeding introduction
motivations & challenges
crossbreeding adaptation
perceptions of crossbred performance
impacts

at farm level
study site and context - Ethiopia

Amhara
2000m a.s.l.
11-30°C; 1200-1500mm
rain-fed highland temperate mixed farming

crossbreeding context:
government extension program (heifer multiplication & distribution), 122 farms
Holstein Friesian dominant

partner:
Amhara Regional Agricultural Research Institute (ARARI)
study site and context - Uganda

Ankole
1500m a.s.l.
17-30°C; 1000-1500 mm
rain-fed pastoral/banana-coffee system

crossbreeding context:
farmer driven; 65 farms
Holstein Friesian dominant

partner:
National Animal Genetic Resource Center and Data Bank (NAGRC&DB)
study site and context - India

Maharashtra
520m a.s.l.
9-41°C; 1000-1500 mm (dry) rain-fed mixed farming system

crossbreeding context:
NGO driven (livestock program), 61 farms
Holstein Friesian dominant

partner:
BAIF Development Research Foundation
data collection and analysis

• 248 farmer interviews
• respondents:
  ➢ resident farmers
  ➢ household head/spouse
  ➢ at least 8 years crossbreeding
  ➢ local dairy cattle before
  ➢ gender
• Statistical Analytical Software (SAS Institute Inc., 2010)
  ➢ Procedure frequency
selected results – crossbreeding information

additional information:
- farmers
- veterinarians

motivation:
- income
- higher milk yield
- better potential crossbreds
- others advice
selected results – crossbred animal source

- Al
- heifer program
- bought crossbred cow
- bought crossbred bull
- used crossbred bull
- crossbred animal was gift
- pure exotic bull
- pure exotic cow

Percent of farms (n=248)

- Ethiopia
- India
- Uganda

05/10/2013

64th Annual Meeting of EAAP, Nantes, France - Session 11 - Dipl. Ing. Romana Roschinsky
selected results – adaptation breeding strategy

initial crossbred level:
- 50% exotic blood

initial exotic breeds:
- Holstein Friesian (dominant)
- Jersey
selected results – adaptation breeding strategy

<table>
<thead>
<tr>
<th>Why have you changed your crossbreeding practice?</th>
<th>percent farmers* (n=248)</th>
</tr>
</thead>
<tbody>
<tr>
<td>increase profits</td>
<td>49</td>
</tr>
<tr>
<td>no option</td>
<td>21</td>
</tr>
<tr>
<td>reach manageable level</td>
<td>19</td>
</tr>
<tr>
<td>lack of information (others decide)</td>
<td>12</td>
</tr>
<tr>
<td>AI service availability</td>
<td>11</td>
</tr>
<tr>
<td>high levels problematic</td>
<td>8</td>
</tr>
<tr>
<td>no change</td>
<td>8</td>
</tr>
<tr>
<td>not specified</td>
<td>6</td>
</tr>
<tr>
<td>alternative breed qualities</td>
<td>5</td>
</tr>
<tr>
<td>breeding problems</td>
<td>4</td>
</tr>
<tr>
<td>used own offspring bull</td>
<td>2</td>
</tr>
<tr>
<td>trust bullkeeper</td>
<td>1</td>
</tr>
<tr>
<td>natural crisis</td>
<td>0</td>
</tr>
</tbody>
</table>

* multiple answers possible

Percent of farms (n=248)

- increase profits
- no option
- reach manageable level
- insufficient information (others decide)
- AI service availability

Uganda, India, Ethiopia
selected results – perception crossbred cow performance

- higher daily yield
- lower age at first calving
- shorter calving interval
- more often sick
- decreased longevity

(n=248)
selected results – impacts production system

more income (98%)

new structures (95%)

increase workload (94%)
selected results – impacts production system

herd size change (91%)

new feedstuffs (84%)

new markets (84%)

Image: © Roschinsky

Image: © Roschinsky

Image: © Roschinsky
selected results – impacts production system

increased vet demand (73%)

new grazing management (71%)

more workers (48%)
selected results –
crossbreeding challenges

- Cost increase
- Investment structures
- Natural resources
- Workload/management increase
- Health/reproduction/adaptation
- Management "on time"
- Financial input
- Access support services
- Breeding strategy
- Input shortage
- Natural setting
- Cooperation
- No challenges

Uganda, India, Ethiopia

Percent of farms (n=248)

05/10/2013
We conclude...

- initiators conform with local context
- fellow farmers important
- motivation: income increase
- link information source "crossbred animal source"
- breeding adaptation
  - reason: context specific
  - if alternatives available
  - increase milk yield by upgrading: lack knowledge optimal level (e.g. Syrstad, 1996)
We conclude...

- perceptions of performance/health fit prior experiences in tropical settings
- substantial production system change
- challenges: highly context specific
  - natural resources → environmental sustainability?
  - increased workload
Sustainable crossbreeding?

**high input**
- manpower
- investment
- resources
- animal health care
- management

**high output**
- income increase
- employment creation
- milk market access
- livelihood improvement

- farmers recommend crossbreeding
- environmental impact
- **resources, markets** and **support system** crucial for success
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Thank you very much for your attention!!

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presenting author supported by BOKU DOC grant
references


references

pictures & figures

- **Figures:**
  - unless indicated otherwise: all photographs by Romana Roschinsky © 2011-2013. All participants have given their permission to be photographed
  - slide 2: graph FAO, 2009 (see reference list)
  - slide 3: Table from McDowell, 1985 (see reference list)

- **Maps:**
  - All maps from googlemaps.com
  - Location maps on globe: wikipedia.com
Results – Herd size change details

![Bar chart showing herd size change details for Ethiopia, India, and Uganda. The chart indicates that increased herd size is most common, followed by decreased size, with no clear trend and no change being less common.]