Alternative feeding options to enhance dairy farm sustainability in Bangladesh

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1. Introduction

Dairying in Bangladesh

- Farmers: 1.2 million, Dairy cows: 6.14 million
- Milk shortage: 55 – 60%, Feed shortage: 45%
- Imported concentrate: 80%
- Main roughages: Rice straw, Local grass and Napier
- Cropping pattern: Paddy rainfed-paddy irrigated/cash crops

Research question: What were the alternative feeding strategies to enhance dairy farm sustainability in Bangladesh?

3. Results

Table 1: Original and optimized farm performance (potential change in %) over a year by using Pareto optimum solutions

<table>
<thead>
<tr>
<th>Variables/Potential change (%)</th>
<th>Operating profit</th>
<th>Feed cost</th>
<th>OM balance</th>
<th>Soil N losses</th>
<th>Self reliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>J-large</td>
<td>14</td>
<td>-3</td>
<td>286</td>
<td>-17</td>
<td>18</td>
</tr>
<tr>
<td>J-medium</td>
<td>12</td>
<td>-16</td>
<td>37</td>
<td>-4</td>
<td>25</td>
</tr>
<tr>
<td>J-small</td>
<td>10</td>
<td>-6</td>
<td>17</td>
<td>-10</td>
<td>16</td>
</tr>
<tr>
<td>M-large</td>
<td>37</td>
<td>-10</td>
<td>4</td>
<td>-8</td>
<td>8</td>
</tr>
<tr>
<td>M-medium</td>
<td>209</td>
<td>-15</td>
<td>13</td>
<td>-16</td>
<td>21</td>
</tr>
<tr>
<td>M-small</td>
<td>22</td>
<td>-7</td>
<td>4</td>
<td>-22</td>
<td>7</td>
</tr>
</tbody>
</table>

Trade-offs:
- Higher Self reliance with lower OP and OM balance (Fig: 3a and 3d)
- Higher OP and OM balance with higher soil N losses (Fig: 3b and 3j)

Synergies:
- Increased Self reliance with lower FC & soil N losses, & higher OM balance (Fig: 3b, 3g and 3d)
- Higher OP & higher OM balance (Fig: 3e)

Figure 3: Pareto-optimum solutions from the J-large farm scenario

Key change:
- External feed
  - Decrease: wheat bran, mustard oil cake
  - Increase: Napier, maize silage, urea treated rice straw
- On-farm feed
  - Decrease: rice straw
  - Increase: Vura grass, Napier, maize grass, lentil, maskalai

4. Discussion

Economic aspects
- Decreased feed costs, Increased feed production
- Replaced: Irrigated paddy-Fodder crops, More crops
- Fodder cultivation increased 15% (Roy et al., 2012)
- Rice surplus: 2 million ton (Kabir et al., 2015)
- Milk shortage: 7 million ton (DLS, 2016)

Environmental aspects
- Increased OM balance, Decreased soil N losses
- Increased Maskalai, Vura, Lentil, Maize
- Green manure, Less chemical fertilizer, Symbiotic N
- Farmers want to change the crops if profitable (Roy et al., 2012)
- Green manure increases the OM balance (Chander et al., 1997)
- Leguminous crops decreased 50-100kg fertilizer(N) ha

5. Conclusions

- Increased profit (10-209%)
- Decreased feed costs (4-25%)
- Increased Self reliance (7-25%)
- Increased OM balance (4-650%)
- Decreased Soil N losses (4-21%)

Funded by: