Effect of three agroecological feeding strategies on the yield and composition of crossbred cows’ milk in the Mexican tropics

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1.- Importance of livestock milk production
OUTLINE

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2.- Challenges related to livestock milk production under tropical conditions
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3.- The Study
What can livestock do for development?

Livestock contributes to development in many ways:

• as an economic activity,
• as food production, and
• as a provider of environmental services.
Importance of livestock:

• 3 billion people live in rural areas, nearly half world population.

• It generates on average 29 % GDP.

• Employment for over 1.3 billion people.

• Important for food security & source of income for the majority of the rural people.
In Mexico:

- Keeping livestock is practiced on about 100 million of ha (55% of the Mexican territory).
- Grassland: about 30 million ha.
- However, due to agricultural production México looses 510,000 ha of tropical forest annually.
Challenges

- forage shortages...
- rainfall is a limiting factor for pasture development, due to the unequal distribution throughout the year: the **dry season** can last for **almost seven months**.
- Tropical pastures (lack of N) do not provide sufficient protein to cover the maintenance and production needs of cows...
- very **low milk production**.
Farmers import great amount of grains (soya, sorghum and maize) / concentrated feed
Alternative:
Adding different forages of improved nutritional quality, including nitrogen fixing species in silvo-pastoral systems.
The present work aims at studying the effect of three feeding systems on milk production.

(1) Intensive silvopastoral system (iSPS) comprising *Leucaena leucocephala* associated with *Panicum maximum* (Guinea grass, buffalograss; Poaceae)
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(2) Native vegetation (NV) including the highest diversity in trees and shrubs forage species, and
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(2) Native vegetation (NV) including the highest diversity in trees and shrubs forage species, and

(3) Confined system (CS) with controlled feeding consisting of chopped grass *Pennisetum purpureum, ad libitum.*

Taiwan grass, elephant grass; Poaceae
Kampepem farm, located near San José Tzal. Tropical weather
L. leucocephala / P. maximum
Diversity in trees and shrubs forage species
Chopped Taiwan grass (*P. purpureum*, *ad libitum*).
n = 15; *Cebú x Holstein:* 487 ± 22 kg at their third calving and within the first lactation period

- Each treatment lasted 21 days:
  - (1) iSPS (20 hrs/d)
  - (2) NV (20 hrs/d)
  - (3) CS

- Milk sampling every 7 days
Each animal was supplemented with:

- 3 kg of fresh, chopped *B. alicastrum* leaves

*Brosimum alicastrum*
Ramón, bread nut tree
Maya nut tree
14-16 % CP
Moraceae
Each animal was supplemented with:

- 3 kg of fresh, chopped *B. alicastrum*

and

- 1 kg of a 2:2:1 mixture of
  - *E. cyclocarpum* ground fruits (400g),
  - ground corn (400g) and
  - wheat bran (200g).
Manual milking conducted once a day: 8.00-9.00 am
Chemical composition

- Analysed using a Lactoscan milk analyser;
- Covariance analysis was conducted (proc PRINT GLM); for differences the Tukey test was applied ($P < 0.05$).
Results

- There were no statistically significant differences in the chemical composition of milk ($P < 0.05$); however, total fat contents confirm a product of high quality with values between 45 and 50 g/kg in all cases.

- **Milk yield** and **lactation energy intake** were **highest in iSPS and NV** (6.3 & 6.4 kg/cow/d; 14.9 & 15.9 MJ/cow/d, respectively).

Table 1: Milk yield (kg/d) and composition under three different feeding strategies.

<table>
<thead>
<tr>
<th>Variable</th>
<th>iSPS</th>
<th>NV</th>
<th>CS</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk yield (kg/d)</td>
<td>4.69a</td>
<td>4.80a</td>
<td>3.50b</td>
<td><strong>0.0001</strong></td>
</tr>
<tr>
<td>Protein (%)</td>
<td>31.16a</td>
<td>30.98a</td>
<td>30.64a</td>
<td>0.4361</td>
</tr>
<tr>
<td>Fat (%)</td>
<td>45.04a</td>
<td>47.87a</td>
<td>50.07a</td>
<td>0.0855</td>
</tr>
<tr>
<td>Lactose (%)</td>
<td>45.21a</td>
<td>46.24a</td>
<td>45.75a</td>
<td>0.5759</td>
</tr>
<tr>
<td>Solids (%)</td>
<td>6.74a</td>
<td>6.84a</td>
<td>6.81a</td>
<td>0.7742</td>
</tr>
<tr>
<td>Net Energy Lactation (MJ/d)</td>
<td>14.98a</td>
<td>15.86a</td>
<td><strong>11.76b</strong></td>
<td><strong>0.0001</strong></td>
</tr>
</tbody>
</table>
Discussion

- The higher values in iSPS and NV (as opposed to CS) suggest that animals are consuming a higher ratio of more digestible vegetation in ecosystems where they can develop a more natural nutrient selectiveness.
Conclusion

- *L. leucocephala* in iSPS is a **viable alternative in dual purpose production systems**, as can a substitution of proteins, thus reducing costs of production and maintenance during the seasonally critical dry periods.
Ceiba pentandra tree

Thank you!

Acknowledgements: