Global competitiveness, sustainability and simplicity: The challenges for a pasture based dairy industry

Dr. Pablo Chilibroste
Dra. Ana Meikle
Consumption fresh dairy products

OECD-FAO Agricultural Outlook 2016-2025
Global Dairy Industry

Uruguay over 65% for export

Adapted from Chadar, Foro INALE, 2015, Montevideo, Uruguay
Higher volatility: whole milk powder price in Oceania

Adapted from INALE, 2016
Uruguayan dairy farmers milk price

[Diagram showing the price of milk from 1990 to 2005 in USD per liter, with data points indicating price fluctuations over the years.]
Uruguayan dairy industry

Producción de leche
Consumo
Exportación

mill. t ECM

Growth foundation: productivity

Ratio milking/dry cows

Thousands of adult cows

1985-1990
1991-1995
1996-2000
2001-2005
2006-2010
2011-2013

192
255
269
284
324

56 %
60 %
65 %
65 %
70 %
73 %

Individual milk production 11 ------- 18 L VO/day

VO  VS
Growth sides effects: land and human capital

- Land losses – 15%
- Individual milk production loss – 2600 L/adult cow
- Human Capital losses – 55% dairies

<table>
<thead>
<tr>
<th>Year</th>
<th>VO (Miles de cabezas)</th>
<th>VS (Miles de cabezas)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985-1990</td>
<td>192</td>
<td></td>
<td>384</td>
</tr>
<tr>
<td>1991-1995</td>
<td>217</td>
<td></td>
<td>434</td>
</tr>
<tr>
<td>1996-2000</td>
<td>255</td>
<td></td>
<td>510</td>
</tr>
<tr>
<td>2001-2005</td>
<td>284</td>
<td></td>
<td>568</td>
</tr>
<tr>
<td>2006-2010</td>
<td>324</td>
<td></td>
<td>648</td>
</tr>
<tr>
<td>2011-2013</td>
<td>324</td>
<td></td>
<td>648</td>
</tr>
</tbody>
</table>

- VO: VO
- VS: VS

- Growth rates: 56%, 60%, 65%, 65%, 70%, 73%
Global milk production costs

45 US$/100 Kg ECM

URUGUAY
Productivity, efficiency and costs under the new international scenario: a dynamic tension between “pastoral” and “supplemented” oriented systems....
Cow’s integrated responses to forage allowance: primiparous cows
First lactation cows: stress (calving) & dominance factors + still growing cows.

Lower DMI intake during early lactation in primiparous vs multiparous cows (McEvoy et al. 2009).

Do they get enough DMI to express their genetic potential with 8 h grazing and supplement? (need of a positive control TMR group)
Effect of herbage allowance on grazing behavior and productive performance of early lactation primiparous Holstein cows

P. Chilibroste\textsuperscript{a,\,*}, D.A. Mattiauda\textsuperscript{a}, O. Bentancur\textsuperscript{b}, P. Soca\textsuperscript{a}, A. Meikle\textsuperscript{c}

- No studies on herbage allowance in primiparous cows.
- Very few during early lactation
- No studies on grazing behaviour, metabolic or reproductive parameters.

Effect of sward condition on metabolic endocrinology during the early postpartum period in primiparous grazing dairy cows and its association with productive and reproductive performance

Ana Meikle\textsuperscript{a,\,*}, María de Lourdes Adrien\textsuperscript{b}, Diego Antonio Mattiauda\textsuperscript{c}, Pablo Chilibroste\textsuperscript{c}
Materials & Methods

44 primiparous Holstein cows

Control: TMR ad libitum forage/concentrate 55:45.

Grazing groups:

- TMR estimated for maintenance requirements + 10 Liters + 8 hs of grazing
- High herbage allowance (HA): 30 kg MS/d/c
- Medium herbage allowance (MA): 15 kg MS/d
- Low herbage allowance (LA): 7.5 kg MS/d/c
Pasture depletion pattern

Bite rate slope differed:
MA/HA vs LA: 0.60 vs 0.29 bites/min/DIM

Probability of grazing:
slope MA/HA vs LA 0.41 vs 0.22 min/1000/DIM

Primiparous cows after calving with reduced grazing time (<35%) and at lower rates (<25 bites/min)
The change from LA to MA treatments increased 0.43 L milk/kg of extra herbage allowance, while from MA to HA did not differ (0.08 L/kg).

But this is not the only response that is economically important…
Reproductive performance is affected by the negative energy balance.

Body Condition Score (BCS)

1) Resumption of ovarian cyclicity (progesterone in plasma)

2) Fertilization and maintenance of pregnancy (appropriate uterine environment for embryo development)
HA with greater BCS than both MA/LA cows.

MA cows sustained milk production with greater lipid mobilization.

MA < HA/TMR at 30 dpp.

LA < rest groups at 55 dpp.
Resumption of cyclicity

Pregnancy (appropriate uterine environment for embryo development)

High allowance

HA cows with greater uterine sensitivity to progesterone

Astessiano et al. 2016 submitted
Supplemented based dairy systems
Use of mixed rations with different access time to pastureland on productive responses of early lactation Holstein cows

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a Facultad de Agronomía, Departamento de Producción Animal y Pasturas, Universidad de la República, Montevideo, Uruguay
b Embrapa Pecuária Sul, Bagé, RS, Brasil
c Facultad de Veterinaria, Departamento de Biología Molecular y Celular, Universidad de la República, Montevideo, Uruguay
## Milk production (DIM 0-60)

<table>
<thead>
<tr>
<th>Treatments</th>
<th>TMR</th>
<th>G-1</th>
<th>G-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk l/cow/d</td>
<td>37.2(^a)</td>
<td>33.7(^b)</td>
<td>33.9(^b)</td>
</tr>
<tr>
<td>Fat %</td>
<td>3.7(^b)</td>
<td>3.9(^a)</td>
<td>3.9(^a)(^b)</td>
</tr>
<tr>
<td>Fat kg/d</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Protein %</td>
<td>3.3</td>
<td>3.5</td>
<td>3.4</td>
</tr>
<tr>
<td>Protein kg/d</td>
<td>1.3(^a)</td>
<td>1.1(^b)</td>
<td>1.1(^b)</td>
</tr>
</tbody>
</table>

DMI - Efficiency

Kg DM/cow/day

<table>
<thead>
<tr>
<th>TMR</th>
<th>G-1</th>
<th>G-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>26,1</td>
<td>14,5</td>
<td>14,3</td>
</tr>
</tbody>
</table>

Liters/kg DMI

- 1.5
- 1.7
- 1.6
Why G2 was able to eat more pasture?

<table>
<thead>
<tr>
<th></th>
<th>G-1</th>
<th>G-2</th>
<th>EE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total grazing time (min)</td>
<td>231.3 b</td>
<td>281.3 a</td>
<td>7.6</td>
</tr>
<tr>
<td>Grazing time 0-1 hour</td>
<td>55.1</td>
<td>54.6</td>
<td>1.7</td>
</tr>
<tr>
<td>Grazing time 0-3 hours</td>
<td>135.5 a</td>
<td>106.3 b</td>
<td>4.4</td>
</tr>
<tr>
<td>Grazing time 0-6 hours</td>
<td>231.3 a</td>
<td>185.0 b</td>
<td>6.8</td>
</tr>
</tbody>
</table>

**Hours in pasture**

- G-1
- G-2

Conjugated linoleic acid (CLA) and omega 3 fatty acid profile in milk: Vaccenic acid C18:1trans and Linolenic acid C18:3(n-3).

Fresh grass in the diet (30-35% DMI) improves the fatty acid profile in milk for human health.

Barca, Tesis MSc., 2016
Functional dairy products

<table>
<thead>
<tr>
<th>Regions</th>
<th>Change 2000/2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Europe</td>
<td>26%</td>
</tr>
<tr>
<td>Easter Europe</td>
<td>57%</td>
</tr>
<tr>
<td>North America</td>
<td>138%</td>
</tr>
<tr>
<td>South America</td>
<td>136%</td>
</tr>
<tr>
<td>Asia</td>
<td>181%</td>
</tr>
<tr>
<td>Middle East and Africa</td>
<td>94%</td>
</tr>
<tr>
<td>Oceania</td>
<td>81%</td>
</tr>
<tr>
<td>Total</td>
<td>89%</td>
</tr>
</tbody>
</table>

PM Food & Dairy Consulting 2014, adapted from Sepúlveda 2014
Lower IGF1 concentrations in G2 than G0/G1 cows

Lower insulin concentrations in G2 than G0/G1 cows

Adaptado de Astessiano et al., 2016. Acta Veterinaria Scandinavica, 57 (1):70
# Margin over feeding: comparison TMR vs partial TMR

## Ratio milk price/feed cost

<table>
<thead>
<tr>
<th>Milk production Difference</th>
<th>TMR</th>
<th>Partial TMR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1.3</td>
<td>1</td>
</tr>
</tbody>
</table>

## Margin over feeding cost (U$S/cow/day)

<table>
<thead>
<tr>
<th>Percentage</th>
<th>TMR</th>
<th>Partial TMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>6.5</td>
<td>3.7</td>
</tr>
<tr>
<td></td>
<td>7.4</td>
<td>5.9</td>
</tr>
<tr>
<td>20%</td>
<td>6.5</td>
<td>3.7</td>
</tr>
<tr>
<td></td>
<td>7.2</td>
<td>5.9</td>
</tr>
<tr>
<td>30%</td>
<td>6.5</td>
<td>3.7</td>
</tr>
<tr>
<td></td>
<td>6.3</td>
<td>5.1</td>
</tr>
</tbody>
</table>

## Nutritional Data

- **Milk production TMR:** 37 l/cow/day
- **Milk price:** 0.35 ctv U$S/l
- **Proportion of grazing:** 35 % total DMI
- **Conversion eff. TMR:** 1.4 l milk/kg DMI
- **Conversion eff. Mix diet:** 1.5 l milk/kg DMI
# Margin over feeding: comparison TMR vs partial TMR

<table>
<thead>
<tr>
<th>Milk production Difference</th>
<th>TMR</th>
<th>Partial TMR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0.7</td>
<td>0.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Margin over feeding cost (U$S/cow/day)</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>4.6</td>
<td>5.1</td>
<td>4.5</td>
</tr>
<tr>
<td>20%</td>
<td>4.6</td>
<td>5.2</td>
<td>4.5</td>
</tr>
<tr>
<td>30%</td>
<td>4.6</td>
<td>5.2</td>
<td>4.5</td>
</tr>
</tbody>
</table>

- Milk production TMR = 37 l/cow/day
- Milk price = 0.25 ctv U$S/l
- Proportion of grazing = 35 % total DMI
- Conversion eff. TMR = 1.4 l milk/kg DMI
- Conversion eff. Mix diet = 1.5 l milk/kg DMI
It is important what you do but also how do you do it .....
Global competitiveness, sustainability and simplicity: the challenges for a pasture based dairy industry
Uruguay
Low cost
Productivity
herd
Reproduction
Health
Productivity
Soil - pasture
Mead field:
Well integrated chain value
Knowledge
Talent
Human health
Soil - pasture
EU
New Zealand All Blacks
Wallabies
Proyecto Producción Competitiva