Pasture based dairies - a systems approach.

John Roche
Get the priorities right

80% of potential gain made by getting the system right
Too many people get it wrong

Fine tuning

System
Rising Demand for Meat and Milk in Developing Countries: Implications for Grass-based Livestock Production

By 2020 large increase in demand for food in developing countries

Growth in monogastric livestock in Asia and South America will continue, but at a reduced rate mainly because of environmental issues

Ruminant livestock products account for an increasing proportion of the increased demand

Inflation-adjusted prices for feed grain will only fall marginally by 2020

Source: Delgado (2005)

Unlikely to be an increase in milk price (OECD)
## Grass-based Vs Confinement

<table>
<thead>
<tr>
<th>System of production</th>
<th>Grass-based</th>
<th>Confinement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed costs</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Feed quality</td>
<td>Variable</td>
<td>High</td>
</tr>
<tr>
<td>Stocking rate</td>
<td>Critical</td>
<td>Ignored</td>
</tr>
<tr>
<td>Milk supply profile</td>
<td>Seasonal</td>
<td>Constant</td>
</tr>
<tr>
<td>Labour requirement</td>
<td>Seasonal</td>
<td>Constant</td>
</tr>
<tr>
<td>Decision support</td>
<td>Rudimentary</td>
<td>Sophisticated</td>
</tr>
<tr>
<td>Effluent management</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Agrochemical use</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Energy use</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Capital Investment</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>
Trends in World Milk Prices

Year

Milk price, US$/cwt
0 2 4 6 8 10 12 14

AUST $12.10/cwt
NZ $10.51/cwt
IRL $6.34/cwt
USA $6.10/cwt

Legend:
- AUST
- NZ
- IRL
- USA
## Physical Characteristics of Farming Systems

<table>
<thead>
<tr>
<th></th>
<th>NZ</th>
<th>Aust</th>
<th>Ire</th>
<th>US Graz</th>
<th>US Conf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm Size (ac)</td>
<td>254</td>
<td>566</td>
<td>59</td>
<td>198</td>
<td>415</td>
</tr>
<tr>
<td>Cow numbers</td>
<td>271</td>
<td>312</td>
<td>45</td>
<td>64</td>
<td>115</td>
</tr>
<tr>
<td>Yield/cow (lb)</td>
<td>8,092</td>
<td>10,560</td>
<td>10,094</td>
<td>17,114</td>
<td>22,535</td>
</tr>
<tr>
<td>Repl. rate (%)</td>
<td>18</td>
<td>15</td>
<td>19</td>
<td>NA</td>
<td>33</td>
</tr>
<tr>
<td>Conc. (lb/cow)</td>
<td>330</td>
<td>880</td>
<td>1650</td>
<td>NA</td>
<td>9,900</td>
</tr>
<tr>
<td>Stocking (cows/ac)</td>
<td>1.1</td>
<td>0.6</td>
<td>0.8</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Cows/person</td>
<td>97</td>
<td>80</td>
<td>44</td>
<td>-</td>
<td>40</td>
</tr>
</tbody>
</table>

LIC, 2003; Dairy Australia, 2004; Fingleton, 2003; IFCN, 2003; Kriegl, 2001; Dillon et al., 2005
The relationship between cost of milk production and proportion of the diet as grazed grass.

For every 10% increase in the quantity of grazed grass in the diet the cost of milk production declines by $1.50/cwt.

\[ y = -0.15x + 22.4 \]

\[ R^2 = 0.78 \]
The relationship between cost of milk production and proportion of the diet as grazed grass.
• Huge opportunities for profitable pasture-based systems
• Focus on returns
  – Low costs
  – Maintaining reasonable milk yields
• Don’t adopt another system
• Adapt successful systems
Maximise Margins

- High pasture production
- High pasture utilisation and animal prodn.
- Assess importance of costs individually
  - Not minimise costs - spend money wisely
- Minimise unnecessary fixed costs
- Simplify management - reduce labour
Maximising profit

• Grow as much pasture as possible.
• Utilise the pasture you’ve grown.
No more powerful force exists, for good or evil, than the control of stocking rate in grassland farming

- C.P. McMeekan
Stocking rate

- Pasture utilisation increases with SR
- Milk production/ha increases with SR

But
- Milk production/cow decreases with SR
- Cows/acre meaningless
  - Cow size
  - Pasture grown
  - Imported feed

- Comparative stocking rate
  - Liveweight/ton of feed
Effect of Stocking Rate

(Milk Yield vs Stocking rate)

Per acre
Per Cow

(Penno 2001)
High Pasture Utilisation

• Stocking Rate
• Calving Date & Spread
Calving date essential

Pasture Growth (lb/acre)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

DMI/ac
Grass growth/ac
High Pasture Utilization

- Stocking Rate
- Calving Date & Spread
- Grazing Management
Vegetative grass tiller

- leaves
- vegetative parent tiller
- daughter tiller
- growing point
- roots
Productivity - sigmoid growth curve

Pasture yield

Slow growth due to reliance on energy reserves

Rapid growth due to adequate leaf area

Slow growth due to shading and decay

Leaf stage 1

Leaf stage 2

Leaf stage 3

Leaf stage 4

Leaf stage 5

Leaf stage 6

Time
By grazing too early we are losing pasture.

Pasture yield

11% 33% 56%

Leaf stage 1

Leaf stage 2

Leaf stage 3

Time
High Pasture Utilization

- Stocking Rate
- Calving Date & Spread
- Grazing Management
- Supplementary Feeding
  - when pasture is not available
  - keep it simple
What limits production on pasture?

Kolver and Muller, 1998

<table>
<thead>
<tr>
<th></th>
<th>Milk (lb/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake</td>
<td>+ 21 (59%)</td>
</tr>
<tr>
<td>Grazing/walking</td>
<td>+ 8 (23%)</td>
</tr>
<tr>
<td>Urea cost</td>
<td>+ 4 (11%)</td>
</tr>
<tr>
<td>Milk composition</td>
<td>+ 2 (7%)</td>
</tr>
<tr>
<td>Liveweight</td>
<td>-1.5 (4%)</td>
</tr>
</tbody>
</table>

\[ 34 \text{ lb} \]

\[ 33.5 \]
Starch

Fibre

Glucose

\[
\begin{align*}
\text{CH}_2\text{OH} & \\
\text{H} & \\
\text{H} & \\
\text{OH} & \\
\text{H} & \\
\text{OH} & \\
\text{H} & \\
\text{H} & \\
\text{O} & \\
\text{H} & \\
\text{H} & \\
\text{H} & \\
\text{OH} & \\
\text{H} & \\
\end{align*}
\]

\[n\]

\[
\begin{align*}
\text{CH}_2\text{OH} & \\
\text{H} & \\
\text{H} & \\
\text{OH} & \\
\text{H} & \\
\text{OH} & \\
\text{H} & \\
\text{H} & \\
\text{O} & \\
\text{H} & \\
\text{H} & \\
\text{H} & \\
\text{H} & \\
\text{OH} & \\
\text{H} & \\
\end{align*}
\]

\[n\]
Carbohydrate Metabolism

Cellulose       Hemicellulose       Pectin       Fructans       Starch
Carbohydrate Metabolism

Cellulose  →  Hemicellulose  →  Pectin  →  Fructans  →  Starch

Cellulose  →  Hemicellulose  →  Pectin  →  Fructans  →  Starch

Pentoses  →  Uronic acids  →  Fructose  →  Galactose

Pentose pathway  →  Sucrose  →  Galactose

Cellobose  →  Cellulose  →  Hemicellulose  →  Pectin  →  Fructans  →  Starch

Fructose  →  Maltose  →  Starch

Glucose
Replace NDF with NSC

Caruthers et al. 1997

- No increase in efficiency of ruminal N utilisation.
- No increase in microbial protein.
- \(<\text{Fat Yld (E. Lact)}\)
- \(>\text{Protein Yld (L. Lact)}\)
Replace NDF with NSC

Caruthers et al. 1997
• No increase in efficiency of ruminal N utilisation.
• No increase in microbial protein.
• <Fat Yld (E. Lact)
• >Protein Yld (L. Lact)

Roche et al. 2006
• <Fat
  - 1.14
  - 1.06
• >Protein
  - 0.80
  - 0.85
Conclusions

• Huge opportunity in the U.S. for pasture-based systems
• Aim to maximise profits – not minimise costs
• High pasture utilisation through
  • High stocking rates (>1 cow/ac)
  • Supplement cows when insufficient pasture
• Forget the toys. You’ve outgrown them!
• Less emphasis on milk yield/cow.
• Don’t listen to nutritionists trained for TMR!