Research Trials-Moorepark and DEXCEL-implications for breeding

Dairy Production Department
Teagasc
Moorepark
Overview

• Background

• Influence of EBI on farm profitability

• Use of alternative breeds/crossbreeding

• Lessons for Dairy Cattle Breeding in Ireland

• Conclusions
Drivers of Change

- Reduction in fertility of Irish dairy herds
- Lower milk price in future
- Seasonality of milk supply
- Reduction in dairy farm numbers
- Farmers Preference
- Nitrate directive
Decline in Fertility 1990-2000
(DairyMIS FARMS)
Decline in Fertility 1990-2002
(DairyMIS FARMS)

The chart shows the decline in fertility rates from 1990 to 2002. The replacement rate (black diamonds) and reappearance rate (pink squares) are plotted over the years.


Replacement rate (%): 65.0, 70.0, 75.0, 80.0, 85.0, 90.0

Reappearance rate (%): 65.0, 70.0, 75.0, 80.0, 85.0, 90.0
Decline in Fertility 1990-2000

(DairyMIS farms)
Holstein-Friesian Strain Trial Review
### Strain comparison

<table>
<thead>
<tr>
<th></th>
<th>EBI (€)</th>
<th>Milk (kg)</th>
<th>Fat (kg)</th>
<th>Prot. (kg)</th>
<th>Calving Interval</th>
<th>Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP</td>
<td>44</td>
<td>253</td>
<td>12.1</td>
<td>10.2</td>
<td>-0.57</td>
<td>-0.60</td>
</tr>
<tr>
<td>HD</td>
<td>42</td>
<td>106</td>
<td>7.8</td>
<td>6.7</td>
<td>-1.86</td>
<td>0.10</td>
</tr>
<tr>
<td>NZ</td>
<td>51</td>
<td>30</td>
<td>9.7</td>
<td>5.0</td>
<td>-3.24</td>
<td>0.89</td>
</tr>
</tbody>
</table>
## Strain Comparison

<table>
<thead>
<tr>
<th>Feed</th>
<th>MP</th>
<th>HC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strain</td>
<td>HP</td>
<td>HD</td>
</tr>
<tr>
<td>Milk (gals)</td>
<td>1389</td>
<td>1312</td>
</tr>
<tr>
<td>Fat (%)</td>
<td>4.11</td>
<td>4.02</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>3.44</td>
<td>3.47</td>
</tr>
<tr>
<td>Milk solids (kg)</td>
<td>491</td>
<td>460</td>
</tr>
<tr>
<td>42-Day in-calf(%)</td>
<td>60</td>
<td>66</td>
</tr>
<tr>
<td>Preg rate (%)</td>
<td>80</td>
<td>85</td>
</tr>
</tbody>
</table>
Key Assumptions

- Farm Size - 40 (ha)
- Quota - 468,000l (100,000gals)
- Milk price (c/l) - High 26.7; Low 22.3
- Cull cow price (€) - High 381; Low 270 (NZ-13)
- Calf price (€) - High 208; Low 102 (NZ -45)
- Concentrate (€) - High 200/t; Low 180/t
- Full costs including labour
Effect of Strain of HF on Farm Profitability-
High Milk Price Scenario

Euro

MPK

HC

High Durability
High Production
New Zealand
Effect of Strain of HF on Farm Profitability - Low Milk Price Scenario

- MPK
  - Euro 4,000
  - Euro 9,000
  - Euro 14,000
  - Euro 19,000
- HC
  - Euro 9,000
  - Euro 14,000
  - Euro 19,000

High Durability, High Production, New Zealand
Strain trial indications

- BCS
- Grass intake
- Energy balance
- Persistent milk production

\[ \uparrow \text{Milk solids} \]
\[ \uparrow \text{Fertility} \]
Results from New Zealand
The Strains

• **NZ90s** = New Zealand High; high BW, sired by NZ sires, low overseas Holstein

• **NZ70s** = NZ 1970s strain; Sired by 1970s bulls, foundation dams were low BW

• **OS90s** = Overseas High BW; high BW, sired by high N. American Holstein %, founder dams high overseas %, but NZ born
Current Average BWs

Top 5% of herds in NZ have $BW > 120 (Dairy Stats, 02/03)
Milksolids by Strain (02-03)

MS(kg/cow)

Feed allowance t DM/cow

- NZ70s
- NZ90s
- OS90s
## Reproductive Performance 01-02

<table>
<thead>
<tr>
<th>Strain</th>
<th>OS90s</th>
<th>NZ90s</th>
<th>NZ70s</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-week</td>
<td>56</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>12-week</td>
<td>83</td>
<td>90</td>
<td>93</td>
</tr>
</tbody>
</table>
Economic Farm Surplus (02-03)

EFS $/ha @ $3.57

NZ70s
NZ90s
OS90s

Feed allowance t DM/cow

4.5 5.0 5.5 6.0 6.5 7.0
Crossbreeding
## Heterosis or Hybrid vigour

<table>
<thead>
<tr>
<th>F1 Cross</th>
<th>NZHF*J</th>
<th>Hol*J</th>
<th>NZHF*Hol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein (kg)</td>
<td>5.5</td>
<td>6.2</td>
<td>2.1</td>
</tr>
<tr>
<td>Fat (kg)</td>
<td>7.5</td>
<td>9.6</td>
<td>2.6</td>
</tr>
<tr>
<td>Milk (kg)</td>
<td>147</td>
<td>157</td>
<td>67</td>
</tr>
<tr>
<td>Incalf (%)</td>
<td>6.8</td>
<td>10.1</td>
<td>3.3</td>
</tr>
<tr>
<td>Survival 2(^{nd}) (%)</td>
<td>3.4</td>
<td>8.8</td>
<td>2.7</td>
</tr>
<tr>
<td>Survival 5(^{th}) (%)</td>
<td>9.6</td>
<td>18.3</td>
<td>6.3</td>
</tr>
</tbody>
</table>
Why Crossbreed?

- "Narrow" selection - Reduction in health and reproductive traits of Holstein-Friesian
- Other breeds better selected for health traits
- Complementarity of breeds
- Hybrid vigour
What do farmers need to know before embarking on crossbreeding?

1. Are there at least two breeds of near equal merit for profitability?

2. How big are the heterosis or crossbreeding effects for profit-related traits?

3. What happens in advanced generations of a crossbreeding plan?
CHOICE SOURCING OF ALTERNATIVE BREED(S)

• Montbeliarde

• Scandanavian Red

• Jersey
Ballydague Experiment

– Breeds compared
  - Montbeliard
  - Norweigan Red
  - Holstein Friesian
  - Normande
  - Montbeliard* Holstein Friesian
  - Normande* Holstein Friesian

– Feeding Systems
  - 500kg V 1000kg/cow
Milk production 2001-2003

Cow Breed

- HF: 5958 kg
- MB: 5469 kg
- MBX: 5857 kg
- NM: 4896 kg
- NMX: 5695 kg
- NR: 5743 kg

Milk yield (kg/cow)
## Reproductive Performance (Ballydague 01-03)

<table>
<thead>
<tr>
<th>Cow Breed</th>
<th>HF</th>
<th>Pure-breds</th>
<th>F1 progeny</th>
<th>NR</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSI (days)</td>
<td>76</td>
<td>75</td>
<td>75</td>
<td>74</td>
</tr>
<tr>
<td>CCI (days)</td>
<td>95</td>
<td>96</td>
<td>90</td>
<td>87</td>
</tr>
<tr>
<td>No. Services/cow.</td>
<td>1.93</td>
<td>1.87</td>
<td>1.74</td>
<td>1.67</td>
</tr>
<tr>
<td>CR - 1\textsuperscript{st} service (%)</td>
<td>42</td>
<td>44</td>
<td>56</td>
<td>61</td>
</tr>
<tr>
<td>6 week incalf rate (%)</td>
<td>56</td>
<td>58</td>
<td>69</td>
<td>74</td>
</tr>
<tr>
<td>Empty rate (%)</td>
<td>19</td>
<td>8</td>
<td>10</td>
<td>9</td>
</tr>
</tbody>
</table>
Heterosis- 6-Week Incalf Rate

Pregnancy rate (%)

<table>
<thead>
<tr>
<th>Group</th>
<th>Heterosis (Rate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF</td>
<td>56</td>
</tr>
<tr>
<td>F1 progeny</td>
<td>69</td>
</tr>
<tr>
<td>MB/NM</td>
<td>58</td>
</tr>
<tr>
<td>NR</td>
<td>74</td>
</tr>
</tbody>
</table>
Heterosis- Overall Incalf Rate

HF F1 progeny Purebreds NR

Incalf rate (%)

81 90 92 91
Preliminary conclusions (1)

• Genetic selection in Ireland must be based on the traits that have the greatest impact on farm profit:
  - High health status
  - High milk solids

• The results demonstrate the importance of progeny testing future sires within the environment they are to be used-IRELAND.
Preliminary conclusions (2)

• For crossbreeding to be successful the alternative breed must be genetically high in traits such as: milk solids, fertility, survival, calving ease, mastitis resistance and beef merit

• To use an alternative breed successfully it must be ranked within the same index as Holstein-Friesian