Lifetime production: an index to show what cows really can produce

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Demand from the market

Develop a lifetime production index for bulls combining production and herdlife

Requirement:

• Shows genetic potential lifetime production of daughters
• Use existing breeding values
Lifetime production index – approach (1)

follow daughter groups during whole life

• Production of each lactation
  – Level: EBV production per day, per lactation (testday model)
  – Rate of maturity
  – Curve: EBV production per day (testday model)
  – Length lactation: EBV calving interval
  – High EBV -> shorter lactations
  – Chance to produce milk at a certain day: EBV longevity
Lifetime production index – approach (2)

Base:
- Fixed dry period: 60 days
- Follow bull during an average of 11 lactations
  \(=>\) all daughters culled

Traits
- Kg milk
- Kg fat
- Kg protein
Example 1: Sunny Boy

Breeding values:

- Milk: +54 kg
- Longevity: +373 days
- Persistency*: 99
- Rate of maturity*: 108 -> relative more production in later lactations
- Calving Interval*: 99

*Relative breeding value:
Mean = 100
Stdev = 4
Lactation curve - milk

Sunny Boy

kg milk/lifetime production (\times1000)

days

prod pop
prod bull

CRV
+ combine production and survival curve

Sunny Boy

kg milk/lifetime production(*1000) vs days

- prod pop
- prod bull
- lifetime prod bull
- survival pop
- survival bull
Sum up production every day

Sunny Boy

kg milk/lifetime production(*1000)

survival

days

prod pop
prod bull
lifetime prod bull
ltp*(1000)
survival pop
survival bull
### Example Addison

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg milk</td>
<td>+1937 kg</td>
<td></td>
</tr>
<tr>
<td>Longevity</td>
<td>+193 days</td>
<td></td>
</tr>
<tr>
<td>Persistency*</td>
<td>107</td>
<td>more persistent curve</td>
</tr>
<tr>
<td>Rate of maturity*</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Calving interval*</td>
<td>95</td>
<td>longer calving interval -&gt; longer lactation</td>
</tr>
</tbody>
</table>

*Relative breeding value: Mean = 100  
Stdev = 4
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg milk</td>
<td>+424 kg</td>
<td></td>
</tr>
<tr>
<td>Longevity</td>
<td>-254 days</td>
<td></td>
</tr>
<tr>
<td>Persistency*</td>
<td>107</td>
<td>more persistent curve</td>
</tr>
<tr>
<td>Rate of maturity*</td>
<td>103</td>
<td></td>
</tr>
<tr>
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<td>95</td>
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*Relative breeding value:
Mean = 100
Stdev = 4
Production cumulative per day

![Graph showing lifetime production milk per day for different cows: sunny boy, addison, louson.](image-url)

- Sunny boy
- Addison
- Louson
Life time production Index

Index is combination of milk, fat and protein

Using milk index factors

$LTP\ Index = -0.03\ milk + 2.2\ fat + 5.0\ protein$

Unit is euro
How does it look for our 3 bulls?

<table>
<thead>
<tr>
<th>Bull</th>
<th>Milk (kg)</th>
<th>fat (kg)</th>
<th>Protein (kg)</th>
<th>LTP Index (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunny Boy</td>
<td>+8472</td>
<td>+528</td>
<td>+357</td>
<td>+2692</td>
</tr>
<tr>
<td>Addison</td>
<td>+11368</td>
<td>+191</td>
<td>+308</td>
<td>+1619</td>
</tr>
<tr>
<td>Louson</td>
<td>-6414</td>
<td>-301</td>
<td>-169</td>
<td>-1415</td>
</tr>
</tbody>
</table>

During the lifetime of a cow, the farmer earns $0.5 \times (2692 - (-1415)) = 0.5 \times 4107 = €2053$ more with Sunny Boy daughters than with Louson daughters.

LTP = price milk (components) – feed cost.
Relation breeding value – production daughters for milk yield

Validation bulls
- Daughter average based on at least 1000 culled daughters
- EBV longevity based on at least 150 culled daughters
- Bull is at least 10 years old

Correlation: 0.79
Slope : 2.02
=> expected

EBV lifetime production milk vs Lifetime production daughters

Validation bulls
- Daughter average based on at least 1000 culled daughters
- EBV longevity based on at least 150 culled daughters
- Bull is at least 10 years old
Genetic trend B&W bulls

- Genetic trend over time for kg fat, kg protein, and kg milk production by birth year.
What does lifetime production index add?

LTP Index = longevity breeding value

LTP Index = euro’s, to be earned during a cows life
  -> economic effect longevity

LTP Index = combination longevity and production
  -> insight in dependency of production on herdlife

LTP Index = helps AI’s in communication with dairy farmer
  -> show what breeding can do!
Thanks for your attention

Big Boukje 192

- 15,000 kg fat+ protein
- Farmer Jos Knoef