Schätzung wirtschaftlicher Gewichte für sekundär Leistungsmerkmale bei Schweizerischen Zweinutzungsprüfleistern unter Anwendung der dynamischen Optimierung

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Schätzung wirtschaftlicher Gewichte für sekundäre Leistungsmerkmale bei Schweizerischen Zwelnutzungsristern unter Anwendung der dynamischen Optimierung

ABHANDLUNG
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Summary

Economic weights for secondary traits of Swiss dual purpose cattle breeds using dynamic programming.

In Swiss dual purpose cattle breeds not only the main performance traits milk and meat are recorded by the breeding associations, but also some secondary traits like fertility, calving ease and conformation traits. The knowledge about the different traits is not included in an aggregate genotype as required by selection theory, but published as single breeding values or population means.

The objective of this study was to estimate economic weights (EW) of the most important secondary traits under Swiss production circumstances. For comparative reasons the EW of the main performance trait milk yield was also estimated.

To calculate the EW the milk production area of a farm was modelled using a dynamic stochastic optimisation model, which includes the state variables lactation number (12 classes), lactation stage (18 - 22 classes) and time of conception (7 classes). The objective function was to maximise the expected net return per kg milk produced. An optimal culling and insemination policy was determined over a 15 year planning horizon. The EW was defined as the difference of the expected net return per year between two performance levels of the trait observed, keeping all other traits constant.

For a defined reference situation, the EW of the six traits observed are presented in Table 1. When expressed relative to genetic standard deviations ($\sigma_g$) milk yield had the highest EW, followed by conception rate, roughage intake capacity, herd life, persistency and calving ease.

Sensitivity analyses were carried out to test model assumptions. All EW were sensitive to the level of milk yield assumed. While with increasing milk yield the EW of milk yield itself decreased the EW of all secondary traits increased. All traits except calving ease were sensitive to the performance level of the trait itself. With increasing performance the EW decreased. The assumed price ratio of concentrates to roughage influenced the EW of milk yield, roughage intake capacity and persistency. With an increasing concentrate price, the EW of milk
yield decreased while the importance of roughage intake capacity and persistency increased. The EW of persistency was sensitive to the calving month. Autumn and winter calvings had a higher EW for persistency than spring and summer calvings.

Table 1: Economic weights (EW) of the six traits modelled for the reference situation and their importance when expressed per genetic standard deviation ($\sigma_g$), relative to milk yield.

<table>
<thead>
<tr>
<th>trait</th>
<th>$\sigma_g$</th>
<th>EW ($\text{SFr.} \cdot \sigma_g^{-1}$)</th>
<th>Importance relative to milk yield (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>milk yield</td>
<td>365 (kg)</td>
<td>173.0</td>
<td>100</td>
</tr>
<tr>
<td>conception rate</td>
<td>5 (%)</td>
<td>55.8</td>
<td>32.2</td>
</tr>
<tr>
<td>roughage intake capacity</td>
<td>0.54 (kg DM$^1$ / day)</td>
<td>54.2</td>
<td>31.3</td>
</tr>
<tr>
<td>herd life</td>
<td>0.28 (year)</td>
<td>43.3</td>
<td>25.1</td>
</tr>
<tr>
<td>calving ease</td>
<td>4.1 (%)</td>
<td>18.5</td>
<td>10.7</td>
</tr>
<tr>
<td>persistency of milk yield</td>
<td>3 (%)</td>
<td>18.7</td>
<td>10.8</td>
</tr>
</tbody>
</table>

$^1$ DM = dry matter;

In the final part of the study the use of the EW is discussed. In addition to their application by breed associations, applications to farmers and to advisers at farm management level are discussed.