Joint genetic analysis of Jersey dairy cows performing in two countries in Sub Saharan Africa

Citation for published version:

Link:
Link to publication record in Edinburgh Research Explorer

Document Version:
Peer reviewed version

Published In:
Joint genetic analysis of Jersey dairy cows performing in two countries in Sub Saharan Africa

O Abejide1,2, M Chagunda2, R Mrode2, G Banos2,3, J Ojango2, C Banga2, G Simm2

1University of Edinburgh, UK, 2SRUC, Edinburgh, UK, 3International Livestock Research Institute (ILRI), Nairobi, Kenya, 4Agricultural Research Council (ARC), Pretoria, South Africa

olyinka.abejide@sruc.ac.uk

Application Currently, there are a few countries that carry out genetic evaluation for dairy cattle in Sub Saharan Africa. Where this is done, it is at individual country level. Results from a joint genetic evaluation may provide robust and accurate genetic parameters.

Introduction Genetic improvement of farmed livestock has had a major impact on productivity and its effects being permanent, cumulative and usually highly cost effective. However, genetic improvement has not been carried out systematically in most Sub Saharan Africa countries because of lack of performance recording and pedigree information. However, some data has been collected in some countries which are currently used for national evaluation. A joint across-country analysis may result in more accurate evaluations in cases where common foreign sires have been used. Using a case study approach with data from Jersey cattle performing in Kenya and South Africa, the hypothesis was that joint genetic evaluation would result in robust and accurate genetic parameters and hence, improve genetic progress.

Material and methods Test interval method (ICAR 2003) was used to determine 305-day milk yield from test day records for Jersey cattle (n=46,242) obtained from the Kenya Livestock Breeders Organisation. In South Africa, 305-day milk yield records (n=1,858,021) were obtained from Agricultural Research Council. Data were from cows between first and fifth lactation from 1988 to 2012. A total of 400 sires with an average of 14 daughters per sire from Kenya and 9,962 sires with an average of 34 daughters per sire from South Africa were used. There were 31 sires that had daughters in both Kenya and South Africa from several foreign countries. The common sires were from USA (18), New Zealand (7), Denmark (1), Canada (1), Great Britain (1) and Australia (1). Variance component estimation was performed fitting a bivariate mixed linear model using ASReml (Gilmour et al., 2009). The model was \( y_{ijkl} = \text{lact}_i(\text{age}) + \text{HYS}_j + \text{animal}_{l(i)} + e_{ijkl} \), where lact was the effect of the jth lactation, HYS was the herd-year-season, animal was the random ith animal and mth pe effect. e was the error term. In the joint evaluation, country of performance was included in the model to account for the production system.

Results Descriptive statistics for production and fertility traits for Jersey cattle performing in Kenya and South Africa are presented in Table 1.

<table>
<thead>
<tr>
<th>Trait</th>
<th>Kenya</th>
<th>South Africa</th>
<th>Joint data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at first calving (months)</td>
<td>31.0 ±7.21</td>
<td>28.0±4.10</td>
<td>29.0±4.50</td>
</tr>
<tr>
<td>Calving interval (days)</td>
<td>493.0±152.01</td>
<td>404.0±89.30</td>
<td>405.2± 91.30</td>
</tr>
<tr>
<td>305-day milk yield (litres)</td>
<td>4818.0±1428.1</td>
<td>5563.0±1417.3</td>
<td>5520.4±1437.5</td>
</tr>
</tbody>
</table>

Cows in Kenya calved for the first time at a slightly older age than in South Africa. However, cows in Kenya had relatively lower milk yield than cows in South Africa with more variation in milk yield in Kenya (CV% = 34%) than in South Africa (CV% = 25%). Genetic parameters for individual and joint evaluations are presented in Table 2.

<table>
<thead>
<tr>
<th>Genetic parameters</th>
<th>Kenya</th>
<th>South Africa</th>
<th>Joint genetic evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heritability of 305-day milk yield (MY)</td>
<td>0.13 (0.10)</td>
<td>0.18 (0.01)</td>
<td>0.21 (0.01)</td>
</tr>
<tr>
<td>Heritability of age at first calving (AFC)</td>
<td>0.15 (0.05)</td>
<td>0.44 (0.05)</td>
<td>0.58 (0.05)</td>
</tr>
<tr>
<td>Heritability of calving interval (CI)</td>
<td>Non estimable</td>
<td>0.04 (0.01)</td>
<td>0.05 (0.01)</td>
</tr>
<tr>
<td>Repeatability of 305-day MY</td>
<td>0.13 (0.10)</td>
<td>0.43 (0.03)</td>
<td>0.43 (0.01)</td>
</tr>
<tr>
<td>Genetic correlation of 305-day MY and AFC</td>
<td>-0.53 (0.24)</td>
<td>-0.12 (0.10)</td>
<td>-0.20 (0.10)</td>
</tr>
<tr>
<td>Genetic correlation of 305-day MY and CI</td>
<td>Non estimable</td>
<td>0.60 (0.05)</td>
<td>0.58 (0.04)</td>
</tr>
</tbody>
</table>

Joint genetic evaluation increased the value of the genetic parameter estimates and accuracy as reflected in low standard errors associated with the estimates.

Conclusion A joint genetic evaluation between Jersey cattle from Kenya and South Africa is feasible and more appropriate than individual country evaluation. This would generally increase the value of genetic parameter estimates and accuracy of selection especially where there are insufficient data available in individual countries for a robust analysis.

Acknowledgement Thanks to the Agricultural Research Council, South Africa, Kenya Livestock Breeder’s organisation and International Livestock Research Institute for data and the SRUC International Engagement Strategy for funding.

References