GENETIC EVALUATION OF CHINESE SIMMENTAL NUCLEUS HERDS

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INTRODUCTION
Simmental were introduced into China at the beginning of last century to improve Chinese yellow cattle. After 21 years of selective breeding using an open nucleus breeding system (ONBS), the improved cattle is now referred to as Chinese Simmental. A total performance index (TPI) including other means of selection was used in the breeding scheme (Junya Li. 2002). The TPI was proposed by Chinese Simmental Association considering the situation in China at that time. Milk yield, milk-fat percentage, body type score and body weight were included in TPI since Chinese Simmental were considered as dual-purpose cattle. The objective of this study was to analyze the fluctuation of TPI as well as the four component traits from 1980 to 2000. The results of this breeding scheme after 21-year were also studied.

MATERIAL AND METHODS
A total of 18,495 records of 7,928 animals born from 1980 to 2000 in 6 national Simmental breeding farms (nucleus herds) were analyzed for adjusted 305-day milk yield (MY), milk-fat percentage (FAT), type score (TS) and adjusted 18-month body weight (WT) traits. Estimates of predicted breeding value (PBV) were obtained from MTDFREML, which is a set of programmes for estimating (co)variance components as well as PBV using animal models and derivative-free REML approach (Boldman et al., 1995).

In summary form, the model is:

\[ Y = X\beta + Zu + e \]

Where:
- \( Y \) is the vector of observations,
- \( X \) is the matrix of fixed effects,
- \( \beta \) is the vector of fixed effects,
- \( Z \) is the matrix of random effects,
- \( \mu \) is the vector of random effects,
- \( e \) is the vector of random residual effects.

Models of the four traits were explained in table 1.

Table 1. Model of adjusted 305 day milk yield, milk-fat percentage, type score and 18-month body weight for Chinese Simmental nucleus herd

<table>
<thead>
<tr>
<th>Traits</th>
<th>FIXED FACTORS</th>
<th>RANDOM FACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MY</td>
<td>FARM, F-Y-S</td>
<td>PERMEN, ADDITI, RESIDU</td>
</tr>
<tr>
<td>FAT</td>
<td>F-Y-S</td>
<td>PERMEN, ADDITI, RESIDU</td>
</tr>
<tr>
<td>TS</td>
<td>F-Y-S, PARITY</td>
<td>PERMEN, ADDITI, RESIDU</td>
</tr>
<tr>
<td>WT</td>
<td>F-Y-S, PARITY</td>
<td>PERMEN, ADDITI, RESIDU</td>
</tr>
</tbody>
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TPI were estimated according to the following model:

\[
TPI = [3 \times \frac{M}{SDM} + \frac{F}{SDF} + \frac{T}{SDT} + \frac{W}{SDW}] \times 50
\]

Where \(M, F, T, W\) are PBVs of 305-day milk yield, milk-fat percentage, type score and 18-month body weight, \(SDM, SDF, SDT, SDW\) are their standard deviation respectively.

RESULTS AND DISCUSSION

Estimates of average PBVs for the four traits are shown in figure 1. Average PBV of MY increased considerably, that of FAT remained almost constant from 1980 to 2000. The TS and WT however, declined during the same period. Average TPI of Chinese Simmental are shown in figure 2, which seemed to increase at the beginning but fell greatly since 1992.

Figure 1. PBVs and genetic trends for milk yield, fat percentage, type score and body weight in Chinese Simmental nucleus herd
From the equation of TPI it is clear that economic weights of MY, FAT, TS and WT is 3:1:1:1. So, it’s obvious that the milk yield could increase rapidly since great emphases were put on it. Because of their superior milking ability and adaptability, Simmental were determined as one of the major breeds to improve Chinese yellow cattle by Ministry of Agriculture in 1986, which resulted in vast demand of Simmental seed stock all over the country ever since. Chinese Simmental Association had to increase the proportion selected in the nucleus herd from 20% to 30%, and this might result in the decline of the TPI since 1992. Effective measures should be taken to improve the body weight since Chinese Simmental is dual-purpose cattle.

**CONCLUSION**

The rapid increase in milk yield was expected since the weight on milk was 3 times more bigger than on other traits. The body weight, however, declined during the same period. Due to various reasons, such as Chinese Simmental was under great demand for crossbreeding with Chinese yellow cattle, there was no obvious increase of average TPI when comparing the value of TPI in year 2000 and year 1980.

**REFERENCES**

