Evaluation of Sources of Error in Weight Records of Commercially Raised Growing Pigs

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Birgit Schauer

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I hereby certify that the thesis has not been submitted for a higher degree at any University or Institution, and work embodied in this thesis is my work unless noted otherwise in the acknowledgements.

________________________________________

Birgit Schauer
This thesis is dedicated to Karl Hammer, who has been a source of inspiration to me for many years.
Abstract

The objective of this research was to investigate sources of errors in pig weight measurements. Three studies were conducted using data from one commercial New Zealand pig farm. In Chapter 4, finisher pigs fed ad libitum or via a computerized liquid feeding system were weighed four times a day over a four-day period. Results showed that standardization of weighing time reduced diurnal fluctuations in pig weight. However, multivariate analysis showed that there was a significant interaction between day and time of day, which indicates that diurnal fluctuations in live weight are not consistent between days, particularly in ad libitum fed pigs. Hence, Chapter 5 investigated whether overnight feed withdrawal for 11 hours (weaners) or 17 hours (growers and finishers) is effective in reducing between-pig variation in live weight and growth rate. For grower and finisher pigs, feed withdrawal was associated with a reduction in variability in live weight and growth rate by up to 11.5%, whilst the effect was inconsistent in weaner pigs. It is recommended to repeat the investigation on other farms to assess long-term effects on pig performance before general recommendations can be made.

Chapter 6 compared the magnitude of sampling error when sampling pens from batches of pigs, using different sample sizes and sampling methods. Increasing the portion of randomly selected pens reduced the sampling error, but in a diminishing manner. Purposive selection of two pens reduced sampling error by more than 64% compared with random sampling. However, purposive sampling introduces the risk of obtaining biased estimates. Thus, it is recommended to select pens from batches at random. These results may be used as an educational tool to demonstrate how to minimize errors in pig weights. Collecting more accurate weight records is likely to lead to improved interpretability of pig weights, and may promote better use of production data.
Acknowledgements

My postgraduate studies at the EpiCentre involved two projects, a German doctorate\(^1\) and this Master thesis. These two projects evolved from my collaboration with five New Zealand pig farms between 2003 and 2005. My special thanks belong to all these pig producers, their families and farm staff who have provided me access to routinely collected growing herd data and supported me in data collection. My work with these farms has contributed a lot to my understanding of the monitoring process in the growing herd. I want to thank particularly Grant Skilton and his family for their help and for being such a great kiwi family to me. My farm stays have always been a very enjoyable experience.

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\(^1\) At [http://edoc.ub.uni-muenchen.de/archive/00006596/01/Schauer_Birgit.pdf](http://edoc.ub.uni-muenchen.de/archive/00006596/01/Schauer_Birgit.pdf)
### Abbreviations

<table>
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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADG</td>
<td>Average daily gain, growth rate (kg/d)</td>
</tr>
<tr>
<td>AIC</td>
<td>Akaike’s information criterion</td>
</tr>
<tr>
<td>AL</td>
<td>Ad-libitum (feeding system)</td>
</tr>
<tr>
<td>AR(1)</td>
<td>First order Autoregressive covariance term</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence interval</td>
</tr>
<tr>
<td>CL</td>
<td>Computerized liquid (feeding system)</td>
</tr>
<tr>
<td>CV</td>
<td>Coefficient of variation</td>
</tr>
<tr>
<td>d</td>
<td>Day(s)</td>
</tr>
<tr>
<td>df</td>
<td>Degrees of freedom</td>
</tr>
<tr>
<td>IQR</td>
<td>Interquartile range</td>
</tr>
<tr>
<td>kg</td>
<td>Kilogram(s)</td>
</tr>
<tr>
<td>ln</td>
<td>Logarithm to the base of e (natural logarithm)</td>
</tr>
<tr>
<td>MJ</td>
<td>Mega joule</td>
</tr>
<tr>
<td>ML</td>
<td>Maximum likelihood</td>
</tr>
<tr>
<td>n</td>
<td>Number or sample size</td>
</tr>
<tr>
<td>P</td>
<td>P-value</td>
</tr>
<tr>
<td>R²</td>
<td>Squared correlation, R-squared value</td>
</tr>
<tr>
<td>RMSE</td>
<td>Root-mean-squared error</td>
</tr>
<tr>
<td>SD</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>SE</td>
<td>Standard error</td>
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<tr>
<td>Wgt</td>
<td>Weight</td>
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