Factors affecting carcass weight, dressing percent, and marbling score of crossbred beef cattle in tropical Thailand

Skorn Koonawottritrin1, Mauricio A. Elzo1, Chawalt Kankawe2, and Mattana Otsoshong2

1Department of Animal Science, Kasetsart University, Bangkok 10900, Thailand
2Department of Animal Sciences, University of Florida, Gainesville, FL 32611-9101, USA

Pon Yang Kham Livestock Breeding Cooperative National Company Ltd., Sakon Nakhon, Thailand

INTRODUCTION
Thailand is a tropical country in South East Asia. Climate in this country is hot (17°C – 30°C) and humid (60% – 80%). In 2010, the number of beef cattle raised in Thailand was 3,625,893 in 3,554,150 farms (mean = 5 animals per farm). The largest beef cattle production region is North Eastern Thailand, with 3,250,794 cattle raised in 940,315 farms (mean = 5 animals per farm). Most beef cattle in Thailand are indigenous Thai (4,611,956; 72% of the population), and the rest are crossbred between the local indigenous breeds (e.g., Chantaburi, Limousin, Simmental, and Angus) and Blue indicator cattle (e.g., Brahman, Indra, etc.).

Commercial beef production for high-quality beef market has been steadily increasing in recent years. However, because most beef producers are small holders, the Thai government has enforced that beef producers to organize themselves into cooperatives as a way to increase the efficiency and cost-effectiveness of their beef operations. One of the most successful beef cooperatives is the Pon Yang Kham Livestock Breeding Cooperative National Company Ltd. (PYK-LBCNC) which was established in 1980 by the governments of Thailand and France, and they have 7,702 member farmers in 2003. The establishment of PYK-LBCNC has collected information on carcass quality and quantity traits of beef cattle even more since 2004, research on fattening performance, and carcass characteristics of crossbred and purebred cattle. The study was carried out to understand the factors affecting carcass weight, dressing percent, and marbling score of crossbred beef cattle and from this study would help beef producers develop suitable feeding, nutrition, and management strategies for fattening beef cattle in Thailand.

RESULTS AND DISCUSSION
Fattening Year-Season
Fattening year-season affected CWT, DP, and MS (P < 0.001). The LSM range from 434.0 ± 4.0 kg (2007-Summer) to 438.6 ± 2.8 kg (2007-Summer) from 2.8 ± 0.2% (2007-Summer) to 3.7 ± 0.1% (2007-Summer). The regression coefficient estimate was -0.30 ± 0.11/year-season (P < 0.001) for CWT, -0.05 ± 0.02/year-season (P < 0.001) for DP, and 0.00 ± 0.001/year-season (P < 0.001) for MS. The fatness of crossbred cattle is highly affected by season traits and the fattening benchmarks should be set for each season to achieve a consistent level of marbling.

Nearby all farmers in this study were small holders, thus the quality of cattle feeding and management across year-seasons may have been highly dependent on their ability to cope with increasing prices of feed ingredients, concentrate, and fuel during the period of the study, as well as variation in weather conditions. A reduction in the amount and quality of feed provided over time may have been one of factors accounting for the decrease in CWT and DP. However, the decrease in CWT and DP for four years may not be caused by decreases in the amount of feed consumption, and the reduction in CWT and DP over the years may be due to the increasing cost of feed ingredients.

MATERIALS AND METHODS
Data, Farms, Feeding, and Management
These data were collected at the slaughter house of the Pon Yang Kham Livestock Breeding Cooperative National Company Ltd. from January 2004 to December 2010. Trains were crossbred weight (CWT), dressing percent (DP), and marbling score (MS); 1 = low to 5 = high. The National Bureau of Agricultural Commodity and Food Standards, 2004. Breed groups were: (1) Charolais × Brahman (CB), (2) Limousin × Brahman (LB), and (3) Simmental × Brahman (SB). Sexes were winter (November to February), summer (March to June), and rainy (July to October). The model included the fixed effects of year-season, breed group, and sex, covariates for slaughter age and slaughter weight, and interactions between the factors. All regression models were computed using Bivariant tools. All sub effects influenced (P < 0.05) CWT, DP, and MS. Crossbred CB and SB animals had similar CWT and DP, but CB had higher (P < 0.0001) MS (0.31 ± 0.01) than LB (0.35 ± 0.01). Crossbred CB and SB animals had similar CWT and DP, but CB had lower (P < 0.0001) MS (0.34 ± 0.04 kg) CB: 341.8 ± 1.6 kg; LB: 431.8 ± 0.45 kg) and SB: 55.6 ± 0.01 %; LB: 56.2 ± 0.02 %; and CB and CB males had higher CWT (434.1 ± 0.20 kg, 386.6 ± 0.27 kg and DP 0.74 ± 0.04 for CB and SB). These results suggested that CB males would be the most advantageous to increase carcass quantity and quality of beef calf under thermal conditions.

SUMMARY
The objective of this study was to characterize factors affecting carcass weight (CWT), dressing percent (DP), and marbling score (MS). 1 = low to 5 = high. The fattened beef cattle were crossbred CB: 341.8 ± 1.6 kg; LB: 431.8 ± 0.45 kg) and SB: 55.6 ± 0.01 %; LB: 56.2 ± 0.02 %. Positive associations existed between slaughter weight and CWT, DP, and MS, but interactions with weight were statistically non-significant. The regression coefficient estimate was -0.30 ± 0.11/year-season (P < 0.001) for CWT, -0.05 ± 0.02/year-season (P < 0.001) for DP, and 0.00 ± 0.001/year-season (P < 0.001) for MS. These results agreed with Park et al. (2002), who studied Hanwoo (Korean native cattle) and reported that carcasses quantity and quality of fattened cattle could be improved with heavier slaughter weights. However, to increase the profitability of beef operations under Thai environmental conditions, farmers may need to improve not only economically important carcass traits but also grow and feed conversion efficiency. In addition, particularly small farmers will need to utilize low cost feeding regimes of appropriate nutritional values, if they are to remain competitive.

Table 1: Least squares means of carcass weight, dressing percent and marbling score of crossbred beef cattle by breed group

<table>
<thead>
<tr>
<th>Breed Group</th>
<th>CWT (kg)</th>
<th>DP (%)</th>
<th>MS score</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CB: Charolais × Brahman</td>
<td>341.8 ± 1.6</td>
<td>35.6 ± 0.2</td>
<td>0.17 ± 0.01</td>
<td>0.001</td>
</tr>
<tr>
<td>LB: Limousin × Brahman</td>
<td>431.8 ± 0.45</td>
<td>56.0 ± 0.03</td>
<td>0.06 ± 0.01</td>
<td>0.001</td>
</tr>
<tr>
<td>SB: Simmental × Brahman</td>
<td>55.6 ± 0.01</td>
<td>55.6 ± 0.01</td>
<td>0.07 ± 0.01</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Table 2: Regression coefficient estimates of slaughter age, slaughter weight, and carcass weight on weight and dressing percent, and marbling score of crossbred beef cattle

<table>
<thead>
<tr>
<th>Traits</th>
<th>Slaughter Age (year)</th>
<th>P-value</th>
<th>Slaughter Weight (kg)</th>
<th>P-value</th>
<th>Dressing Percent (%)</th>
<th>P-value</th>
<th>Marbling Score (MS score)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWT</td>
<td>-0.02 ± 0.005</td>
<td>0.967</td>
<td>0.005 ± 0.001</td>
<td>0.967</td>
<td>0.005 ± 0.001</td>
<td>0.967</td>
<td>0.005 ± 0.001</td>
<td>0.967</td>
</tr>
<tr>
<td>DP</td>
<td>-0.03 ± 0.015</td>
<td>0.997</td>
<td>0.001 ± 0.001</td>
<td>0.997</td>
<td>0.001 ± 0.001</td>
<td>0.997</td>
<td>0.001 ± 0.001</td>
<td>0.997</td>
</tr>
<tr>
<td>MS score</td>
<td>0.015 ± 0.002</td>
<td>0.991</td>
<td>0.001 ± 0.001</td>
<td>0.991</td>
<td>0.001 ± 0.001</td>
<td>0.991</td>
<td>0.001 ± 0.001</td>
<td>0.991</td>
</tr>
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LITERATURE CITED


