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ESTIMATION OF THE GENOTYPE × ENVIRONMENT INTERACTION FOR THE WEANING WEIGHT OF BEEF CATTLE BREEDS IN THE CZECH REPUBLIC

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INTRODUCTION

Genotype × environment interaction is increasingly important, because breeding programs tend to be more globally oriented.

MATERIAL AND METHOD

The genotype × environment interaction (G×E) was estimated for the weaning weight of four beef cattle breeds: Angus(AA), Beef Simmental(MS), Hereford (HE) and Charolais (CH) (n = 19,760) and for different regions of the Czech Republic The environment was defined in regions by five criteria: Altitude (A), Crop-plat Growing Regions (CGR), Economic Value of Soil (EVS), Less Favored Areas (LFA) and Performance Level in a Herds (PL). The existence of G×E was examined by the mixed model (fixed and random effects) with and without interaction.
The following model was used (MIXED procedure - SAS, 2005):

Models 1:

$$y_{ijklmno} = \mu + Sex_i + PF_j + AgeM_k + Breed_l + Env_m + hys_{mn} + sire_{lo} + (Breed \times Env)_{lm} + e_{ijlkmno}$$

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where:
y_{ijklmo} – weaning weight at the age of 210 days
μ - overall mean
Sex_i - fixed effect of the sex (either young bull or heifer)
PF_j - fixed effect of the parturition frequency (either single or twin born)
$AgeM_k$ – fixed effect of the age of dam
$Breed_l$ - fixed effect of the breed
Env_m - fixed effect of the environment
$sire_{lo}$ – random effect of the sire nested in the breed
hys_{mn} – random effect HYS nested in the environment
$(Breed \times Env)_{lm}$ - interaction between the breed ($Breed_l$)and the environment (Env_m)
$e_{ijklmno}$ – random residual deviation

The suitability of various types of environment for the estimation of G×E was tested by means of the residual error variance (REV) and Akaik's information criterion (AIC). The suitability of various types of environment for the estimation of G×E was tested by means of the residual error variance (REV) and Akaik's information criterion (AIC).

RESULTS AND DISCUSSION

The LFA and PL were the best from all criteria of environment.
The incorporation of G×E into the models for both types of environment had:

a) No impact on the estimated residual error variance for models with G×E (LFA - 957, PL - 954) and without G×E (LFA - 958, PL – 954).
b. An evident impact on the AIC for models G×E (LFA - 195102, PL -193343) and without G×E (LFA - 195166, PL – 193393).

The estimated G×E were for both types of environment highly significant (P<0.0001).

Table 1. Significant of the environment

	Altitude	Crop-plat Growing Regions	Economic Value of Soil	Less Favored Areas	Performance Level in a Herds
F<Pr	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Connecting sire	37%	37%	42%	37%	74%
Progeny of the connecting sire	54%	47%	58%	54%	90%
σ^2_e – *model 1*	958.25	958.54	957.29	957.68	954.12
σ^2_e – *model 2*	958.72	958.64	958.47	958.75	954.51
AIC – model 1	195091.20	195035.50	195030.60	195102.40	193343.50
AIC – model 2	195157.60	195181.60	195105.40	195166.00	193393.10

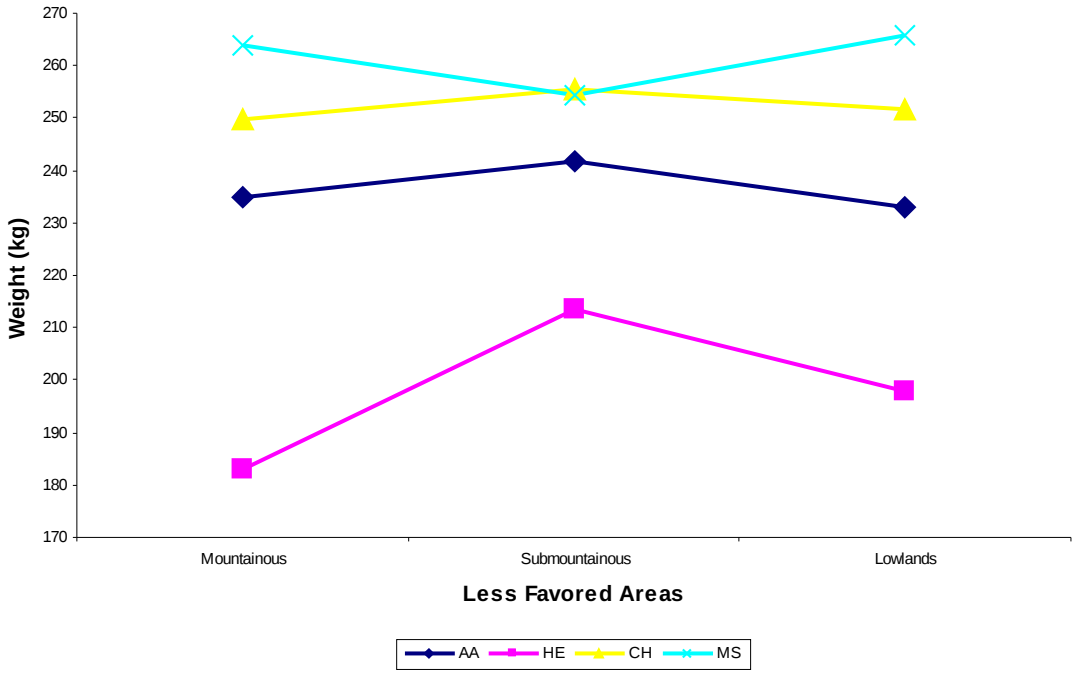

Figure 1. Less Favored Areas

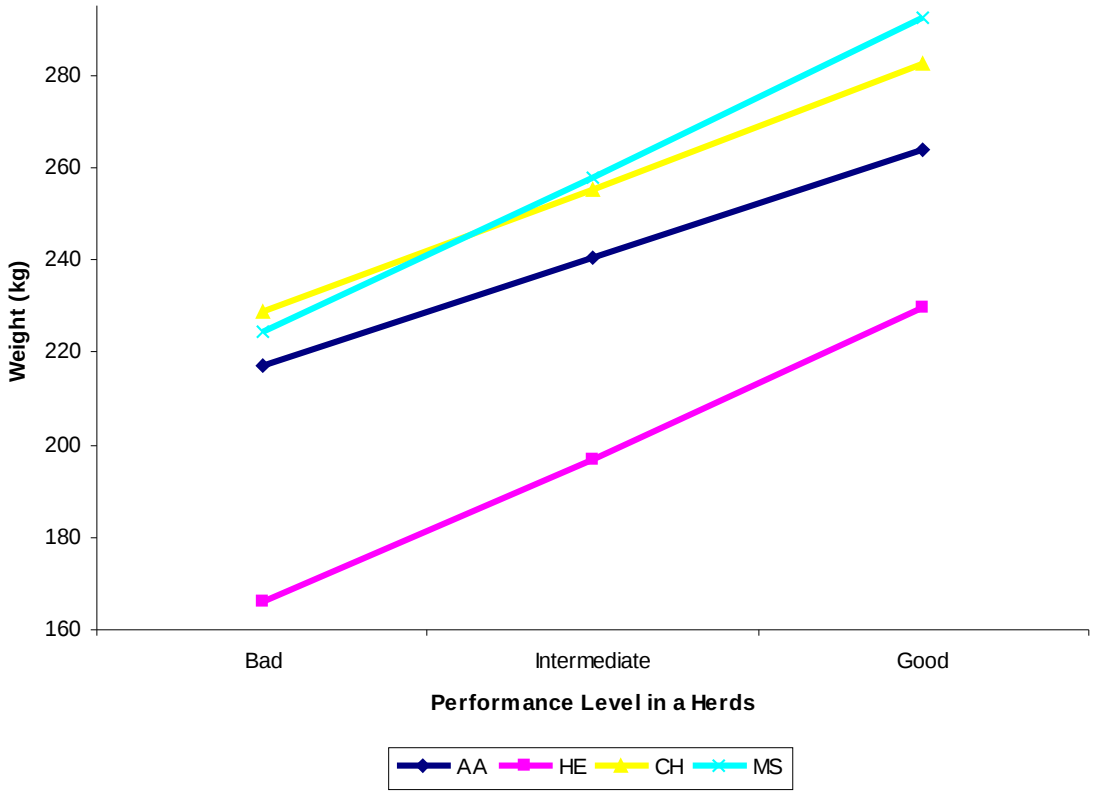

Figure 2. Performance Level in a Herds

CONCLUSION

Genotype × Environment interaction should be considered into evaluation of the weaning weight of beef cattle.

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