ECONOMIC WEIGHTS FOR BEEF TRAITS IN SLOVAKIAN SIMMENTAL POPULATION

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Summary
Economic weights of the integrated beef cattle production system in Slovakian Simmental were calculated for the following growth traits (birth weight, weight at 120 days, weaning weight, yearling weight) and carcass traits (dressing percentage, fleshiness and fat covering). The economic weights were calculated for three different marketing strategies: A/ commercial herds producing breeding heifers and breeding bulls for own replacement with surplus male and female calves fattened in intensive feedlot; B/ breeding herds producing breeding heifers and breeding bulls for own replacement with every surplus male and female calves exported for feedlot after weaning; C/ breeding herds producing breeding heifers and breeding bulls for own replacement with selling surplus breeding heifers to other herds and fattening of surplus male calves. A bio-economic simulation model of an integrated beef cattle enterprise was used to simulate economic efficiency for the mentioned marketing strategies. The relative economic importance of weaning weight comparing to weight at 120 days was the same, while the economic importance of yearling weight was lower in system with export of animals after weaning. The production and economic parameters of the system are discussed more in detail.

INTRODUCTION

Beef cattle farming is an important part of animal production in many countries (Albera et al., 2002; Fuerst-Waltl et al., 2002). In Slovakia, 9 beef and dual purpose breeds and their crosses (Aberdeen Angus, Blonde d´ Aquitaine, Hereford, Charoais, Limousine, Piemontese, Beef simmental, Slovak Simmental and Slovak Pinzgau) are used as suckler cows. The most numerous breed is Slovak Simmental.

Animal recording that involves such traits as weight at birth, 120, 210, 365 and 500 days is carried out under field test only. About 90% of animals are included in performance testing. Currently 27 422 cows belong to beef system and this population is still increasing.

In Slovakia, the system for genetic evaluation of beef traits using the animal model and BLUP method has been introduced in 2002 (Krupa et al., 2002). The breeding values for growth traits (birth weight, weight at 120 days of age, weaning weight and yearling weight) based on performance testing on farms have been estimated using the four-trait animal model.

The objective of animal breeding is to improve the genetic merit of animals in order to produce more efficiently under future production circumstances. Therefore complex breeding objectives are defined for each production system. In the complex selection index (aggregate genotype) the breeding values for each trait of interest are weighted by economic values (economic weights). Very few literature sources dealt with the economic analysis of beef cattle farming in Slovakia (Kubanková 2003; Daňo et al., 2001; Daňo et al., 1999). The authors mentioned above mainly dealt with the economic aspects of breeding the suckling cows in Slovakia. They did not include the calculation of economic weights and conclusions for specific marketing strategies in their work.

Wolfová et al. (2004) developed a bio-economic model for a wide range of beef cattle production systems and various economic and marketing circumstances. It was primarily established for development of breeding goals for beef cattle of different breeds. Beside this, a PC-program written on the base of this model by Wolf et al. (2004) enables to calculate the profitability of beef cattle production systems within a breed or breed crosses.

The aim of this paper was to calculate the economic weights for beef traits in Slovakian Simmental cattle under alternative marketing strategies.

MATERIAL AND METHOD

Bio-economic input parameters of Slovakian Simmental population farming in suckling system were used for calculation of economic efficiency and economic weights. Slovak Simmental is a dual purpose cattle raised in herds with average number of breeding cows about 30, in regions of altitude from 600 to 900 meters. A bio-economic simulation model suggested by Wolfová et al. (2004) for an integrated beef cattle enterprise was used to simulate economic efficiency for the following marketing strategies:

- Strategy A - commercial herds producing breeding heifers and breeding bulls for own replacement. Every surplus male and female calves are fattened in intensive feedlot.
- Strategy B - breeding herds producing breeding heifers and breeding bulls for own replacement. Every surplus male and female calves are exported for feedlot to other country after weaning.
- Strategy C - Breeding herds producing breeding heifers and breeding bulls for own replacement. Sale of surplus breeding heifers and bulls to other herds. Surplus male calves are fattened.

The animals were raised in traditional middle European pasture system with spring calving and autumn weaning. The pasture period lasted from May 1 to October 30. Average date of calving for all females in herd (cows and heifers) was February 25 and average date of conception for all females was May 16.

Mating season covered the interval from April 10 to June 18 and covered three estrus cycles usually started with artificial insemination. 10 percent of heifers were assumed to be inseminated in our calculation. After a week break, natural mating followed. Fixed length of reproduction cycle covering 365 days was assumed. The minimum live weight for mating was set to 390 kg. The standard deviation for mating weight was 50 kg. All calves were weaned at the same date (on September 30). Except the birth weight, three weighings were performed during the lifetime:

- 1st weighing at the age of 120 days
- 2nd weighing at the age of 210 days (weaning weight)
- 3rd weighing at the age of 365 days (yearling weight)

Table 1 shows the main characteristics of cow herds. Based on these parameters, the structure of cow herds in all systems was calculated using Markov chains as described by Wolfová et al. (2004). Calving performance were characterised with four scores: (1) no assistance, (2) assistance of 1 or 2 people, (3) veterinary assistance and (4) caesarian section. Structure of progeny born in the herds and their utilization depended on the alternative marketing strategy. 10 percent of male calves from the breeding herds were tested and eighty percent of them were selected and sold for natural mating or to AI stations. Table 2 contains general characteristics for main beef traits of progenies, breeding bulls and cows.

The total profit value came from fattened animals, sold breeding animals or sold animals

for export, respectively, depended on used alternative marketing strategy and calculated as the difference between returns and costs per one calving in the herd and year.

Revenues from slaughtered animals depended on the slaughter weight, dressing percentage and on the distribution of carcasses across 5 commercial fleshiness classes and 5 fat covering classes (payment was based of EUROP grading system). The average fleshiness classes were 3.26, 3.83, 3.49 and 3.75 for bulls, cows, castrates and heifers. the average fat covering classes were 2.48, 2.48, 3.30 and 3.15 for respective categories of animals. The main input parameters for revenue calculations are shown in Table 3. These parameters describe the market situation in the Slovak Republic in 2003. The costs were related to feeding of animals, housing, health, breeding, labour and investments.

RESULTS AND DISCUSSION

The marginal economic weights calculated for beef traits for Slovakian Simmental for three different marketing strategies are presented in Table 4. Economic weights are expressed in Slovak crowns (1EUR=41Sk) per standard female unit (SFU) and year. In our calculation, the term SFU means a cow entering reproduction cycle. Number of standard female units in herd means the number of cows during the calving period.

Generally higher economic values for growth traits (birth weight, weight at 120 days, weaning weight and yearling weight) were calculated for strategy B (with surplus male and female calves exported for feedlot to other country after weaning) and C (with selling of surplus heifers and fattening of surplus male calves). The economic weights for birth weight achieved double values (30.31 Sk per kg and standard female unit and 31.80 Sk per kg and SFU in strategies B and C, respectively, comparing to 14.5 Sk in marketing strategy A).

The calculated economic weights of weight at 120 days for system with export of surplus animals after weaning (strategy B/) or selling the breeding heifers and fattening of surplus male calves (strategy C/) were very similar (43.50 Sk and 45.53 Sk, resp.) while lower value 25.60 Sk per kg and SFU was calculated for system with intensive feedlot in strategy A. Similar tendency was found for weaning weight.

On the other hand, the economic weight for yearling weight was more than doubled in strategy C with selling breeding animals (49.61 Sk comparing to 22.68 Sk and 21.26 Sk per kg and SFU in systems A and B).

If the genetic standard deviations of the traits were taken into account (see the footnotes in Table 4), the relative economic importance of the weaning weight comparing to economic importance of weight at birth (in percentage: 100:5, 100:6, 100:6 for strategy A, B and C, respectively) and weight at 120 days was (100:66, 100:67, 100:67 for strategy A, B and C, respectively) were very similar for all three marketing strategies under study. Yearling weight was of the highest relative importance in strategy C (100:157 ratio of relative importance for weaning weight to yearling weight), where breeding animals for herd replacement and selling heifers for breeding and fattening surplus males are produced. Slightly lower relative importance (100:119) was calculated in system A where surplus male and females are fattened in intensive feedlot. Naturally, the yearling weight was less important than weaning weight (75:100) in strategy B with selling animals for feedlot after weaning.

The highest economic values for dressing percentage, fleshiness and fat covering were calculated for strategy with intensive fattening of all surplus animals. The economic weights for those traits and strategy B and C were the same.

Under given input parameters for the system, the total profit calculated for all three marketing strategies were negative even when the governmental support (approx. 12340 Sk per SFU) has been taken into account. The highest economic loss -12437 Slovak crowns, (1

EUR = 41 Sk) was calculated for strategy A with integrated feedlot of every surplus male and female calves. The smallest monetary loss (-2218 Sk) was achieved in strategy B with surplus male and female calves exported for feedlot to other country after weaning.

CONCLUSION

In this study, the first economic weights for beef traits in Slovakian Simmental under the different marketing strategies have been estimated. Impact of all important production parameters (reproduction, growth and fattening traits) and the influence of the most important economic input parameters (meat prices, prices for breeding animals, costs for feeding and fixed costs etc.) on the profitability of the production systems of beef cattle in Slovak conditions have to be studied more in detail. This will be objective of the next studies.

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Table 1. Main herd characteristics

Variable (units)	
Average lifetime of cows (year)	4.22
Total conception rate of females (heifers and cows)	0.89
Average dystocia incidence per one calving	0.03
Cows died after dystocia cycles 1 – 10	0.05
Heifers mated in first period	0.57
Heifers mated in second period	0.43
Total number of heifers conceived	0.99
Number of male calves born alive(per SFU)	0.470
Number of female calves born alive(per SFU)	0.473
Number of male calves alive 48 hours after calving(per SFU)	0.459
Number of female calves alive 48 hours after calving(per SFU)	0.466
Losses of calves from 48 hours after calving till weaning(per SFU)	0.046

Variable (units)	
Number of male calves weaned (per SFU)	0.443
Number of female calves weaned (per SFU)	0.436
Average age of heifers at first conception (months)	27.1
Minimal weight of heifers at first conception (kg)	390
Number of reinseminations per one insemination	1
Pregnancy length (days)	285
Peak milk yield (kg/day)	12
Fat content in milk (%)	4
Protein content in milk (%)	3.5
Mature weight of cows (kg)	655

SFU – standard female unit

Table 2. Performance of progeny groups, breeding bulls and cows

Variable (units)	
Weight of female calves at birth (kg)	40
Weight of male calves at birth (kg)	43
Weight of female calves at 120 days of age (kg)	150
Weight of male calves at 120 days of age (kg)	160
Weight of female calves at 210 days of age (kg)	230
Weight of male calves at 210 days of age (kg)	250
Weight of female calves at 365 days of age (kg)	340
Weight of male calves at 365 days of age (kg)	420
Daily gain of heifers in fattening (kg/day)	1.2
Daily gain of bulls in fattening (kg/day)	1.3
Slaughter weight of heifers in fattening (kg)	500
Slaughter weight of bulls in fattening (kg)	600
Dressing percentage of heifers (%)	56
Dressing percentage of bulls(%)	58
Dressing percentage of cows(%)	54
Daily gain of bulls in test (kg/day)	1.7
Productive lifetime of breeding bulls (reproduction cycles)	6
Mature weight of bulls (kg)	1000

Table 3. Parameters used to calculate revenues

Parameter (units)		
Price per kg slaughter weight of the best quality on the EUROP grading system	-heifers (Sk/kg)	69.61
	-bulls (Sk/kg)	86.21
	-cows (Sk/kg)	57.93
Price per kg live weight of calves for export (Sk/kg)	-male	70
	-female	65
Price for pregnant breeding heifers (Sk/animal)		30000
Price for breeding bulls		38000
Governmental financial support per SFU and year (Sk)		12340

Sk = Slovak crown , (1 EUR = 41Sk)

Table 4. Marginal economic values for three alternative marketing strategies

	Strategy A	Strategy B	Strategy C
Birth weight (Sk per kg and SFU)	14.57	30.31	31.80
Weight at 120 days (Sk per kg and SFU)	25.60	43.50	45.53
Weaning weight (Sk kg per and SFU)	26.80	45.13	47.16
Yearling weight (Sk kg per and SFU)	21.26	22.68	49.61
Dressing Percentage (Sk per % per SFU)	236.75	4.32	4.32
Mean class of fleshiness (Sk per changing of mean class by 0.01 and per SFU)	9.99	2.02	2.02
Mean class of fat covering (Sk per changing of mean class by 0.01 and per SFU)	9.42	1.27	1.27

Genetic standard deviations: s_g(birth weight) = 1.70; s_g (weight at 120 days) =12.20; $_{Sg}$ (weaning weight) = 13.10; s_g(yearling weight) = 26.30Sk = Slovak crown, (1 EUR = 41Sk)