Economic values of traits for Slovakian Pied cattle under different marketing strategies

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ABSTRACT: Economic values of 15 production and functional traits for Slovakian Pied cattle were calculated under different marketing strategies. The traits were as follows: birth weight of calves, daily gain of calves in fattening, mature weight of cows, weight of calves at 120, 210 (weaning weight) and 365 days (yearling weight) of age, dressing percentage, mean class for fleshiness and fat covering, conception rate of heifers and cows, losses of calves at calving and from 48 hours to weaning, lifetime of cows and mean class for calving performance. A purebred cow-calf pasture system producing its own female and male replacement was assumed for all strategies. The following marketing strategies for surplus weaned female and male calves were taken into account: (A) export of all surplus calves, (B) intensive fattening of all surplus calves, (C) rearing and selling of all surplus non-pregnant (1) or pregnant (2) breeding heifers and fattening or export of surplus male calves. All calculations were carried out with the computer program Ecoweight. The relative economic importance of traits was calculated multiplying the economic values by the genetic standard deviations of the traits. The lifetime of cows was the most important trait when applying export or fattening of all calves or when selling pregnant breeding heifers, whereas the yearling weight was even more important for the strategy with selling non-pregnant heifers. The second most important trait was weaning weight in strategy A, yearling weight in strategy B and lifetime of cows in marketing strategy C. Carcass conformation traits had the lowest economic importance in all calculations.

Keywords: cattle; Slovakian Pied cattle; bio-economic model; economic weights; beef traits; functional traits; marketing strategies

Beef cattle farming is an important part of animal production in many countries (Albera et al., 2002; Fuerst-Waltl et al., 2002). In Slovakia, seven beef breeds (Aberdeen Angus, Blonde d'Aquitaine, Hereford, Charolais, Limousin, Piemontèse, Beef Simmental) and two dual-purpose breeds (Slovakian Pied and Slovak Pinzgau) and their crosses are used as suckler cows, Slovakian Pied being the most numerous breed.

Currently, approximately 27 000 beef cows belong to the beef system and this population is still increasing. Animal recording is carried out under field conditions only. About 90% of the animals are included in performance testing. The breeding values for growth traits (birth weight, weight at 120 days of age, weaning weight and yearling weight) have been estimated using a four-trait animal model since 2002.

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. They should include all economically important traits. In the aggregate

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genotype, the breeding values for each trait of interest are weighted by economic weights. Only few literature sources deal with the economic analysis of beef cattle farming in Slovakia and in the Czech Republic (Kvapilík et al., 1997; Kvapilík, 2000; Daňo et al., 2001; Golda et al., 2001; Kubanková, 2003). Neither did these authors include the calculation of economic weights nor did they consider different marketing strategies in their papers.

Wolfová et al. (2005a) developed a bio-economic model for a wide range of beef cattle production systems and various economic and marketing circumstances. It was established for development of breeding goals for beef cattle of different breeds and implemented in a PC-program (Wolf et al., 2003) which can serve for calculating the profitability of purebred and crossbred beef cattle production systems.

The aim of the present paper was to calculate economic weights for production and functional traits of Slovakian Pied cattle under alternative marketing strategies.

MATERIAL AND METHODS

The Slovakian Pied breed is raised in herds with an average number of breeding cows of about 30, in regions of the altitude from 600 to 900 meters. The traditional Central European pasture system with spring calving and autumn weaning is applied. The pasture period was assumed to last from May 1 to October 30, the average date of calving for all females in the herd (cows and heifers) being February 25 and the average date of conception being May 16.

The mating season lasted from April 10 to June 18 and covered three oestrus cycles starting with artificial insemination in the first cycle. A total of 10% of the heifers and 30% of the cows were assumed to be inseminated. After a break of one week, natural mating followed. A fixed length of the reproduction cycle of one year (365 days) was assumed. The minimum live weight for mating was set at 390 kg. The standard deviation for mating weight was 50 kg. Under the assumed growth rate for female calves, the proportion of heifers that were mated in the first mating period after weaning was 51%. All calves were weaned on the same date (on September 30). In addition to birth weight, the animals were weighed three times during their lifetime: at an age of 120, 210 (weaning weight) and 365 days (yearling weight). Ten per cent of male weaned calves were included in performance testing and eighty per cent of these tested males were selected and sold for natural mating or to AI stations.

Tables 1 and 2 show the main characteristics of the cow herd and progeny performance. Four scores for calving performance were used: (1) no assistance, (2) assistance of 1 or 2 persons, (3) veterinary assistance and (4) Caesarean section. Dystocia rate was calculated as the sum of scores 3 and 4. Most of the parameters for the cow herd differ between the 1st and subsequent reproduction cycles. The structure of the cow herd was calculated using Markov chains as described by Wolf et al. (2003) and Wolfová et al. (2005a).

The following three basic marketing strategies were used for surplus female and male progeny that were not necessary for herd replacement:

Strategy A: All surplus calves were exported after weaning

Strategy B: All surplus calves were intensively fattened to the constant slaughter weight

Strategy C: All heifers were reared

Within Strategy C there was a further differentiation:

Strategy C1E: Surplus breeding heifers were sold pregnant, surplus males were exported

Strategy C1F: Surplus breeding heifers were sold pregnant, surplus males were fattened

Strategy C2E: Surplus breeding heifers were sold non-pregnant, surplus males were exported

Strategy C2F: Surplus breeding heifers were sold non-pregnant, surplus males were fattened

Comment: For specifying more than one variant, the asterisk (*) will be used in the same sense as in designing the names of files. C*E means C1E or C2E, C1* means C1E or C1F, C** stands for all four substrategies of strategy C.

The profit calculated as the difference between returns and costs per calving in the herd and per year (both returns and costs discounted to the birth year of progeny by a discount rate of 2%) was used as a criterion of economic efficiency for all marketing alternatives.

The revenues came from fattened bulls and heifers or from sold weaned calves, from sold breeding bulls and heifers, culled cows and heifers and from governmental subsidies. Revenues from slaughtered animals depended on slaughter weight, dressing percentage (Table 2) and on the distribution of the carcasses among the commercial EUROP classes

Table 1. Herd characteristics

Trait (unit)		Value
Cow losses within reproduction cycles (%)	– cycle 1	2
	– cycles > 1	1
Culling rate of cows due to health problems excluding dystocia (%)		2
Dystocia rate[1] when a female is born (%)	– cycle 1	3.9
	– cycles > 1	2.4
Dystocia rate[1] when a male is born (%)	– cycle 1	8.2
	– cycles > 1	3.8
Abortion rate (%)		1
Stillborn calves as a proportion of cows with easy calving (%)		
	– cycle 1	5
	– cycles > 1	4
Stillborn calves as a proportion of cows with dystocia (%)		20
Calves died within 48 hours as a proportion of calves born alive after easy calving (%)		
	– cycle 1	1
	– cycles > 1	0.8
Calves died till 48 hours as proportion of calves born alive after dystocia (%)		
	– cycle 1	5
	– cycles > 1	2
Conception rate of heifers (%) after	– 1st mating[2]	70
	– 2nd mating[3]	70
	– 3rd mating[3]	60
Conception rate of cows without dystocia (%)	– 1st mating[2]	30
	– 2nd mating[3]	70
	– 3rd mating[3]	60
Losses of calves from 48 hours after calving to weaning (%)		5
Peak milk yield (kg/day)		12
Fat content in milk (%)		4.1
Protein content in milk (%)		3.35
Mature weight of cows (kg)		655

[1]sum of calving scores 3 and 4, [2]artificial insemination, [3]natural mating

for fleshiness (5 classes) and fat covering (5 classes). The best class was class 1 (E) in both cases. The average class for fleshiness for Slovakian Pied cattle was 3.58, and the average class for fat covering was 2.85. The price differences between the classes were set up according to Vrchlabský and Golda (2000). Revenues from exported calves depended on breed, sex and live weight. The main input parameters necessary for calculating revenues are summarized in Table 3. They describe the market situation in the Slovak Republic at the end of 2003.

Costs were related to feeding, housing, health, breeding, labour and interest of investments. The main cost components are summarised in Table 4. These input parameters were adapted according to own investigation taking into account the inflation rate and expected price trends in the Slovak Republic.

The marginal economic value of trait l (ev_l), l = 1, ..., L was calculated as the numeric derivation of the profit function with respect to trait l as follows (Wolfová et al., 2005a):

$$ev_l = \frac{\text{profit}(\mu_1, \mu_2, \ldots, \mu_l + d_l, \ldots, \mu_L) - \text{profit}(\mu_1, \mu_2, \ldots, \mu_l - d_l, \ldots, \mu_L)}{2d_l} = \frac{\Delta\text{profit}_l}{\Delta_l}$$

where: μ_l = the mean of trait l

d_l = a small value by which the mean is changed

The value of 0.5 % of μl was assumed for d_l. L is the number of traits. Altogether, the following 15 traits were considered:

Growth traits: Birth weight of calves (kg), weight of calves at 120 days of age (kg), weaning weight of calves (at 210 days of age, in kg), yearling weight (at 365 days of age, in kg), mature weight of cows (kg) and daily gain in fattening (g/day);

Carcass traits: Dressing percentage (%), mean class for fleshiness and mean class for fat covering;

Functional traits: Conception rate of heifers (%), conception rate of cows (%), mean class for calving performance, losses of calves at calving (%), losses of calves from 48 hours to weaning (%) and lifetime of cows (years).

In addition, daily gains from birth to 120 days of age, from 120 to 210 days of age and from 210 to 365 days of age were used as alternative growth traits (g/day) and the lifetime of cows was alternatively expressed as cow losses (%).

In all calculations, a trait expressed in both sexes was assumed to be one trait. Therefore, changing the trait level, proportional changes were made in females and males. Increasing mature weight of cows, a proportional increase in mature weight of bulls, in slaughter weight of fattened animals and in minimal weight of heifers at mating was assumed. The growth rates in different life periods of calves were treated as independent traits. A detailed description of the method for the calculation of economic weights and a comprehensive definition of the individual traits are given in Wolfová et al. (2005a) or in the User's Manual for the program Ecoweight (Wolf et al., 2003).

Ranking breeding animals according to an economic selection index, only the relative economic importance of traits in the aggregate genotype is of interest. To express the relative economic importance $ev_l^{[rel]}$ of trait l (l = 1, …, L), the marginal economic value was multiplied by the genetic standard

Table 2. Performance of the progeny

Trait (unit)		Value
Weight at birth (kg)	female	41
	male	45
Weight at 120 days of age (kg)	female	150
	male	160
Weight at 210 days of age (kg)	female	230
	male	250
Weight at 365 days of age (kg)	female	340
	male	420
Daily gain in fattening (kg/day)	heifers	1.05
	bulls	1.30
Slaughter weight in fattening (kg)	heifers	500
	bulls	600
Dressing percentage (%)	heifers	56
	bulls	58
	cows	54
Daily gain of bulls in test (kg/day)		1.7
Productive lifetime of breeding bulls (years)		6
Mature weight of bulls (kg)		1 000

Table 3. Parameters used to calculate revenues

Parameter (unit)	Value
Price per kg slaughter weight of the best quality in the EUROP grading system	69.60
– heifers (SKK/kg)	86.20
– bulls (SKK/kg)	57.90
– cows (SKK/kg)	
Price per kg live weight of calves for export (SKK/kg) – males	70.00
– females	65.00
Price of pregnant breeding heifers (SKK/animal)	30 000
Price of non-pregnant breeding heifers (SKK/animal)	25 000
Price of breeding bulls (SKK/animal)	38 000
Governmental subsidies per fattened animal (SKK/animal)	1 000
Governmental subsidies per weaned calf (SKK/animal)	14 877

SKK is the Slovak currency unit (Slovak crowns), (1 € ≅ 41 SKK)

Table 4. Main input parameters used to calculate costs

Parameter (unit)	Value
Costs of veterinary treatment	
– cow with calf till weaning in a pasture system (SKK/year)	520
– heifers from weaning to calving in a pasture system (SKK/animal)	400
– breeding bulls in a pasture system (SKK/animal)	2 550
– animals in fattening (SKK/animal)	151
Veterinary costs connected with calving score 3 (SKK/calving)	984
Veterinary costs connected with calving score 4 (SKK/calving)	1 460
Costs of disposal and rendering of a dead cow (SKK/animal)	2 000
Costs of disposal and rendering of a dead young animal (SKK/animal)	1 000
Additional labour costs connected with calving score 3 and 4 (SKK/hour)	100
Fixed costs[1] (SKK/day)	
– cow with calf till weaning in a pasture system	29.0
– heifers from weaning to calving in a pasture system	14.6
– breeding bulls in a pasture system	30.6
– breeding bulls at a station	31.3
– animals in fattening	30.6
Price of a portion of semen for AI including labour costs (SKK/portion)	470
Price of re-insemination (sperm portion plus labour costs (SKK/portion)	470
Price per breeding bull for natural mating (SKK/animal)	55 000
Price per kg fresh matter of feeding ration (each in SKK/per kg fresh matter) for	
– cows, heifers and breeding bulls in summer (pasture)	0.48
– cows in winter	1.07
– heifers in winter	1.30
– breeding bulls in winter	1.47
– calves till weaning (without milk) in summer	1.34
– calves till weaning (without milk) in winter	3.60
– bulls in fattening	2.34
– heifers in fattening	2.12
Price of straw for housing (SKK/kg)	0.15
Price of dung (SKK/kg)	0.20
Price of water (SKK/l)	0.02

[1]Fixed costs include labour, capital replacement (buildings and machinery), repairing, insurance, energy and overhead expenses

deviation of the trait and expressed as percentage of this value for weaning weight.

The values for the genetic standard deviations were taken from Miesenberger (1997), Koots and Gibson (1998), Coopman et al. (1999), Amer et al. (2002), Hradecká (2002), Brumatti et al. (2002) and Přibyl et al. (2003).

RESULTS

The herd structure in the stationary state and the number of progeny per 100 calvings are shown in Table 5. The economic efficiency for all calculations is listed in Table 6 in the form of the value of profit and of profitability calculated as the ratio of profit

Table 5. Herd structure in the stationary state

Reproduction cycle	1	2	3	4	5	6	7	8	9	10
Number of cows per 100 calvings	18.3	15.5	13.3	11.4	9.6	8.4	7.3	6.2	5.4	4.6

Calves born alive per 100 calvings – female: 47.2; male: 47.0
Calves weaned per 100 calvings – female: 45.5; male: 45.1

Table 6. Values (in SKK) of economic characteristics for alternative marketing strategies

Economic characteristics[1]	Values of characteristics (in SKK) for marketing strategy[2]					
	A	B	C1E	C1F	C2E	C2F
Total costs	31 943	43 857	37 489	44 773	35 483	42 766
Total revenues	15351	18 275	21 110	23 888	17 855	20 633
Total subsidies[3]	13 472	13 472	13 472	13 472	13 472	13 472
Profit	–3 120	–12 109	–2 907	–7 412	–4 156	–8 661
Profitability[4] (%)	–9.8	–27.6	–7.8	–16.6	–11.7	–20.3

[1]Revenues, costs and governmental subsidies per cow and its progeny born per year, all discounted to the calving date; [2]Marketing strategies: A: export of all surplus weaned calves; B: fattening of all surplus weaned calves; C: rearing of all heifers and selling of surplus heifers; subcategories of C: 1: selling of pregnant heifers; 2: selling of non-pregnant heifers; E: export of surplus male calves; F: fattening of surplus male calves; [3]total governmental subsidies; [4]profitability is calculated as profit per monetary unit of costs and given in per cent

to costs. Under the given conditions, no strategy was profitable for the economic situation assumed in the Slovak Republic. The economic losses varied between 0.08 and 0.28 SKK (1 € ≅ 41 SKK) per SKK of invested costs according to the marketing strategy.

Marginal economic values for the investigated traits and marketing strategies are listed in Table 7. The growth traits of calves were expressed in two alternative ways, as weights at a given age or as average daily gains. Cow survival was expressed either as average lifetime of cows or cow losses. Marginal economic values express the change in the total profit per calving and year by increasing the trait level. The negative values for calf losses, calving performance and mean classes for fleshiness and for fat covering were due to the fact that an increase in the trait level means a change to more unfavourable values of the trait. The increase in mature weight of cows had a negative impact on profit because the higher energy requirement of the cows was not compensated by higher revenues

$$ev_l^{[\mathrm{rel}]} = 100 \times \frac{ev_l \times \sigma_l}{ev_{\mathrm{weaning\,weight}} \times \sigma_{\mathrm{weaning\,weight}}} \ [\%]$$

for heavier slaughter animals. All other marginal economic values were positive.

The economic weights of the traits differed in marketing strategies. For example, lifetime of cows or birth weight of calves had twice as high economic importance when exporting weaned calves in comparison with their fattening. Increasing the conception rate of cows by one per cent raised the profit by 6.73 SKK when applying fattening of progeny, whereas the profit increased by 186 SKK when progeny were exported. The reason for this was the fact that the costs of fattening exceeded the revenues especially in fattening heifers. Daily gain of calves till weaning also had higher economic importance when exporting animals. The higher the weaning weight, the higher the revenues from exported calves. Applying fattening, the higher the weaning weight, the higher the feed cost of maintenance. The simultaneous decrease of fixed costs due to a shorter fattening period did not compensate these costs as the revenues for slaughter animals did not change.

Differences in economic values between the strategies with selling pregnant heifers (C1*) and the strategies with selling non-pregnant heifers (C2*)

Table 7. Marginal economic values of traits for alternative marketing strategies

Trait (unit)	Marginal economic values (in SKK per unit, per calving and year) for strategy					
	A	B	C1E	C1F	C2E	C2F
Birth weight of calves (kg)	32.06	15.38	33.72	22.21	35.04	23.54
Weight of calves at 120 days of age (kg)	47.03	29.16	49.31	38.26	50.03	38.98
Weaning weight of calves (at 210 days of age, in kg)	48.61	30.02	50.90	39.13	51.62	39.85
Yearling weight of calves (at 365 days of age, in kg)	20.81	20.17	49.13	48.97	49.88	49.73
Mature weight of cows (kg)	–3.67	–19.24	–3.77	–11.12	–3.67	–11.02
Daily gain in fattening (g/day)	–	9.08	–	5.51	–	5.51
Dressing percentage (%)	4.42	249.42	4.42	177.20	4.32	177.20
Mean class for fleshiness (0.01 class)	–2.03	–9.82	–2.03	–7.29	–2.03	–7.29
Mean class for fat covering (0.01 class)	–1.28	–6.50	–1.28	–4.01	–1.28	–4.01
Conception rate of heifers (%)	17.50	14.70	10.90	10.64	10.71	10.45
Conception rate of cows (%)	185.96	6.73	196.02	187.62	148.26	139.94
Mean class for calving performance (0.01 class)	–32.29	–17.19	–32.80	–27.71	–30.01	–24.92
Losses of calves at calving (%)	–296.98	–167.67	–300.69	–249.08	–279.00	–227.47
Losses of calves from 48 hours to weaning (%)	–279.64	–155.66	–283.20	–237.40	–261.82	–215.72
Life time of cows (years)	2 809	1 346	2 874	2 824	2 480	2 430
Daily gain from birth to 120 days of age (g/day)	5.64	3.50	5.92	4.59	6.00	4.68
Daily gain from 120 to 210 days of age (g/day)	4.38	2.70	4.58	3.52	4.65	3.59
Daily gain from 210 to 365 days of age (g/day)	3.23	3.13	7.62	7.59	7.73	7.71
Cow losses (%)	–216.25	–103.61	–221.25	–217.41	–190.94	–187.10

See Table 6 for the explanation of the marketing strategies

were small both when exporting (C*E) and when fattening (C*F) surplus male calves.

The relative economic importance of the 15 traits (the alternative expression of traits was not included) is shown in Table 8. Lifetime of cows was the most important trait when applying export or fattening of all calves (strategies A and B) or when selling pregnant breeding heifers (strategies C1*), whereas the yearling weight was even more important for the strategy with selling non-pregnant heifers (strategies C2*). The second most important trait was weaning weight and mature weight of cows in strategies A and B, respectively, and lifetime of cows in strategies C2* or yearling weight in strategies C1*. Carcass conformation traits had the lowest economic importance in all calculations. The reason for this was the low price difference between the classes of fleshiness and fat covering assuming the same costs for each class.

Conception rate of females and losses of calves had relatively low economic importance as the level of these traits was already high (total conception rate of heifers and cows was 0.89, losses of calves at calving were 7.53% and losses till weaning 1.85%) and their genetic standard deviations were relatively low (Table 8).

DISCUSSION

A direct comparison of the economic weights calculated in different studies is difficult because of differences in breeds, in the definition of traits and in rearing and marketing strategies. Nevertheless, at least some general conclusions can be drawn from the literature.

The general statement of Phocas et al. (1998) that reproductive traits seem to be economically more

Table 8. Relative economic importance of traits as per cent of the economic importance of weaning weight for alternative marketing strategies

Trait (unit for standard deviation)	Genetic standard deviation	Relative economic importance (% of weaning weight) for strategy					
		A	B	C1E	C1F	C2E	C2F
Birth weight of calves (kg)	1.70	6.37	4.95	6.40	5.48	6.56	5.71
Weight of calves at 120 days of age (kg)	12.20	67.07	67.33	67.15	67.78	67.18	67.80
Weaning weight of calves (at 210 days of age, in kg)	17.60	100.00	100.00	100.00	100.00	100.00	100.00
Yearling weight of calves (at 365 days of age, in kg)	26.30	63.97	100.40	144.24	187.01	144.39	186.48
Mature weight of cows (kg)	32.00	−13.73	−116.53	−13.47	−51.67	−12.93	−50.28
Daily gain in fattening (g/day)	40.00	–	68.77	–	32.00	–	31.42
Dressing percentage (%)	0.80	0.41	37.77	0.39	20.58	0.38	20.21
Mean class for fleshiness (class)	−0.015	−0.36	−2.79	−0.34	−1.59	−0.34	−1.56
Mean class for fat covering (class)	−0.014	−0.21	−1.72	−0.20	−0.82	−0.20	−0.80
Conception rate of heifers (%)	2.1	4.30	5.84	2.56	3.24	2.48	3.13
Conception rate of cows (%)	2.5	54.34	3.18	54.70	68.11	40.80	49.88
Mean class for calving performance (class)	0.22	−83.03	−71.58	−80.55	−88.52	−72.67	−78.17
Losses of calves at calving (%)	0.95	−32.98	−30.15	−31.89	−34.36	−29.17	−30.81
Losses of calves from 48 hours to weaning (%)	0.60	−19.61	−17.68	−18.97	−20.68	−17.29	−18.45
Life time of cows (years)	0.5	160.88	127.38	160.41	205.03	136.49	173.23

See Table 6 for the explanation of the marketing strategies

important than growth and carcass traits could not be confirmed by our study in general. The relative importance of these groups of traits seems to be dependent on the production system, the marketing strategy and the average level of traits (Wolfová et al., 2005b).

Among the reproduction traits, reproductive success (though measured in different ways as conception or weaning rate, calving day, calving interval) had the highest economic importance in many studies (Ponzoni and Newman, 1989; Phocas et al., 1998; Barwick, 1995; Amer et al., 2001; Albera et al., 2002; Mwansa et al., 2002; Kahi and Nitter, 2004). In our investigation, the calving performance showed the highest importance among reproduction traits. The same result was reported by Wolfová et al. (2005b) for the Charolais breed.

As shown by Hirooka et al. (1998) or Albera et al. (2002), the economic importance of a trait is higher when herd performance for the trait is relatively low. The calving performance of Charolais purebred cows is generally lower than that of Slovak Pied, Hereford, Limousin or Angus cows as shown in our study and in the above-mentioned studies. This could explain the twice or six times higher economic importance of calving performance in comparison with the conception rate of cows reported by Wolfová et al. (2005b) whereas this relationship was much closer to 1 (1.5 to 1) in the present paper using the Slovak Pied breed.

The unexpected low value of the conception rate of cows in the marketing strategy with fattening of all surplus progeny was caused by costs exceeding revenues in the fattening of surplus heifers. Increasing the conception rate of cows yields more surplus heifers, which will lower the profit under given economic conditions. The same reason led to such "unexpected" economic weights for the calving interval in the paper of Kahi and Nitter (2004) or for calving success in the paper of Phocas et al. (1998) when these authors examined the sensitivity of economic weights to changes in prices or costs. As mentioned by Wolfová et al. (2005b), further research is needed to examine how to treat such situations leading to "untrue" economic weights in the development of breeding objectives.

The growth traits of calves showed generally higher relative economic importance in comparison with other traits (except the lifetime of cows) than it was reported in literature. Among the growth traits, the yearling weight of calves showed the highest economic importance for Slovak Pied cattle (after all in strategies with selling breeding heifers) whereas Wolfová et al. (2005b) reported higher importance for weaning weight than for yearling weight in Charolais.

Amer et al. (1997), Phocas et al. (1998) and Albera et al. (2002) reported relatively high economic importance of carcass quality traits in comparison with growth traits. Our study as well as the results of Wolfová et al. (2005b) did not support their findings as very small relative economic weights of carcass fleshiness and fat covering scores were calculated for all investigated situations. These results were caused by low price differences between the individual classes of the EUROP grading system in the Slovak Republic and in the Czech Republic.

Economic importance of lifetime and mature weight of cows was studied mainly in dairy cattle (e.g. Miesenberger, 1997; Wolfová et al., 2001; Pärna et al., 2002). Lifetime of cows was the first or the second most important trait under Slovak as well as Czech conditions (Wolfová et al., 2005b) for all marketing strategies. For the Australian dairy herds Visscher at al. (1994) reported a standardized economic value (per genetic standard deviation) of cow mature weight as high as the economic values of cow survival and nearly as high as the economic value of milk volume and milk fat. The published economic weight for cow mature weight was mostly negative in agreement with our study. Therefore, more attention than hitherto should be paid to lifetime of cows (or cow survival rate as an alternative trait) and mature weight of cows. Marginal economic values calculated for reproduction and functional traits in our study showed the possibility for an improvement of the economic efficiency of production systems when including these traits into the breeding goal. The same conclusion was expressed in breeding programmes for dairy cattle as shown for example by Sölkner et al. (2000).

Marginal economic values as well as the relative economic weights differed between marketing strategies. In our opinion, this variability was mainly caused by the differences between the revenues and costs for different animal categories within each strategy. For the given economic conditions, export of calves is more profitable than fattening, and the feedlot of surplus heifers is not profitable at all. The changes in the investigated traits influence the number of animals in each category of progeny sold or fattened per cow and year to a different extent. An increasing number of animals in categories the keeping of which is unprofitable will then bias the true economic importance of the causal trait.

CONCLUSIONS

As there are substantial differences in the relative economic importance of traits for different marketing strategies, it will be beneficial to construct different production indices for Slovakian Pied cattle (in pure-breeding systems) that will allow farmers to choose the best breeding animals according their marketing strategy. It is recommended to drop the carcass traits from the indices for the marketing strategy with export of surplus calves as their relative economic importance is currently low. However, defining the overall breeding goal for this breed, the economic values calculated for certain marketing strategies should be weighted by the number of cows on the farms applying these strategies in order to obtain the average economic values for each trait in the population applying pure-breeding.

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