Impact of economic parameters on economic values in dairy sheep

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ABSTRACT: The impact of variation in economic conditions on the economic values of fourteen production and functional traits was examined for the Improved Valachian breed using a bio-economic model implemented in the ECOWEIGHT software. The following economic parameters were investigated: market prices of lambs, milk, and cheese (variation ± 40%), costs for roughage, concentrates, and total feeding rations , costs for labour and veterinary care, fixed costs (variation ± 20% for all costs), and discount rate of revenues and costs (0 and 3%). Results of the analyses were presented in detail for the marginal and relative economic values of the four most important traits: milk yield in the 150-day milking period, conception rate of ewes, litter size per lambed ewe, and productive lifetime of ewes. Furthermore, cumulative relative economic values of the four trait complexes – milk production, growth, functional, and wool traits – were presented. Prices for sheep products were found to be the most important factor for both the marginal and the relative economic values of the evaluated traits. The four traits with the highest relative economic values in the base calculation stayed the most important for all investigated economic parameters ranges. The relative economic values of the remaining 10 traits did not exceed 6.1%. The relative economic values of milk yield and litter size were the most sensitive to the variation in economic circumstances. For the investigated range of economic parameters, the relative economic value for the complex of milk production traits ranged 30.6–48.1%, for growth traits 6.3–9.4%, and that for functional traits 45.4–59.7%. The relative economic value for the wool trait did not exceed 0.3%.

Keywords: market prices; costs; milk production; functional traits; Improved Valachian; sensitivity analysis

Improving animal performance should be sustainable and economically profitable, therefore economic selection indices have been used in most breeding programmes for livestock. For this purpose, economic weighting factors have to be estimated for all traits in the breeding objective. The economic effects of genetic changes in sheep traits (economic values of traits) have been calculated under specific economic conditions in different countries (e.g. Conington et al., 2004; Jones et al., 2004; Fuerst-Waltl and Baumung, 2009). In Slovakia, the economic values of 14 production and functional traits were calculated for two dairy sheep breeds (Improved Valachian and Tsigai) for the average economic conditions valid from 2004 to 2008 (Krupová et al., 2009).

It has been shown in many papers that the economic values of traits can be sensitive to market prices of sheep products and to different costs items. For example, Cottle (1990) investigated the impact of wool prices on wool quality traits. Amer et al. (1999) and Kosgey et al. (2003) analyzed the sensitivity of economic values for meat sheep traits to variation in meat prices, feed, and other costs. Conington et al. (2004) showed the impact of lamb, ewe, and wool prices and of costs for ewe

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feed and pasture fertilizer on the economic values for production and functional traits in meat sheep in production systems with different production intensities. Jones et al. (2004) showed fluctuation in economic values for lean and fat weight of lambs under UK commercial conditions during the period 1995–2000. However, sensitivity analyses of economic values to economic conditions for dairy sheep traits have been rare (Tolone et al., 2011).

Most of the sensitivity analyses in literature were focused only on the marginal economic values. However, not the absolute marginal economic values of traits, but their mutual relationships are crucial for ranking animals according to an economic selection index. Wolfová et al. (2001) analyzed the sensitivity of relative economic values to variation in economic circumstances for traits in dairy cattle. To the best of our knowledge, no paper has dealt with such sensitivity analyses in dairy sheep. Therefore, the objective of this study was to investigate the impact of variation in economic conditions on the absolute marginal and especially on the relative economic values of dairy sheep traits.

MATERIAL AND METHODS

Sensitivity analyses, i.e. investigations of the impact of changes in economic conditions on the absolute and relative economic importance of traits were done for the Improved Valachian and Tsigai breeds, the most widespread dairy sheep breeds in Slovakia. As the overall economic conditions and the results of sensitivity analyses were found to be very similar for both breeds, only the results for the Improved Valachian breed are presented here. The biological, production, and economic parameters used for the estimation of the marginal and relative economic values of traits for the base calculation, represented the average production and economic conditions in Slovakian dairy sheep farms in the period 2004–2008 (for details see Krupová et al., 2009). Therefore, only the main economic parameters essential for the presented sensitivity analyses are given in Table 1.

The economic efficiency of the Improved Valachian breed population under all the investigated economic conditions was expressed as the present value of profit (P) per ewe lambing per year:

$$P = (\mathbf{R'} - \mathbf{C'}) \times \mathbf{n} + S \qquad (1)$$

where:

$\mathbf{R'}$, $\mathbf{C'}$ = row vectors of revenues and costs for the individual sheep categories (ewes, rams, weaned lambs, female and male flock replacements)

$\mathbf{n}$ = column vector of the number of animals in the individual sheep categories attributable per ewe lambing and year

S = subsidies per ewe lambing and year

A production system with one lambing per year was modelled. Revenues came from sold milk and cheese, from weaned lambs, culled ewes and rams, wool, and manure. Costs included expenses for feeding, winter housing, labour, health care, milking, cheese production, shearing, purchasing rams for crossing, and fixed costs (depreciation expenses, energy, repairs, insurance, and overhead costs). Feeding costs for individual sheep categories (see Table 1) considered real costs (without subsidies) needed for crop production in highland regions.

Fixed costs include depreciation expense, energy, repairs, insurance, and overhead costs. Though these costs are called fixed in the model, their sum is variable in each system according to the number of animals in each category and the length of the time the animals are kept. Thus, an alternative use of saved production factors (e.g. shorter rearing period of replacements because of increased growth rate) is possible and the costs normally called fixed are assumed to be variable in the long-run perspective. On the other hand, increasing the number of live born lambs requires more places and would result in higher total fixed costs (see Wolfová et al., 2009).

The average subsidy S per ewe per year (76.94 €) remained constant in all analyses. This value comprised the direct payment per animal (20 €), single area payments (SAPs), support per crops grown on arable land (oat, rape seed, etc.), and support for less favourable areas (LFA) according to Council Regulation (EC) No. 1257/1999. The Improved Valachian breed is mostly kept in mountain regions more than 800 m above sea level with higher proportion of LFA areas. The presented subsidies were obtained as a mean value for the breed considering the proportion of arable land and LFA in the breed locations. These subsidies were not connected with animal performance, and therefore did not influence the economic values of traits. The present value of profit expressed the fact that all revenues and costs connected with ewes and their progeny were discounted to the lambing date using an annual discount rate of 1.5%. Therefore, the level of the discount rate can also be an important parameter influencing the economic efficiency.

The variability of economic parameters in the period 2004–2010 was a crucial factor for choosing the range of the parameters investigated in the sensitivity analyses. Market prices of the main sheep products (milk, cheese, and lambs) were increased and decreased by 40%. The price of feed components, labour, veterinary and fixed costs varied by ± 20%. Different proportional changes were chosen for product prices and costs, because prices were twice as volatile as costs during the studied period (2004–2010).

When altering the labour costs, the charge for herdsman's hour was changed by ± 20%, which

Table 1. Economic parameters used for the base calculation (base level) and for the sensitivity analysis (lower and upper bound of the values)

Parameter (unit)	Lower bound	Base level	Upper bound
Market price of lambs (€/kg of live weight)	1.632	2.720	3.808
Market price of milk (€/kg)	0.422	0.704	0.986
Market price of cheese (€/kg)	3.582	5.970	8.358
Subsidies (€/ewe per year)	76.940	76.94	76.940
Discount rate of revenues and costs (%/year)	0.000	1.500	3.000
Roughage feed costs (€/kg fresh matter)			
Pasture grass	0.010	0.013	0.016
Grass silage	0.036	0.045	0.054
Hay meadow	0.041	0.051	0.061
Wheat straw	0.014	0.018	0.021
Concentrate feed costs (€/kg fresh matter)			
Compounded feedstuffs	0.164	0.205	0.247
Oat grain	0.124	0.155	0.186
Cereal bran	0.074	0.093	0.112
Rape meal	0.134	0.167	0.201
Costs for feeding ration (€/kg fresh matter)			
Lactating ewes (with one suckled lamb) in winter	0.056	0.070	0.084
Lactating ewes (with one suckled lamb) in summer	0.025	0.031	0.037
Ewes in low pregnancy, dry or barren ewes in winter	0.038	0.048	0.057
Ewes in low pregnancy, dry or barren ewes in summer	0.012	0.015	0.017
Rams during the year (outside the breeding season)	0.035	0.044	0.053
Lambs from birth to weaning[a]	0.253	0.316	0.379
Replacement lambs in winter	0.048	0.060	0.072
Replacement lambs in summer	0.023	0.029	0.035
Labour costs (€/man-h)	2.656	3.319	3.983
Veterinary costs for service and drugs per animal			
Ewe (€/reproduction cycle)	6.081	7.601	9.122
Ram (€/reproduction cycle)	2.682	3.353	4.023
Replacement lamb from weaning to the 1st breeding season (€/animal)	0.876	1.095	1.314
Replacement lamb from the 1st to the 2nd breeding season (€/animal)	2.682	3.353	4.023
Fixed costs (€/stable place per day)			
Ewes including lambs till weaning	0.127	0.159	0.191
Rams	0.056	0.070	0.084
Female or male replacements	0.058	0.072	0.087

[a]supplemental feeding for lambs till weaning excluding costs for milk

influenced the overall labour costs for all animal categories. According to our investigation, the labour costs made about 30% of the costs for milking and cheese production and about 50% of the veterinary costs. Therefore, when investigating the impact of labour costs on economic values, the direct costs for milking and cheese production were changed by ± 6% and the veterinary costs by ± 10%. For the discount rate, the base level (1.5%) was changed to 0 and 3%. The base level and the range of the altered economic parameters are given in Table 1.

The marginal economic value (MEV) for each of the 14 production and functional traits was defined as the partial derivative of the profit function with respect to that trait (Wolfová et al., 2009). The MEVs of all traits were then standardized by multiplying them by the genetic standard deviation of the traits and subsequently expressed as relative economic values (REVs). The relative economic value of trait i (REV_i) was calculated as the absolute value of the standardized MEV_i of that trait expressed as percentage of the sum of the absolute values of the standardized MEVs of all evaluated traits:

$$REV_i = \frac{100\% \times \left|MEV_i \times \sigma_{gi}\right|}{\sum_i \left|MEV_i \times \sigma_{gi}\right|} \quad (2)$$

where:

σ_{gi} = genetic standard deviation of trait i

Genetic standard deviations of the traits were taken from the Breeding Services of the Slovak Republic (not published) or from the literature (Safari and Fogarty, 2003; Oravcová et al., 2005). The relative importance of traits is crucial when ranking animals for selection; therefore, the sensitivity analyses focused mainly on changes in the REVs. Impact of the changes in economic conditions were analyzed for all traits but for readability, only results for the four most important traits (their REV was higher than 7%, the average REV of all traits in the base calculation) are presented in the paper. Means and genetic standard deviations of these traits and their MEVs and REVs for the base level of economic parameters are summarized in Table 2. The cumulative REVs for the four trait complexes (milk production, growth, functional, and wool traits) were also calculated. The milk trait complex included milk yield, fat, and protein content; the growth trait complex comprised birth weight, growth rate of lambs from birth to weaning, mature weight of ewes, and growth rate of replacements; the functional trait complex contained conception rate of ewes and of ewe lambs, litter size, survival rate of lambs at lambing and from 24 h until weaning, and productive life of ewes. The only wool trait which was included was fleece weight.

The EWSH1 program (Version 1.1.6.) from the Program Package ECOWEIGHT (Version 5.1.1., 2011) was used for all calculations. The program

Table 2. Mean values ($\bar{x}$), genetic standard deviations (σ_g), marginal and relative economic values of traits in the base calculation

Trait (unit)	$\bar{x}$	σ_g	MEV[a]	REV[b]
Milk yield in the 150-day milking period (kg)	101.26	14.20	1.025	36.20
Conception rate of ewes (%)	83.90[c]	6.56	1.155	18.90
Litter size (lambs/lambed ewe)	1.21[c]	0.136	26.894	9.10
Productive lifetime of ewes (years)	3.59	0.43	13.387	14.30
Other traits[d] together	–	–	–	21.50
Sum of the relative values	–	–	–	100.00

[a]MEV (in € per unit of the trait, per ewe, and per year) is the marginal economic value which indicates the change in profit when increasing the mean of the trait

[b]REV (in %) is the relative economic value calculated according to Equation (2)

[c]averaged overall reproductive cycles

[d]included traits: milk components (protein and fat content), birth weight of lambs, growth rate of lambs till weaning and in the rearing period, mature weight, conception rate of ewe lambs, survival rate of lambs at lambing and till weaning, fleece weight

is based on the bio-economic model described by Wolfová et al. (2009).

RESULTS

Marginal economic values (MEVs) of the four most important traits calculated for all economic variants are summarized in Table 3. As expected, the MEV of milk yield was most sensitive to milk and cheese prices and rose linearly with increasing of these prices, whereas lamb prices and fixed costs did not influence the MEV of milk yield. The impact of variation in feed costs on MEV for milk yield was much lower than the impact of milk product prices. The MEVs of functional traits (ewe conception rate, litter size, and ewe productive lifetime) were influenced by the variation of all economic parameters, but to a different extent; the most important factor was the lamb price.

The REVs of the four most important traits calculated for different economic conditions are shown in Figures 1 and 2. It is evident that the changes in the MEVs of traits (Table 2), caused by the variation in economic parameters, are not expressed to the same extent in the changes of the REVs of traits. Though the price of lambs did not influence the MEV of milk yield, the REV of milk yield rose by 4 percent points (pp) when decreasing the lamb price by 40%, which was nearly the same change as when increasing the milk and cheese price by 40% (change by 6 pp, see Figure 1).

Table 3. Impact of changes in economic parameters on the marginal economic values (in € per unit of the trait, per ewe, and per year) of the four economically most important traits[a]

Parameters and their relative deviations from the base level	Marginal economic values			
	milk yield	conception rate of ewes	litter size	productive lifetime
Base parameter level[b]	1.03	1.16	26.89	13.39
Price				
Lambs +40%	1.03	1.29	37.04	14.62
Lambs –40%	1.03	1.02	16.75	12.17
Milk +40%	1.21	1.20	28.24	13.70
Milk –40%	0.84	1.11	25.55	13.07
Cheese +40%	1.24	1.21	28.46	13.75
Cheese –40%	0.81	1.10	25.33	13.02
Milk and cheese +40%	1.43	1.26	29.81	14.06
Milk and cheese –40%	0.62	1.05	23.99	12.71
Costs				
Roughages +20%	1.02	1.21	26.98	13.95
Roughages –20%	1.03	1.07	26.80	12.83
Concentrates +20%	1.02	1.16	25.64	13.53
Concentrates –20%	1.03	1.15	28.15	13.25
All feeding rations +20%	1.01	1.21	25.70	14.13
All feeding rations –20%	1.04	1.10	28.09	12.65
Labour +20%	1.02	1.18	26.82	13.72
Labour –20%	1.03	1.13	26.97	13.06
Veterinary costs +20%	1.03	1.16	26.89	13.43
Veterinary costs –20%	1.03	1.15	26.90	13.34
Fixed costs +20%	1.03	1.21	26.88	14.24
Fixed costs –20%	1.03	1.11	26.91	12.53
Discount rate 0%	0.97	1.14	26.44	13.37
Discount rate 3%	1.09	1.17	27.38	13.38

[a]milk yield in the 150-day milking period in kg; conception rate of ewes in %; litter size in number of lambs born per lambed ewe; ewe productive lifetime in number of reproductive cycles

[b]for the base level of the investigated economic parameters see Table 1

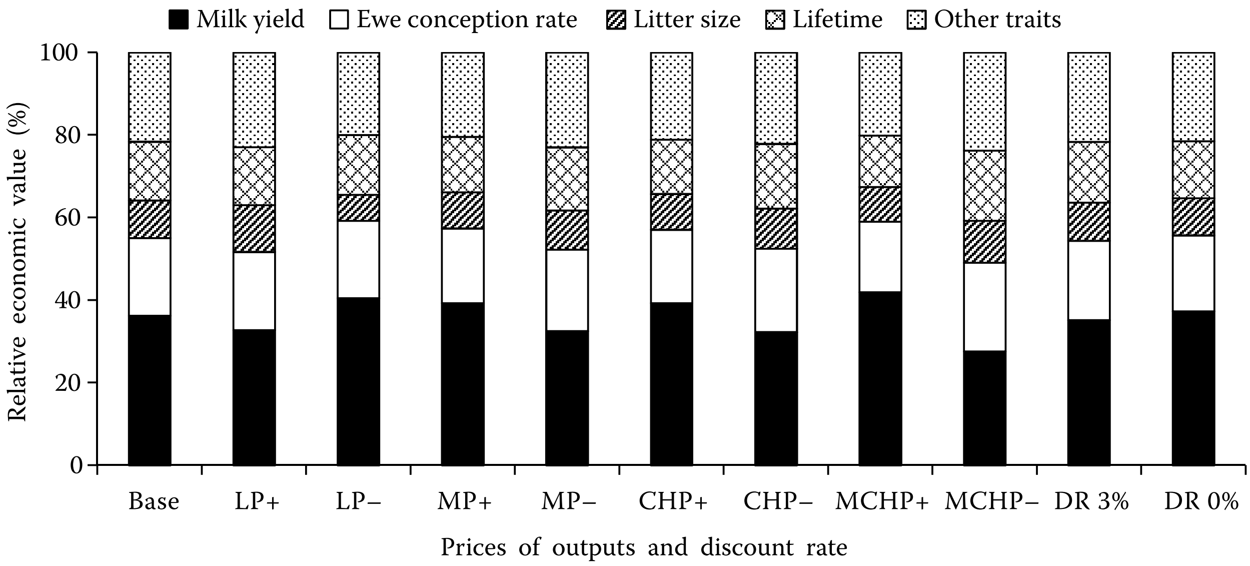

Figure 1. Relative economic values of traits for the base calculation with the average economic conditions in Slovakia in the period 2004–2010 and for increased (+) or decreased (–) market product prices by 40% and for alternative annual discount rates

LP = price per kg live weight of lambs, MP = price per kg milk, CHP = price per kg cheese, MCHP = price per kg milk and cheese changed simultaneously, DR = annual discount rate

The change of product prices by ± 40% caused a variation of the REV for milk yield from 28 to 42%, whereas the REV of ewe conception rate ranged 17–21%, that of litter size 6–11%, and of ewe productive lifetime 12–17%. On the other hand, the change of cost items had a higher impact on functional traits than on milk yield. A variation in costs by ± 20% caused fluctuation in REV of milk yield only by about + 1% whereas the REV for ewe conception rate made 17–19%, that for litter size 9–12%, and for ewe lifetime 13–15% (see Figure 2).

Using a zero discount rate when calculating the present value of profit, the revenues or costs for traits expressed early after lambing are evaluated equally

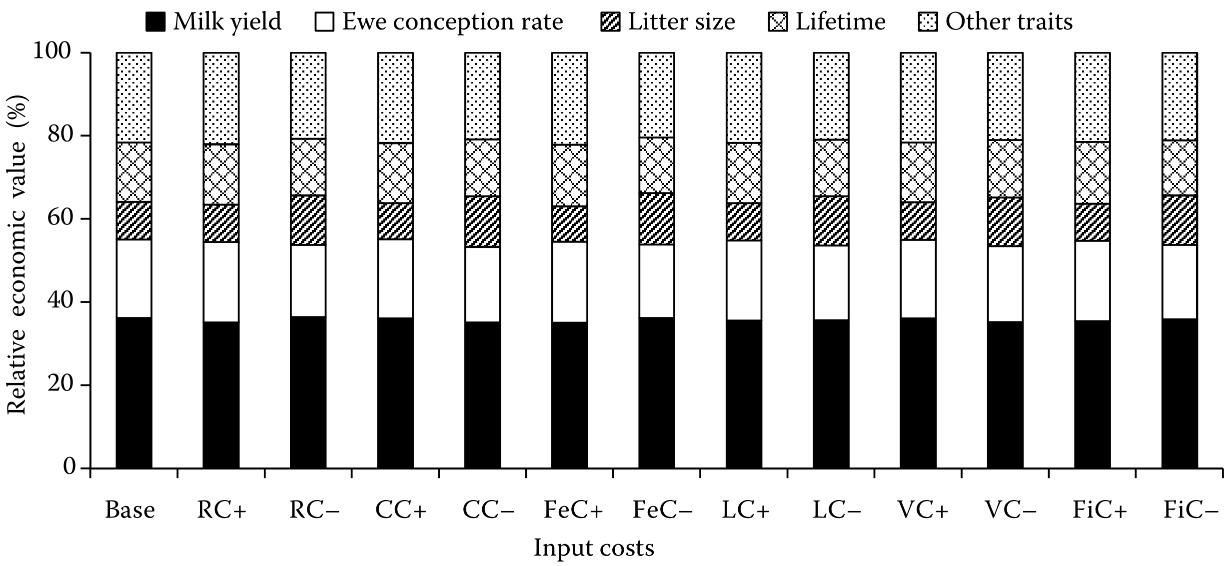

Figure 2. Relative economic values of traits for the base calculation with the average economic conditions in Slovakia in the period 2004–2010 and for cost items increased (+) or decreased (–) by 20%

RC = roughage costs, CC = cost for concentrates, FeC = average feeding costs (simultaneous increasing of costs for roughage and concentrates), LC = labour costs, VC = veterinary costs, FiC = fixed costs

Table 4. Impact of changes in economic parameters on the relative economic values (in %) for trait complexes[a]

Parameters and their relative deviations from the base level	Cumulative relative economic values			
	milk traits	growth traits	functional traits	wool traits
Base parameter level[b]	41.1	7.6	51.1	0.2
Price				
Lambs +40%	37.2	8.4	54.2	0.2
Lambs –40%	46.0	6.5	47.2	0.3
Milk +40%	44.4	6.9	48.5	0.2
Milk –40%	37.2	8.3	54.3	0.2
Cheese +40%	45.5	6.8	47.5	0.2
Cheese –40%	35.7	8.5	55.6	0.2
Milk and cheese +40%	48.1	6.3	45.4	0.2
Milk and cheese –40%	30.6	9.4	59.7	0.3
Discount rate 0%	42.4	7.5	49.9	0.2
Discount rate 3%	40.0	7.6	52.2	0.2
Costs				
Roughages +20%	40.0	8.0	51.8	0.2
Roughages –20%	41.4	6.9	51.5	0.2
Concentrates +20%	41.0	7.7	51.1	0.2
Concentrates –20%	40.0	7.2	52.6	0.2
All feeding rations +20%	39.8	8.2	51.9	0.1
All feeding rations –20%	41.3	6.6	51.8	0.3
Labour +20%	40.6	7.5	51.7	0.2
Labour –20%	40.5	7.4	51.9	0.2
Veterinary costs +20%	41.1	7.5	51.2	0.2
Veterinary costs –20%	40.0	7.4	52.4	0.2
Fixed costs +20%	40.3	7.4	52.1	0.2
Fixed costs –20%	40.8	7.4	51.6	0.2

[a]milk traits include milk yield, fat, and protein content; growth traits include birth and mature weights and growth rates from birth to weaning and in the rearing period of replacements; functional traits are conception rates of ewes and ewe lambs, lamb survival rates at lambing and till weaning, ewe productive lifetime, and litter size; wool traits include fleece weight only
[b]for the base level of the investigated economic parameters see Table 1 and for the level of all other parameters in the base calculation see Krupová et al. (2009)

to those expressed later after lambing. The impact of variation in the discount rate on the marginal and relative economic values depends highly on the time when the specific trait influences the revenues and costs in different animal categories. The range of the discount rate investigated here was low (0–3%) and did not have a meaningful impact on the relative economic values of traits (see Figure 1).

The relative economic values of the remaining ten evaluated traits (milk fat and protein content, birth weight, growth rate of lambs until weaning, growth rate of replacements, mature weight, conception rate of ewe lambs, and survival rate of lambs until 24 h and until weaning) did not exceed 6.1% (average REV for all traits was 7%) in all the investigated economic circumstances.

The impact of variation in economic parameters on the relative economic importance of the four trait complexes is presented in Table 4. It is evident that a decrease in product prices had a higher impact on the relative importance of all trait complexes than the same increase in product prices. For example, lowering of milk and cheese prices by 40% decreased the relative importance of the milk traits from 41.1 to 30.6% and increased the relative importance of growth traits from 7.6 to 9.4% and of functional traits from 51.1 to 59.7% while the same increase in milk and cheese prices increased the importance of milk traits from 41.1 to only 48.1% and decreased the importance of growth traits from 7.6 to 6.3% and of functional traits from 51.1 to 45.4%. Feed prices had the highest impact on the relative importance of growth traits. A variation in the price by ± 20% for all feeding rations changed the relative importance of growth traits from 7.6 to 6.6% and to 8.2%, respectively, whereas only minor changes were observed in the relative importance of milk traits and functional traits (Table 4).

DISCUSSION

Most of the literature analyses dealing with the sensitivity of economic values to production circumstances have focused only on the MEVs, and just a few papers have analyzed also the sensitivity of REVs of traits (Wolfová et al. (2001) in dairy cattle). Therefore, our results can be compared to literature results mainly on the basis of the sensitivity of marginal economic values.

Our analyses confirmed the finding of many authors that the market prices of animal products (milk or meat) are of higher importance for the MEVs compared to the prices (costs) of inputs, especially for the MEV of milk and meat production traits. Miesenberger (1997) and Vargas et al. (2002) found the milk price to be the most important factor for the MEVs of traits in dairy cattle. Kosgey et al. (2003), Conington et al. (2004), and Lôbo et al. (2011) stated that the lamb price was the most important economic parameter influencing MEVs in meat sheep. This finding was also true for the REVs calculated by Wolfová et al. (2001) for dairy cattle and for the REVs in our analyses. The relationship between the MEVs of traits and product prices was generally found to be linear. Furthermore, as stated Connington et al. (2004), the MEVs of traits, which are not affected directly by the trait in question, are robust to variation in prices. For example, the MEV of milk yield was not affected by the lamb prices in our analyses as well as in the study of Tolone et al. (2011). However, this finding was not valid for the REVs. For example, the REV of milk yield depended highly on the lamb prices and was more sensitive to the decrease than to the increase in product prices (see Figure 1).

In the sensitivity analyses carried out by Tolone et al. (2011), the MEVs for litter size and lamb survival were sensitive to meat prices, but not to milk prices, whereas in our analyses, the MEV of litter size depended also on milk and cheese prices. This incongruity was caused by different assumptions about the relationship between the number of lambs suckled per ewe and the milk yield per ewe in the models used for the calculation of economic values. Tolone et al. (2011) included no relationship among ewe milk production and number of suckled lambs, whereas our model assumed a positive effect of higher litter size on milk production per ewe not only in the lamb suckling period, but also after weaning (see also Snowder and Glimp, 1991). Including the effect of the number of suckled lambs on milk yield in the MEV of litter size does not mean a double counting of the economic importance for milk yield, because when estimating the genetic potential of ewes for milk production (breeding value), the milk yield of each ewe is adjusted for the number of suckled lambs in Slovakia.

However, ewes with higher litter size need more concentrates which led to the lowering of the MEV for litter size with increased concentrate price in our analyses as well as in the sensitivity analyses carried out by Conington et al. (2004) and by Lôbo et al. (2011). On the other hand, Tolone et al. (2011) found no impact of feeding costs on the MEV for litter size, because they did not assume higher feed costs for ewes when number of lambs born increased. Also Haghdoost et al. (2008) reported a small impact of concentrate costs on the MEV of litter size due to the absence of concentrates in the feeding ration for lambs. A variation in fixed or labour costs by 20% had nearly no impact on the MEV of litter size in our analyses, which was in agreement with Haghdoost et al. (2008) who found only a 1% change in the MEV of litter size when changing the management costs by ± 10%. In the study of Tolone et al. (2011), the MEV for litter size depended slightly also on the costs for medical care of lambs, which was not found in our study because of the small impact of litter size on veterinary costs in Slovak conditions.

A change in productive lifetime of ewes caused a change in the age structure of the ewe flock which led also to a change in the structure of progeny (less ewe lambs needed for replacement, a higher number of sold lambs and a higher milk production). Therefore the MEV of productive lifetime was influenced by each investigated economic parameter which varied and rose with increased product prices as well as with increased cost items; this was comparable with the impact of product prices and costs on the MEV for ewe mortality found by Lôbo et al. (2011) and for ewe survival rate by Kosgey et al. (2003).

For ranking breeding animals using economic selection indices, only the REVs of traits included in the breeding objective are important. Wolfová et al. (2001) stated that the variation in input and output prices in a range of ± 20% did not have a meaningful impact on the REVs of traits in dairy cattle. However, the variation in sheep product prices in the investigated period 2004–2010 in Slovakia was much higher (± 40%) which had an important impact on the REVs of traits in sheep, mainly on the REV of milk yield. Nevertheless, the four most important traits, the cumulative REV of which was 78.5% in the base calculation, stayed the most important traits (cumulative REV between 76 and 80%) under all investigated economic conditions.

CONCLUSION

Sensitivity analyses should be based on the relative economic values of traits rather than on their absolute marginal economic values. The results of our sensitivity analyses showed that the relative economic values for the most important traits in Slovak dairy sheep were stable under different levels of costs (varying by ± 20%), but were sensitive to a high variation (± 40%) in product prices. Therefore, the economic values of the traits in the overall breeding objectives for dairy sheep should be recomputed when the market prices of sheep products will change substantially. Based on the economic analysis only, milk yield, conception rate, litter size, and productive lifetime of ewes were found to be the most important traits in the Improved Valachian breed. However, the conclusion on which of the 14 investigated traits selection should be based on ought to follow index calculations and an analysis of the contribution of each goal trait to overall genetic gain in economic performance. In the present paper, similar results were obtained for both Slovak sheep breeds, the Improved Valachian and Tsigai, but those for the latter were not presented here.

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