USING OPTIMALISATION MODELLING IN MARKETING MANAGEMENT OF EFFICIENT PRODUCTION OF PORK

VYUŽITIE OPTIMALIZAČNÉHO MODELOVANIA V MARKETINGOVOM MANAŽMENTE EFEKTÍVNEJ VÝROBY BRAVČOVÉHO MÄSA

Peter BIELIK, Elena HORSKÁ, Michal VICEN, Dušan DOBÁK

Slovak Agricultural University in Nitra, Slovakia

The situation in pig breeding in Slovak Republic has been unfavourable in the long run. Numbers of sows and fattening pigs have been decreasing incessantly, number of producers is being reduced, imports of pigs and pork from other EU countries are on the rise. This is the consequence of the deepening unprofitability of pig breeding. Opportunities for correction and further positive development are presented in this paper. Using optimalisation model it quantifies the impact of cost changes, realisation prices, production and reproduction indices, on economic results of pig breeding. Based on this, it determines the level of relevant production and economic parameters so as to make pig breeding profitable.

Key words: optimalisation model, pig breeding, production indices, costs, prices

The unfavourable situation in pig breeding in Slovakia is intensifying incessantly. Numbers of sows continue to decrease (from 131 thousand in 2000 to 67 thousand in 2007), those of fattening pigs as well (from 742 thousand to 420 thousand for the same period). At the same time, two differing trends are getting manifested: growing number of farms with low pig concentration (up to 50 sows) and, on the other hand, increased mean concentration of animals in larger farms (above 500 sows). Also increasing is the import, not only of pork but also of carcass pigs and weanlings to be fattened, from other EU countries to Slovakia. Reproduction and efficiency parameters are getting consolidated though, but are still lagging behind the developed countries. Their level is determined by a whole complex of factors of zootechnical-breeding, technical--technological, nutrition and biological character (Bulla, 2005; Brestenský et al. 2002; Mihina et al., 1999). An important factor of pig breeding efficiency is the price level of carcass pigs. A detailed analysis of pork prices development was made by Kretter (2003) who points out considerable seasonal price fluctuation in the course of year, emphasising more dynamic price changes in pork as compared with those in beef. Grimek (2005) characterises the present situation in meat market as commercial pressure for price reduction. The unfavourable price development is better controlled by big producers, but even here the yields were reduced by 3 to 10 %. Severalauthors apply the quantitative methods at prognostics and market structure modeling (Stehlíková, 2004; Rost and Čermáková, 2003). Solving the problems in pig breeding via models was undertaken by Farkašová (2000) who, using polynomic functions, investigated correlations between costs proper and efficiency in pig breeding.

The paper intends to quantify, using optimalisation model, the expected impact of changes, costs, realisation prices of carcass pigs, production and reproduction pig indices to economic results of pig breeding so as to enable farm managers using information from this model in a complex of marketing instruments secure favourable economic results of pig breeding.

Material and methods

Data necessary to solve the given problems have been obtained from Situation and Prospective Reports of Ministry of Soil Culture, Slovak Republic, for the years 2001 to 2006, proper costs and management results of agricultural corporations in SR for 2001 to 2005, issued by Research Institute of Economics in Agriculture, Bratislava, and monthly reports on animal production and animal products sale Poľ (Agr) 1–12 for 2000 to 2006. The obtained numeric factography has been classified, processed and evaluated using optimalisation model. The aim of the model is to consider the economy of pig breeding from the aspect of real financial flows respecting at the same time production, reproduction and economic relations between respective pig categories. Based on calculated values, the model predicted cost changes and realisation prices of carcass pigs, production and reproduction indices to pig breeding economy.

General figure of optimalisation model:

Final function (*FUF*):

$$FUF: Z_{max(min)} = \sum_{j=1}^{n} c_j x_j \qquad (1)$$

Proper restricting conditions (*RCOP*):

$$RCOP: \sum_{j=1}^{n} a_{ij} x_j \leq; =; \geq b_i \quad (i = 1, 2, ..., m) \qquad (2)$$

Condition of non-negativity (*PN*):

$$PN: x_j \geq 0 \qquad (3)$$

where:

c_j – coefficient of final function (price coefficient) expressing 1 unit of *j*-th variable,

x_j – sought value (magnitude) of *j*-th variable,

a_{ij} – technical-economical coefficient of i-th range related to the unit of j-th variable,

b_i – right margins of proper restricting conditions,

n – number of variables,

m – number of restricting conditions,

Values c_j, a_{ij}, b_i are constant.

Used for model solution of pig breeding in Slovakia was software HAPPY – Home Agricultural Production Planning sYstem created specially for the needs of biological--mathematical analyses and prognosing of all branches of agricultural production both on enterprise level and on the level of the branch as a whole.

Reversal point was determined for particular indices, making it possible to set the margin of economical efficiency for each index, i.e. index level to achieve profit.

Reversal (critical) point can be determined from relation:

$$P \cdot c = v \cdot P + F$$

where:

P – production volume,

c – market price for production unit,

v – variable cost for production unit,

F – total fixed cost.

Profit and/or loss for accounting year per hundred sows of basic herd and other turnover categories created based on real production and reproduction indices have been calculated as a difference of total yields and total costs: the former including earnings from sow culling, from sales of fattening pigs meat, activation of basic herd sows.

Model solution is applied in two variants with model representation of 100 sows of the basic herd and subsequent

turnover categories of sows. The first variant of calculation has been done based on real mean production, reproduction, cost and price indices in pig breeding in Slovak Republic for the year 2005 (cost per 2006 have not been available yet) as stated in Table 1.

The second variant calculated the economic point of reverse in pork production when cost per 100 sows breeding, including corresponding scope of other pig categories, equal the sales for produced fattening pigs. Based on this, the second variant changes production and reproduction indices while respecting EU valid prices. To achieve the economic reversal point in pork production, beeders must achieve parameters given in the second column of Table 1 as compared with present reality.

Results and discussion

Resuls of model solution calculations in accordance with the above variants are shown in the following tables (2, 3, 4).

The second variant is explicitly characterised by more favourable parameters. Its use shall secure a greater number of fatttening pigs sold and a shorter period of fattening, i.e. a higher turnover of fattening and more efficient use of stable room.

Based on herd turnover data, economic evaluation of the two variants has been performed. Profit and/or loss have been calculated as a difference of sales and total costs per 100 sows respecting the principles of herd turnover, i.e. total costs including profits from sow culling and from fattening pigs sales, whereas total costs per 100 sows included the corresponding condition of other categories of pigs up to their out-storage in slaughter weight of 107 kg.

Calculated economic parameters per individual pig categories point at more positive economic results in the second variant. Cost per basic herd sow breeding are the same, cost per suckling breeding is lower by up to 21 %, and

Table 1 Production, reproduction and economic indices: input to optimalisation model

Index (1)	Variant 1	Variant 2
Number of sows in pcs (2)	100.00	100.00
Culling of sows in % (3)	42.00	42.00
Sucklings born per 1 sow in pcs (4)	18.75	23.63
Suckling mortality rate in % (5)	9.00	9.00
Weight of animals at the start of fattening in kg.pc^{-1} (6)	8.50	8.50
Mortality rate during time total of fattening in % (7)	4.00	4.00
Mean weight of fattening pigs at sale in kg.pc^{-1} (8)	107.00	107.00
Mean weight of culled sows at sale in kg.pc^{-1} (9)	184.05	184.05
Net cost per 1 fattening day in sow category in Sk.KD^{-1} (10)	60.88	60.88
Net cost per 1 fattening day in pig fattening category in Sk.KD^{-1} (11)	21.49	21.49
Realisation price of culled sows in Sk.kg^{-1} (12)	25.00	25.00
Realisation price of fattening pigs in Sk.kg^{-1} (13)	39.00	39.00

Tabuľka 1 Produkčné, reprodukčné a ekonomické ukazovatele vstupujúce do optimalizačného modelu
(1) ukazovateľ, (2) počet prasníc v ks, (3) brakovanie prasníc v %, (4) narodenie ciciakov na 1 prasnicu v ks, (5) úhyn ciciakov v %, (6) hmotnosť zvierat pri zaradení do výkrmu v kg.ks^{-1}, (7) úhyn počas celej doby výkrmu v %, (8) priemerná hmotnosť výkrmových ošípaných pri predaji v kg.ks^{-1}, (9) priemerná hmotnosť brakovaných prasníc pri predaji v kg.ks^{-1}, (10) vlastné náklady na 1 kŕmny deň v kategórii prasnice v Sk.KD^{-1}, (11) vlastné náklady na 1 kŕmny deň v kategórii výkrm ošípaných v Sk.KD^{-1}, (12) realizačná cena brakovaných prasníc v Sk.kg^{-1}, (13) realizačná cena výkrmových ošípaných v Sk.kg^{-1}

Table 2 Herd turnover in natural indices

Index (1)	Variant 1	Variant 2	Index V2/V1
Number of sows (2)	100.00 pcs	100.00 pcs	1.00
Sows culled (3)	42.00 pcs	42.00 pcs	1.00
Suckling mortality rate (4)	168.75 pcs	212.67 pcs	1.26
Suckling rate needed for sow breeding (5)	42.00 pcs	42.00 pcs	
Suckling transfer to fattening (6)	1706.25 pcs	2 150.33pcs	1.26
Pig mortality rate in fattening (7)	67.00 pcs	84.00 pcs	1.25
Fattening pig sales (8)	1598.18 pcs	2 024.00 pcs	1.26
Mean annual capacity in fattening (9)	755.89 pcs	814.66 pcs	1.07
Fattening period of 1 pc in days (10)	172,63.days	146.87 days	0.85

Tabuľka 2 Obrat stáda v naturálnych ukazovateľoch
(1) ukazovateľ, (2) počet prasníc, (3) brakovanie prasníc, (4) úhyn ciciakov, (5) potreba ciciakov pre odchov prasničiek, (6) prevod ciciakov do výkrmu, (7) úhyn ošípaných vo výkrme, (8) predaj výkrmových ošípaných, (9) priemerný ročný stav vo výkrme, (10) doba výkrmu 1 kusa v dňoch

Table 3   Calculated indices per sow category

Serial no. (1)	Index (2)	Unit of measur. (3)	Variant 1	Variant 2
1.	Mean number of sows (4)	pcs	100.00	100.00
2.	Cost per 1 mean pc per year (5)	Sk	22,221.83	22,221.83
3.	Cost per 1 fattening day (6)	Sk	60.88	60.88
4.	Culling of basic herd sows (BH) (7)	%	42.00	42.00
5.	Mean weight of culled sow (8)	kg	184.05	184.05
6.	Number of pcs (9)	pcs	42.00	42.00
7.	Toal weight of culled sows (10)	ton	7.73	7.73
8.	Market price of 1 kg meat of culled sows (11)	Sk	25.00	25.00
9.	Sales for culled sow meat (12)	Sk	193,252.00	193,252.00
10.	Cost per BH of sows (13)	Sk	2,222,103.00	2,222,103.00

Tabuľka 3   Vypočítané ukazovatele za kategóriu prasnice
(1) poradové číslo, (2) ukazovateľ, (3) merná jednotka, (4) priemerný počet prasníc, (5) náklad na 1 priemerný kus za rok, (6) náklad na 1 kŕmny deň, (7) brakovanie prasníc základného stáda (ZS), (8) priemerná hmotnosť brakovanej prasnice, (9) počet kusov, (10) hmotnosť brakovaných prasníc spolu, (11) trhová cena 1 kg mäsa brakovaných prasníc, (12) tržba za brakované mäso prasníc, (13) náklady na ZS prasníc

Table 4   Calculated indices per suckling category

Serial no. (1)	Index (2)	Unit of measur. (3)	Variant 1	Variant 2	Index V2/V1
1.	Number of sucklings born per sow (4)	pcs	18.75	23.63	1.26
2.	Total number of sucklings born (5)	pcs	1,875.00	2,363.00	1.26
3.	Suckling mortality rate (6)	%	9.00	9.00	1.00
4.	Breeding per 1 mean sow of BH (7)	pcs	17.06	21.50	1.26
5.	Mortality rate of sucklings per 1 sow of BH (8)	pcs	1.69	2.13	1.26
6.	Transfer to fattening (9)	pcs	1,706.25	2,150.33	1.26
7.	Weight at transfer to fattening (10)	kg	8.50	8.50	1.00
8.	Price cost of 1 suckling at tansfer (11)	Sk	1,228.66	971.84	0.79
9.	Price cost per 1 kg at transfer (12)	Sk	144.55	114.33	0.79

Tabuľka 4   Vypočítané ukazovatele za kategóriu ciciaky
(1) poradové číslo, (2) ukazovateľ, (3) merná jednotka, (4) počet narodených ciciakov na prasnicu, (5) počet narodených ciciakov, (6) úhyn ciciakov, (7) odchov na 1 priemernú prasnicu ZS, (8) počet uhynutých ciciakov na 1 prasnicu ZS, (9) prevod do výkrmu, (10) hmotnosť pri zaradení do výkrmu, (11) nákladová hodnota 1 ciciaka pri prevode, (12) nákladová hodnota 1 kg pri prevode

Table 5   Calculated indices per pig fattening category

Serial no. (1)	Index (2)	Unit of measur. (3)	Variant 1	Variant 2	Index V2/V1
1.	Mean annual numbers (4)	pcs	755.89	814.66	1.07
2.	Mean daily increment (5)	kg	0.57	0.67	1.17
3.	Out-storage weight (6)	kg	107.00	107.00	1.00
4.	Breeding period of 1 pc in category (7)	day	164.08	150.32	0.92
5.	Weight increase of 1 pc in category (8)	kg	98.40	98.40	1.00
6.	Sale in pcs (9)	pcs	1,598.18	2,024.63	1.26
7.	Market production – out-storage (10)	ton	171.01	216.64	1.26
8.	Cost per 1 fattening day (11)	Sk	21.49	21.49	1.00
9.	Cost per 1 kg increment (12)	Sk	37.70	32.07	0.85
10.	Cost per breeding 1 pc in category (13)	Sk	3,709.84	3,156.14	0.85
11.	Calculated cost per mortality of 1 out- stored pc (14)	Sk	12.88	10.17	0.78
12.	Total cost value at sale (15)	Sk	4,994.28	4,173.01	0.83
13.	Total cost value of 1 kg live weight (16)	Sk	46.68	39.00	0.83
14.	Market price per 1 kg live weight (17)	Sk	39.00	39.00	1.00
15.	Market price of 1 pc (18)	Sk	4,173.00	4,173.00	1.00
16.	Profit or loss in 1 pc sale (19)	Sk	-821.28	0	–
17.	Profit or loss per breed total (20)	Sk	-1,312,545.25	0	–

Tabuľka 5   Vypočítané ukazovatele za kategóriu výkrm ošípaných
(1) poradové číslo, (2) ukazovateľ, (3) merná jednotka, (4) priemerný ročný stav, (5) priemerný denný prírastok, (6) vyskladňovacia hmotnosť, (7) nárast hmotnosti 1 ks v kategórií, (8) dĺžka odchovu 1 ks v kategórií, (9) predaj v kusoch, (10) tržná produkcia – vyskladnenie, (11) náklad na 1 kŕmny deň, (12) náklad na 1 kg prírastku, (13) náklad na odchov 1 ks v kategórií, (14) rozpočítaný náklad za úhyn na 1 vyskladnený kus, (15) celková nákladová hodnota pri predaji, (16) celková nákladová hodnota 1 kg živej hmotnosti, (17) tržná cena za 1 kg živej hmotnosti, (18) tržná cena 1 kusa, (19) zisk alebo strata pri predaji 1 kusa, (20) zisk alebo strata za celý chov

Table 6   Economic impact of price changes depending on variants

Serial no. (1)	Index (2)	Variant 1	Variant 2
1.	Calculated profit/loss for total pig breeding per 100 sows in implementing mean production and reproduction indices in 2004 was (3)	-1,312,545 Sk	0 Sk
2.	Increasing realisation price per 1 kg meat by 1 Sk shall increase profit/reduce loss of total breeding by (4)	171,005.18 Sk	216,635.33 Sk
3.	Reducing realisation price per 1 kg meat by 1 Sk would increase loss of total breeding by (5)	-171,005.18 Sk	-216,635.33 Sk
4.	Economic point of production reverse without grants shall occur if mean realisation price per 1 kg meat of fattened pigs shall increase by (6)	7.68 Sk	0 Sk

Tabuľka 6   Ekonomický dopad zmien ceny podľa variantov
(1) poradové číslo, (2) ukazovateľ, (3) vypočítaný zisk (strata) za celý chov ošípaných je na 100 prasníc pri implementovaných priemerných produkčných a reprodukčných ukazovateľoch v roku 2006 je, (4) zvýšenie realizačnej ceny za 1 kg mäsa o 1 Sk zvýši zisk (zníži stratu) celého chovu o, (5) zníženie realizačnej ceny za 1 kg mäsa o 1 Sk by prehíbilo stratu celého chovu o, (6) ekonomický bod zvratu výroby bez dotácií nastane, ak sa priemerná realizačná cena 1 kg mäsa výkrmových ošípaných zvýši o

Table 7   Economic impact of price cost and utility changes

Serial no. (1)	Index (2)	Variant 1	Variant 2
1.	Economic impact of 1 % cost increase per 1 KD in total breeding is (3)	81 750,87 Sk	86 421,04 Sk
2.	Economic impact of 1 % cost increase in sow category (BH) is (4)	22,221.83 Sk	22,221.83 Sk
3.	Economic impact of 1 % cost increase per 1 KD in pig fattening category is (5)	59 362,00 Sk	63 991,62 Sk
4.	Economic impact of 0.01 kg mean daily increment in pig fattening category is (6)	102 224,08 Sk	93,970.68 Sk
5.	Economic impact of 0.01 kg decrease in mean daily increment in pig fattening category is (7)	-105 874,94 Sk	-96,818.28 Sk
6.	Economic impact of 1 pc increase of live born sucklings per 1 sow (8)	39 304,68 Sk	87 691,72 Sk

Tabuľka 7   Ekonomický dopad zmien nákladov a úžitkovosti
(1) poradové číslo, (2) ukazovateľ, (3) ekonomický dopad zvýšenia nákladov o 1 % na KD v celom chove je, (4) ekonomický dopad zvýšenia nákladov o 1 % v kategórií prasnice (ZS) je, (5) ekonomický dopad zvýšenia nákladov o 1 % na KD v kategórií výkrm ošípaných je, (6) ekonomický dopad zvýšenia priemerného denného prírastku o 0,01 kg v kategórií výkrm ošípaných je, (7) ekonomický dopad zníženia priemerného denného prírastku o 0,01 kg v kategórií výkrm ošípaných je, (8) ekonomický dopad zvýšenia počtu živo narodených ciciakov na 1 prasnicu o 1 kus

cost per total pig breeding by 15 % lower in the second variant compared with the first variant. These favourable economic results shall be shown in the final economic effect in that whereas the first variant has loss (re-calculated per 100 sows from the pig breeding) 1,312,545 Sk per year, the second variant keeps balance in management total and the whole breed is without losses.

Prices, costs and utility parameters are decisive indices of economic efficiency of production. Economic impact of their changes depending on the variants can be seen in Tables 6 and 7.

In the competition of EU countries such a high increase of price in variant 1 is not real. It could only occur in critical lack of pork caused by some breeding crisis, such as planary occurrence of pig plague that would significantly reduce the number of these animals.
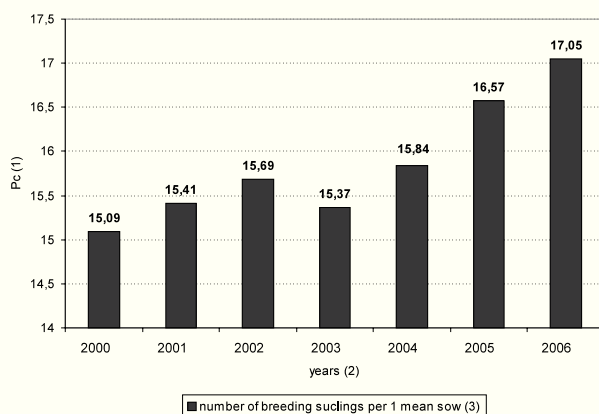
The above economic impact of parameters evaluated in Sk (Slovak Crown) points at economic dependence of relations in improving or worsening of utility, cost and price indices to breeding economy.

Based on model results, we can conclude that (calculated per 100 sows):
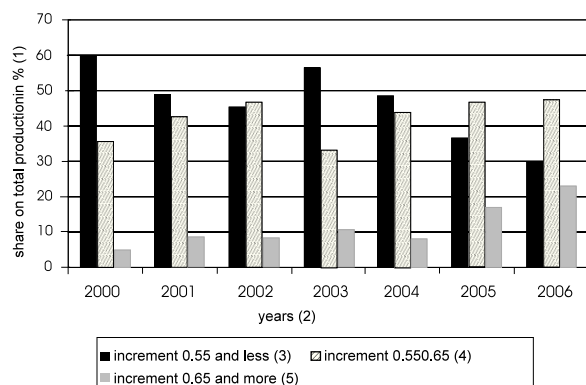
- increasing realisation price of fattening pigs meat by 1 Sk shall increase profit (reduce loss) of total breeding by 216,635.33 Sk,
- reducing realisation price by 1 Sk shall intensify loss of total breeding (reduce profit) by 216,635.33 Sk,
- economic impact of increased or reduced cost by 1 % per total breeding make 86,421.04 Sk,
- economic impact of increased or reduced cost by 1 % in sow category shall make 22,221 Sk,

- economic impact of increased or reduced cost by 1 % in pig fattening category shall make 63,991.62 Sk,
- economic impact of increasing mean daily increment by 0.01 kg in fattening category shall make 93,970.68 Sk,
- economic impact of reducing mean daily increment by 0.01 kg in fattening category shall make -96 818.28 Sk,
- economic impact of increasing number of live born piglets by 1 pc shall be 87,691.72 Sk.

These expected economic changes (in parametering bigger or smaller changes) of interval parameters of pig breeding shall be calculated dynamically, not as a multiple of change in

Graph 1   Breeding suclings per 1 mean sow
Graf 1   Počet odstavených prasiat na prasnicu v SR
(1) kusy, (2) roky, (3) počet odstavených prasiat na prasnicu

Graph 2   Share of pork production by increments in the Slovak republic in %
Graf 2   Percentuálny podiel produkcie bravčového mäsa podľa prí-
                  rastkov v SR
                  (1) podiel na celkovej produkcii v %, (2) roky, (3) prírastok 0,55 a me-
                  nej, (4) prírastok 0,55–0,65, (5) prírastok 0,65 a viac

changing parameter. The given theoretical calculation is based on mean SR indices.

In the graphs there is introduced the development of number of entities involved in pig breeding and development of productive and reproductive indices in Slovakia during 2000–2006 by the statistical reports, Agric. 1–12.

Every individual subject includes in his production conditions real costs, production and reproduction indices, whose result is pork production at varying cost level. Market price of meat, that the producers cannot influence, shall always be an instrument determining parameters of production and competitiveness.

Negative impact of incessant pressure on reducing prices of carcass animals has been emphasised by Grimek (2005). This fact results in reducing the number of carcass animal producers.

Model calculation has shown what production and reproduction indices shall have to be achieved by Slovak breeders in their breeding so as to be economically competitive confronted with EU market prices, i.e. not to be selling the meat produced with loss. Hence the following level of indices shall have to be achieved:

- increment in pig fattening minimum 0.67 kg per fattening day (from fattening inclusion weight, i.e. 8.50 kg up to slaughter weight, i.e. 107 kg),
- mortality rate in pig fattening maximum 4 %,
- number of live-born sucklings per 1 sow per year minimum 23.63 pcs,
- suckling mortality rate (from birth to fattening transfer) maximum 9 %.
- Other breeding and economic parameters to be achieved for securing pig competitiveness are included in greater detail in previous tables.

Similar conclusions have also been achieved by Hudák (2001); according to him Slovak pigs, pork and meat products are highly incompetitive in EU markets. This is mainly caused by higher cost of production and lower labour productivity in pig breeding in Slovakia. Ižáková (2001), based on similar analysis of competitiveness of particular agricultural and foodstuff products, also claims that significantly incompetitive in EU markets are our pork products.
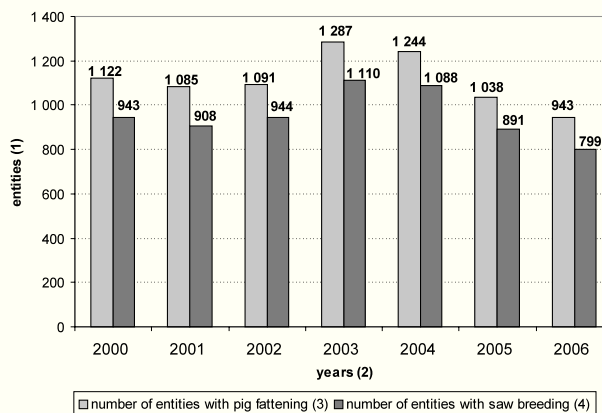
The above limits of production and reproduction indices in present-day Slovakia are only achieved by a relatively small

rate of farms here. Pertinent data analysed for the year 2006 prove that Slovakia produced 111,640 tons of pork, of which breeds exceeding 0.65 kg per piece per day achieved 25,677.2 tons, which only makes 23 %. Based on this we can claim that up to 77 % of carcass pigs are produced inefficiently (with loss). Concerning live-born and weaned piglets, the situation is even slightly worse. In 2006 SR ran 799 farms with sow breeding, of which only 131 (i.e. 16.4 %) has weaning more than 18 piglets per sow per year. It should be, however, added that higher weaning (above 18 pcs) was achieved predominantly in farms with higher sow concentration (200 and more pcs), as these produce up to 48.8 % of all piglets. This means that a great number of farms (708) bread small numbers of sows with low reproduction parameters, so that pig production here is unprofitable.

The abovementioned facts bring evidence on the unprofitability of the whole branch of pig breeding in Slovakia. This has also been confirmed by the results of cost analysis undertaken by VÚEPP (Research Institute of Pig Breeding) in Bratislava at a selected set of farms (Kubánková, 2006). The results show that in 2005 mean losses in sow breeding in Slovakia was -22.07 Sk per fattening day, and profitability 2.16 Sk calculated per 1 kg increment in pig fattening.

Lower level of pig utility parameters in Slovakia compared with developed countries also results from data by Borecká (2005). In 2006, as compared with 2004, the number of live born piglets per sow per year may have grown (18.75 pcs), along with the number of weaned (17.06 pcs) piglets per sow per year, and increased mean daily increments in pig fattening to 0.568 kg.pc^{-1}, yet, Slovakia lags behind significantly, even compared with elder data (Hetényi, 2000). The number of weaned piglets per sow and year in Germany was 18.6 pcs, in Denmark even 22 pcs. Mean daily increment in pig fattening in Germany was 640 g, in Denmark even 730 g per piece.

A factor not to be overlooked, that also negatively influences the situation in pig breeding is the reinforcement of the Slovak crown (Sk) in recent years. As a result of the growing Sk : € course, the unit price of imported goods recalculated to Sk gets reduced. Our processors pay ever less for imported pork and/or carcass pigs from other EU countries. This fact has a retarding effect on carcass pig prices in home market. For the SR post-accession period to EU,the Sk : € course improved

Graph 3   Number of entities with pig fattening and saw breeding
Graf 3   Počet subjektov, ktoré majú výkrm ošípaných a ktoré chovajú
                  prasnice
                  (1) subjekty, (2) roky, (3) počet subjektov, ktoré majú výkrm ošípa-
                  ných, (4) počet subjektov, ktoré chovajú prasnice

by 4.24 Sk (from 41.491 Sk : € in 2003 to 37.248 Sk : € in 2006). For the same period the unit price of pigs in Slovakia only increased by 2.63 Sk per kg live weight (from 37.48 Sk.kg^{-1} in 2003 to 40.11 Sk.kg^{-1} in 2006) and reaches average EU price level (in 2006+ it was 1.13 € per kg).

The above facts should be realised by managers deciding on the extent of breeding sow and carcass pigs in farms and specialised enterprises. Primarily, it shall be necessary to proceed from the realisation prices of carcass pigs that are established in the market irrespective of the particular enterprise; the other side is influenced by the cost level of sow breeding, including subsequent pig categories, that is individual and partly influencible by enterprise measures. It is, of course, necessary to consider real possibilities of achieving the level of production and reproduction parameters of breeding in line with particular technical-technological solution of breeding, quality and quantity of forage provision, genetical utility prerequisities of animals and professional level of labour forces in breeding. All these factors should be combined with the concurrent use of most seasonal moves in prices of carcass pigs in the course of the year (in general, prices are highest in autumn) so as to achieve the most favourable economic effect of the whole pig breeding.

Súhrn

Situácia v chove ošípaných v Slovenskej republike je dlhodobo nepriaznivá. Neustále klesajú početné stavy ošípaných, znižuje sa počet producentov, zvyšuje sa dovoz ošípaných i bravčového mäsa z iných krajín EÚ. Je to výsledok prehlbujúcej sa stratovosti chovu ošípaných. Možnosti nápravy a ďalšieho vývoja naznačuje príspevok. Pomocou optimalizačného modelu kvantifikuje dopad zmien nákladov, realizačných cien, produkčných a reprodukčných ukazovateľov na ekonomické výsledky chovu. Na základe toho stanovuje úroveň príslušných výrobných a ekonomických parametrov tak, aby chov ošípaných nebol stratový.

Kľúčové slová: optimalizačný model, chov ošípaných, produkčné ukazovatele, náklady, ceny

References

BORECKÁ, S. 2005. Jatočné ošípané. Situačná a výhľadová správa k 31. 12. 2005 (Carcass pigs. Situational and prospective report to Dec 31, 2005). Bratislava : VÚEPP, 2005, 57 s. ISBN 80-8058-419-2

BRESTENSKÝ, V. et al. 2002. Sprievodca chovateľa hospodárskych zvierat (Farm animals breeder´s guide). Nitra : VÚŽV, 2002, 72 s. ISBN 80-88872-18-9

BULLA, J. 2005. Šľachtenie zvierat, biotechnológia a kvalita potravín (Animal improvement, biotechnology and food quality). In: Zbor-

ník prednášok zo VII. zjazdu Slovenskej spoločnosti pre poľnohospodárske, lesnícke, potravinárske a veterinárne vedy SAV. Bratislava : SAV, 2005, s. 18–21. ISBN 80-227-2308-8

FARKAŠOVÁ, M. 2000. Matematické algoritmy v modelovaní ekonomických závislostí v chove ošípaných (Mathematical algorithms in modelling economic correlations in pig breeding). In: Trendy v poľnohospodárskej ekonomike a manažmente. Zborník vedeckých prác MVD 2000. Nitra : SPU, 2000, s. 206–212. ISBN 80-7137-715-5

GRIMEK, D. 2005. Analýza súčasného stavu na trhu s mäsom v SR (Analysis of current trends in meat market in SR). In: Marketing a obchod. Zborník z medzinárodnej vedeckej konferencie. Zvolen : TU, 2005, s. 107–111. ISBN 80-89029-97-3

HUDÁK, J. 2001. Konkurencieschopnosť komodít živočíšneho pôvodu z aspektu vplyvu na trh (Competitiveness of commodities of animal origin from the aspect of market influence). In: Konkurencieschopnosť vybraných agrárnych komodít pred vstupom do EÚ. Zborník vedeckých prác. Nitra : SPU, 2001, s. 96–99. ISBN 80-7137-967-0

IŽÁKOVÁ, V. 2001. Konkurencieschopnosť slovenských poľnohospodárskych podnikateľských subjektov PPoK na integrovanom európskom trhu (Competitiveness of Slovak agricultural subjects PPoK in integrated European market). In: Teoretické a praktické prístupy k riešeniu podnikateľských kríz. Zborník z medzinárodnej vedeckej konferencie. Račkova dolina : MP SR, Nitra : SPU, 2001, s. 127–132. ISBN 80-7137-936-0

KRETTER, A. 2003. Analýza vývoja spotrebiteľských cien hovädzieho a bravčového mäsa v Slovenskej republike (Analysing the development of beef and pork consumer prices in the Slovak Republic). In: Aktuálne problémy manažmentu a marketingu vo výučbe na vysokých školách. Zborník vedeckých prác na CD. Nitra-Kolíňany : SPU, 2003, s. 115–119. ISBN 80-8069-284-x

KUBÁNKOVÁ, M. – BURIANOVÁ, V. 2006. Vlastné náklady a výsledky hospodárenia poľnohospodárskych podnikov v SR za rok 2005 v triedení podľa oblastí (Proper cost and management results of agricultural enterprises in SR for 2005 classified by regions). Bratislava : VÚEPP, 2006, 64 s. ISBN 80-8058-381-1

MIHINA, Š. et al. 1999. Kongres Európskej zootechnickej asociácie (European Zootechnical Association Congress). Bratislava : MP SR vo vydavateľstve NOU. In: Poľnohospodárstvo, roč. 45, 1999, č. 3, s. 231–240. ISSN 0551-3677

ROST, M. – ČERMÁKOVÁ, A. 2003. Možnosti některých kvantitativních metod hledání tržních struktur. In: Acta oeconomica et informatica, roč.6, 2003, č. 2, s. 37–41. ISSN 1335-2571

STEHLÍKOVÁ, B. 2004. Nový metodologický prístup k prognózovaniu demografických časových radov. In: Acta oeconomica et informatica, roč. 7, 2004, č. 2, s. 49–52. ISSN 1335-2571

Contact address:
prof. Ing. Peter Bielik, PhD, FEM SPU in Nitra, Department of Economics, e-mail: Peter.Bielik@fem.uniag.s
doc. Dr. Ing. Elena Horská, FEM SPU in Nitra, Department of Marketing, e-mail: Elena.Horska@fem.uniag.sk
doc. Ing. Michal Vicen, CSc., FEM SPU in Nitra, Department of Marketing, e-mail: Michal.Vicen@fem.uniag.sk
Ing. Dušan Dobák, FEM SPU in Nitra, Department of Marketing, e-mail: Dusan.Dobak@fem.uniag.sk