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ECONOMIC SUSTAINABILITY OF THE LOCAL DUAL-PURPOSE CATTLE

Krupová, Z.[(1)], Krupa, E.[(1)], Michaličková, M.[(2)], Zavadilová, L.[(1)], Kadlečík, O.[(3)]

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SUMMARY

Base economic characteristics (total revenues, total costs, profit and profitability ratio) of the Slovak Pinzgau breed were calculated in this study. Under the actual production and economic conditions of the breed, production system is operated with loss (-457 € per cow and per year) and with negative profitability ratio (-20%). Optimisation of the production parameters on the level defined in the breed standard (5,200 kg milk per cow and year, 92% for conception rate of cows, 404 days of calving interval and 550 g in daily gain of reared heifers) and improved udder health traits (clinical mastitis incidence and somatic cells score) was of positive impact on the total revenues (+34%), on the effective utilisation of costs (+105%) and balanced profit of dairy systems. Next to the positive profitability of the system, higher quality and security of dairy milk products should be mentioned there. Moreover, direct subsidies as an important factor of positive economic result of dairy cattle systems has to be pointed as well. Subsidies should be provided to compensate the real biological limitation of the local breed farmed in marginal areas. However, improvement of the production parameters of the Slovak Pinzgau breed is recommended with the same attention to reach the economic sustainability of dairy production system. To reach economic sustainability of the breed from practical point of view, the farmer activity should be aimed especially to the enhanced herd management.

Key-words: Slovak Pinzgau, economic sustainability, health traits, optimisation

INTRODUCTION

Cattle production plays an important role in agriculture sector especially in countries with substantial forage resources (Doucha et al., 2012). Its economics is determined by many factors, by natural conditions, breed character and its production level, marketing policy, human sources and generally by effective utilisation of inputs (Krupová et al., 2012; Michaličková et al., 2014). The impact of components of farm profit and their relationship should be respected by farmers (Miller et al., 2001).

The Slovak Pinzgau cattle is typically farmed in the mountainous regions of Slovakia. It has been classified as an Animal Genetic Resource since 1994 (Kadlečík et al., 2008). Its breeding aims to produce combined (milk and meat) cattle breed suitable for mountains regions. Production and economic parameters of the breed have been changed substantially in the last seven years period. Milk yield of cows was increased by 278 kg per lactation. However, conception rate of female deteriorated and average calving interval of a cow raised by 10 days (Breeding Service of the Slovak Republic, unpublished data). Increase in market price of outputs (by 0.04 € per kg of milk and by 0.42 € per kg of weaned calf) was not relevant to change in input prices (Michaličková et al., 2014) and finally, the size of dairy cow population was reduced.

The current level of breed production is under the standards defined by Association of Slovak Pinzgau breeders (ASPB, 2014). Therefore the aim of the study was to calculate the main economic characteristics of dairy production system the Slovak Pinzgau breed based on the current production and economical parameters.

(1) Ph.D. Zuzana Krupová (krupova.zuzana@vuzv.cz), Ph.D. Emil Krupa, PhD. Ludmila Zavadilová - Institute of Animal Science, PO Box 1, 104 01 Prague, Czech Republic (2) Monika Michaličková, M. Eng. Agr. - NAFC, Research Institute for Animal Production Nitra, Hlohovecká 2, 951 41 Lužianky, Slovak Republic, (3) Prof. Dr. Ondrej Kadlečík – Slovak University of Agriculture Nitra, Tr. A. Hlinku 2, 94901 Nitra Slovak Republic

Followed this, optimization of the traits based on breed standard was provided to reach economic sustainability of the breed farmed in marginal areas of Slovakia.

MATERIAL AND METHODS

Economic parameters for the purebred dairy population of Slovak Pinzgau breed farmed in a classical indoor and free housing system with regular access to pasture were calculated. Selling of surplus calves at weaning and surplus pregnant breeding heifers was assumed. The cow herd structure at the stationary state was derived using the Markov chain methodology (described by Wolfová et al., 2007).

The economic efficiency of dairy population was measured as total profit (total revenues minus total costs) per cow entering a reproductive cycle and per year (Wolfová et al., 2007). Profitability ratio of the production system (total profit divided by the total cost expressed in %) including direct subsidies was calculated to measure the effectiveness of expended costs. Revenues came from milk and sold breeding heifers, weaned calves, slaughtered cows and heifers, manure (market price at 3.65 € per t) and subsidies. Revenues from sold milk and animals were function of the production level and the market pricing system. Regarding the revenues, the direct subsidies (average value over the last three years period; MA SR, 2014) were considered. Costs for feeding, housing, veterinary treatment, breeding and fixed costs were calculated for individual cattle category. Daily energy and protein requirement for maintenance, production and activity of the given category were taken into account to define the feeding costs (Wolf et al., 2013).

Actual production, reproduction, management and economic parameters of the breed (averaged over the last three years period) were defined by the own investigations in cooperated farmers (Michaličková et al., 2014), databases of the Breeding service of the Slovak Republic (unpublished data), and on the literature resources (Wolfová et al., 2006; Vasiľ, 2009). For the actual production system one alternative was modelled. The main production parameters of the breed were optimised on the level defined by the breed standard (ASPB, 2014) in this alternative. Base input data of the breed under the actual level and after the optimization are shown in Table 1. The bio-economic model of the program package ECOWEIGHT 6.0.4, Program EWDC version 3.0.4 for cattle (Wolf et al., 2013) was used for all calculations.

Table 1. Basic parameters of the breed under the actual level and after optimization

Parameter (unit)	Input parameters	
	Actual	Optimal
Milk yield (kg/cow and year)	4,473	5,200
Conception rate of cows (%)	88	92
Calving interval (days)	424	404
Daily gain of females in rearing (kg per day)	0.426	0.550
Basic price for milk (€ per kg)	0.310	
Price for nonstandard[1] milk (€ per kg)	0.247	
Revenues from sold breeding heifer (€ per head)	2,028	
Cost per cow (€/day) - fixed[2]	2.315	
feed	2.51	2.71
veterinary[3]	0.23	0.21

Resource: own calculation; [1]Milk with somatic cells content over 400 thousand per mL; [2]Include costs for labour, energy, reparations, insurance, fuel, overhead and depreciation of property; [3]Include costs for clinical mastitis incidence and other veterinary treatment

RESULTS AND DISCUSSION

Base economic parameters of dairy population of Slovak Pinzgau breed are shown in Table 2. When considering the actual conditions, it is operating with loss (-457 € per cow and per year) and with negative profitability ratio (-20%). Economic result calculated for local cattle population is comparable with literature (Komlósi et al., 2010; Hietala et al., 2014) where loss (ranged from -6 to -962 €) per dairy cow per year was published. Regarding the profit in dairy farms, the production level of cows can be defined as the most important factor (Taylor and Field, 1995). In Slovak conditions, it is under the breed standard defined by ASPB (2015), especially for milk yield (up to 5,500 kg of milk per lactation), conception rate of cows (90 to 95%) and average calving interval (up to 400 days). Optimising of the conception rate of heifers and cows by 4 and 6 percentage points (p.p.), respectively has a positive impact on the overall herd structure being in accordance with results published by Taylor and Field (1995). For example, overall proportion of cows at first lactation lowered by 5 p.p. and average lifetime increased from 3.7 to 4.5 years per one cow in this case. Number of calves available to be sold after weaning increased by 2 males and proportion of heifers needed for herd replacement reduced from 32 to only 24 per 100 cows. Surplus heifers (8 heifers per 100 cows) can be sold as breeding animals (in the case of an open herd turnover). In the closed herd turnover, these heifers can remain in the herd and be included in the breeding process. The first option was the case in this study as the stationary state of the herd structure was supposed.

In relation to the rearing of heifers, optimization of growth intensity (from 426 to 550 g per day; see Table 1) has a positive impact on the overall length of rearing period. Age at first calving deteriorated from 1,151 to

958 days and associated costs decreased by 12% to 1,469 € per reared heifer. Similar saving in costs (-15%) was found out for surplus heifers sold at constant live weight (450 kg).

Milk is well known as the main source of revenues in dairy cattle production systems. It ranged from 85% (found in this study for actual production system) to 96% (when surplus calves were sold at young age and no subsidies were included; Hietala et al., 2014). Therefore, the optimisation of milk traits (milk yield per lactation, somatic cell content and clinical mastitis incidence) were expected to be of the higher impact on the system profitability. Increase of the average milk yield by 16% (Table 1) and improvement of the udder health traits (to 2.32 for somatic cell score and clinical mastitis incidence to 0.12 cases per cow-year at risk) enhanced the revenues by 301 € per cow and per year whereas milk accounted for 87% of the total revenues (+3 p.p.). Simultaneously, the veterinary costs were deteriorated by 11% and feeding costs (needed for higher milk production) increased. Finally, increase in the total costs (+3%) were fully compensated by improvement in the total revenues (+34%).

Next to the production level and udder health traits, direct subsidies were also found out as an important parameter of the system profitability. The economic loss of 0.20 per each € of invested costs calculated for actual system would increase nearly two-times (0.34 € per each € of invested costs) when direct subsidies are not considered. For other dairy cattle populations (Komlósi et al., 2010; Hietala et al., 2014) even with the considerably high milk yield of cow (over 8,300 kg per 305 d milking period) the profitability of system strongly depended on agricultural subsidies was indicated. Moreover, low production prices together with the high production costs have resulted in the ineffective utilisation of costs (Hietala et al., 2014). Positive profitability (ranged from 0.4 and 11%) was found out in these studies only when subsidies were taken into account. Proportion of subsidies on the total income for Hungarian and Finnish cattle (ranged from 10 to 21%) was comparable to the Slovak Pinzgau farms (17%, Table 2). In Slovak conditions, a part of direct subsidies was related to milk yield (0.01 € per kg). Therefore, value of payments a slightly increased (by 23 € per cow and per year; Table 2) when optimal value of milk yield was modelled. Similarly, in Finland conditions, considering direct payments per fattened animals (412 € per animal) next to the milk yield (0.1 € per kg) was also taken into account. When comprehensive modelling of the optimal production parameters (given in Table 1) of Slovak Pinzgau breed was provided, positive economic result (21 € per cow and per year) for the production system was found out. In this case, higher level of revenues and effective utilisation of costs was reached in the production system.

To reach the economic sustainability of the breed from practical point of view, the farmer activity should be aimed especially to the enhanced herd management. Activities intended to reproduction parameters of cows (fertile oestrus detection, early pregnancy diagnose) next to the optimal body-condition score over the cows life are recommended. Intensive selection of heifers reared for replacement is expected as the secondary effect of the increased calf production. Higher growth intensity of calves can be reached by effective utilisation of pasture resources and grazing management. Moreover, keeping the appropriate hygienic conditions on farm and early therapy are recommended (Vasil', 2009) as an important factor for prevalence and elimination of udder disease in dairy farms.

Table 2. Base economic parameters of dairy population of Slovak Pinzgau breed

Economic variable (€ per cow and year)	Input parameters		Difference
	Actual	Optimal	
Total revenues	1 519.20	2 037.60	+34%
Revenues from milk (€ per cow and year)	1 295.10	1 596.00	+23%
Direct subsidies[1]	313.40	336.10	+7%
Total cost	2 289.70	2 352.20	+3%
Profit or loss	-457.10	21.50	+105%
Profitability[2] (%)	-20.00	0.90	+105%

[1]Sum of direct subsidies paid for milk production, livestock unit, performance testing of cattle and animal genetic resource (MA SR, 2014); value is averaged over the last three years period. Not include subsidies per agricultural land, less favoured areas and other indirect payments; [2]Expressed as proportion of profit (with accounting of direct subsidies) on the total costs

CONCLUSION

Dairy production system of Slovak Pinzgau breed, under current production and economic conditions, is operating with loss and with negative profitability ratio. To reach the sustainability of the local breed its production parameters should be improved. Milk yield, conception rate of females and growth intensity of heifers on the breed standard level is recommended at first. Profitability of dairy production system also depends on subsidies. These should be provided to compensate the real biological limitations of the breed. From practical point of view enhanced herd management should be applied by farmers to reach economic sustainability of the breed.

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