



Economic efficiency of Bulgarian dairy synthetic population and Assaf sheep breeds

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(Manuscript received 1 December 2019; accepted for publication 28 February 2020)

Abstract. *The economic efficiency of ewes from the Bulgarian dairy synthetic population (BDSP) and Assaf sheep breeds, reared in three production systems, e.g. grazing on pasture, stall-pasture rearing and stall rearing was studied. The results from the study showed that BDSP ewes in the stall-pasture rearing system had a relatively low milk yield for a specialised dairy sheep breed – 80L for the lactation period. In this system, without the subsidy, the profit and cost efficiency were negative, while with subsidy, minimum positive results were achieved. For BDSP ewes reared in a stall-pasture rearing system with stall feeding during the grazing period and grazing on improved pastures, the obtained milk yield was by 33% higher. The subsidy resulted in satisfactory profit and cost efficiency, while without the subsidy, the farm ended in loss. BDSP and Assaf ewes reared in stalls, demonstrated substantially higher milk yield and productivity. They realised a profit and good cost efficiency. The milk yield of BSDP sheep reared in stalls was 200L per lactation, and fertility - 140%. The Assaf breed in which a high level of selection and regulated reproduction cycle was achieved, had 250L milk per lactation and 140% fertility. The profit with subsidy was 128.85 BGN (1Lev=0.975€) and without the subsidy: 48.85 BGN, with relatively high cost efficiency. An introduction of traits for higher milk yield, polyestrus and fertility from Assaf into BSDP sheep is necessary.*

Keywords: selection control, subsidy, revenues, costs, profit, cost efficiency, stall-pasture rearing

Introduction

In Bulgaria sheep farming is the most traditional occupation. For centuries, it had played a leading role in people's existence and livelihood. Apart from dairy, meat and textile products, it comprised a significant share of the national gross domestic product. In the 1980s to the beginning of the 1990s, Bulgaria exported more than 1 million fattened lambs and dairy products at an amount equal to their entire current production of such. During the years of transition from a planned to a market-oriented economy (after 1990), the number and production of sheep products was drastically decreased. Sheep breeding has lost its long-standing leading role (Stankov et al., 2002).

At this stage sheep farming in Bulgaria is represented by rearing dairy type and local (autochthonous) sheep breeds. The reasons for the catastrophic decrease in the sheep population in Bulgaria is the disturbed structure of the agrarian sector and the orientation mainly towards production of cereals and oilseeds, the loss of traditional markets for sheep products-breeding, the lack of skilled personnel, etc. (Tyankov et al., 1997).

European Parliament resolution of 3 May 2018 on the current situation and prospects of sheep and goat farming in the EU (2017/2017/INI) states that both sectors have the lowest efficiency and profitability. This threatens the development of rural and geographically disadvantaged areas, landscape maintenance and the conservation of biodiversity.

These problems are even more obvious in Bulgaria, which requires measures to be taken for sustainable development of sheep farming in Bulgaria and, particularly, for milk and meat production.

The milk type sheep is represented by 5 breeds, including one Bulgarian (Bulgarian dairy synthetic population, BDSP) and 4 imported from other countries - Assaf, Awassi, Lacaune and Chios. This type is the leading one comprising over 60% of the sheep in Bulgaria (Livestock breeds in the Republic of Bulgaria, 2017).

Studies on the stages of creation and productive traits of dairy sheep breeds in our country were carried out by Tsvetanov (1989) and Dimov (1995). The productive performance of the created BDSP which has become the leading one with the largest relative share, has been studied by Hinkovski et al. (2008), Iliev (2011), Slavova et al. (2015), Ivanova and Raycheva (2015) and Stancheva et al. (2015). The authors' studies show that the BDSP has not yet reached the goals set by the original breeding programme. Studies on the Assaf breed, imported from Spain, are insufficient.

Studies on the economic performance of dairy sheep farming have been carried out by Georgiev (1995), Momchilov (2005), Atanasov et al. (2010), Mihaylova-Toneva (2011), Harizanova (2013) and Slavova et al. (2015). Research data demonstrated predominantly low cost efficiency due to the unrealised genetic potential of sheep.

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The purpose of the present study was to evaluate the economic efficiency of the sheep of the BDSP and Assaf breeds, reared under different production systems, namely: pasture-stall, stall-pasture and in stalls.

Material and methods

The study comprised four sheep herds from four sheep farms, as follows:

Sheep herd No 1: Bulgarian dairy synthetic population (BDSP) – reared on pasture and stall, without selection control, in Stara Zagora municipality; 210 ewes; 130% fertility; 3kg wool yield in ewes; 80L milk yield; 55kg average live weight of ewes. Ewes from that herd were reared on pasture and stall, on natural pastures during the major part of the year. Lambing was seasonal, and milking began after weaning of lambs and continued until end of August. Feeding of ewes during the indoor period was with traditional fodders – concentrate, hay and straw. Machine milking and shearing were practiced.

Sheep herd No 2: BDSP – stall-pasture rearing, with selection control, in Elhovo municipality, Pchela village; 250 ewes; 130% fertility; 3kg wool yield in ewes; 120L milk yield; 60kg average live weight of ewes. Ewes from this herd were reared in stall and on pasture. During the grazing period, they received additional concentrate, and pastures were improved. Feeding during the indoor period was with concentrate, silage, meadow and alfalfa hay. Machine feeding, milking and shearing were practiced. Lambing and milking of ewes were seasonal.

Sheep herd No 3: BDSP – stall rearing, with selection

control, in Tutrakan municipality; 300 ewes; 140% fertility; 3kg wool yield in ewes; 200L milk yield; 60kg average live weight of ewes. Ewes from the herd were reared in stalls year round. The main production processes were mechanised. Lambing was seasonal, and lambs were reared with artificial ewes to prolong the lactation period. Feeding was balanced with regard to productivity.

Sheep herd No 4: Assaf, stall rearing, with selection control, in Provadia municipality, Belogradets village; 300 ewes; 140% fertility; 3kg wool yield in ewes; 250L milk yield; 60kg average live weight of ewes. Ewes of that herd were reared in stalls all year round with complete mechanisation and partial automation of production processes. Feeding was balanced with regard to physiological state and productivity. The lambs were reared with artificial ewes. Reproduction was managed, with insemination out of the natural breeding season, providing year-round lambing and milking of ewes. The herd was pedigree, for ram production.

Expenses and revenues were obtained from farm records and adapted to current prices. The profit and cost efficiency were calculated. Data were submitted to statistical analysis using MS Excel software.

Results and discussion

Natural and value parameters per ewe in each herd were determined on the basis of data from farm records. Table 1 presents information for Bulgarian dairy synthetic population (BDSP) and Assaf ewes reared under three production systems: pasture-stall, stall-pasture and stall rearing.

Table 1. Natural and value parameters of BDSP and Assaf breeds – revenues

Parameters	Average price, BGN	BDSP– Pasture-stall		BDSP – Stall-pasture		BDSP – Stall rearing		Assaf	
		kg/L	Total, BGN	kg/L	Total, BGN	kg/L	Total, BGN	kg/L	Total, BGN
Milk per lactation period, L	1.30	80.00	104.00	120.00	156.00	200.00	260.0	250.00	134.40
Lambs from one ewe, kg	5.00	24.96	124.80	24.96	124.80	26.88	134.40	26.88	134.40
Wool	1.50	3.00	4.50	3.00	4.50	3.00	4.50	3.00	4.50
Sold culled sheep (relative share from the herd)	1.50	11.50	17.25	11.50	17.25	11.50	17.25	11.50	17.25
Subsidy (national payments for livestock)	40.00	-	40.00	-	-	-	-	-	-
Subsidy for sheep under selection control	80.00	-	-	-	80.00	-	80.00	-	80.00
Total			290.56		382.55		496.15		561.15

*BDSP- Bulgarian dairy synthetic population; 1lev (BGN) = 0.975€

Data demonstrated relatively higher milk yield in ewes reared in pasture and stall. This was reflected in obtaining higher revenue from one ewe. In the same herd, sheep were under selection control and the subsidy was double. The values of the other natural parameters were the same. Values of natural parameters of BDSP ewes and Assaf ewes imported

from Spain and reared entirely in stall were considerably higher.

An important factor for the better productivity in stall rearing is the higher level of selection and balanced feeding with constant access to fodders. In intensive regions with good fodder base, indoor rearing is much more justified and guarantees better economic results from high-yielding

breeds. In Assaf sheep, year round milk production through insemination of ewes out of the normal breeding season is practiced following a scheduled plan as well as using artificial ewes for lambs. The data also showed that milk yield in stall-reared sheep had a much higher effect on revenues at farms.

Data from Table 2 showed that BDSP ewes in the pasture-

stall rearing system without additional supplementation during the grazing period had a relatively higher share of fixed costs – 54.39% and especially for labour – 49.21%. Fodder costs came second, but with relatively lower percentage (38.01%) compared to the other groups. In this group, grazing was the main feeding during the pasture season and sheep did not receive additional feed.

Table 2. Production costs of Farm 1 in BDSP ewes – pasture-stall rearing system

Parameters	Value, BGN	% from variable and fixed costs	% from total costs
I. Variable costs			
Total variable costs	212.54	100.00	45.61
Fodders	103.50	83.84	38.01
Veterinary services	5.10	4.10	1.87
Water, electricity	8.50	6.84	3.12
External services	7.10	5.72	2.61
II. Fixed costs			
Total fixed costs	148.10	100.00	54.39
Labour	134.00	90.48	49.21
Facilities	2.30	1.56	0.84
Machinery	11.80	7.96	4.34
All production costs	272.30		100.00

*BDSP- Bulgarian dairy synthetic population; 1lev (BGN) = 0.975€

Table 3 presents the production costs of BDSP ewes in the stall-pasture rearing system. In this group, variable and fixed

costs were almost equal.

Table 3. Production costs of Farm 2 in BDSP ewes – stall-pasture rearing system

Parameters	Value, BGN	% from variable and fixed costs	% from total costs
I. Variable costs			
Total variable costs	162.30	100.00	50.34
Fodders	141.50	87.19	43.89
Veterinary services	5.90	3.63	1.83
Water, electricity	8.10	4.99	2.51
External services	6.80	4.19	2.11
II. Fixed costs			
Total fixed costs	160.10	100.00	49.66
Labour	144.20	90.07	44.73
Facilities	3.50	2.18	1.08
Machinery	12.40	7.75	3.85
All production costs	322.40		100.00

*BDSP- Bulgarian dairy synthetic population; 1lev (BGN) = 0.975€

Fodder costs were higher compared to ewes reared on pasture and stalls, due to the longer indoor period and supplementation with concentrate during the grazing period. Labour costs were almost identical to those in the first group.

Table 4 shows that BDSP ewes reared in stall year-round had substantially higher variable costs that fixed costs, in

comparison to the former two groups. This is due to feeding with fodders with higher energy value, higher protein, vitamin and mineral content. Labour costs were lower (34.59%) compared to groups reared in pasture-stall (49.21%) and stall-pasture systems (44.73%), which is explained by the high level of mechanisation of production processes.

Table 4. Production costs of Farm 3 in BDSP ewes – stall rearing system

Parameters	Value, BGN	% from variable and fixed costs	% from total costs
I. Variable costs			
Total variable costs	250.70	100.00	60.95
Fodders	226.50	90.35	55.07
Veterinary services	6.80	2.71	1.65
Water, electricity	10.30	4.11	2.50
External services	7.10	2.83	1.73
II. Fixed costs			
Total fixed costs	160.60	100.00	39.05
Labour	142.30	88.60	34.59
Facilities	4.80	2.99	1.17
Machinery	13.50	8.41	3.29
All production costs	411.30		100.00

*BDSP- Bulgarian dairy synthetic population; 1 lev (BGN) = 0.975 €

The data from Table 5 showed almost the same production costs as those of BDSP reared in stalls in terms of variable and fixed costs. Numerically, they are by about 5.1% higher. In Assaf ewes reared in stalls, labour costs were also lower due to mechanisation and automation of production and lower share of human labour.

Table 5. Production costs of Farm 4 in Assaf ewes – stall rearing system

Parameters	Value, BGN	% from variable and fixed costs	% from total costs
I. Variable costs			
Total variable costs	263.40	100.00	60.93
Fodders	237.50	90.17	54.94
Veterinary services	7.40	2.81	1.71
Water, electricity	10.20	3.87	2.36
External services	8.30	3.15	1.92
II. Fixed costs			
Total fixed costs	168.90	100.00	39.07
Labour	148.60	87.99	34.37
Facilities	6.50	3.84	1.51
Machinery	13.80	8.17	3.19
All production costs	432.30		100.00

*1lev (BGN) = 0.975€

The data from Table 6 demonstrate that for almost the same level of selection of BDSP ewes, economic results were rather different. This is due mainly to the rearing system. In stalls, ewes have a constant access to fodder. Feeding is balanced and compliant with productivity of animals.

Table 6. Efficiency of revenues and costs of the studied farms

Parameters of ewes	Farm 1 BDSP, Pasture-stall	Farm 2 BDSP, Stall-pasture	Farm 3 BDSP, Stall rearing	Farm 4 Assaf, Stall rearing
Revenues without subsidy	250.55	302.55	416.15	481.15
Revenues with subsidy	290.56	382.55	496.15	561.15
Expenses	272.30	322.40	411.30	432.30
Profit without subsidy	-1.75	-19.85	+4.85	+48.85
Profit with subsidy	+18.26	+60.15	+84.85	+128.85
Cost efficiency of revenues without subsidy	-8.68	-6.56	+1.16	+10.15
Cost efficiency of revenues with subsidy	+6.28	+15.72	+17.10	+22.96
Cost efficiency of expenses without subsidy	-7.99	-6.15	+1.12	+11.30
Cost efficiency of expenses with subsidy	+6.71	+18.57	+20.63	+29.81

*BDSP- Bulgarian dairy synthetic population

In pasture-stall system, ewes travel a certain distance to the pasture and during the grazing period rely mainly on grass. Without the subsidy, this group ends in loss, while with the subsidy, a small profit is realised. The cost efficiency follows the same trend as the profit.

Ewes reared in stall-pasture system with better feeding and improved pastures also cover the costs with difficulty. Without the subsidy, the profit and cost/revenue efficiency are negative. In this group, as well as in others, the price of one liter of milk – 1.30 Leva (BGN) is not sufficient to achieve a more important economic effect. In the third group of BDSP ewes reared only in stalls, the profit is insignificant despite the higher milk yield and fertility. The results of Assaf sheep breed, imported from Spain showed that the higher level of selection in the stall production system could achieve a good profit and high cost efficiency despite the low prices of milk and meat.

Conclusion

The study results showed that ewes from the Bulgarian dairy synthetic population (BDSP) reared in pasture-stall and stall-pasture production systems, exhibited a relatively low economic result. With the subsidy, a minimum profit was obtained and positive efficiency of costs and revenues. BDSP ewes reared in stall year-round had better economic results, as their feeding was balanced and complete, and the main production processes - mechanised. The Assaf breed in which a high level of selection and regulated reproduction cycle was achieved in the stall rearing system, was outlined with high milk yield and fertility. The use of artificial ewes for rearing of lambs contributed to prolongation of the lactation period. It is evident that the introduction of heritability elements from Assaf into BDSP breed is necessary.

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