# Economic efficiency of rearing Karakachan sheep in the mountain regions of Bulgaria

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## Abstract

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The purpose of the study is to make an economic assessment of rearing Karakachan sheep in the mountain regions of Bulgaria. Subject of research is a model of a farm with 300 Karakachan ewes and the corresponding categories rams and lambs. Production system has been analyzed, based on parameters, averaged after surveys, conducted on several sheep farms. Revenues, costs and subsidies, which are a subject of the economic analysis, are valued by current prices and rates for 2017. The profit and profitability rate are calculated, applying the Benefit-cost analysis.

On the basis of results obtained, the following conclusions are drawn:

Total Costs predominate in terms of Gross Production, meaning that the level of productivity of the animals is not high enough to compensate them;

The highest relative share in the structure of the Total Revenues show the Subsidies – 64.5%, which is an indicator of the strong dependence of the farm on their availability and size;

The Rate of Profitability after Subsidies has a positive value – 20.39%, i.e. rearing of Karakachan sheep in the mountainous regions of Bulgaria under the parameters of the study would be cost-effective.

*Keywords:* Karakachan sheep; sheep farm; economic efficiency; rate of profitability

## Introduction

Karakachan breed is a local sheep breed, reared mainly in the mountainous and semi-mountainous regions of Bulgaria. In the past, Karakachan sheep were raised in a nomadic way, i.e. with seasonal transitions from summer to winter pastures. In the summer they were kept in the Balkan Mountains, Rila, Vitosha and the Rhodopes, while in the winter moved to the White Sea Thrace (Nedelchev et al., 2006). Over the last 5-6 decades, the breed has been a part of the country's endangered biodiversity, despite of being a valuable genetic resource. Karakachan sheep are well adapted to their areal, resistant to disease, relatively unpretentious to the trophic base, having a strong maternal instinct and long productive life (Staykova et al., 2015).

Due to that reason, in 2001, Bulgarian Association for Conservation of Biodiversity SEMPERVIVA started a project for its conservation, and with Regulation No 11/6.04.2009 on the conditions and procedure for implementing Measure 214 "Agri-ecology Payments" of the Rural Development Program (2007-2013), Karakachan breed is declared endangered in Bulgaria. In recent years, the economic circumstances of the livestock sub-sector have necessitated raising animals that are less demanding of environmental conditions in the unfavorable areas of the country.

The need for producing environmentally friendly products of animal origin that are safe for human health is also extremely urgent (Staykova et al., 2015). In this regard, rearing of Karakachan sheep could prove to be necessary and useful, due to their good acclimatization to ecological areas, such as mountain zones, and the relatively lower production costs per unit of high quality production. Object of interest is the question of whether breeding sheep of the Karakachan breed would also be profitable under the current market conditions and payment schemes. An advantage in rearing indigenous breeds threatened with extinction appears the subsidy provided under Measure 10 "Agroecology and Climate" of the Rural Development Program 2014-2020.

A number of researches on various productive traits of the breed have been conducted by Odzhakova (1994), Panayotov et al. (2003), Boykovski (2005), Dimitrov et al. (2003), Boikovski et al. (2004, 2005), etc.

A recent study on the economic efficiency of rearing Karakachan sheep is conducted by Odzhakova et al. (2010), and Popova et al. (2011) analyze the results of production and processing of sheep milk.

The purpose of this paper is to make an economic assessment of rearing Karakachan sheep in the mountain regions of Bulgaria.

## Materials and Methods

Object of the study is a model of a farm with 300 Karakachan ewes and the corresponding categories rams and lambs (Table 1). Production system is analyzed, based on parameters, averaged after surveys, conducted on several farms. Animals are reared in stall-pasture, as being provided with concentrates (0.400 kg per day) and alfalfa hay (1-1.5 kg per day) for 180 days (November-May). From 30 to 60 days of age, lambs are given a starter of about 0.300 kg per day, and then until the time of their sale on the market (about 4 months) a starter for fattening of about 0.700 kg per day. Feeding is consistent with the productivity, age and physiological status of the animals. The required concentrates and hay are purchased at market prices.

The live weight of the sheep is about 36 kg on average and that of the rams is 53 kg, with a 30:1 ratio in the flock. Repair is in the range of 15%-20%, according to the need for

**Table 1. Animals in the flock**

| Category | Number |
|---|---|
| Ewes | 300 |
| Rams | 10 |
| Ewe lambs and ram lambs | 49 |
| Lambs | 233 |

culling sheep in the particular year. The conception rate is 90% for sheep and 85% for the ewe lambs, on average. Fertility is about 90%, and the death rate of lambs until weaning is 3%. The lambs are weaned at about 4 months of age, when reaching 22-23 kg, as part of them being for sale, and the other left for breeding. Milking period lasts 120 days, as the milking procedure is being done manually. The average milk yield is about 30 l per ewe. The wool yield is 2-2.5 kg per ewe, and 3.5 kg per ram. The breeding season is once a year during estrous. The sheep are being mated at 18 months of age after flock review and rating.

Three permanent workers are involved in the animal husbandry. The flock is under selection control and farmer has a contract with a breeding association, responsible for the breeding activities. The farm receives direct payments and state aid under the relevant schemes. The pasture area, which the farmer is given subsidies for is estimated to 60 ha with a density of 0.75 AU/ha at a minimum of 0.15 AU/ha, according to the requirements. The amount of direct payments for breeding activities and agri-environmental payments is not given for the total number of 300 ewes (50 AU) but for 49 AU, since in most cases there are animals for which the farms do not receive subsidies for various reasons. Revenues, costs and subsidies, which are a subject of the economic analysis, are valued by current prices and rates for 2017. The profit and profitability rate are calculated, applying the Benefit-cost analysis. Data is processed with mathematical-statistical model and Excel program.
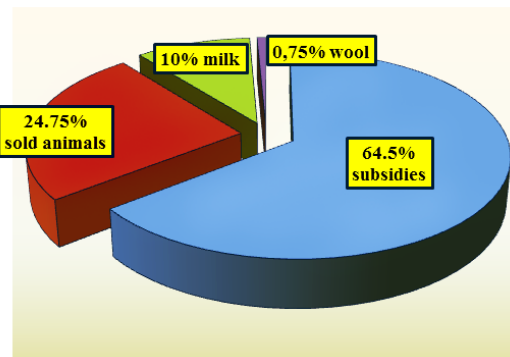
## Results and Discussion

The farm generates income from sold milk, animals and wool, which evaluated form the value of the Gross Production (GP). Total revenues (TR) are represented by the sum of GP and Subsidies (Table 2). The highest relative share of GP has the revenues from sold lambs for slaughter – 47.7%. Revenues from breeding lambs represent 12.47%, as their size is being variable for each year and depends on market demand and supply. Milk revenues represent 28.18% and wool only 2% of the GP value.

Total Revenues amounts to 101366.01 BGN, i.e. 337.89 BGN per ewe, respectively. In the structure of TR, Subsidies account for the highest relative share – 64.5%, followed by the sold animals – 24.7%, milk – 10% and wool – 0.75% (Figure 1). Thus, could be summarized that, Subsidies are more significant to the size of farm revenues than animal performance.

Production costs are shown in Table 3, as Fixed costs (FC) represents only 10% of the Total Costs (TC). The lead-

**Table 2. Revenues, BGN**

| Type of Revenue | kg/l/n | Price/kg,n | Value, BGN |
|---|---|---|---|
| 1. Gross Production (GP) | | | 35977.00 |
| 1.1. From milk | 7800 | 1.30 | 10140.00 |
| 1.2. From sold animals | – | – | 25077.00 |
| – lambs for slaughter | 3432 | 5.00 | 17160.00 |
| – breeding lambs | 690 | 6.50 | 4485.00 |
| – ewe lambs for slaughter | 80 | 3.50 | 280.00 |
| – culled ewes | 1376 | 2.00 | 2752.00 |
| – breeding rams | 2 | 200.00 | 400.00 |
| 1.3.From wool | 950 | 0.80 | 760.00 |
| 2. Субсидии/Subsidies (S) | | | 65389.01 |
| 2.1. For ewes under selection control | | | 24471.36 |
| 2.2.Agro-ecology | | | 12420.65 |
| 2.3.De minimis | | | 879.00 |
| 2.4.Payments for pastures | | | 11794.80 |
| 2.5.For redistributive payment | | | 8383.20 |
| 2.6. For climate and environmental friendly agricultural practices | | | 7440.00 |
| 3. Total Revenues (TR) = GP+S | | | 101366.01 |
| 4. TR per ewe | | | 337.89 |



**Fig. 1. Structure of revenues in the farm, %**

**Table 3. Costs, BGN**

| Type of Cost | Value, BGN |
|---|---|
| 1. Fixed costs | 8500.00 |
| 1.1. Membership fees in association | 750.00 |
| 1.2. Accounting costs | 2500.00 |
| 1.3. Rent for pasture | 3600.00 |
| 1.4. Costs for maintaining pasture | 1000.00 |
| 1.5. Others | 650.00 |
| 2. Variable costs | 75698.60 |
| 2.1. Feeds | 36971.40 |
| – concentrates | 15456.00 |
| – starters | 6179.40 |
| – alfalfa hay | 12936.00 |
| – straw for bedding | 2400.00 |
| 2.2. Labour costs | 27997.20 |
| 2.3. Medicaments and veterinary service | 2480.00 |
| 2.4. Electricity | 2200.00 |
| 2.5. Water | 450.00 |
| 2.6. Transport | 2100.00 |
| 2.7. External services | 1680.00 |
| 2.8. Fuels, repairs, materials | 1820.00 |
| 3. Total costs (FC+ VC)/ | 84198.60 |
| 4. TC per ewe | 280.66 |

**Table 4. Economic results, BGN**

| Indicators | Value, BGN |
|---|---|
| Gross Production, BGN | 35977.00 |
| Total Revenues, BGN | 101366.01 |
| Total Costs, BGN | 84198.60 |
| Profit before Subsidies, BGN (GP-TC) | -48221.60 |
| Profit before Subsidies per ewe, BGN | -160.74 |
| Profit after subsidies, BGN (TR-TC) | 17167.41 |
| Profit after subsidies per ewe, BGN | 57.22 |
| Rate of profitability before Subsidies, % (Profit before Subsidies:TC)x100 | -57.27 |
| Rate of profitability after subsidies, % (Profit after Subsidies:TC)x100 | 20.39 |

ing among Variable Costs (VC) is that of feed – 36971.40 BGN (48.84%), followed by the labour cost – 27997.20 BGN (33.25%), as all others have a relative share of up to 3%. Thus, TC on the farm and per ewe amount to 84198.60 BGN and 280.66 BGN, respectively.

The economic performance of the farm is presented in Table 4. The Profit, calculated as a difference between GP and TC, is -48221.60 BGN, i.e. -160.74 BGN per ewe. When subsidies are added, the result turns to positive – 17167.41 BGN and 57.22 BGN, respectively. The rate of profitability before subsidies is -57.27%, and after adding them – 20.39%. For comparison, Odjakova et al. (2010) reported profit per ewe and profitability rate with subsidies – 25.42 BGN and 28.45% in a flock of 150 Karakachan ewes in 2007.

## Conclusions

On the basis of the results obtained, the following conclusions are drawn:

Total Costs predominate in terms of Gross Production, meaning that the level of productivity of the animals is not high enough to compensate them.

The highest relative share in the structure of the Total

Revenues show the Subsidies – 64.5%, which is an indicator of the strong dependence of the farm on their availability and size.

The Rate of Profitability after Subsidies has a positive value – 20.39%, i.e. rearing of Karakachan sheep in the mountainous regions of Bulgaria under the parameters of the study would be cost-effective.

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