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DETERMINATION OF AGRI-ENVIRONMENTAL SUPPORTING RATES TO PROTECT BIODIVERSITY OF INDIGENOUS SHEEP BREEDS

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Abstract

The main objective of this paper is to determine the supporting rates for indigenous sheep breeds in context of the agri-environmental policy measures in the Republic of Macedonia. Agri-environmental measures can provide different level of preservation of livestock biodiversity, contribute at building higher nature value farming systems and ensure sustainability of low input breeding systems. The method used is based on partial budgeting, as a criterion framework used to compare the costs and the benefits arising from choosing different sheep breeds (three autochthonous sheep breeds: Karakachanian, Sharplaninian and Ovchepolian, as opposed to the usual practise). Thus, all aspects of farm profits, as well as the matching variable and fixed costs that remain unchanged are excluded. This procedure emphasizes the changes in income and costs that result from rearing alternative breed and enables computation of the financial supporting rate, as upper ceiling compensating the economic loss of the farmer. Moreover, the supporting rates for different sheep breeds are adjusted in terms of endangerment gradation and geographical distribution, using fitted coefficients. Support rates differ among breeds and also among output alternatives (cheese finalisation i.e. milk sales). The highest support rate was estimated for Karakachanian sheep (3,675 MKD i.e. 2,610 MKD), followed by Ovchepolian sheep (2,067 MKD i.e. 1,578 MKD) while the lowest rate was noted for Sharplaninian sheep (1,723 MKD i.e. 1,315 MKD). The results and the analysis revealed variations of the supporting rates. These aspects should be taken into consideration for further validation of the agri-environmental measures.

Key words: agro-environmental measures, Karakachanian, Ovchepolian, Sharplaninian, supporting rates.

Introduction

Agri-environmental measures (AEM) can provide different level of preservation of livestock biodiversity, contribute at building higher nature value farming systems and ensure sustainability of low input breeding systems. These measures support payments to farmers in return for implementing agri-environmental commitments that involve more than the application of usual good farming practice (COM, 2005). The main objectives of these measures are to diminish the environmental risks caused by agriculture and preserve the landscape (*ibid*). Therefore the mentioned measures include general directions such as: reduction of inputs, extensification of livestock production, farming of local breeds of animals that are highly adapted to the conditions of breeding and biodiversity conservation (Uthes *et al*, 2007). The participation in these programs is optional and voluntary, envisaging certain remuneration to the farmers for their commitment. These measures tend to compensate the most profitable use of land as the essential production factor and “payment levels have to be set sufficiently high to attract farmers to join schemes while avoiding over-compensation” (COM, 2005), thus requiring calculation of appropriate support rates.

Some specific conditions, next to biodiversity conservation and management of genetic resources, must be fulfilled in order for AEM to be realized. Namely, AEM can be provided for “local breeds indigenous to the area and in danger of being lost to farming” (Commission Regulation, 1257/1999) if the breeds significantly contribute to maintenance of the local environment and typical breeding systems in the country. Eligibility of local breeds for inclusion in the appropriate payment structure are defined in Commission Regulation (EC) No. 817/2004 were the threshold of each population is determined. A number of breeding females from each species, beneath which a breed is considered to be endangered and which are included in recognized register, represent the main threshold parameter. According to this regulation the thresholds are 7.500 for cattle, 10.000 for sheep, 10.000 for goats, 5.000 for equidae, 15.000 for pigs and 25 000 for avian species (Commission Regulation (EC) No. 817/2004).
The breeding of rare local breeds indigenous to the area helps maintain the generic diversity, but also indirectly contributes to preserving the landscape (COM, 2005). For the farmers point of view, it is more profitable and convenient to rear more yielding and improved breeds, hence deepening the endangerment.
Sheep production systems (extensive and intensive) are generally connected to climatic conditions, economic characteristics in the country and planned size of the farm. The specific climatic conditions and landscape in as well long tradition are ideal for development of sheep industry. In the Republic of Macedonia extensive semi-nomadic sheep breeding system is dominant, although recently there have been attempts to intensify production in some new sheep farms. From mid-May to early November sheep are in the highland pastures and during the rest of the year in the winter pastures. Technology in most farms is traditional, meaning lambing once a season (January-February), suckling period of lambs is until March-April and lactation period is to mid-July.

The main objective of this paper is to determine the supporting rates for indigenous sheep breeds in context of the agri-environmental policy measures in the Republic of Macedonia.

Materials and methods

The method used is based on partial budgeting, as a criterion framework used to compare the costs and the benefits arising from choosing different sheep breeds (three autochthonous sheep breeds: Karakachanian, Sharplaninian and Ovchepolian, as opposed to the usual practise).
All names for Karakachanian sheep (Karakachanka, Black-Vlahian, Sara-Krachanian, Kuco-Vlahian, Albano-Vlahian and Karatsaniko) are associated with the name of the breeders of this sheep ethnic minority Vlahs. This breed has no concrete breeding region and often is breed in the most extensive region of the Republic of Macedonia. It is very resistant, modest and adaptive in extensive breeding conditions, vital and energetic animal, with lowest milk yield (24-26 l) per lactation. The coat color is grey-black and brown-black, but some time pure white individuals appear. The head is small with well spirally developed horns in rams, most of ewes are hornless (7-10% are horned). The wool is rough, coarse and long (up to 26 cm). The average weight of ewes is up to 33 kg and of rams is up to 44 kg. Regarding the tail length this breed belongs to the group of short tailed sheep.
Name of Sharplaninian population is originated from his originally area of breeding mountain massive Shar-Planina which is located in the Western part of the country. But today area of breeding of this sheep population is North-west and central part of the R. Macedonia. As the main characteristic of this pouplation is complete white pigmentation of head, ears and legs. The head is tidily small, rams have well developed horns and most of ewes are polled but

sometime can appear horned individuals. The average weight of ewes is up to 32.3 kg and of rams is up to 44.2 kg. Lactation period is on average 199 days with milk yield of 62.60 L per lactation (with variation from 61 up to 120 L). Today up to 30 % of sheep population in the Republic of Macedonia belongs to this sheep population.

The Ovchepolian sheep got his name from the Ovchepolian plateau, area of breeding of this population, which is localized in the Eastern part of the Republic of Macedonia. Typical represent of this population has always full or partial pigmented head. Head pigmentation is black or brown. Face pigmentation haze a shapeless spot which spans up to horn root, both visage sides up to mouth. Head is tightened and long. Snout is always black pigmented sometimes even in the interior of the mouth. Horns are well developed in rams but some time can appear individuals without horns, ewes are always pooled. The average weight of rams is up to 45 kg (35-48kg) and of ewes is up to 36kg (25-48kg). Lactation period is on average 191 days with average milk yield of 72.49 L, with great variation in milk yield (38.74L-91.28L). Today is present on 2/3 of the territory of the Republic of Macedonia.

The breeds supported by agri-environmental measure are compared to an average usual practice sheep population (case farm constructed on the base of the average statistical data where are raised crosses of Ovchepolian and Shraplaninian population with other improved sheep breeds).

The calculation of premia is typically performed on the basis on cost incurred and income foregone for the participating farmer in the agri-environmental program; support rate calculations are taking into account the variable costs and the loss of potential income. This procedure emphasizes the changes in income and costs that result from rearing alternative breed and enables computation of the financial supporting rate, as upper ceiling compensating the economic loss of the farmer. The calculated premia is expected to be “considerably higher than existing ones that cover marginal costs or marginal income forgone only” (COM, 2005). Though payments calculation or the support level considers additional costs and income foregone, some EU countries use combination of these elements and some even consider the transaction costs (Krisciukaitiene et al, 2007)

The partial budgeting approach emphasizes the changes in income and costs that result from implementing a specific alternative. Thus, all aspects of farm profits that are unchanged are excluded. In general, the fixed costs are regarded as equal, and in this case therefore omitted, so change is foreseen only in the area of the variable specific costs and in the yield/producer price level. The partial budget is flexible enough, analyses the impact of the profit on a certain change and can be used for analyzing a number of important decisions as modifying production practice is (www, Penn State). The format of a partial budget varies depending on the specific needs for the calculation, but additional costs, reduced revenue, additional revenue and reduced costs are always included in a partial budget no matter what the layout or organizational methods may be (Kay *et al.*, 2008).

Standard data regarding the technological features of the usual practice breed (crosses of Ovchepolian and Shraplaninian population with other improved sheep breeds) and the rare indigenous breeds were taken into account, in terms of typical outputs, and inputs. The output prices were gathered through the State Statistical Office (SSO, www), while input prices through direct farmer contacts.

Population thresholds (number of breeding females) below which a breed is considered to be endangered for the purposes of incentive payments are specified. The categorisation of the coefficient of endangerment is presented in Table 1, in local sheep populations is observed different level of endangerment.

Table 1. Categorisation of the coefficient of endangerment

Indigenous breed	Category	CE
Karakachanian (K)	(1) Critical, <300 heads	1,20
Ovchepolian (O)	(5) Not endangered, 3000 heads	1,01
Sharplaninian (Sh)	(5) Not endangered, 3000 heads	1,01

Additionally the geographical distribution coefficient values are added in order to illustrate geographical distribution of the breed (table 2) (Kastelic et al., 2006). Only Ovchepolian is determined as local, while the other two indigenous breeds are also present in neighboring countries.

Table 2. Categorisation of the coefficient of geographical distribution

Indigenous breed	Category	GD
Karakachanian (K)	Regional (in neighbouring countries)	1,00
Ovchepolian (O)	Regional (only in Macedonia)	1,20
Sharplaninian (Sh)	Local (in neighbouring countries)	1,00

The theoretical calculation of indicative supporting rates for breeding autochthonous sheep breeds was further based on application of the calculation formula distribution (Kastelic et al., 2006)**:** YS= E x CE x G,
where: YS = yearly support, E = economic loss, CE = coefficient of endangerment, GD = geographical distribution.
The conversion of these breeds estimated for the purpose of this paper into Livestock Units is as follows: Karakachanian (0.07), Sharplaninian and Ovchepolian (0.09).

Results and discussion

According to presented data in this research, based on official data, highest level of endangerment is noted for Karakachanian population. Thos population is the most endangered with less than 300 ewes, placed under the higher category of critical endangerment. Ovchepolian and Sharplaninian are ranked in the fifth category, with low level of endangerment.
Sheep farmers typically produce cheese as more profitable and less risky alternative to selling sheep milk to dairies. However, for illustration and comparison purposes, the economic loss of rearing autochthonous sheep is calculated also for the case of milk sales (Table 3 and 4).
The Karakachanian breed produces milk only to satisfy the needs for the lambs, hence resulting into visibly lower output value than all other breeds. The output volume and prices differ among the different alternatives; ranging from 1523 MKD in the case of Karakachanian up to 6868 MKD in the case of the usual practice breed. Once the partial cost items that differ among the alternatives are taken into account (excluding those costs that remain unchanged regardless the alternative breed reared), the economic loss in the “cheese option” is estimated at 1706 MKD for the Sharplaninian and Ovchepolian breeds, i.e. 3063 MKD for the Karakachanian breed.

Table 3. Partial budget of economic loss in usual practice versus autochthonous sheep production, cheese output option

Output values	**UP**	**K**	**O**	**Sh**
Milk yield (kg/ewe)	70	26	50	50
Milk for lambs (kg)	15	26	20	20
Cheese from remaining milk (kg)	15.7	/	8.6	8.6
Cheese price (MKD/kg)	260	/	260	260
Output value – cheese	**4086**	**/**	**2229**	**2229**
Wool	2.5	1.5	1.7	1.7
Wool price (MKD/kg)	25	15	15	15
Output value – wool	**62.5**	**22.5**	**25.5**	**25.5**
Lamb (kg)	17	10	12	12
Lamb price (MKD/kg)	160	150	150	150
Output value – lamb	**2720**	**1500**	**1800**	**1800**
Total output value	**6868**	**1523**	**4055**	**4055**
Partial differentiated costs (PDC) in MKD				
Alfalfa hay (MKD)	880	800	800	800
Concentrate feed (MKD)	1800	1200	1500	1500
Cheese processing costs	1603	/	874	874
Total PDCs	**4283**	**2000**	**3174**	**3174**
Partial difference	2585	-2283	-1109	-1109
Economic loss		**-3063**	**-1706**	**-1706**

In the case of “raw milk” sales (Table 4), the output value is lower in all four alternatives, but also the cost value is lowered since the cheese processing costs are omitted. The output value is 1523 MKD for the Karakachanian breed, 2696 MKD for the Sharplaninian and Ovchepolian breeds, and 4378 MKD for the usual practice. Expectedly, the economic loss is lower and is estimated at 1302 MKD for the Sharplaninian and Ovchepolian breeds, i.e. 2175 MKD for the Karakachanian breed.

Table 4. Partial budget of economic loss in usual practice versus autochthonous sheep production, milk output option

Output values	**UP**	**K**	**O**	**Sh**
Milk yield (kg/ewe)	70	26	50	50
Milk for lambs (kg)	15	26	20	20
Milk for sale (kg)	55	/	30	30
Milk price (MKD/kg)	29	/	29	29
Output value – milk	**1595**	**/**	**870**	**870**
Wool	2.5	1.5	1.7	1.7
Wool price (MKD/kg)	25	15	15	15
Output value – wool	**62.5**	**22.5**	**25.5**	**25.5**
Lamb (kg)	17	10	12	12
Lamb price (MKD/kg)	160	150	150	150
Output value – lamb	**2720**	**1500**	**1800**	**1800**
Total output value	**4378**	**1523**	**2696**	**2696**
Partial differentiated costs (PDC) in MKD				
Alfalfa hay	880	800	800	800
Concentrate feed	1800	1200	1500	1500
Total PDCs	**2680**	**2000**	**2300**	**2300**
Partial difference	1698	-680	-380	-380
Economic loss		**-2175**	**-1302**	**-1302**

The support rates are product of the economic loss and the coefficients of endangerment and geographical distribution; in the first option (Table 5), the support rates range from 1723

MKD/head or 21533 MKD/LU for Sharplaninian to 3675 MKD/head or 52506 MKD/LU for Karakachanian. In the raw milk sales option (Table 6), the highest support rate was estimated for Karakachanian sheep with 2,610 MKD/head or 37286 MKD/LU, followed by Ovchepolian sheep 1,578 MKD/head or 17534 or 37286 MKD/LU, while the lowest rate was for Sharplaninian sheep 1,315 MKD/head or 16438 or 37286 MKD/LU.

Table 5. Support rates for indigenous sheep breeds, with cheese output option

Breed	Support rate per head (MKD)	Support rate per head (€)	Support rate per LU (MKD)	Support rate per LU (€)
Karakachanian	3675	59.76	52506	853.76
Ovchepolian	2067	33.61	22968	373.47
Sharplaninian	1723	28.01	21533	350.13

Table 6. Support rates for indigenous sheep breeds, with milk output option

Breed	Support rate per head (MKD)	Support rate per head (€)	Support rate per LU (MKD)	Support rate per LU (€)
Karakachanian	2610	42.44	37286	606.27
Ovchepolian	1578	25.66	17534	285.10
Sharplaninian	1315	21.38	16438	267.28

Conclusions

The European experience is that the agri-environment measures are highly accepted by farmers, with a correspondingly high level of compliance. Having payment calculations in place, following the standard methods for estimation of the support rates, is of high importance in the processed of planning and projecting this type of measures.

In our research, we came to estimate that the support rates differ among breeds and also among output alternatives (cheese finalisation i.e. milk sales); The highest support rate was estimated for Karakachanian sheep (3,675 MKD i.e. 2,610 MKD), followed by Ovchepolian sheep (2,067 MKD i.e. 1,578 MKD) while the lowest rate was noted for Sharplaninian sheep (1,723 MKD i.e. 1,315 MKD). The results and the analysis revealed certain variations of the supporting rates, depending on the basis of calculating the output form. These aspects should be taken into consideration as range values when planning the agri-environmental measures.

Defining and implementation of specific AEM for indigenous sheep populations in the future will represent solid base for their preservation that directly will provide conservation, characterization and promotion of animal genetic resources in order to protect livestock biodiversity.

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