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ENVIRONMENTAL CONCERN AMONG SHEEP FARMERS IN BULGARIA

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Abstract

The aim of the research was to study the environmental concern among sheep farmers in Bulgaria. Questionnaire information was collected from 22 sheep farmers in Bulgaria about their attitude toward environmental protection. It was found that more than half (66.7%) of farmers tried to purchase on a regular base equipment or raw materials that pollute the environment less. 61.9% of the respondents considered environmental protection to be very high priority for the farm. None of the farmers stated that environmental protection was very low priority for the farm.
The surveyed Bulgarian sheep farmers were in general interested in environmental protection, they strove to purchase equipment and raw materials that were safe for the environment, but this wasn't always possible for them mainly due to lack of funds and insufficient awareness of environmental issues. We also concluded that the better competitiveness of the farm led to higher willingness for investing in environment friendly materials and equipment ($p < 0.05$). There was a tendency for an increase of the environmental concern with the increase of the competitiveness of farms. One of the methods for farmers to protect the environment was by usage of pesticides that did not affect bees and aquatic organisms, and packaging collection. Biggest part of manure and animal bedding were utilized as soil fertilizers. About a third of crop leftovers was used to feed sheep. Another part was used as bedding material. Only 13.6% of farmers used renewable resources and energy: solar photovoltaic and collecting rainwater in micro-dams. 45.5% of the farms had their own water source: water pump and / or micro-dam. A small part of the farmers (13.6%) had certified organic production: they produced organic meat, milk, and fodder.

Key words**:** *sheep farms, environmental protection, competitiveness*

INTRODUCTION

Agriculture is influenced by many risk factors, some of which may have adverse effect on a farm level [6]. It could be seen in sheep breeding: the sector provides traditional livelihoods for the population in rural areas. But in the last 20 years sheep farming in Bulgaria had largely lost its attractiveness, which reflected in the decrease in the number of animals: from 1,571.41 thousand heads in 2001 to 1,281 thousand heads in 2019 [7], [8]. Pollution, connected with animal husbandry is mainly due to nitrogenous substances [13]. Poor management in animal production can potentially provide harmful impact of the environment [11]. Waste management of farms is important topic and one of the problems it considers is the air pollution by farm animals [1].
Greenhouse gas emissions from the sheep sector in Bulgaria had also decreased significantly over the last two decades in parallel with the decrease in the number of animals: from 0.4843 gigagrams of methane (CH_4) in 2000 to 0.266 gigagrams in 2010 and 0.2502 gigagrams in 2018, respectively [5]. Therefore, in the period 2000 – 2018, there was a decrease of 48% of methane emitted by sheep. The same percentage of decrease was observed for the released nitric oxide (N_2O) (from 0.0862 gigagrams in 2000 to 0.0445 gigagrams in 2018) and for the emissions in carbon dioxide equivalent (from 36.8766 gigagrams in 2000 to 19.0509 gigagram in 2018). The methane emitted in 2018 by the total livestock sector in the country was 9.086 gigagrams, and sheep breeding accounted for 2.8% of this amount. The largest share was occupied by cattle breeding (50.7%), poultry breeding (23.7%) and pig breeding (20.5%) (own calculations, based on data [5]).
The protection of the environment is connected with the applied technologies in the sheep farms. The purchase of modern equipment with low fuel consumption and

high performance creates prerequisites for better care for the environment and more effective use of the raw materials and labor.
The aim of the research is to study the environmental concern among sheep farmers in Bulgaria.

MATERIALS AND METHODS

Questionnaire information was collected from 22 sheep farmers in Bulgaria about their attitude toward environmental protection. Farmers estimated through the scale from 1 to 5 to what extent the environmental protection was a priority in the activity of their farms by answering to the next statements:
-"Yes, I always try to purchase equipment or raw materials that pollute the environment less". With that statement the willingness for purchasing of equipment or raw materials that pollute the environment less was measured.
-"The care for the environment is a priority for my farm". With that statement the care for the environment as a priority was measured.
The studied farmers were divided into 3 groups according to the competitiveness of their farms: first group – farmers, who failed to cover the current expenses of the farm; second group – farmers, who covered all current expenses of the farm, but could not allocate funds for investments; third group - farmers, who managed to cover the current expenses of the farm and managed to invest in equipment, buildings or animals. The mean values of the groups were compared by ANOVA.
In order to gather information on the extent to which sheep farmers' activities fell within the scope of the term "clean technology", the following questions were asked:
-Do you utilize animal waste products?
-Are the waste products from fodder production / plant materials used as animal feed?
-Do you use renewable resources and energy?
-Is the sheep farm with its own water source?
The farmers were also asked if they had a certified organic production and what was it. They also answered if they were planning to buy new high-performance machinery on the farm.
The number of observations varied from 20 to 22, because some of the farmers didn't answer to all questions.

RESULTS AND DISCUSSIONS

It was found that 19% of respondents think that the statement "Yes, I always try to purchase equipment or raw materials that pollute the environment less" was absolutely not applicable to their farms, meaning that they did not try to buy equipment and raw materials that pollute less the environment (Fig. 1).

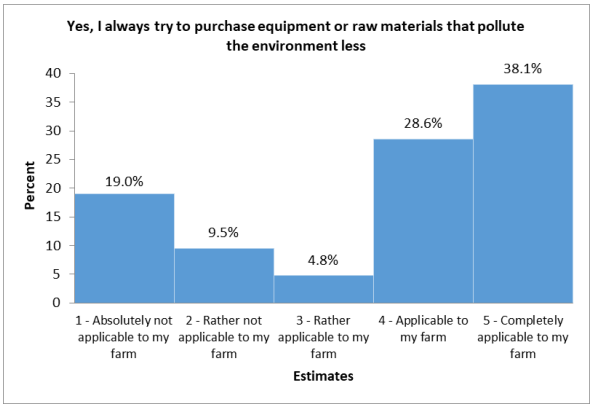

Fig 1. Willingness for purchasing of equipment or raw materials that pollute the environment less (n = 21)
Source: own calculations.

9.5% thought that the statement was rather not applicable to their farms, so these farmers were not so interested in at what extend the equipment and raw materials pollute the environment, although they considered this when they bought equipment and row materials. According to us the main reason for this was on the one hand, the insufficient information on environmental issues by some of the farmers, and on the other hand - the financial motives - more precisely, the additional costs of purchasing environmentally friendly equipment and materials.
4.8% of farmers thought that it was rather applicable to their farms. Respondents tried to buy materials that were environment friendly, but they made exceptions regularly. 28.6% of sheep farmers considered the statement as applicable to their farms and they often bought raw materials and equipment that

pollute less. 38.1% of farmers answered that they always comply with this.
So we concluded that more than half (66.7%) of farmers tried to purchase on a regular base equipment or raw materials that pollute the environment less (estimates 4 and 5).

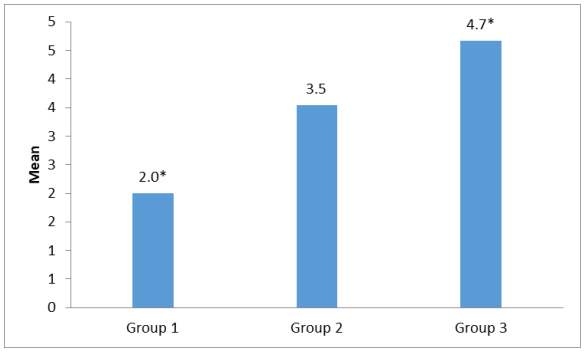

Fig 2. Mean values of the willingness for purchasing of equipment or raw materials that pollute the environment less
*The difference between the first and third group is significant at 5% level.
Source: own calculations.

The mean values for the three groups of farmers of their willingness to purchase equipment and raw materials that pollute less, were presented in Fig. 2.
The difference between the means of the groups was significant ($p < 0.05$).
The mean value of the indicator for the first group of farmers (those, who failed to cover the current expenses of their farms) differed significantly from the mean value of the third group (those, who managed to cover the current expenses of the farm and managed to invest in equipment, buildings or animals), meaning that the better competitiveness of farms led to stronger willingness to invest in environmentally friendly raw materials and equipment. The second group had a mean value of 3.5, lower than the third group, but higher than the first group. Although the mean value of the second group did not differ significantly from the other two groups, it indicated that the better competitiveness of the farm, the higher willingness for investing in environment friendly materials and equipment.

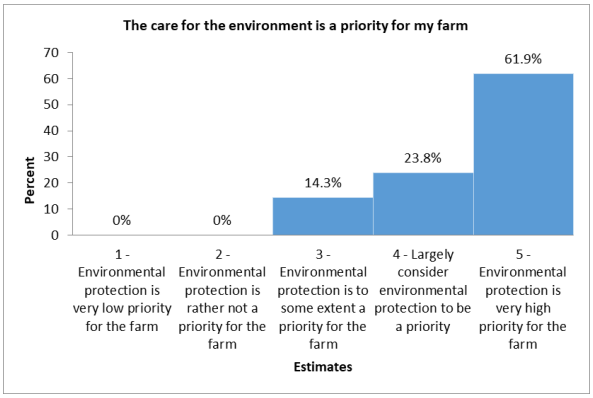

Fig 3. Care for the environment as a priority (n = 21)
Source: own calculations.

The present study found (Fig. 3), that 14.3% of the surveyed farmers stated that environmental protection was to some extent their priority; 23.8% largely consider environmental protection to be their priority. 61.9% considered environmental protection to be very high priority for their farms. None of the farmers stated that environmental protection was very low priority for the farm. It was noted by the farmers that usage of pesticides that did not affect bees and aquatic organisms, and packaging collection were one of the methods to protect the environment.

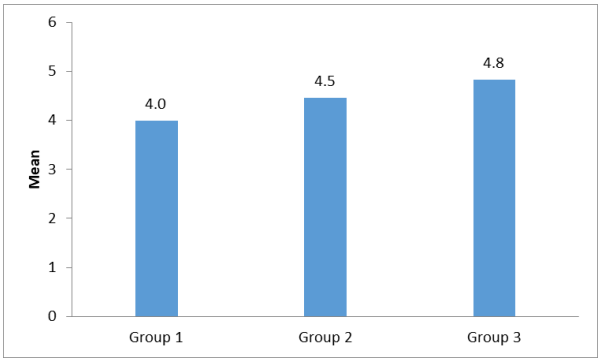

Fig 4. Mean values of the care for the environment as a priority
Source: own calculations.

The mean value for the first group was 4.0, for the second group the indicator was 4.5 and for the last group it was slightly higher than the second group - 4.8 (Fig. 4). The differences between the groups were not significant, but they presented a tendency for an increase of the environmental concern with the increase of the competitiveness of farms.

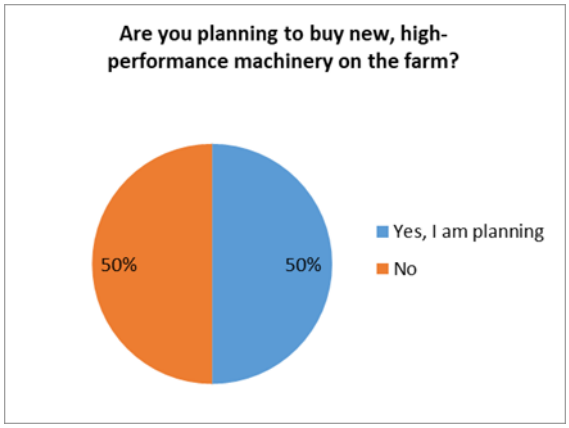

Fig 5. Plans for buying new, high-performance machinery (n = 22)
Source: own calculations.

50% of farmers were willing to buy new, high-performance machinery, and the remaining 50% of sheep farmers did not have such plans (fig. 5).

The application of clean technologies in agriculture gain importance as a sequence of its negative environmental impact [12]. One of the ways to reduce the harmful impact of animal husbandry on the environment is by applying clean technologies on a farm level as far as possible.

Clean technologies are those that lead to more efficient use of resources, generate less pollution to the environment; for the production is used as little energy as possible; generate less waste and recycle waste materials where possible [2], [3], [10].

Organic farming is connected with clean technologies, because in both there is a desire to reduce environmental pollution.

In organic farming, the use of conventional plant protection products, fertilizers, hormones and, as a last resort, antibiotics for the treatment of animals, is limited. Organic farming aims to restore soil fertility through appropriate agri-environmental practices; to grow resistant plant varieties and animal breeds; to reduce pasture depletion, environmental pollution and soil erosion [4].

From the point of view of clean technologies, the utilization of waste products from animal husbandry and crop production helps to reduce environmental pollution. The data about renewable resources usage and organic production was presented in table 1. 63.6% of farmers from the present study utilized livestock waste. Sheep farmers answered that they used manure from their animals and used bedding materials to fertilize arable land, pastures and meadows. 35% of farmers used leftovers from their crop production to feed the sheep. The straw obtained from cereals was used as bedding material indoor, as well as feed. Only 13.6% of farmers used renewable resources and energy: solar photovoltaic and collecting rainwater in micro-dams. 45.5% of the farms had their own water source: water pump and/or micro-dam. A small part of the farmers (13.6%) had certified organic production: they produced organic meat, milk, and fodder.

By using the waste products in the next production cycle, the resources are utilized more efficiently. In turn, organic farming helps to reduce contamination of soil, water and air with plant protection products and fertilizers by creating in that way healthier environment.

Renewable energy production, especially from wind and solar, is an alternative to fossil fuel energy production, leading to lower carbon emissions and pollution [9]. Having own water source in the farm, especially when it is connected with collecting rainwater, helps to use natural resources more efficiently: rainwater replaces drinkable water that would otherwise come from a public water source and is proper for household needs.

Table 1. Renewable resources usage and organic production

Do you utilize animal waste products?(n=22)		**Are the waste products from fodder production/plant materials used as animal feed?(n=20)**	
Yes%	No %	Yes%	No %
63.6	36.4	35	65
Do you use renewable resources and energy? (n=22)		**Has the sheep farm its own water source? (n=22)**	
Yes%	No %	Yes%	No %
13.6	86.4	45.5	54.5
Do you have certified organic production? (n=22)			
Yes%	No %		
13.6	86.4		

Source: own calculations.

CONCLUSIONS

More than half (66.7%) of farmers tried to purchase on a regular base equipment or raw materials that pollute the environment less. 61.9% of the respondents considered environmental protection to be very high priority for the farm. None of the farmers stated that environmental protection was very low priority for the farm.

The surveyed Bulgarian sheep farmers were in general interested in environmental protection, they strove to purchase equipment and raw materials that were safe for the environment, but this was not always possible for them mainly due to lack of funds and insufficient awareness of environmental issues.

We also concluded that the better competitiveness of the farm led to higher willingness for investing in environment friendly materials and equipment ($p < 0.05$). There was a tendency for an increase of the environmental concern with the increase of the competitiveness of farms. One of the methods for farmers to protect the environment was by usage of pesticides that did not affect bees and aquatic organisms, and packaging collection.

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