

## AGRICULTURAL ACTIVITIES AS AN ADDITIONAL WORK FOR SHEEP FARMERS IN BULGARIA

Tsvetana HARIZANOVA – METODIEVA, Nikola METODIEV

Institute of Animal Science, Kostinbrod, Bulgaria, 2232, E-mails: ts\_harizanova@abv.bg; n\_metodiev@abv.bg

**Corresponding author:** ts\_harizanova@abv.bg

### Abstract

*The aim of the present study is to analyze the agricultural activities (tillage applied and the types of crops grown) as an additional work for sheep farmers in Bulgaria. The information from the survey was gathered from 14 Bulgarian sheep farmers. Out of 14 farmers, 4 of them (29%) alternate autumn crops (maize, wheat, rye, triticale) with spring crops (oats, peas) or with alfalfa, and one farmer leaves cultivated areas fallow every two years due to the increased acidity of the soil. Farmers who do not practice crop rotation mostly grow alfalfa. Two of the farmers (14%) stated that they grow alfalfa as a monoculture. The majority of farmers (87%) grow leguminous fodder for feeding sheep, and half (53%) of farmers grow cereals. Of the tillage methods used for soil preparation among the surveyed sheep farmers, it is the most applied deep ploughing (57.2%), followed by disking (42.8%), shallow ploughing (35.7%) and lastly harrowing (21.5%) and other tillage methods (21.5%). More than half of farmers (64.3%) do not use plant protection products, 28.6% apply conventional products, and 7.1% - products compatible with organic farming. The prevailing part of farmers (42.9%) applied both mechanical and chemical means of control of weeding. Half of the farmers answered that they only fertilize with animal manure.*

**Key words:** sheep farmers, tillage applied, crops, control of weeds, fertilizers

### INTRODUCTION

Fodder production is needed for feeding farm animals, including sheep. Although sheep in Bulgaria can be raised, in the majority of cases, entirely on pasture during the summer season, during the winter season it is necessary to feed them with concentrated, juicy and coarse fodder. For this reason, the prevailing part of sheep farmers produce fodder and, accordingly, cultivate own and/or rented lands. To produce profitable sheep production, it is necessary to keep production costs under control, and farmers strive to reduce the cost of production of milk and animals for sale. For this reason, a large number of sheep farmers prefer to produce at least part, if not all, of the necessary fodder for the animals, with the idea being that the cost of the produced fodder is lower than the purchase price on the market. For this reason, the production of fodder is an inseparable part of the production activity of many sheep farms in Bulgaria. The sale of fodder is also an additional income for sheep farmers, important for the financial efficiency of the

farms, and more precisely: surplus amounts of fodder produced by the farmers are sold [6].

Tillage, fertilization of soil, plant protection methods, irrigation systems, crop rotation, weed control and the condition of agricultural machinery are an integral part of forage production, which has a direct impact on the farm efficiency. Fertilizers and soil improvers are plowed into the soil during tillage.

Tillage of the soil is needed for the aeration of the soil, weed, temperature, water and moisture control [11]. Different tillage methods affect weed density and thus generate different levels of production costs for farmers [9]. It was found that conventional tillage is connected with higher production costs, time and energy, compared to conservation tillage [2]. Conservation tillage is important for the keeping of productivity of crops and for restoration of degraded lands [12], as well as this method is effective for the water management, prevention of the erosion process [3]. Also conservation tillage can foster fertility of land and yields [7]. Proper tillage management improves yields and contributes to the reduction of atmospheric

carbon dioxide by sequestration of soil organic carbon [8].

The aim is to analyze the tillage methods applied and the types of crops grown by Bulgarian sheep farmers.

## MATERIALS AND METHODS

The information was gathered from 14 Bulgarian sheep farmers by the survey interview method. The farmers were asked the following questions:

- What crop rotation do you practice?
- Do you grow monocultures?
- What irrigation system do you use?
- What crops do you grow on the arable land?
- What tillage methods do you apply?
- What plant protection products do you apply?
- How do you control weeds?
- What do you fertilize the land with?
- Which of the statements describes the best used agricultural machinery on the farm?

The possibilities for answer are: I do not have agricultural machinery and I do not use it; I rent someone else's equipment / services; most of my equipment is old, but with low to medium fuel consumption; my equipment is old and has a high fuel consumption; most of my equipment is new and with low fuel consumption; most of my equipment is new, but with medium fuel consumption.

## RESULTS AND DISCUSSIONS

Out of 14 farmers, 4 of them (29%) alternate autumn crops (maize, wheat, rye, triticale) with spring crops (oats, peas) or with alfalfa, and one farmer leaves cultivated areas fallow every two years due to the increased acidity of the soil. Farmers who do not practice crop rotation mostly grow alfalfa. Two of the farmers (14%) stated that they grow alfalfa as a monoculture. Only 1 farmer irrigates about 80% of the alfalfa arable land with sprinkler irrigation. The remaining farmers practice non-irrigated agriculture.

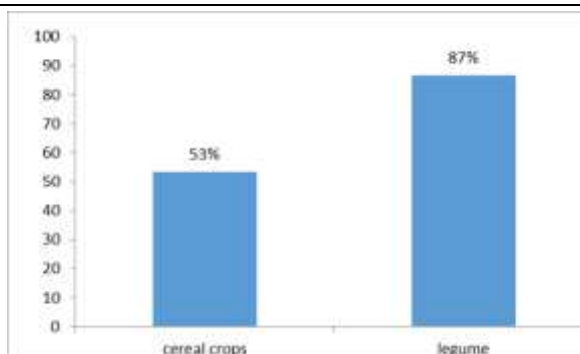


Fig. 1. What crops do you grow on the arable land? \* n=14

\* The sum of the percentages is over 100, because most farmers grow more than one crop.

Source: Own calculations.

It was found that the majority of farmers (87%) grow leguminous fodder for feeding sheep, and half (53%) of farmers grow cereals (Fig.1). Studies have shown that adding alfalfa to lamb diets increases profit compared to straw or hay [10].

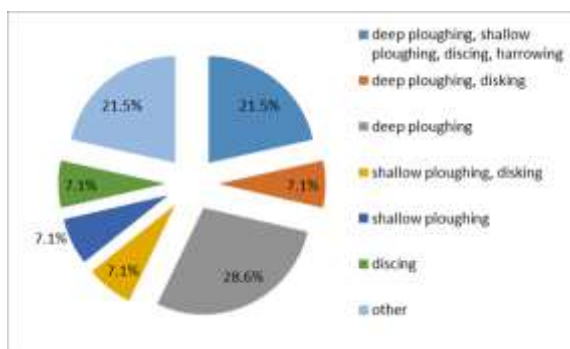


Fig. 2. Tillage methods applied (n=14)

Source: Own calculations.

Of the tillage methods used for soil preparation among the surveyed sheep farmers, it is the most applied deep ploughing (57.2%), followed by discing (42.8%), shallow ploughing (35.7%) and lastly harrowing (21.5%) and other tillage methods (21.5%) (Fig.2). About 1/3 of farmers apply more than 1 tillage method (35.7%). 21.5% of farmers practice: deep ploughing, shallow ploughing, discing and harrowing; 7.1% - deep ploughing and discing; 28.6% - only deep ploughing; 7.1% - shallow ploughing and discing; 7.1% - discing only.

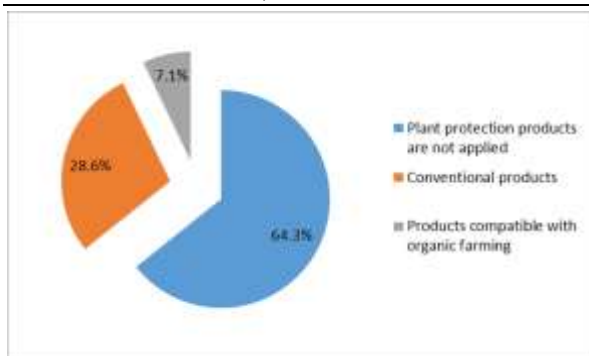


Fig. 3. Plant protection products applied (n=14)  
Source: Own calculations.

Plant protection products applied from the the surveyed sheep farmers are presented on Fig. 3. More than half (64.3%) do not use plant protection products. 28.6% apply conventional products, and only 7.1% - products compatible with organic farming. It has been found that consumers are attracted to organic food, which they perceive to be healthier when compared to that produced by conventional agriculture [5].

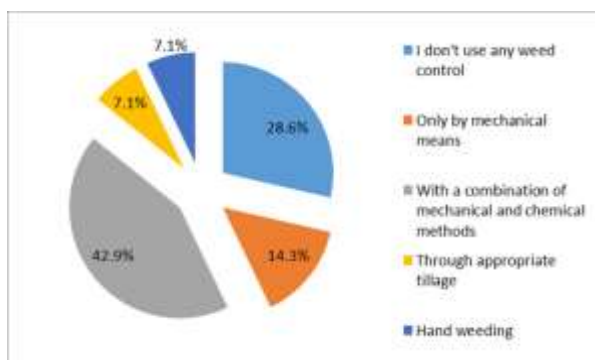


Fig. 4. How do you control weeds?  
Source: Own calculations.

When asked how you control weeding (Fig. 4), 28.6% of farmers answered that they do not apply any weeding control method; 14.3% control weeds with the help of mechanical means; the majority of farmers (42.9%) applied both mechanical and chemical means of control; 7.1% - through appropriate tillage and 7.1% - through hand weeding. Losses from weeds have been found to exceed losses from any other agricultural pest and can reduce yields with 50% or more through competition for water [1].

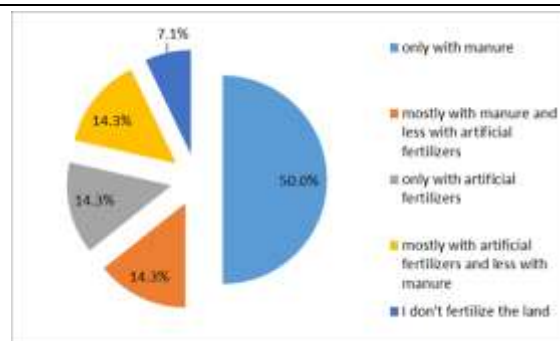


Fig. 5. What do you fertilize the land with (n=14)?  
Source: own calculations.

To the question "What do you fertilize the land with?" (Fig. 5), half of the farmers answered that they only fertilize with animal manure. An equal percentage of farmers (14.3%) mainly use manure and less artificial fertilizers; fertilize only with artificial fertilizers; fertilize mainly with artificial fertilizer and less with manure. 7.1% of sheep farmers do not fertilize the land. Application of sheep manure to contaminated soils has been found to improve plant growth [4].

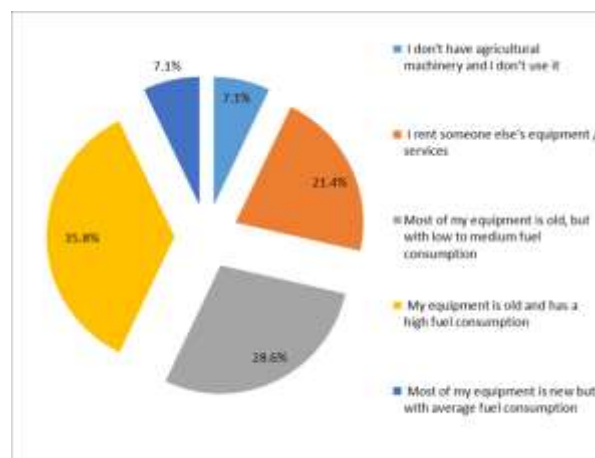


Fig. 6. Which of the statements describes the best used agricultural machinery on the farm ? (n=14)  
Source: own calculations.

Fig. 6 shows the distribution of sheep farms in terms of the agricultural machinery used. Only 7.1% of farmers do not have and use agricultural machinery. 21.4% of sheep farms rent someone else's equipment / services; in 28.6% of farms, the equipment owned is mostly old, but with low to medium fuel consumption. In 35.8% of the farms, the equipment owned is old and with high fuel consumption. It is noteworthy that none of the farmers indicated the option "most of my equipment is new and with low fuel

consumption". 7.1% of the respondents indicated that most of the equipment is new, but with average fuel consumption.

## CONCLUSIONS

We can conclude that a large part of the interviewed farmers cultivated land and harvested fodder crops in order to support the activity of the farm, provide quality forages and reduce the cost of feeding the animals. It was found that the majority of farmers (87%) grow leguminous fodder for feeding sheep, and half (53%) of farmers grow cereals. Out of 14 farmers, 4 of them (29%) alternate autumn crops (maize, wheat, rye, triticale) with spring crops (oats, peas) or with alfalfa, and one farmer leaves cultivated areas fallow every two years due to the increased acidity of the soil. Farmers who do not practice crop rotation mostly grow alfalfa. Of the tillage methods used for soil preparation among the surveyed sheep farmers, it is the most applied deep ploughing (57.2%), followed by disking (42.8%), shallow ploughing (35.7%) and lastly harrowing (21.5%) and other tillage methods (21.5%). More than half of farmers (64.3%) do not use plant protection products, 28.6% apply conventional products, and 7.1% - products compatible with organic farming. The prevailing part of farmers (42.9%) applied both mechanical and chemical means of control of weeding. Half of the farmers answered that they only fertilize with animal manure.

## REFERENCES

- [1]Abouziena, H.F., Haggag, W.M., 2016, Weed control in clean agriculture: A review. *Planta Daninha*, Viçosa-MG, 34(2), 377-392.
- [2]Akbarnia, A., Farhani, F., Heidary, B., 2013, Economic comparison of tillage and planting operations in three tillage systems. *Agric Eng Int: CIGR Journal*, 15(4): 180–184.
- [3]Amini, S., Asoodar, M.A., 2015, The effect of conservation tillage on crop yield production. *Elixir Agriculture* 84 (2015), 33927-33930.
- [4]Elouear, Z., Bouhamed, F., Boujelben, N., Bouzid, J., 2016, Application of sheep manure and potassium fertilizer to contaminated soil and its effect on zinc, cadmium and lead accumulation by alfalfa plants. *Sustainable Environment Research*, Vol. 26(3), 131-135, <https://doi.org/10.1016/j.serj.2016.04.004>, Accessed on Sept. 10, 2024.
- [5]Gomiero, T., 2018, Food quality assessment in organic vs. conventional agricultural produce: Findings and issues. *Applied Soil Ecology*, Vol. 123, p. 714-728, <https://doi.org/10.1016/j.apsoil.2017.10.014>, Accessed on Sept. 10, 2024.
- [6]Harizanova – Metodieva, Ts., 2021, Competitiveness in sheep farming - status, analysis and trends. Monograph. Institute of Animal Science – Kostonbrod.
- [7]Li, H., Zhang, Y., Sun, Y., Liu, P., Zhang, Q., Wang, X., Wang, R., Li, J., 2023, Long-term effects of optimized fertilization, tillage and crop rotation on soil fertility, crop yield and economic profit on the Loess Plateau. *European Journal of Agronomy*, Vol. 143, 126731, <https://doi.org/10.1016/j.eja.2022.126731>, Accessed on Sept. 10, 2024.
- [8]Li, S., Hu, M., Shi, J., Tian, X., Wu, J., 2021, Integrated wheat-maize straw and tillage management strategies influence economic profit and carbon footprint in the Guanzhong Plain of China. *Science of The Total Environment*, Vol. 767, 145347, <https://doi.org/10.1016/j.scitotenv.2021.145347>, Accessed on Sept. 10, 2024.
- [9]Ozpinar, S., Ozpinar, A., 2011, Influence of tillage and crop rotation systems on economy and weed density in a semi-arid region. *Journal of agricultural science and technology (JAST)*, 13(5), 769-784., <https://sid.ir/paper/63092/en>, Accessed on Sept. 10, 2024.
- [10]Rong, Y., Yuan, F. and Johnson, DA., 2014, Addition of alfalfa (*Medicago sativa* L.) to lamb diets enhances production and profits in northern China. *Livestock Research for Rural Development*, 26 (12) 2014, Article #224, <http://www.lrrd.org/lrrd26/12/rong26224.htm>, Accessed on Sept. 10, 2024.
- [11]Šarauskis, E., Kriauciūnienė, Z., Romaneckas, K., Buragienė S., 2018, Impact of Tillage Methods on Environment, Energy and Economy. In: Lichtfouse, E. (eds) *Sustainable Agriculture Reviews* 33. Sustainable Agriculture Reviews, Vol 33. Springer, Cham, [https://doi.org/10.1007/978-3-319-99076-7\\_2](https://doi.org/10.1007/978-3-319-99076-7_2), Accessed on Sept. 10, 2024.
- [12]Zhang, Y., Zhang, Y., Gao, Y., McLaughlin, N.B., Huang, D., Wang, Y., Chen, X., Zhang, S., Liang A., 2024, Effects of tillage practices on environment, energy, and economy of maize production in Northeast China. *Agricultural Systems*, Vol. 215, March 2024, 103872.