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Greenhouse gas mitigation and soil carbon sequestration practices in the sheep sector

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Abstract

Greenhouse gas (GHG) emissions from sheep production contribute 8 per cent to global GHG emissions from the livestock sector. In some countries, GHG emission intensity from sheep meat production even accounts for the highest share of the country's GHG emission intensity from the livestock sector. However, little is known about the sheep sector's current GHG mitigation and soil organic carbon (SOC) sequestration practices. Therefore, this study aims to identify policies and actors promoting these practices as well as what kind of practices are adopted, including adoption barriers. Data were collected in 2022 through a survey of 16 agricultural economic experts from 12 countries (Algeria, Argentina, Australia, Canada, Colombia, France, Germany, India, Iran, Peru, Spain and Tunisia). The results reveal that governments in 11 out of 12 countries have implemented at least one policy instrument to promote GHG mitigation and SOC sequestration practices with relevance for sheep production. These are often soft policy instruments such as research and development and/or farmers' training. Research bodies and independent farm advisors are the non-governmental stakeholders that are most active in promoting these practices. On average, farmers in the selected countries are likely to adopt animal management practices or practices that enhance productivity to reduce GHG emissions.
The practices that farmers most likely adopt are feeding a diet balanced in energy and protein, increasing diet digestibility, increasing the lamb growth rate for earlier finishing and improving ewe nutrition in late gestation. However, the adoption of soil and pasture management practices to reduce GHG emissions or enhance SOC is less likely. This is especially the case for practices related to pasture renovation and plant selection, land use change, fertiliser and nutrient management or soil moisture. Avoid conversion of peatlands is the practice that has been selected most often to be unlikely adopted by farmers. The adoption of practices that enhance productivity is mainly prevented by economic barriers (e.g. uncertain returns and results as well as hidden costs). Behavioural/psychological barriers (e.g. conflict with traditional methods) are the main reason for the non-adoption of soil and pasture as well as animal management practices.

Keywords: Adoption barriers, adoption of GHG mitigation practices, sheep production

Introduction

GHG emissions from sheep production contribute 8 per cent to global GHG emissions from the livestock sector (FAOSTAT, 2022). In Australia, Brazil, Colombia, Ireland, Jordan, New Zealand, Tunisia, United Arab Emirates, United Kingdom and Uruguay, GHG emission intensity (CO2eq per kg live weight) from sheep meat production even accounts for the highest share of the country's GHG emission intensity from the livestock sector.

Albania, Bangladesh, Sudan, Armenia, Burundi, Montenegro, Somalia and Syria, mention sheep or small ruminants in their NDCs (Climate Watch, 2022), indicating the importance of this livestock category regarding their national climate change actions.

Ongoing efforts to reduce GHG mitigation from sheep production, e.g. by the EU LIFE Green Sheep project (Life Green Sheep, 2022) or by a project of the FAO-Turkey Partnership Programme on Food and Agriculture on "Improving efficiency of small ruminants production for reduction of the GHG emission intensity" (FAO, 2021) highlight the importance of this topic.

However, little is known about the sheep sector's current GHG mitigation and soil organic carbon (SOC) sequestration practices. To improve information in this area, the author has conducted an online survey with *agri benchmark* sheep partners to identify policies and actors promoting these practices as well as what kind of practices are adopted, including adoption barriers.

Material and Methods

The survey was answered by 16 agricultural economics experts from 12 countries in the timespan of 17th May 2022 and 9th June 2022. The unique infrastructure of the *agri benchmark* beef and sheep network was exploited to reach out to agricultural economics experts.

The questionnaire included 6 sections. First, the experts have been asked which country they come from and their contact details. In Section 2, the agricultural economists selected all policy instruments and actors that promote GHG mitigation and soil carbon sequestration practices in the sheep sector in their countries. Afterwards, the experts indicated the likelihood of the adoption of different GHG mitigation and soil carbon sequestration practices by farmers in their country (very likely/likely/neutral/unlikely/very unlikely). Following Jones (2014), these practices have been clustered into three categories: animal management practices, practices that enhance productivity and soil and pasture management practices. In Sections 4 and 5, the experts had the chance to specify the reasons for the adoption of all practices that are very likely/likely to be adopted and the adoption barriers for all practices that are unlikely/very unlikely to be adopted. Finally, the experts could list best practices from their point of view and provide a final statement.

The questionnaire had been sent out to 127 experts from 41 countries. A total of 16 answered questionnaires equal a response rate of 12.6 per cent.

Results and Discussion

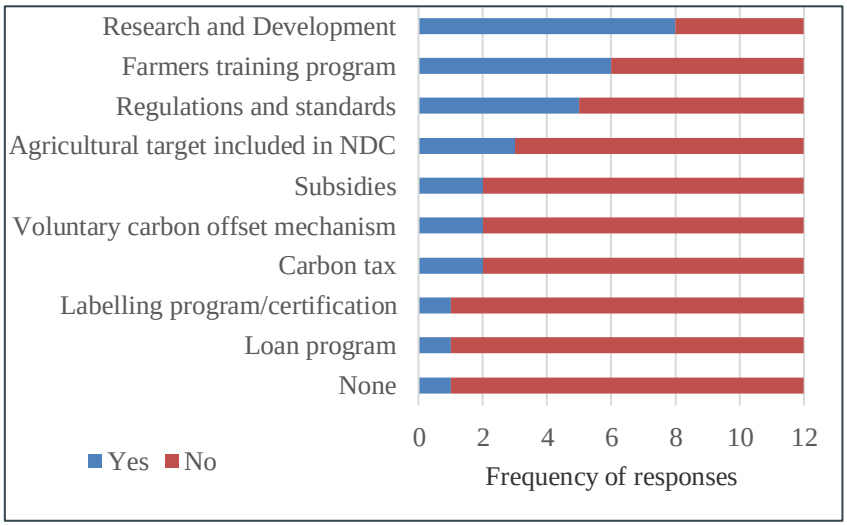

Figure 1: Policy instruments to promote GHG mitigation and/or SOC sequestration relevant to sheep production

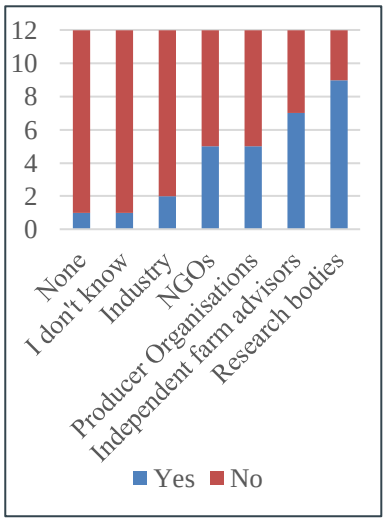

Figure 2: Non-governmental stakeholders promoting GHG mitigation and/or SOC sequestration practices in the sheep sector

As shown in Figure 1, almost all experts consulted, except for one, stated that the countries they are located in have implemented at least one policy instrument to promote GHG mitigation and SOC sequestration that is relevant to sheep production. However, no expert confirmed that price support has been chosen for this purpose. According to 83 per cent of the experts consulted, the focus of their country's national government is on soft policy instruments such as research and development and/or farmers' training programs.

As shown in Figure 2, this focus is also reflected by the non-governmental stakeholders that are most often involved in the promotion of GHG mitigation and/or SOC sequestration practices in the sheep sector in the countries considered in this survey: research bodies and independent farm advisory. According to the experts consulted, stakeholders in almost all countries, except for one, promote GHG mitigation/SOC practices.

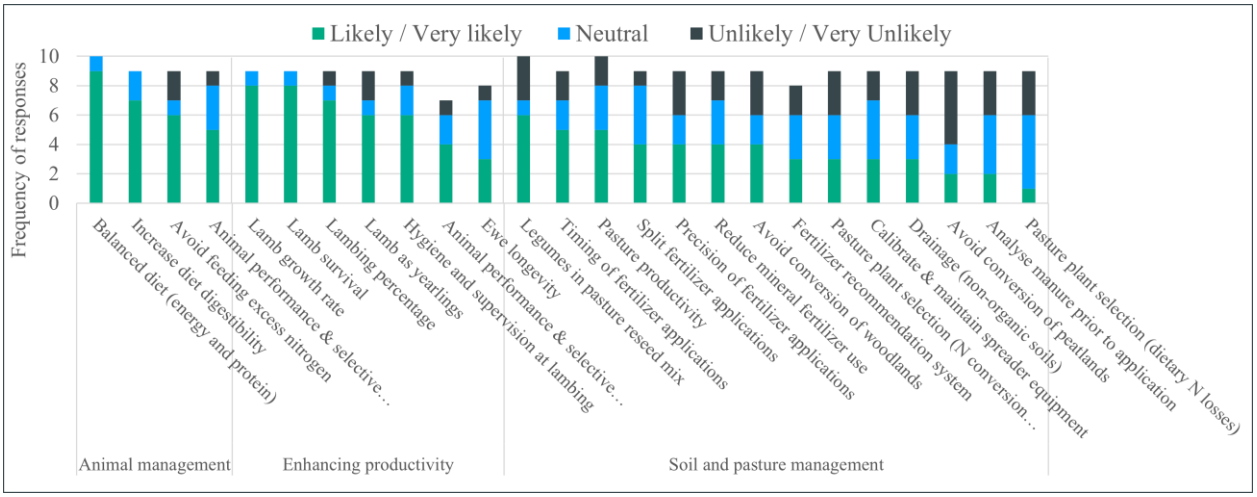

Figure 3: Likelihood of adoption of GHG mitigation and SOC sequestration practices

Figure 3 shows that, on average, only one of the experts stated that farmers in their home countries are unlikely/very unlikely to adopt any animal management practice or a practice that

enhances productivity. All experts who replied expect that the following practices are going to be adopted by the farmers in their country: (1) Feed a diet balanced in energy and protein, (2) Increase diet digestibility, (3) Increase the lamb growth rate for earlier finishing, (4) Improve ewe nutrition in late gestation to increase lamb survival.
The adoption of soil and pasture management practices is less likely. For half of the selected practices between 25 per cent and 42 per cent of the experts have mentioned that adoption of these practices is unlikely/very unlikely. These practices are related to pasture renovation and plant selection, land use change, fertilizer and nutrient management or soil moisture management. The practice that most often has been selected by the experts to be unlikely or very unlikely adopted by farmers in their home countries is: Avoiding the conversion of peatlands.

The survey results have shown that the adoption of practices that enhance productivity is mainly prevented by economic barriers (e.g. uncertain returns and results as well as hidden costs). Behavioural/psychological barriers (e.g. conflict with traditional methods) are the main reason for the non-adoption of soil and pasture as well as animal management practices.

Conclusions and Outlook

This study shows that the sheep sector does not play yet an important role in national climate policies (of the selected countries) but governments started to implement soft policy instruments.
Other stakeholders (mainly research bodies and independent farm advisors) are already promoting GHG mitigation and SOC sequestration practices. Some of the practices are likely/very likely to be adopted and thereby offer great potential for the sheep sector to reduce GHG emissions and sequester SOC.
Since economic barriers play an important role, cost-benefit analyses of GHG mitigation and SOC sequestration practices in the sheep sector may be helpful to guide policy actors and non-governmental stakeholders on which practices to promote/support.

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References

Climate Watch, 2022. *Explore Nationally Determined Contributions (NDCs)*. Available at: https://www.climatewatchdata.org/ndcs-explore. (Accessed 15th August 2022).

FAO, 2021. *Improving efficiency of small ruminants production for reduction of the GHG emission intensity*. Available at: https://www.fao.org/3/cb5251en/cb5251en.pdf (Accessed 5th June 2022).

FAOSTAT, 2022. *Data*. Available at: https://www.fao.org/faostat/en/#data. (Accessed 6th July 2022).

Jones, A.K., 2014. *The mitigation of greenhouse gas emissions in sheep farming systems*. Bangor University (United Kingdom).

Life Green Sheep, 2022. *Life Green Sheep*. Available at: https://life-green-sheep.eu/. (Accessed 5th June 2022).